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ADULT Parenteral Drug Therapy Manual Downtime Procedure Only

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Part of Lower Mainland Pharmacy Services

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ADULT Parenteral Drug Therapy Manual Downtime Procedure

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External Links:

Cancer Drug Monographs	http://www.bccancer.bc.ca/health-professionals/clinical-resources/cancer-drug-manual/drug-index
Cancer Drug Manual	http://www.bccancer.bc.ca/health-professionals/clinical-resources/cancer-drug-manual
If Cancer Drug monographs /manual links are also down, go to:	H:\EVERYONE\SYSTEMIC\Chemo\Downtime Access to Protocols
Immunization	http://www.bccdc.ca/health-professionals/clinical-resources/communicable-disease-control-manual/immunization
Lexicomp	http://online.lexi.com/lco/action/home
Neonatal drug information	https://your.healthbc.org/sites/Neonatal/_layouts/15/start.aspx#/Neonatal%20Drug%20Guidelines/Forms/AllItems.aspx
Pediatric parenteral drug information	http://infosource/cw/content/cw_Parenteral_Man/content/home.asp

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acetaminophen

Warnings	Classification	Alternate Names
	analgesic, antipyretic	

Indications

- short term management of mild to moderate pain and/or fever (monotherapy or as an adjunct) when administration by IV route is deemed clinically necessary
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- premixed single use bags: 1000 mg in 100 mL (10 mg/mL)
- store at room temperature, in the original container including the metalized overpack (to protect from light)

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ 1000 mg: use premixed bag of 1000 mg in 100 mL ▪ less than 1000 mg: transfer dose from premixed bag into empty sterile bag (obtain bag from stores or pharmacy) ▪ infuse undiluted over 15 minutes	Advanced Monitoring baseline BP, then every 15 minutes for one hour after the end of the infusion
Continuous IV infusion	NO		

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acetaminophen

Dosage

Maximum daily doses, refer to total amount of acetaminophen from all routes of administration and all products that contain acetaminophen.

- 50 kg or more: 1000 mg every 6 hours or 650 mg every 4 hours; maximum single dose is 1000 mg; maximum daily dose: 4000 mg/day
- less than 50 kg: 12.5 mg/kg every 4 hours or 15 mg/kg every 6 hours; maximum single dose: 15 mg/kg/dose; maximum daily dose: 75 mg/kg/day (to a maximum of 3750 mg/day)
  note: some experts recommend this reduced dosing if used in patients with chronic alcoholism, malnutrition, or dehydration regardless of weight

Hepatic impairment:
- mild to moderate impairment: consider dosage reduction
- severe impairment: do NOT use acetaminophen

Potential Hazards of Parenteral Administration

- injection site pain
- hypersensitivity reactions including anaphylaxis (rare)
- hypotension (infrequent reports in the literature of significant hypotension, within 30 minutes of the end of the infusion)

Important Implications

Contraindications/Cautions
- *Contraindication*: severe hepatic impairment or severe active liver disease
- *Caution*:
  - hepatic impairment or active hepatic disease, heavy alcohol use, and chronic malnutrition
  - hypovolemia (e.g. due to dehydration or blood loss)
  - glucose 6 phosphate dehydrogenase (G6PD) deficiency

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *GI*: nausea, vomiting; hepatotoxicity and hepatic failure-typically associated with doses that exceed the maximum daily dose
- *CVS*: hypertension, hypotension, peripheral edema (adults)
- *CNS*: headache, insomnia
- *skin*: reactions including acute generalized exanthematous pustulosis, Stevens-Johnson syndrome, and toxic epidermal necrolysis (rare)

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acetazolamide

Warnings	Classification	Alternate Names
	carbonic anhydrase inhibitor, diuretic	DIAMOX acetazolamide sodium

Indications

- rapid reduction of intraocular pressure (IOP) in glaucoma
- treatment of metabolic alkalosis when oral route is not feasible
- diuretic for congestive heart failure (CHF) or drug induced edema

Reconstitution and Stability

- 500 mg vial: reconstitute with sterile water for injection 5 mL to provide 100 mg/mL solution

Compatibility

- Compatible with dextrose, saline, dextrose-saline combination, ringers and lactated ringers.

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	*preferred route* give undiluted, over 1 to 3 minutes maximum rate: 500 mg/minute	Basic Monitoring
IV intermittent*	YES	dilute dose in 50 mL; give over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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acetazolamide

Dosage

Treatment of acute or secondary closed-angle glaucoma:
- 250 to 500 mg IV direct or IV intermittent; then 125 to 250 mg IV Q4H. Maximum:1 g/24 hours
- creatinine clearance 10 to 50 mL/minute: 125 to 250 mg Q12H

Metabolic alkalosis:
- 500 mg IV direct once, improvement should occur within 2 hours

CHF or drug induced edema:
- 250 to 375 mg IV direct or IV intermittent once daily
- If diuretic effect declines after initially responding, hold acetazolamide for 1 day. Then, administer on alternate days or once daily for 2 days, then one day off.

Potential Hazards of Parenteral Administration

- pain on injection
- hypersensitivity: fever, rash, anaphylaxis
- Extravasation risk: irritant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- *Contraindicated* if severe renal or hepatic impairment, hypokalemia or hyponatremia, adrenocorticoid insufficiency and hyperchloremic acidosis
- *Contraindicated* for long-term treatment of chronic non-congestive closed angle glaucoma
- *Caution* if patient receiving concomitant high dose aspirin (anorexia, tachypnea, lethargy, coma and death have been reported)
- C*aution* in patients with sulfonamide allergy (acetazolamide is a sulfonamide derivative)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CNS*: drowsiness, paresthesia, dizziness, confusion (usually dose related)
- *GI*: altered taste/smell, nausea, diarrhea, anorexia (common)
- *renal*: polyuria (common), crystalluria, renal stones (uncommon)
- *hematopoetic*: bone marrow depression, haemolytic anaemia, leukopenia, thrombocytopenia
- *metabolic/endocrine*: metabolic acidosis, hypokalemia

Monitoring
- CBC and platelets: baseline and during therapy, serum electrolytes
- acetazolamide is ineffective if creatinine clearance less than 10 mL/min

Other
- onset of action: reduction in intraocular pressure occurs in 2 minutes

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acetylcysteine

Warnings	Classification	Alternate Names
	antidote	MUCOMYST N-acetylcysteine

Indications

- antidote to prevent or lessen hepatic injury due to acetaminophen overdose

Contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911

Reconstitution and Stability

- vials are stable at room temperature

Compatibility

- D5W is the preferred diluent
- compatible with NS, sodium chloride 0.45%, combination dextrose and saline solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	o **Initial infusion bag**: over 1 hour o **Second infusion bag**: over 4 hours o **Third and subsequent infusion bags**: • refer to table in Dosage section • repeat until physician discontinues order see the infusion preparation table in the Dosage section	Basic Monitoring
Continuous IV infusion	NO		

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acetylcysteine

Dosage

Acetaminophen overdose:
acetylcysteine therapy should be started within 24 hours and preferably within 8 to 10 hours of acetaminophen ingestion; however therapy is effective even if given after 24 hours

- **Initial IV Infusion bag:** 150 mg/kg (to a maximum of 15 g) over 1 hour, followed by
- **Second IV Infusion bag:** 50 mg/kg (to a maximum of 5 g) over 4 hours; then
- **Third and subsequent IV infusion bags:**
  - 100 mg/kg (to a maximum of 10 g) over 16 hours (per DPIC monograph, equivalent to 6.25 mg/kg/hour); continue infusion at this infusion rate until repeat bloodwork results available and physician discontinues order

  For massive ingestions of acetaminophen or for persistently high serum acetaminophen levels or patients who present / diagnosed 24 or more hours after ingestion:
  - 200 mg/kg (to a maximum of 20 g) over 16 hours (per DPIC monograph, equivalent to 12.5 mg/kg/hour); continue infusion at this infusion rate until repeat bloodwork results available and physician discontinues order

Preparation and administration table	**Dose/volume of acetylcysteine 200 mg/mL required to prepare each infusion bag**			
	Initial Infusion	**Second Infusion**	**Third Infusion**	
	150 mg/kg	50 mg/kg	100 mg/kg	200 mg/kg
	Remove 50 mL from 250 mL D5W; then add acetylcysteine (**mL**)	Add acetylcysteine (**mL**) to D5W 500 mL bag	Add acetylcysteine (**mL**) to D5W 1000 mL bag	
Weight (kg)	acetylcysteine dose (**mL**) to be added to bag:			
40 to 50	7.5 g = 37.5 mL	2.5 g = 12.5 mL	5 g = 25 mL	
51 to 60	9 g = 45 mL	3 g = 15 mL	6 g = 30 mL	
61 to 70	10.5 g = 52.5 mL	3.5 g = 17.5 mL	7 g = 35 mL	
71 to 80	12 g = 60 mL	4 g = 20 mL	8 g = 40 mL	
81 to 90	13.5 g = 67.5 mL	4.5 g = 22.5 mL	9 g = 45 mL	
91 or greater	15 g = 75 mL	5 g = 25 mL	10 g = 50 mL	
	infuse over 1 hour	infuse over 4 hours	**infuse each bag over 16 hours**, repeat until physician discontinues	**infuse each bag over 8 hours**, repeat until physician discontinues

- *prolonged therapy* is often required in patients presenting after 8 hours post ingestion, in those with large ingestions, or in those who present with elevated liver enzymes. Continue to administer acetylcysteine as per the third infusion until DPIC criteria for discontinuation are met.
- the following acetaminophen plasma levels are associated with hepatic toxicity, warranting *prolonged therapy*

hours post-ingestion	**acetaminophen plasma level** (micromol/L)
4	993
8	464
15	132
24	26

Potential Hazards of Parenteral Administration

- bronchospasm and anaphylaxis, although rare, have been reported

Important Implications

Contraindications/Cautions
- Caution in those with history of asthma
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- skin rash, hives, fever, nausea, vomiting, flushing

Monitoring
- monitor liver enzymes, INR, serum creatinine, acetaminophen levels
- acetaminophen serum levels taken before 4 hours post ingestion may underestimate risk of hepatotoxicity

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acyclovir

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antiviral agent	ZOVIRAX acyclovir sodium

Indications

- treatment of mucocutaneous and disseminated infections caused by herpes simplex virus (HSV) types 1 and 2 and varicella zoster (VZ)
- prophylaxis of HSV in immunocompromised patients

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, dextrose-saline solutions and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa dilute doses: o up to 700 mg in 100 mL o greater than 700 mg in 250 mL infuse over 1 hour	Basic Monitoring
Continuous IV infusion	NO		

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acyclovir

Dosage

- Use total body weight (TBW) for dosing.
  If TBW is more than 125% IBW (ideal body weight), use [adjusted body weight = IBW + 0.4 (TBW - IBW)] to calculate the dose.

- HSV infection: 5 mg/kg IV Q8H for 7 days

- Herpes encephalitis, herpes ophthalmitis, VZ: 10 to 15 mg/kg IV Q8H for 7 to 14 days

- Bone Marrow Transplant HSV prophylaxis: 5 mg/kg IV Q12H

- Dose adjustment in renal impairment as follows:

Creatinine Clearance	Dose
30 to 50 mL/minute	5 to 10 mg/kg every 12 hours
Less than 30 mL/minute	5 to 10 mg/kg every 24 hours
Hemodialysis (HD)	2.5 to 5 mg/kg every 24 hours after dialysis on HD days
Continuous ambulatory peritoneal dialysis	2.5 to 5 mg/kg every 24 hours

Potential Hazards of Parenteral Administration

- phlebitis at the injection site
- rapid intravenous injection may result in precipitation of acyclovir crystals in the renal tubules
- Extravasation risk: irritant (reports of vesicant effects); at concentration greater than 7 mg/mL
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Contraindication: patients who have hypersensitivity to acyclovir or valacyclovir
- *Caution*:
  - an increase in serum creatinine and decreased creatinine clearance may occur in patients who:
    - are poorly hydrated, ensure adequate hydration (e.g. NS 250 mL to 500 mL) prior to each dose, based on volume status
    - are receiving concomitant nephrotoxic drugs
    - have pre-existing renal damage
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- rash, urticaria, diaphoresis, hematuria, encephalopathic changes and nausea may occur
- increase in serum creatinine

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adenosine

Warnings	Classification	Alternate Names
	antiarrhythmic	ADENOCARD

Indications

- conversion to sinus rhythm of narrow-complex paroxysmal supraventricular tachycardia (PSVT)
- diagnosis of broad-complex tachycardia in the emergency setting
- pharmacologic stress for myocardial perfusion imaging
- to facilitate intra-operative clipping of intracranial aneurysms
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- discard if there is cloudiness or precipitation

Compatibility

- compatible with NS, D5W and Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted; over 1 to 2 seconds, immediately flush tubing with 20 mL NS	Full Monitoring See site-specific restrictions
IV intermittent	YES	myocardial perfusion imaging or fractional flow reserve measurement draw up dose into: ○ empty sterile bag, or ○ syringe (for use in syringe driver) infuse over 6 minutes *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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adenosine

Dosage

Arrhythmias
6 mg IV direct; if no response in 1 to 2 minutes, may give 12 mg IV direct

Myocardial perfusion imaging:
0.14 mg/kg/minute IV intermittent over 6 minutes (central or peripheral line)

Fractional Flow Reserve (FFR) measurement:
- 0.14 mg/kg/minute IV intermittent over 6 minutes (central or peripheral line), or
- High Dose: 0.18 mg/kg/minute IV intermittent over 6 minutes (peripheral line only)

Potential Hazards of Parenteral Administration

- facial flushing, dyspnea, gastrointestinal distress, chest discomfort; usually resolve within one minute due to short half-life of adenosine (10 seconds); inform patients that symptoms are temporary
- sinus bradycardia/arrest, atrial fibrillation and AV block (generally self-limiting)
- aminophylline injection may be used to treat adenosine-induced adverse reactions

Important Implications

Contraindications/Cautions
- contraindicated in patients with second or third-degree AV block (without pacemaker)
- caution in patients with asthma or chronic obstructive pulmonary disease; may cause bronchoconstriction
- numerous drug interactions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- headache, neck discomfort, dizziness, tachycardia, hypotension

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alemtuzumab

Warnings	Classification	Alternate Names
high alert medication	monoclonal antibody antineoplastic	MABCAMPATH

Indications

- Primary uses: B-cell chronic lymphocytic leukemia and T-cell prolymphocytic leukemia
  - for *all* indications see BC Cancer benefit drug list
  - restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- used as part of the conditioning regimen prior to stem cell transplantation

Reconstitution and Stability

- refrigerate
- protect vials from light
- DO NOT SHAKE vial prior to use
- diluted solution stable for 8 hours at room temperature (use within 8 hours of preparation); protect solution from light

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	rotate sites on thighs or abdomen	Basic monitoring or according to protocol
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in NS or D5W 100 mL (gently invert to mix); and infuse over 2 hours flush line with 10 mL NS before and after infusion *rate must be controlled with an IV infusion pump*	Basic Monitoring or according to protocol
Continuous IV infusion	NO		

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alemtuzumab

Dosage

Dose and schedule depend on protocol and patient response. **Follow specific protocol**.
B-cell Chronic Lymphocytic Leukemia (B-CLL) example (IV or SUBCUT):

- during the first week, give 3 mg on day 1, 10 mg on day 3 and then 30 mg on day 5
- maintenance dose of 30 mg/day (range 3 to 30 mg) administered 3 times/week on alternate days (e.g. Mon/Wed/Fri) for up to 12 weeks depending on progress
- AVOID doses over 30 mg/day or cumulative weekly doses over 90 mg due to increased risk of pancytopenia

Conditioning Regimen for Stem Cell Transplant: 20 mg IV daily for 5 days

Note: pre-medication with acetaminophen, antihistamines and/or corticosteroids may help prevent or lessen infusion reactions

Potential Hazards of Parenteral Administration

- infusion-related adverse effects include hypotension, rigors, fever, shortness of breath, bronchospasm, nausea and chills
    - subcutaneous administration reduces infusion-related symptoms as listed above
- rash - if rash occurs, consider pre-medicating with antihistamines on treatment days
- anaphylaxis: resuscitation equipment must be readily available including epinephrine, diphenhydrAMINE and hydrocortisone; discontinue infusion and notify physician
- pain, redness or swelling at the site of injection

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- prolonged lymphopenia, pancytopenia, marrow hypoplasia, anemia, neutropenia, thrombocytopenia
- increased risk of opportunistic infections such as CMV and *Pneumocystis jiroveci* pneumonia (formerly called *Pneumocystis carinii* pneumonia – PCP)
- subcutaneous administration may cause Grade 1 or 2 local skin reactions during the first 2 weeks of therapy. Ice packs and cold compresses may help alleviate symptoms.

Monitoring

- CBC and platelets at weekly intervals
- blood pressure for hypotensive symptoms, especially in patients with ischemic heart disease or on antihypertensive medications. If hypotension occurs, hydration with NS is indicated.
- patients should be monitored for opportunistic infections and should receive prophylactic anti-infectives
- if dyspnea occurs, patients may be treated with a beta-2 agonist (e.g. salbutamol)

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alpha 1-proteinase inhibitor (human), highly purified

Warnings	Classification	Alternate Names
	alpha1-antitrypsin replenisher	PROLASTIN-C; alpha1-antitrypsin

Indications

- replacement therapy for patients with alpha 1-proteinase inhibitor (alpha1-antitrypsin) deficiency
- other indications approved by Pharmacare
- Restrictions apply

Reconstitution and Stability

- All doses are prepared in pharmacy. Use within 3 hours of reconstitution

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	60 mg/kg over minimum 15 minutes 240 mg/kg over minimum 60 minutes maximum rate: 4 mg/kg/minute	Basic Monitoring
Continuous IV infusion	NO		

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alpha 1-proteinase inhibitor (human), highly purified

Dosage

- alpha1-antitrypsin replenisher: 60 mg/kg IV once weekly or 240 mg/kg IV once monthly

Potential Hazards of Parenteral Administration

- Hypersensitivity and anaphylactic reactions can occur; stop infusion promptly for acute hypersensitivity; immediate treatment (including epinephrine) should be available.

Important Implications

Contraindications/Cautions

- *Contraindicated* in those with a hypersensitivity to alpha1-antitrypsin or to any component of the formulation or those with selective IgA deficiencies with known anti-IgA antibody
- *Caution* in patients at risk for circulatory overload as this is a colloidal solution that will increase plasma volume.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- most commonly reported: chills, possibility of malaise, headache, rash (severe), hot flushes and pruritus
- increased ALT and AST, approximately 4 times upper normal limit

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alprostadil

Warnings	Classification prostaglandin	Alternate Names PROSTIN VR PGE_1; prostaglandin E_1

Indications

- diagnosis of erectile dysfunction

Reconstitution and Stability

- refrigerate ampoules

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intracorpus cavernosum	YES	**by physician only**	Advanced Monitoring

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alprostadil

Dosage

- 5 to 20 mcg injected intracorpus cavernosum

Potential Hazards of Parenteral Administration

bruising or small amount of bleeding at injection site; penile pain

Important Implications

Side effects
- hypertension
- dizziness, headache
- prolonged erection (greater than 4 hours in 4%)
- rash, swelling

Monitoring
- pain, duration of erection

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alteplase

Warnings	Classification fibrinolytic agent	Alternate Names ACTIVASE; CATHFLO tissue plasminogen activator, tPA, rt-PA

Indications

- thrombolysis in acute ischemic stroke (within 4.5 hours of onset)
- pulmonary embolism (PE)
- treatment of prosthetic valve thrombosis where other options are not appropriate
- lysis of acute or partial occlusion of an artery, vein, central venous catheter (CVC), fistula or graft
- treatment of pleural effusion

Reconstitution and Stability

- 50 mg and 100 mg powder vials are stored at room temperature; 2 mg powder vial stored in fridge
- reconstitute to 1 mg/mL:
  - 2 mg vial: add 2.2 mL sterile water for injection (SWFI)
  - 50 mg vial: add 50 mL SWFI (diluent provided)
  - 100 mg vial: add 100 mL SWFI (provided)

- to avoid foaming, direct water down side of the vial. DO NOT SHAKE. Roll vial in the palm of hands to mix.
- reconstituted solutions stable for 8 hours at room temperature or in fridge
- *if dilution is required*:
  - in NS (preferred), one may dilute to as low as 0.01 mg/mL
  - in D5W, the concentration must be 0.5 mg/mL or higher
  - solutions diluted to these concentrations are stable for 24 hours at room temperature

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
See page 2			

This monograph has 3 pages

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alteplase

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**acute ischemic stroke:** loading dose: undiluted over 1 minute *may administer via Alaris bolus feature* **prosthetic valve thrombosis:** loading dose: undiluted over 2 minutes, *may administer via Alaris bolus feature* **PE associated with cardiac arrest:** undiluted over 2 minutes	Advanced Monitoring and per site protocols See site-specific restrictions
IV Intermittent	YES	**acute ischemic stroke:** undiluted (1 mg/mL), (programmed as continuous infusion in Alaris pump) **prosthetic valve thrombosis:** undiluted (1 mg/mL), (programmed as continuous infusion in Alaris pump) **massive pulmonary embolism:** undiluted (1 mg/mL), infuse over 2 hours requires practitioner with specialized training, **occluded hemodialysis CVC, fistula , AV graft:** dilute: o 2 mg in NS 50 mL o 4 mg in NS 100 mL infuse over 1 to 2 hours; refer to site specific protocols *rate must be controlled with an infusion pump*	Advanced Monitoring and per site protocols See site-specific restrictions
Intra-arterial or continuous IV infusion	YES	requires practitioner with specialized training **initiated in radiology: PE (catheter directed) / vascular occlusion thrombolysis:** standard solution concentration: 0.024 mg/mL: dilute 12 mg (reconstitute 6 x 2 mg vials) in NS 500 mL (reconstitution: see reconstitution & stability on page 1) *rate must be controlled with an infusion pump*	Advanced Monitoring and per site protocols See site-specific restrictions
Intra-cannula (intra-catheter) dwell	YES	requires practitioner with specialized training **occluded CVC:** refer to site specific protocols	Basic Monitoring and per site protocols
Intra-pleural instillation	YES	**by physician or Nurse practitioner** dilute 10 mg in NS 30 mL; dwell-time: 1 to 4 hours	Basic Monitoring

This monograph has 3 pages

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alteplase

Dosage

Acute Ischemic Stroke: 0.9 mg/kg (maximum dose 90 mg) given as follows:

- 10% of dose IV direct (or Alaris bolus feature) over 1 minute; immediately followed by 90% of dose IV infusion over 60 minutes

Prosthetic Valve Thrombosis:

- high dose (100 mg): 10 mg IV direct (or Alaris bolus feature) over 2 minutes, followed by 90 mg IV infusion over 3 hours
- low dose (50 mg): 20 mg IV direct (or Alaris bolus feature) over 2 minutes, followed by 30 mg IV infusion over 3 hours

Pulmonary embolism (PE) associated with cardiac arrest:

- 50 mg IV over 2 minutes; repeat 50 mg in 15 minutes if return of spontaneous circulation is not achieved; initiate heparin infusion with or shortly after alteplase administration

Massive Pulmonary Embolism:

- 100 mg IV intermittent over 2 hours, then initiate heparin at end of alteplase infusion

Pulmonary embolism (PE), catheter directed/ vascular occlusion thrombolysis:

- may initiate with 5 mg IV direct or as per site protocol
- 0.5 to 2 mg/hour (usual 1 mg/hour) intra-arterial or continuous IV infusion for 6 to 72 hours

Occluded hemodialysis CVC, fistula, AV graft (IV intermittent)

- CVC: 2 mg per occluded lumen infused over 1 hour each lumen; see site specific protocols
- fistula/AV graft: 2 to 4 mg infused into fistula/graft needle over 1 hour

Occluded CVC (intra-cannula/intra-catheter dwell)

- CVC/PICC: 2 mg per occluded lumen; IVAD:3 to 4 mg per port;
- dwell for 30 to 120 minutes then aspirate; may repeat once
  if failed attempt, may allow to dwell longer (24 to 72 hours) to extend contact time with clot (preferred)
- *hemodialysis CVC*:
  - 1 or 2 mg per occluded lumen; dwell for 1 hour then aspirate, or
  - 1 or 2 mg per occluded lumen; dwell for 48 to 72 hours or until next hemodialysis then aspirate

Intra-Pleural Instillation:

- 10 mg in 30 mL NS instilled via chest tube; dwell 1 to 4 hours; may repeat daily until resolution of pleural fluid drainage (1 to 14 days)

Potential Hazards of Parenteral Administration

- hemorrhage - severe bleeding may occur, hypotension
- hypersensitivity reactions (e.g. anaphylaxis, urticaria, angioedema) have been reported

Important Implications

Contraindications/Cautions

- contraindicated in *lysis of acute occlusion* or *pulmonary embolism if*:
  - active internal bleeding or active peptic ulcer disease
  - recent stroke (within 2 months), intracranial or intra-spinal surgery, intracranial neoplasm
  - severe uncontrolled hypertension; recent prolonged CPR; severe trauma (within 10 days)
- contraindicated in *acute ischemic stroke if*:
  - intracranial or subarachnoid hemorrhage, intracranial neoplasm; vascular malformation (not meningioma)
  - stroke, head injury, intracranial surgery within 3 months; major surgery within 14 days
  - myocardial infarct within 3 weeks; aortic dissection; pericarditis; severe uncontrolled hypertension
  - anticoagulation within 48 hours (with INR over 1.7 or prolonged PTT) or platelets less than 100,000
  - internal bleeding within 21 days; arterial puncture at non-compressible site within 7 days
  - seizures at onset of stroke; recent lumbar puncture; rapidly improving neurological signs or minimal deficit
  - blood glucose below 3 or above 22 mmol/L
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring: CBC; assess invasive catheters hourly for bleeding

Other: venipuncture should be performed carefully; upper extremity vessels are preferable

- avoid IM injections

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amikacin

Warnings	Classification antibiotic (aminoglycoside)	Alternate Names AMIKIN; amikacin sulfate

Indications

- treatment of serious infections caused by susceptible strains of gram-negative bacteria with highly suspected or documented resistance to gentamicin and tobramycin
- Indications and / or prescribing restrictions apply.

Reconstitution and Stability

- stable at room temperature
- pale yellow solution does not indicate loss in potency; dark coloured solutions should be discarded

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	give undiluted; deeply into large muscle mass	Basic Monitoring
IV direct	NO		
IV intermittent	YES	*preferred route* dilute in 100 mL; administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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amikacin

Dosage

- Dose based on ideal body weight (IBW), not total body weight (TBW).
- If TBW more than 125% IBW, dosing weight is IBW + 0.4 (TBW - IBW).
- If actual body weight is *less than* IBW, use actual body weight for dosing.
- If pregnant use TBW. If TBW is more than 125% IBW, dosing weight is IBW + 0.4 (TBW - IBW).

- Once daily dosing: refer to dose table below for dosing interval based on renal function:

Creatinine Clearance	Dose
60 mL/minute or greater	15 mg/kg Q24H
40 to 59 mL/minute	15 mg/kg Q36H
Less than 40 mL/minute	not recommended; contact pharmacy for dosing recommendations or further treatment options
Exclusions to once daily dosing: burns greater than 20%, dialysis, septic shock	

- Multiple daily dosing: 5 mg/kg IV Q8H or 7.5 mg/kg IV Q12H if normal renal function (CrCl 60 mL/min or greater). Dosing adjustment is required for renal impairment. **Contact pharmacy for dosing guidance.**

- Hemodialysis (HD): serum levels suggested prior to second maintenance dose
  - Loading Dose: 7.5 mg/kg IV
  - Maintenance Dose: 5 to 7.5 mg/kg IV, (target pre HD level: less than 10 mg/L)
  - give doses after HD or over last 15 minutes of dialysis

Potential Hazards of Parenteral Administration

- pain at IM injection site
- thrombophlebitis with IV administration
- hypersensitivity reactions

Important Implications

Contraindications/Cautions
- caution in patients with myasthenia gravis; can cause neuromuscular blockade and muscular paralysis

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- ototoxicity, nephrotoxicity and neurotoxicity

Monitoring
- monitor renal function (BUN, SCr twice weekly)
- baseline and weekly auditory testing recommended if therapy lasts longer than 14 days
- Once daily dosing: pre-dose serum drug levels should be negligible (less than 1 mg/L)
- Multiple daily dosing: Serum drug levels are recommended around the third dose following initial therapy or any change in dose.
  - *Pre-dose level*: 0 to 30 minutes before next dose should be less than 10 mg/L
  - *Post-dose level*: 30 minutes after completion of an IV infusion should be 25 to 30 mg/L

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aminophylline

Warnings	Classification	Alternate Names
vesicant	bronchodilator	theophylline ethylenediamine

Indications

- symptomatic treatment of reversible bronchoconstriction
- reversal of side effects from dipyridamole or adenosine during myocardial perfusion imaging

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, dextrose solutions, dextrose-saline combinations, lactated ringers and ringers

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	**by physician only** give over at least 1 minute	Full Monitoring See site-specific restrictions
IV intermittent*	YES	dilute dose in 50 mL; infuse over 20 to 60 minutes maximum rate: 25 mg/minute *rate must be controlled with IV infusion pump*	Intermediate Monitoring
Continuous IV* infusion	YES	**standard solution concentration:** 1 mg/mL: dilute 250 mg in 250 mL *rate must be controlled with IV infusion pump*	Intermediate Monitoring

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aminophylline

Dosage

- aminophylline dose = theophylline dose x 1.25 (e.g. 400 mg theophylline is equivalent to 500 mg aminophylline)
- use ideal body weight (IBW) for dose calculation

Bronchoconstriction:
- Loading dose:
  - If NO theophylline within last 24 hours: 6 mg/kg IV intermittent
  - If patient received theophylline within last 24 hours: 3 mg/kg IV intermittent

- Maintenance dose: start infusion per table below

clinical factors	maintenance IV infusion (mg/kg/hour)
smokers	0.8
non-smokers	0.5
cardiac decompensation, cor pulmonale, liver dysfunction	0.25

Myocardial Perfusion Imaging - reversal of dipyridamole or adenosine side effects (angina pectoris, ventricular arrhythmias, bronchospasm):
- 50 to 100 mg IV direct. May repeat.

Potential Hazards of Parenteral Administration

- rapid IV administration may result in hypotension, syncope, cardiac arrest, and death
- serious arrhythmias and convulsions may occur with serum theophylline levels greater than 110 micromol/L (20 mcg/mL) and often not preceded by signs of toxicity, including nausea or persistent repetitive vomiting
- Extravasation risk: vesicant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- caution: many significant drug interactions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- adverse effects include anorexia, nausea, vomiting, restlessness, irritability, insomnia, headache

Monitoring
- therapeutic serum theophylline levels for bronchoconstriction: 27 to 83 micromol/L)
- each 1.25 mg/kg aminophylline corresponds to approximately 11 micromol/L plasma theophylline

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amiodarone

Warnings	Classification	Alternate Names
vesicant	antiarrhythmic agent	CORDARONE

Indications

- treatment of life-threatening ventricular tachycardia or supraventricular arrhythmias
- first-line therapy for ventricular fibrillation/pulseless ventricular tachycardia
- prevention of post-operative atrial fibrillation (in high risk patients), associated with cardiac surgery

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W
- compatible with NS at concentrations of 1.8 to 4 mg/mL ONLY
- amiodarone is stable in polyvinyl chloride (PVC) container for up to 2 hours
- infusions greater than 2 hours must be prepared in glass or non-PVC (i.e. PVC free and DEHP free) container

Preparation and Administration

- *Peripheral IV use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	*ventricular fibrillation or pulseless ventricular tachycardia only*: • give dose undiluted, • followed by 20 mL D5W or NS rapidly	Full Monitoring See site-specific restrictions
IV intermittent*	YES	*ventricular tachycardia or supraventricular arrhythmias*: • dilute 150mg in D5W 100 mL • give over 10 minutes (or via Alaris bolus feature) *prevention of post-op atrial fibrillation in cardiac surgery patients*: • dilute 150mg in D5W 100 mL • give over 30 minutes (or via Alaris bolus feature) use tubing with 0.2 micron in-line filter *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions
Continuous IV infusion*	YES	**standard solution concentrations:** 1.8 mg/mL: dilute 450 mg in D5W 250 mL (peripheral or central line) 3.6 mg/mL: dilute 900 mg in D5W 250 mL (central line only) o prepare in glass or non-PVC container (i.e. PVC free and DEHP free) o use tubing with 0.2 micron in-line filter *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions

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amiodarone

Dosage

Ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT):
300 mg IV direct; if pulseless VF or VT recurs/continues after subsequent defibrillation, give 150 mg IV direct

Ventricular tachycardia or supraventricular arrhythmias:

- **First 24 hours:** 150 mg IV intermittent over 10 minutes (or via Alaris bolus feature), followed by a continuous IV infusion of 1 mg/minute for 6 hours, then 0.5 mg/minute for 18 hours. During the last 18 hours, the infusion rate may be increased to suppress breakthrough arrhythmias (maximum dose:10 to 20 mg/kg/day)

- **After 24 hours:** 0.5 mg/minute continuous IV infusion for 24 hours; infusion rate may be increased to suppress breakthrough arrhythmias (maximum dose:10 to 20 mg/kg/day)

Prevention of post-operative atrial fibrillation (in high risk patients), associated with cardiac surgery:
First 24 hours post-op: 150 mg IV intermittent over 30 minutes (or via Alaris bolus feature), followed by a continuous IV infusion of 1 mg/minute for 6 hours, then 0.5 mg/minute for 18 hours.

Potential Hazards of Parenteral Administration

- hypotension, cardiovascular collapse, and congestive heart failure from too rapid administration
- hot flushes, sweating or nausea can occur from too rapid administration
- increased risk of hypotension with doses greater than 2100 mg/day
- pain and phlebitis at injection site - concentrations greater than 2 mg/mL should be given via a central line
- Extravasation risk: vesicant
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Contraindication: hypersensitivity to iodine or any component of the formulation
- Caution in presence of hypotension, cardiomyopathy and severe heart failure

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- may cause worsening of atrioventricular conduction in patients with pre-existing conduction defects
- may cause moderate and transient lowering of blood pressure
- may cause prolongation of the QTc interval
- may potentiate sinus bradycardia if used with beta blockers or calcium channel blockers
- early and usually moderate rise in serum transaminases may occur; rarely accompanied by frank cholestasis with jaundice

Monitoring

- liver enzymes, baseline chest x-ray (pulmonary toxicity), electrolytes

Other

- serum digoxin levels may double after the start of amiodarone
- amiodarone potentiates the pharmacological effects of warfarin, phenytoin, procainamide, lidocaine and cycloSPORINE
- many other significant drug interactions – contact pharmacy for further guidance

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amoxicillin-clavulanate

Warnings	**Classification** aminopenicillin antibiotic, beta-lactam antibiotic & beta-lactamase inhibitor	**Alternate Names** CLAVULIN amoxicillin sodium and potassium clavulanate

Indications

- for the treatment of moderate to severe infections caused by susceptible strains of bacteria

Reconstitution and Stability

- store vials at room temperature
  available as:
  - 500 mg-100 mg vial (contains amoxicillin 500 mg and clavulanate 100 mg)
  - 1000 mg-200 mg vial (contains amoxicillin 1000 mg and clavulanate 200 mg)
  - 2000 mg-200 mg vial (contains amoxicillin 2000 mg and clavulanate 200 mg)

  reconstitute each vial with sterile water for injection as follows:
  - 500 mg-100 mg vial: add 10 mL
  - 1000 mg-200 mg vial: add 20 mL
  - 2000 mg-200 mg vial: add 20 mL

  on dissolution/reconstitution, the solution may transiently look pink, but rapidly returns to being clear; reconstituted solution is only stable for 15 minutes:
  - dilute immediately and administer promptly
  - diluted solution stable for 60 minutes at room temperature

- also available as Minibag Plus, store at room temperature
  once the vial is activated (drug diluted in the bag), use immediately

Compatibility

- compatible in NS, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	▪ maximum dose 1000 mg-200 mg ▪ undiluted over 3 to 4 minutes	Basic Monitoring
IV intermittent	YES	▪ dilute 500 mg-100 mg in NS 50 mL ▪ dilute 1000 mg-200 mg *or* 2000 mg-200 mg in NS 100 mL ▪ administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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amoxicillin-clavulanate

Dosage

- amoxicillin-clavulanate vials available as 500 mg-100 mg, 1000 mg-200 mg and 2000 mg-200 mg

Dosing is based on the amoxicillin component

- *Usual*: 1000 mg every 8 hours.
  - (*each dose = two 500 mg-100 mg vials or one 1000 mg-200 mg vial*)
  - provides a 5:1 ratio of amoxicillin to clavulanic acid

- *For severe infections:* 2000 mg every 12 hours, to a maximum of 2000 mg every 8 hours
  - *(only use 2000 mg-200 mg vial)*
  - provides a 10:1 ratio of amoxicillin to clavulanic acid; this formulation is preferred to avoid unnecessarily high clavulanate exposure

- Dosage adjustments for renal impairment as follows (*only use 500 mg-100 mg or 1000 mg-200 mg vials*): Creatinine clearance less than 30 mL/minute: 1000 mg IV once, followed by 500 mg IV Q12H

Potential Hazards of Parenteral Administration

- hypersensitivity reactions (immediate and delayed) e.g. pruritus, rash, severe cutaneous reactions and anaphylaxis

Important Implications

Contraindications/Cautions
- Contraindicated if allergy to penicillin antibiotics; refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult pharmacist if patient has an allergy to a cephalosporin.
- Contraindicated in patients with a history of amoxicillin-clavulanate associated hepatic dysfunction.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex
  Use near delivery in the setting of preterm prelabour rupture of membranes has been associated with necrotizing enterocolitis in the newborn.

Side effects
- *GI*: diarrhea, nausea, vomiting, mucocutaneous candidiasis
- *CNS*: seizures (with renal impairment or in those receiving high doses)

Other
- sodium and potassium content:
  500 mg-100 mg vial: 31.4 mg (1.4 mmol) of sodium and 19.6 mg (0.5 mmol) of potassium
  1000 mg-200 mg vial: 62.9 mg (2.7 mmol) of sodium and 39.3 mg (1 mmol) of potassium
  2000 mg-200 mg vial: 125.9 mg (5.5 mmol) of sodium and 39.3 mg (1 mmol) of potassium

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amphotericin B

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antifungal	FUNGIZONE

Indications

- treatment of progressive, potentially fatal disseminated mycotic infections

Reconstitution and Stability

- refrigerate vial; protect from light
- reconstitute each 50 mg vial with 10 mL sterile water for injection to provide a 5 mg/mL solution

Compatibility

- compatible with D5W only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute doses: **peripheral line**: o up to 25 mg in D5W 250 mL o 26 to 50 mg in D5W 500 mL o 51 to 100 mg in D5W 1000 mL infuse over 4 to 6 hours (use large vein in forearm; if possible avoid hand, wrist or antecubital fossa) **central line**: o up to 100 mg in D5W 100 mL o greater than 100 mg in D5W 250 mL infuse over 4 to 6 hours ▪ do NOT use in-line filter ▪ flush all lines with D5W before and after administration *rate must be controlled with infusion pump*	Basic Monitoring
Continuous IV infusion	NO		
Intrathecal/ Intraventricular	YES	**by physician only**	Basic Monitoring

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amphotericin B

Dosage

- maintenance dose: 0.5 to 1 mg/kg IV per 24 hours. Alternative dose: 1 to 1.5 mg/kg IV every other day. Infusion may be initiated as full dose or incremental doses.

- Fungal meningitis (intrathecal, intraventricular): 0.1 mg initial dose then 0.5 mg every 48 to 72 hours depending on patient's condition

- If nephrotoxicity occurs, increase dosing interval or consider changing to amphotericin B *liposomal* (restrictions apply).

Potential Hazards of Parenteral Administration

- rapid administration may result in convulsions, anaphylaxis, hypotension, ventricular fibrillation, or cardiac arrest
- pain at injection site with or without thrombophlebitis
- Extravasation risk: irritant (reports of vesicant effects)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- *Caution*:
    - concomitant use of nephrotoxic agents
    - adequate hydration prior to infusion is required to reduce risk of nephrotoxicity; 1 L of NS should be administered over 1 hour immediately prior to amphotericin B; if patient is fluid overloaded, consider reducing NS to 250 mL or 500 mL

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- fever, chills, headache, malaise, delirium
- hypotension, tachypnea
- anorexia, nausea and vomiting (less frequent with intrathecal), diarrhea, heartburn, cramping, epigastric pain
- decreased renal function; renal abnormalities including azotemia, renal tubular acidosis, acute tubular necrosis
- generalized pain, including muscle and joint pains (less frequent with intrathecal)
- hypokalemia, hypomagnesemia
- normochromic-normocytic anemia

Monitoring

- electrolytes, serum creatinine, urea; monitor closely during therapy
- complete blood counts as required

Other

- side effects may potentially be decreased by using alternate day therapy
- premedication with analgesics, antiemetics, antihistamines and hydrocortisone may be required

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Amphotericin B lipid complex (ABELCET)

Warnings	Classification	Alternate Names
	antifungal	ABELCET

Indications

- treatment of progressive, potentially fatal disseminated mycotic infections in patients who are refractory to or intolerant of conventional amphotericin B therapy
- **amphotericin B is available in different liposomal preparations that are not interchangeable. This monograph is specific for ABELCET.**
- indications and/or prescribing restrictions apply

Reconstitution and Stability

- available as 5 mg/mL solution
- refrigerate vial; protect from light

Compatibility

- compatible with D5W only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use the supplied 5 micron filter to transfer contents of vial into D5W bag dilute to: 1 to 2 mg/mL and infuse at 2.5 mg/kg/hour reduce rate if infusion reaction occurs ▪ flush all lines with D5W before and after administration ▪ gently shake bag at start of infusion and every 2 hours if infusion is longer than 2 hours, to re-suspend contents *rate must be controlled with an infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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Amphotericin B lipid complex (ABELCET)

Dosage

- 5 mg/kg/day, duration of therapy should be based on the clinical situation

Dose adjustments:
- dose may need to be reduced in renal failure, however there are no guidelines for dose adjustment based on serum creatinine. The decision about dose adjustments should be based on the overall clinical condition of the patient
- hemodialysis patients - give dose after dialysis

Potential Hazards of Parenteral Administration

- anaphylaxis or hypersensitivity reactions (rare)
- infusion reactions are common (fever, chills), may occur 1 to 2 hours after start of infusion, especially with first few doses.
- thrombophlebitis, inflammation and erythema at injection site.

Important Implications

Contraindications/Cautions
- *Caution*:
  - concomitant use with other nephrotoxic agents
  - adequate hydration prior to infusion is required to reduce risk of nephrotoxicity;
    1 L of NS should be administered over 1 hour immediately prior to amphotericin B lipid complex;
    if patient is fluid overloaded, consider reducing NS to 250 mL or 500 mL

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
Frequent:
- increased serum creatinine, epigastric pain, anorexia, nausea, vomiting, headache, and diarrhea.

Less frequent:
- hypotension, bronchospasm, malaise, rash, muscle and joint pain, dyspnea, respiratory failure, nephrotoxicity
- hypokalemia, hypocalcemia, hypomagnesemia, increased serum AST and ALT, anemia, leukopenia, and thrombocytopenia.

Rare:
- agranulocytosis, acute renal failure, cardiac arrhythmias, shock, polyneuropathy, seizures, hypertension, and hyperkalemia

Monitoring
- serum creatinine, BUN, urinalysis, blood counts and electrolytes should be monitored closely
- generally less nephrotoxicity than conventional amphotericin B, dose limiting renal toxicity may still be observed.

Other
- Premedication with acetaminophen, diphenhydramine and hydrocortisone may be required.

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amphotericin B liposomal (AMBISOME)

Warnings	Classification antifungal	Alternate Names AMBISOME liposomal amphotericin B

Indications

- treatment of progressive, potentially fatal disseminated mycotic infections in patients who are refractory to or intolerant of conventional amphotericin B therapy
- **amphotericin B is available in different liposomal preparations that are not interchangeable. This monograph is specific for AMBISOME**.
- indications and/or prescribing restrictions apply

Reconstitution and Stability

- refrigerate vial; protect from light
- reconstitute each 50 mg vial with 12 mL sterile water for injection to provide a 4 mg/mL solution

Compatibility

- compatible with D5W only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use the supplied 5 micron filter to transfer contents of the vial into a D5W bag dilute doses: o up to 500 mg in D5W 250 mL o greater than 500 mg in D5W 500 mL ▪ flush all lines with D5W before and after administration ▪ inline filters (1 micron or larger) may be used infuse over 2 hours (or longer than 2 hours if patient experiences discomfort) *rate must be controlled with an infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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amphotericin B liposomal (AMBISOME)

Dosage

- usual dose:
  - 3 to 6 mg/kg/day; daily dose and duration of therapy should be based on the clinical situation

- dose adjustments:
  - dose may need to be reduced in renal failure, however there are no guidelines for dose adjustment based on serum creatinine. The decision about dose adjustments should be based on the overall clinical condition of the patient
  - hemodialysis patients - give dose after dialysis

Potential Hazards of Parenteral Administration

- anaphylaxis, hypotension, bronchospasm, arrhythmias, and shock are rare
- acute reactions (including chills, rigors, fever) may occur 1 to 2 hours after start of infusion. These reactions occur less frequently than with amphotericin B; if reactions do occur, they are more common with the first few doses and generally diminish with subsequent doses.

Important Implications

Contraindications/Cautions

- Caution:
  - concomitant use of nephrotoxic agents
  - adequate hydration prior to infusion is required to reduce risk of nephrotoxicity;
    1 L of NS should be administered over 1 hour immediately prior to amphotericin B liposomal;
    if patient is fluid overloaded, consider reducing NS to 250 mL or 500 mL

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- elevated serum BUN and creatinine (generally less nephrotoxic than amphotericin B, however dose limiting renal toxicity may still be observed)
- abnormal liver function enzymes
- hypokalemia, hypomagnesemia, and hypocalcemia
- anemia

Monitoring

- serum creatinine, BUN, urinalysis, blood counts and electrolytes should be monitored closely

Other

- Premedication with acetaminophen, diphenhydramine and hydrocortisone may be required.

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ampicillin

Warnings	Classification penicillin antibiotic, Beta-lactam antibiotic	Alternate Names PENBRITIN, AMPICIN, ampicillin sodium

Indications

- treatment of infections caused by susceptible strains of microorganisms

Reconstitution and Stability

- powder is stable at room temperature
- reconstitute vials with sterile water for injection as follows:
  500 mg vial: add 1.7 mL to provide 250 mg/mL solution
  1000 mg vial: add 3.4 mL to provide 250 mg/mL solution
  2000 mg vial: add 6.8 mL to provide 250 mg/mL solution
- use reconstituted solution within one hour

Compatibility

- compatible in NS
- compatible in D5W, but only stable for 4 hours

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	give deeply into large muscle	Basic Monitoring
IV direct	YES	dilute with NS to 100 mg/mL; administer into large vessel maximum rate: 100 mg/minute	Basic Monitoring
IV intermittent	YES	*preferred route* dilute doses: • up to 1000 mg in NS 50 mL; administer over 15 minutes • over 1000 mg in NS 100 mL; administer over 20 to 30 minutes maximum rate: 100 mg/minute	Basic Monitoring
Continuous IV infusion	NO		

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ampicillin

Dosage

- Usual: 1 g to 2 g IM or IV every 4 to 6 hours
- Severe systemic infections: up to 14 g/day IV in equally divided doses every 4 to 6 hours
- Dosage adjustments required for renal impairment, see below:

Creatinine Clearance	Dose and interval
30 to 50 mL/minute	1 to 2 g Q6H to Q8H
less than 30 mL/minute	1 to 2 g Q12H
hemodialysis	1 to 2 g Q12H (give one of the dialysis day doses after dialysis)
Continuous Ambulatory Peritoneal Dialysis (CAPD)	1 g Q12H

Potential Hazards of Parenteral Administration

- hypersensitivity reactions (immediate and delayed)
- too rapid IV administration may cause convulsions or muscular irritability
- severe pain is a frequent occurrence with IM administration
- pain at injection site
- thrombophlebitis with long term use

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to penicillin antibiotics; refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult pharmacist if patient has an allergy to a cephalosporin
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- ampicillin has been implicated in causing pseudomembranous colitis
- rash (may be potentiated by hyperuricemia or allopurinol)

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antithymocyte globulin (Equine)

Warnings	Classification immunosuppressant, lymphocyte-selective immunosuppressant	Alternate Names ATGAM ATG, lymphocyte immune globulin

Indications

- treatment of severe aplastic anemia

Reconstitution and Stability

- refrigerate; bring solution to room temperature before infusing
- solution is usually transparent to slightly opalescent or colourless to light brown

Compatibility

- compatible with sodium chloride 0.45% and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intradermal Skin test	YES	*prepared by pharmacy*: 5 mg (0.1 mL) ATGAM diluted in NS 100 mL, then **5 mcg** (0.1 mL) withdrawn into prefilled syringe and supplied to ward **by physician only**	Intermediate Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**administer intradermal test dose before first infusion** do not shake, avoid foaming administer through an in-line 0.2 micron filter central line (recommended): o doses up to 2 g in NS 500 mL o doses over 2 g in NS 1000 mL peripheral line: concentration of 1 mg/mL or less initial dose to be infused over 6 to 12 hours if no reaction, subsequent doses can be infused over a minimum of 4 hours *rate must be controlled with an IV infusion pump*	Advanced Monitoring and per site specific protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent.*	

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antithymocyte globulin (Equine)

Dosage

Dose must be individualized:

- 10 to 40 mg/kg/day depending on protocol
- refer to site specific protocols

Test dose is required before administration of first infusion:

- 5 mcg intradermally and a contralateral saline control (use only freshly diluted drug for skin testing)
- do not use if systemic reaction occurs (generalized rash, tachycardia, hypotension, dyspnea or other signs of anaphylaxis)
- if no local reaction occurs within 1 hour of intradermal test dose, proceed with full dose

Potential Hazards of Parenteral Administration

- anaphylaxis (can occur in the presence of a negative skin test)
- respiratory distress and/or hypotension - may indicate anaphylactoid reaction
- may cause vein irritation if administered peripherally; use high flow vein

Important Implications

Contraindications/Cautions

- treatment should be discontinued in the event of anaphylaxis or severe and unremitting thrombocytopenia or leukopenia

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hemolysis, thrombocytopenia
- chills, fever, arthralgia
- itching, erythema

Other:

- premedication with corticosteroids, acetaminophen, and/or an antihistamine 30 minutes to 1 hour prior to the infusion is recommended to reduce the incidence and intensity of side effects during the infusion

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antithymocyte globulin (Rabbit)

Classification
immunosuppressant
lymphocyte-selective immunosuppressant

Alternate Names
THYMOGLOBULIN, rATG

Indications

- treatment and prevention of acute allograft rejection episodes in solid organ transplantation
- prevention of graft-versus-host disease (GVHD) or treatment of steroid-resistant GVHD in patients who have undergone bone marrow transplantation (BMT)
- has been used in the treatment of aplastic anemia
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store vials in refrigerator; protect from light
- reconstitute 25 mg vial with 5 mL sterile water for injection (provided) to give a concentration of 5 mg/mL; further dilution required and use immediately

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	administer through an in-line 0.2 micron filter via central line: o dose up to 50 mg in NS 100 mL o 51 to 125 mg in NS 250 mL o 126 to 250 mg in NS 500 mL o 251 mg or more in NS 1000 mL if no central line access and patient has good venous access, may administer via peripheral line for up to 5 doses: o dilute doses up to 250 mg in **NS 500 mL only** o to minimize venous complications, add heparin 1000 units and hydrocortisone 20 mg to each 500 mL initial dose infused over a minimum of 8 to 12 hours (up to 24 hours) o if no reaction, then subsequent doses can be infused over a minimum of 4 hours *rate must be controlled with an IV infusion pump*	Advanced Monitoring and per site specific protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent.*	

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antithymocyte globulin (Rabbit)

Dosage

Solid organ transplantation:
- Prophylaxis: 1 to 1.5 mg/kg IV daily (maximum dose 150 mg) for 5 to 10 days
- Treatment: 1.5 to 2 mg/kg IV daily (maximum dose 150 mg) for 7 to 10 days

Prevention of GVHD in BMT:
- 4.5 mg/kg IV divided over 3 days (per site-specific protocol/regimen)

Steroid-resistant acute GVHD following BMT:
- 1 mg/kg IV actual body weight for 4 doses on days 1,3, 5 and 7.
- hold cycloSPORINE (or TACrolimus) for 7 days

Aplastic anemia with treatment failure or intolerance to antithymocyte globulin (Equine):
- 3.5 mg/kg IV daily for 5 days

Potential Hazards of Parenteral Administration

- rarely anaphylactoid reactions
- injection site reaction including pain, swelling, erythema and chemical phlebitis

Important Implications

Contraindications/Cautions
- contraindicated in patients with known hypersensitivity to rabbit proteins, acute viral illness or history of anaphylaxis with previous anti-human thymocyte immunoglobulin

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- fever, chills, arthralgia, skin rash, dyspnea, thrombocytopenia, neutropenia, opportunistic infection (including Epstein-Barr virus-associated lymphoproliferative disease), and serum sickness. Signs of serum sickness including thrombocytopenia may be observed towards the end of the first week of treatment and can be controlled with steroids. If severe, the drug must be discontinued

Monitoring
- daily CBC

Other
- premedication with corticosteroids, acetaminophen, and/or an antihistamine 30 minutes to one hour prior to the infusion is recommended to reduce the incidence and intensity of side effects during the infusion

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argatroban

Warnings	Classification	Alternate Names
	direct thrombin inhibitor, anticoagulant	

Indications

- prophylaxis and treatment of venous thromboembolism (VTE) in patients with heparin-induced thrombocytopenia (HIT)
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- protect from light

Compatibility

- compatible with D5W, NS and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration:** 1 mg/mL: add 125 mg to 125 mL add 250 mg to 250 mL *rate must be controlled with an IV infusion pump*	Basic Monitoring

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argatroban

Dosage

Initial dose: 1 mcg/kg/minute continuous IV infusion; adjust dose to prolong the PTT to 60 to 90 seconds per argatroban nomogram (refer to order set)

Dose adjustment required in hepatic impairment (Child Pugh score greater than 6):
initial dose: 0.5 mcg/kg/minute continuous IV infusion; adjust dose to prolong the PTT to 60 to 90 seconds per argatroban nomogram (refer to order set)

Dose adjustment guided by PTT:
- check PTT 2 hours after initiating therapy;
- then check PTT 4 hours after a dose change;
- if PTT is in target range, continue to check Q4H until 3 consecutive results in target range, then monitor daily
- target range: maintain PTT at 60 to 90 seconds (see pre-printed orders or Powerplan)

Infusion chart
argatroban infusion rates for concentration 1 mg/mL

Potential Hazards of Parenteral Administration

- overdose: hemorrhage
  - treatment: stop infusion, check PTT; no specific antidote, fresh frozen plasma may be indicated

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- major/minor bleeding, fever, sepsis, pain, hypotension, ventricular tachycardia, cardiac arrest, bradycardia, myocardial infarction, dyspnea, headache, cough
- nausea, vomiting and diarrhea

Monitoring:
- hemoglobin and platelets at baseline and at least every 2 days
- PTT as outlined under Dosage section
- *co-administration of warfarin and argatroban*:
  - the INR will increase with argatroban; measure INR daily
  - with argatroban doses up to 2 mcg/kg/minute, an INR of 4 may be interpreted as an INR between 2 to 3 attributed to warfarin alone
  - if INR is greater than 4: stop argatroban and repeat INR after 4 to 6 hours. If the repeat INR is subtherapeutic, resume argatroban infusion; repeat this procedure daily until INR is therapeutic
  - with argatroban doses greater than 2 mcg/kg/minute, interpretation of INR on combined therapy is less well established. It is recommended to temporarily reduce the dose to 2 mcg/kg/minute and obtain an INR 4 to 6 hours later

Other
- anticoagulant effects reach steady-state levels within 2.5 hours following initiation or dose adjustment
- upon discontinuation, little or no argatroban remains after 4 hours

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arginine

Warnings	Classification	Alternate Names
vesicant	diagnostic agent, amino acid	L-arginine, arginine hydrochloride

Indications

- pituitary function test (growth hormone)
- treatment of metabolic disorders

Reconstitution and Stability

- store at room temperature

Compatibility

- D5W, D10W

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent*	YES	▪ Mitochondrial stroke: dilute dose in D5W 100 mL; ▪ Growth hormone reserve test: remove 70 mL from D5W 250 mL bag, then add 30 g to bag; ▪ Glutaric aciduria: dilute 10 g in D5W 250 mL; infuse over 30 minutes ▪ Hyperammonemia: dilute dose in D10W 1 L (with sodium phenylacetate and sodium benzoate); give o priming dose over 90 minutes o sustaining dose over 24 hours *rate must be controlled with an infusion pump*	Basic Monitoring
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent.*	

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arginine

Dosage

Refer to site specific treatment protocols for complete information.

Mitochondrial stroke : 3.3 g/m^2 IV Q8H for 3 doses (most effective if given within 6 hours of onset of stroke)

Growth hormone reserve test: 30 g IV intermittent

Glutaric aciduria: 10 g IV intermittent Q12H for 3 doses

Hyperammonemia:
- Priming dose: 4 g/m^2 (mixed with sodium phenylacetate and sodium benzoate) IV, then
- Sustaining dose: 4 g/m^2 (mixed with sodium phenylacetate and sodium benzoate) IV

Potential Hazards of Parenteral Administration

- venous irritation
- extravasation risk: vesicant (solution is hyperosmolar): may cause necrosis and superficial phlebitis
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- Severe, potentially fatal hyperkalemia has occurred following arginine therapy for metabolic alkalosis in several patients with severe hepatic disease who had recently received spironolactone. Combined use of potassium-sparing diuretics and arginine should be avoided.
- Caution: in patients with hepatic disease or those receiving drugs that can elevate serum potassium.
- Caution: in patients with hyperchloremic acidosis, renal failure, diabetes

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea, vomiting, numbness, headache (especially if administered too rapidly)
- arginine stimulates pancreatic release of insulin and glucagon, and causes increase in blood glucose

Monitoring
- acid-base status, serum creatinine and electrolytes (sodium, potassium, chloride, bicarbonate, phosphorous), BUN, glucose
- monitor infusion site

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ARIPiprazole long-acting

Warnings	Classification	Alternate Names
	antipsychotic	ABILIFY MAINTENA

Indications

- management of the manifestations of schizophrenia or related psychotic disorders (not dementia related)
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- follow the manufacturer's instructions (package insert) provided within the ABILIFY MAINTENA kit; *Synopsis*: Reconstitute the 300 mg and 400 mg vials with 1.5 mL and 1.9 mL sterile water for injection respectively, provided in kit. Final concentration is 200 mg/mL. Shake the vial vigorously for 30 seconds to provide a uniform milky white suspension. Use the provided syringes and vial adapter to withdraw the volume to be injected.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	▪ inject into deltoid or gluteal muscles; choose appropriate needle as outlined in the package insert found in the kit ▪ if initiating treatment with 2 injections, administer in two different sites ▪ rotate sites between the two deltoid or gluteal muscles	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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ARIPiprazole long-acting

Dosage

For patients who have never taken ARIPiprazole, establish tolerability with oral ARIPiprazole prior to initiating treatment with ABILIFY MAINTENA.

- initiate treatment with either *one injection* start or *two injection* start:
  - *one injection start*: on day of treatment initiation, administer one injection of 400 mg ARIPiprazole long-acting and continue with 10 to 20 mg oral ARIPiprazole daily or on patient's current oral antipsychotic for 14 days
  - *two injection start*: on the day of treatment initiation, administer two separate injections of 400 mg ARIPiprazole long-acting at separate injection sites and a single 20 mg dose of oral ARIPiprazole. Discontinue current oral antipsychotic upon initiation of ARIpiprazole long-acting.
- continue with 400 mg IM once monthly*
  *monthly = 28 days (minimum interval of 26 days)

- if adverse reactions occur with 400 mg, consider decreasing to 300 mg IM once monthly*

Dosage adjustments:
- Dosage to be adjusted in patients taking both ARIPiprazole long-acting and strong CYP3A4 inhibitors (e.g. clarithromycin), strong CYP2D6 inhibitors (eg. quiNIDine, PARoxetine) or in patients who are poor CYP2D6 metabolizers – **for more than 14 days**. Refer to manufacturer's instructions.
- Avoid the use of CYP3A4 inducers (eg. carBAMazepine, rifaMPin) combined with ARIPiprazole long-acting for **more than 14 days** because ARIPiprazole serum concentrations may fall below effective levels.
- For missed doses, refer to manufacturer's instructions.

Potential Hazards of Parenteral Administration

- injection site reaction and pain

Important Implications

Contraindications/Cautions
- avoid in elderly patients with dementia-related psychosis
- may lower seizure threshold
- pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CNS*: headache, extrapyramidal reactions, insomnia; *Endocrine & metabolic:* weight gain, elevated lipids, increased serum glucose, hyperprolactinemia ; *CVS*: orthostatic hypotension *GI*: nausea, constipation

Monitoring
- blood glucose, neurologic function, serum lipid profile, serum prolactin, weight

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arsenic

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	TRISENOX arsenic trioxide

Indications

- leukemia, acute promyelocytic
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible in D5W or NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 100 to 250 mL, and infuse over 1 to 2 hours; may be extended up to 4 hours if acute vasomotor reactions are observed *rate must be controlled with an IV infusion pump*	Intermediate monitoring or according to protocol
Continuous IV infusion	NO		

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arsenic

Dosage

Dose and schedule depend on protocol and patient response. **Follow specific protocol**.

- Usual induction dose: 0.15 mg/kg IV once daily until bone marrow remission (total induction dose should not exceed 60 doses)

- Usual consolidation dose:
  - usually begins 1 to 6 weeks after completion of induction therapy
  - 0.15 mg/kg (range 0.075 to 0.15 mg/kg) IV once daily, given 5 days per week (maximum 25 doses over a period of up to 5 weeks)

- May require dose reduction in renal impairment (creatinine clearance less than 30 mL/min) or hepatic impairment.

- For further information, refer to: BC Cancer Drug Monographs

Potential Hazards of Parenteral Administration

- injection site pain, inflammation, erythema, hemorrhage

- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Contraindications*: history of hypersensitivity reaction to arsenic trioxide or baseline QT/QTc interval greater than 500 msec (unless corrected and reassessed with serial ECG)
- *Caution*: QT prolongation and complete atrioventricular block; use with caution in patients with known risk factors for torsades de pointes. If possible avoid concurrent administration with QT prolonging drugs (eg. antiarrhythmics) or drugs which disrupt electrolytes. QT prolongation is expected with arsenic treatment and develops gradually over a period of 6 to 24 days.
- Use with *caution* in patients with renal, hepatic, or neurological impairment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CNS*: headache, fever, insomnia; *CVS*: tachycardia, QTc prolongation; *RESP*: cough, dyspnea; *GI*: diarrhea, nausea and vomiting; *other*: chills, dermatitis, fatigue, paresthesia
- Metabolic and electrolytes: hyperglycemia, hypokalemia, hypomagnesemia
- Blood disturbances: hyperleukocytosis, thrombocytopenia
- Acute Promyelocytic leukemia (APL) Differentiation Syndrome may be experienced in up to 30% of patients with acute promyelocytic leukemia. Signs and symptoms include: dyspnea, unexplained fever, weight gain, peripheral edema, hypotension, acute renal failure or congestive heart failure, and interstitial pulmonary infiltrates or pleuropericardial effusion with or without leukocytosis. Arsenic should be temporarily interrupted if APL differentiation syndrome is suspected and appropriate treatment implemented.

Monitoring
- ECG prior to first dose and then weekly or more frequently if patient is clinically unstable.
- Close electrolyte monitoring is required. Maintain serum magnesium above 0.7 mmol/L and serum potassium above 4 mmol/L.

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ascorbic acid

Warnings	Classification	Alternate Names
	vitamin	vitamin C

Indications

- prophylaxis and treatment of ascorbic acid deficiency

Reconstitution and Stability

- store at room temperature
- slight discolouration does not affect therapeutic potency

Compatibility

- compatible with dextrose solutions, NS, Lactated Ringers solution, Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	NO		
IV intermittent	YES	dilute in D5W 50 mL give over 15 minutes	Basic Monitoring
Continuous IV infusion	NO		

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ascorbic acid

Dosage

- Prophylaxis and treatment of deficiency: 100 to 500 mg per day.

Potential Hazards of Parenteral Administration

- rapid IV administration may cause temporary dizziness or faintness
- transient pain and swelling at injection site

Important Implications

Contraindications/Cautions

- caution in patients with kidney stones
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hyperoxaluria can occur after large doses; may lead to formation of kidney stones

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asparaginase erwinia (ERWINASE)

Warnings	Classification	Alternate Names
high alert medication	antineoplastic	ERWINASE erwinia asparaginase

Indications

- acute lymphoblastic leukemia
- treatment of those who have developed hypersensitivity to asparaginase e.coli (KIDROLASE) or pegaspargase (ONCASPAR)
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- available through Health Canada Special Access Program; contact pharmacy

Reconstitution and Stability

- syringes stable for 4 hours at room temperature
- all doses are prepared by pharmacy

Compatibility

- compatible with NS

Preparation and Administration

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	• maximum volume of 2 mL per site • if volume greater than 2 mL, use more than one site	Advanced monitoring or per protocol observe for 1 hour after administration
Intramuscular	YES	• maximum volume of 2 mL per site • if volume greater than 2 mL, use more than one site	Advanced monitoring or per protocol observe for 1 hour after administration
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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asparaginase erwinia (ERWINASE)

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response

Example: ALL 13-01 protocol: 12,500 units/m^2 IM twice weekly to complete 30 weeks of asparaginase therapy

- When asparaginase erwina (ERWINASE) is used following a hypersensitivity reaction to asparaginase e.coli (KIDROLASE), dosing is different because of the different pharmacokinetic profiles.

- Refer to BC Cancer Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity reactions, include rash, urticaria, edema, hypotension, respiratory distress, chills, fever and anaphylaxis
- anaphylactic reactions are significantly greater in patients who have reacted to E. Coli derived asparaginase
- during administration, resuscitation equipment and emergency drugs should be readily available

Important Implications

Contraindications/Cautions
- contraindicated in patients with a history of an allergy to asparaginase erwinia (ERWINASE), or past or present pancreatitis, or in those who have experienced significant hemorrhagic or thrombotic side effects with other formulations of asparaginase

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CVS:* coagulation abnormalities ; fibrinogen decreased ; thrombosis
- *GI*: hepatotoxicity; pancreatitis acute
- *metabolic/laboratory*: bilirubin, transient increase ; transaminase, transient increase
- *CNS*: neurotoxicity, generally reversible

Monitoring
- liver function tests, serum amylase

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aspergillus skin test

Warnings	Classification diagnostic agent	Alternate Names

Indications

- diagnostic aid to detect IgE-mediated allergy to aspergillus (as part of fungal skin testing).

Reconstitution and Stability

- refrigerate (2 to 8°C)

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intracutaneous (skin prick/scratch test)	Yes	**physician only** or practitioner with advanced skills in how to administer and interpret the test	Basic Monitoring

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aspergillus skin test

Dosage

- Reagents from manufacturers differ and give slightly different skin prick test results in different people. Currently pharmacy stocks Alk-Abello 1:10 w/v pin prick solution

Potential Hazards of Parenteral Administration

- hypersensitivity reaction (urticaria, shortness of breath, anaphylaxis); all precautions should be taken for handling anaphylaxis, including having epinephrine and antihistamines available

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- there is a possible loss of reactivity in elderly patients, those with suppressed immune systems due to illness (HIV) or medications (corticosteroids, chemotherapy), or recent administration of viral vaccines
- topical steroids should be discontinued at the skin test site for at least 2 to 3 weeks before skin testing
- topical local anesthetics may suppress the flare response and should be avoided in skin test sites

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atropine

Warnings	Classification	Alternate Names
	anticholinergic; antidote	atropine sulphate

Indications

- pre-operative suppression of salivary, gastric and respiratory secretions
- sinus bradycardia and atrioventricular block
- antidote for organophosphate and other anticholinesterase poisoning
- management of irinotecan induced diarrhea and cholinergic symptoms

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Advanced Monitoring
Intramuscular	YES		Advanced Monitoring
IV direct	YES	give undiluted; rapidly over a few seconds	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	use preservative-free product **standard solution concentration**: 0.048 mg/mL dilute 24 mg in NS 500 mL *rate must be controlled with infusion pump*	Full monitoring See site-specific restrictions

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atropine

Dosage

Organophosphate poisoning:

- *atropinization*: 1 to 2 mg IV direct initially; repeat with 1 to 5 mg every 20 to 30 minutes as necessary until excessive bronchial secretions, wheezing, bradycardia and hypotension is controlled (and pulse does not exceed 140 beats/minute).
- *maintenance*:
  - continue with dose required for atropinization until a gradual reduction in dose does not result in reappearance of cholinergic symptoms. Gradually reduce dose prior to discontinuing if patient has received high doses or long term therapy, **or**
  - 0.02 to 0.08 mg/kg/hour continuous IV infusion may be preferred when high doses are required for prolonged periods. Initiate hourly infusion rate at 10 to 20 % of the atropinizing dose; reassess often and titrate as needed (larger doses may be required).

Preoperative: 0.4 mg IM, subcutaneous or IV direct administered 30 to 60 minutes prior to anesthesia

Bradycardia: 0.5 mg IV direct, may repeat every 3 to 5 minutes to a maximum of 3 mg

Irinotecan induced diarrhea and cholinergic symptoms:

- prophylaxis: 0.3 to 0.6 mg subcutaneous
- treatment: 0.3 to 0.6 mg subcutaneous every 30 to 60 minutes as needed, repeat up to a maximum dose of 1.2 mg for early diarrhea, abdominal cramps, rhinitis, lacrimation, diaphoresis or flushing

Potential Hazards of Parenteral Administration

- local irritation
- tachycardia, temporary sensation of lightheadedness

Important Implications

Contraindications/Cautions

- contraindicated in the presence of tachycardia secondary to cardiac insufficiency or thyrotoxicosis, acute hemorrhage with unstable cardiovascular status, acute angle-closure glaucoma
- contraindicated in severe heart disease, hypertension, hyperthyroidism, autonomic neuropathy
- caution: paradoxical slowing of heart rate occurs with low doses and/or slow infusion rates
- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects

- tachycardia, temporary sensation of lightheadedness
- anticholinergic side effects may occur (signs of excessive atropinization include: hot dry skin, dry mouth, CNS excitation, psychosis)

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azaCITIDine

Warnings	Classification	Alternate Names
hazardous drug group 1 high alert medication	antineoplastic, pyrimidine analogue	VIDAZA

Indications

- treatment of : myelodysplastic syndrome (MDS), acute myeloid leukemia (AML)
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- refrigerate if dose not used immediately
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

Preparation and Administration

- **VCH** – refer to Hazardous Drugs– Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	▪ rotate sites for each injection into the upper arm, thigh or abdomen; subsequent doses should be at least 2.5 cm from previous injection site ▪ allow syringe to come to room temperature for a maximum of 30 minutes prior to administration ▪ maximum volume per site is 4 mL ▪ volumes greater than 4 mL are to be injected in divided doses at separate sites ▪ Pharmacy provides syringe with air added for resuspension: o re-suspend contents of syringe by vigorously rolling between palms immediately prior to administration until cloudy suspension is achieved o administer using “air sandwich” technique to reduce severity of injection site reactions	Basic monitoring or according to protocol
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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azaCITIDine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response**.**

- AML or MDS: 75 mg/m^2 subcutaneous once daily for 7 consecutive days starting on day 1. Followed by a rest period of 21 days. Repeat every 4 weeks.

- Dose modifications required for hematological toxicity, significant GI toxicity, renal dysfunction and serum bicarbonate below 20 mmol/L.

- For further information, refer to: BC Cancer Drug Monographs

Potential Hazards of Parenteral Administration

- injection site reactions including erythema (up to 43%, severe 5%)
- Extravasation risk: non-vesicant (irritant)
    - VCH see: Hazardous Drugs– Administration and Handling
    - PHC see: extravasation management

Important Implications

Contraindications/Cautions
- contraindication: advanced malignant hepatic tumors
- caution: patients with high tumour burden prior to treatment are at risk of developing tumour lysis syndrome

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *hematological toxicities including*: neutropenia (32 to 66%, severe 61%), anemia (51 to 70%, severe 14%), leukopenia (18 to 48%, severe 15%) and thrombocytopenia (66 to 70%, severe 58%) all with mean time to nadir of 15 to16 days
- *cardiovascular* : chest pain (16%); *constitutional symptoms:* fatigue/lethargy/malaise (up to 14%, severe 3%), fever (30 to 52%, severe 5%), dizziness (19%) and headache (22%);
- *skin*: ecchymosis (31%), erythema (17%), pruritus (12%) and rash (10 to 14%);
- *gastrointestinal*: anorexia (21%), constipation (34 to 50%), diarrhea (36%), emetogenic potential - low to moderate as follows: nausea (48 to 71%, severe 2%) and vomiting (27 to 54%);
- *pulmonary*: dyspnea (15 to 29%, severe 3%)

Monitoring
- Liver function tests and serum creatinine prior to start of therapy and prior to each treatment cycle. Complete blood counts prior to start of therapy and as needed to monitor response and toxicity.

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azithromycin

Warnings	Classification antibiotic (macrolide)	Alternate Names ZITHROMAX

Indications

- treatment of infections caused by susceptible strains of microorganisms in patients with community acquired pneumonia or pelvic inflammatory disease

Reconstitution and Stability

- powder is stable at room temperature
- 500 mg vial: add 4.8 mL sterile water for injection to provide 100 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 250 mL D5W; give over at least 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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azithromycin

Dosage

- 500 mg IV once daily; convert to oral therapy as soon as possible

Potential Hazards of Parenteral Administration

- pain at site of injection and/or local inflammation during infusion
- hypersensitivity reactions

Important Implications

Contraindications/Cautions

- use with caution in patients with severe hepatic dysfunction; drug is eliminated primarily via biliary excretion
- use with caution in patients with prolonged QT interval

- Pregnancy /Lactation: refer to Lexicomp or Micromedex

Side effects

- headache, dizziness, nausea, vomiting, abdominal pain, diarrhea
- prolongation of the QT interval and development of ventricular arrhythmias (rare)

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aztreonam

Warnings	Classification antibacterial monobactam, monocyclic Beta-lactam antibiotic	Alternate Names AZACTAM

Indications

- treatment of infections caused by susceptible strains of gram negative aerobic bacteria
- available through Health Canada **Special Access Program**; contact pharmacy

Reconstitution and Stability

- store vials at room temperature
- for IV or IM administration, reconstitute vials with sterile water for injection (SWFI) as follows:
  - 1 g vial: add 3 mL to provide 333 mg/mL solution
  - 2 g vial: add 6 mL to provide 333 mg/mL solution
- shake vigorously until the powder is dissolved
- reconstituted solutions are colourless to a light straw yellow; may develop pink tinge on standing (potency is not affected)

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers or lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	▪ into large muscle mass (upper outer quadrant of gluteus maximus or lateral part of thigh) ▪ doses of more than 1 g should be given IV	Basic Monitoring
IV direct	YES	▪ dilute dose up to 10 mL with SWFI ▪ administer over 3 to 5 minutes	Basic Monitoring
IV intermittent	YES	▪ dilute 1 g in 50 mL ▪ dilute 2 g in 100 mL ▪ infuse over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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aztreonam

Dosage

- Moderately severe infections: 1 to 2 g IV Q8H to Q12H
- Severe infections: 2 g IV Q6H to Q8H; *maximum dose is 8 g/day*
- 1 g doses may be given IM; doses of more than 1 g should be given IV

- Dosage adjustments for renal impairment as follows:

Renal impairment	Dose and interval
creatinine clearance of 10 to 29 mL/minute	1 to 2 g every 12 hours
creatinine clearance of less than 10 mL/minute	1 to 2 g every 24 hours
hemodialysis (give after dialysis on dialysis days)	1 to 2 g every 24 hours
peritoneal dialysis	1 to 2 g every 24 hours

Potential Hazards of Parenteral Administration

- local reactions: phlebitis/thrombophlebitis, induration, erythema with IV administration; discomfort, swelling, pain with IM injection
- low incidence of immunologic reactions which include rash, pruritus, bronchospasm rarely anaphylaxis

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to aztreonam *or*
  - delayed beta-lactam antibiotic allergy causing interstitial nephritis, hepatitis, hemolytic anemia or delayed severe skin allergic reactions [Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis, acute generalized exanthematous pustulosis (AGEP), drug reaction with eosinophilia and systemic symptoms (DRESS)]

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- transient increase in liver enzymes
- nausea, vomiting, diarrhea, altered sense of taste

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baclofen

Warnings	Classification	Alternate Names
	muscle relaxant, antispasmodic	LIORESAL INTRATHECAL

Indications

- management of patients with severe spinal cord spasticity who are unresponsive or experience unacceptable side effects from oral baclofen
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- stable at room temperature, protect from heat
- discard if solution is cloudy, discoloured, or contains particulate matter

Compatibility

- compatible with normal saline

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intrathecal	YES	• **test dose by physician only** by barbotage over at least 1 minute • maintenanace continuous intrathecal infusion by RN with specialized training • all doses prepared by pharmacy	Advanced Monitoring or per site specific intrathecal protocol per site specific intrathecal protocol

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baclofen

Dosage

Test dose:
- 25 to 50 mcg intrathecally; if no response, increase dose by 25 mcg increments every 24 hours until a 4 to 8 hour clinical response is demonstrated; if no response occurs to a 100 mcg test dose, then no further dose should be considered
- If adverse reaction occurs to initial 25 mcg test dose, a 10 mcg test dose may be considered

Maintenance dose:
- Double the test dose that gave clinical response and administer by continuous intrathecal infusion over 24 hours; if the response to the test dose lasted greater than 12 hours, then give the same dose over 24 hours (do not double the dose). Dose may be increased in titrations of 10 to 30% every 24 to 48 hours
- Maintenance dose range: 10 to 1200 mcg/day (average 300 to 800 mcg/day)

Potential Hazards of Parenteral Administration

- life-threatening CNS depression, cardiovascular collapse and/or respiratory failure
- avoid abrupt withdrawal as a hyperactive state with rapid and uncontrolled spasms, and increased rigidity may occur; to discontinue, dose should be tapered slowly over a period of 1 to 2 weeks
- patients receiving concomitant benzodiazepines or opiates are at higher risk of respiratory depression

- **Confirm resuscitative equipment is readily available**

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- most common side effects include drowsiness, weakness in the lower extremities, dizziness/lightheadedness, seizures, headache, nausea and vomiting

Other
- onset of effect (intrathecal bolus): 1 to 2 hours; peak onset: 2 to 4 hours; duration of effect: 4 to 8 hours
- intrathecal baclofen produces effective CSF concentrations with resultant plasma concentrations 100 times lower than those occurring following oral administration

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basiliximab

	Classification	Alternate Names
	monoclonal antibody immunosuppressant	SIMULECT

Indications

- *prevention* of acute rejection in solid organ transplant (SOT) recipients (i.e. liver, kidney, heart, islet cell, pancreas, lung transplant)
- *treatment* of refractory acute graft-versus-host disease (GVHD) in bone marrow transplant (stem cell transplant) recipients
- restrictions apply

Reconstitution and Stability

- store in refrigerator
- reconstitute 20 mg vial with 5 mL sterile water for injection to make a 4 mg/mL solution; shake vial gently to dissolve powder
- reconstituted solution and solution diluted for infusion is **stable for 4 hours only** at room temperature

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in NS or D5W 50 mL; infuse over 20 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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basiliximab

Dosage

Refer to site specific pre-printed orders.

Prophylaxis of acute rejection in solid organ transplant (liver, kidney, heart, islet cell, pancreas, lung):
20 mg IV post-op on the day of transplant (post-op day 0); repeat with 20 mg IV on post-op day 4

Treatment of refractory acute GVHD:
20 mg IV on days 1 and 4; may repeat for recurrent acute GVHD

Potential Hazards of Parenteral Administration

- severe, acute hypersensitivity reactions (rare) may occur both on initial exposure and second dose:
  - urticaria, pruritus, hypotension, tachycardia, dyspnea, bronchospasm, pulmonary edema and respiratory failure
  - stop the infusion and notify physician; resuscitative equipment and medications for treating hypersensitivity reactions should be readily available; do not give second dose if reactions occur

Important Implications

Contraindications/Cautions
- patients who have previously been given basiliximab should only be re-exposed to a subsequent course of therapy with extreme caution
- **NOT** indicated for *treatment* of acute rejection of solid organ transplant

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- abdominal pain, constipation, nausea and vomiting
- hypertrichosis, flushing, dizziness and headache
- hypertension, pain, edema, tremor

Other
- basiliximab is a recombinant, chimeric (murine / human) monoclonal antibody against CD25 (IL-2)

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BCG

Warnings	Classification	Alternate Names
hazardous drug group 1	antineoplastic, biologic response modifier	ONCOTICE, VERITY-BCG Bacillus Calmette-Guerin

Indications

- bladder cancer (intravesical)
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store vials in the refrigerator
- ONCOTICE: dilute the contents of 1 vial (50 mg) in 45 or 50 mL NS, stable for 2 hours in refrigerator
- alternatively doses are prepared by pharmacy in a biological safety cabinet, stable for 2 hours in refrigerator
- protect from sunlight (direct or indirect); minimize exposure to artificial light

Compatibility

- compatible with NS only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravesicular antineoplastics (see Classification above). Refer to Hazardous Drugs-Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intravesical (bladder instillation)	YES	▪ patient must empty their bladder prior to instillation ▪ retain solution in bladder for one to two hours	Basic monitoring or according to protocol

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BCG

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response**.**

Usual dose for bladder instillation:
ONCOTICE 50 mg or VERITY-BCG 80 mg diluted in 45 or 50 mL NS and retained in the bladder for 1 to 2 hours

Example: BC Cancer GUBCG protocol:
- Induction: use above dose once weekly for 6 weeks
- Maintenance:
  - *high risk* :weekly for 3 consecutive weeks at 3, 6, 12, 18, 24, 30, 36 months
  - *intermediate risk*: weekly for 3 consecutive weeks at 3, 6, 12 months

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- *contraindicated* in patients:
  - on immunosuppressive therapy or with compromised immune systems due to risk of overwhelming systemic mycobacterium sepsis
  - with urinary tract infections due to the risks of disseminated BCG infection and greater severity of bladder irritation
  - with fever of unknown origin
- *caution*: a Mantoux (PPD) test should be performed prior to the first instillation; a positive result contraindicates proceeding only in the presence of supplemental evidence of an active tuberculosis infection
- *caution*: it is recommended that intravesical BCG not be administered any sooner than 1 to 2 weeks following bladder biopsy, transurethral resection or traumatic catheterization

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- significant cystitis for a few days is expected following intravesical administration (urinary frequency, dysuria, nocturia, hematuria)
- flu-like symdrome consists of fever, malaise, vomiting, arthralgia, myalgia and headache. These symptoms respond to bed rest and antipyretic treatment.
- Most local adverse reactions occur following the third intravesical instillation. Symptoms usually begin 2 to 4 hours after instillation and persist for 24 to 72 hours.

Other:
- urine voided within 6 hours after instillation should be disinfected by adding 500 mL of undiluted bleach to the toilet bowl; allow to stand 15 minutes before flushing
- if systemic BCG infection is suspected, the patient should immediately be treated with fast-acting antituberculosis therapy

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bendamustine

Warnings	Classification	Alternate Names
hazardous drug group 1 high alert medication	antineoplastic, alkylating agent	TREANDA bendamustine hydrochloride

Indications

- Primary indications: non-Hodgkin's lymphoma and chronic lymphocytic leukemia. May also be used for Hodgkin's lymphoma.
- for *all* indications see BC Cancer benefit drug list
- Restricted to indications outlined in the BCCA Benefit Drug List AND patients who are registered with BC Cancer

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- complete administration within 24 hours of mixing if stored in the fridge and within 3 hours of mixing if stored at room temperature

Compatibility

- compatible with NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 250 to 500 mL NS (final concentration 0.2 to 0.6 mg/mL) infuse over 60 minutes	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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bendamustine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples of dosing schedules:
- Non-Hodgkin's Lymphoma: 90 mg/m^2 (up to 120 mg/m^2) on days 1 and 2 of cycle; repeat every 28 days (4 weeks). Maximum of 6 cycles.
- Chronic lymphocytic leukemia: 70 mg/m^2 (up to 100 mg/m^2) on days 1 and 2 of cycle; repeat every 28 days (4 weeks). Maximum of 6 cycles.

Dose modification for hematologic or clinically significant non-hematologic toxicity : per protocol.

Dosage in renal failure: avoid use if creatinine clearance is less than 40 mL/minute

Dosage in hepatic failure: avoid use if AST/ALT is equal to or more than 2.5 x upper limit of normal (ULN) or bilirubin is equal to or more than 1.5 x ULN

Refer to BC Cancer Drug Manual monographs

Potential Hazards of Parenteral Administration

- infusion reactions: including fever, chills, pruritus, and rash commonly occur
- hypersensitivity and rarely anaphylactoid reactions (particularly in 2nd or subsequent cycles); ensure epinephrine and oxygen are readily available
- injection site reactions: including erythema, phlebitis, pruritus, marked swelling, and pain
- Extravasation risk: non-vesicant (irritant)
    - VCH see: Hazardous Drugs- Administration and Handling
    - PHC see: extravasation management

Important Implications

Contraindications/Cautions
- *Contraindications*: history of hypersensitivity reaction to bendamustine or mechlorethamine, mannitol
- *Cautions*:
    - tumour lysis syndrome can occur, with usual onset occurring during the first cycle; the use of allopurinol concurrently with bendamustine may increase the risk of severe skin toxicity
    - avoid bendamustine in patients with serious infections, including HIV; infections have been associated with hospitalization, septic shock, and death
    - hypertension, including hypertensive crisis, has been reported; hypertension should be well-controlled prior to treatment with bendamustine
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *hematologic*: anemia, leukopenia, neutropenia, thrombocytopenia
- *gastrointestinal*: anorexia, constipation, diarrhea, nausea and vomiting, stomatitis
- *CNS*: headache
- *skin*: rash - may be progressive and increase in severity, may require stopping treatment, Stevens-Johnson syndrome
- *others*: cough, weight loss

Monitoring
- CBC, ANC, serum creatinine, electrolytes (eg. possibility of hypokalemia, hypomagnesemia), AST and ALT

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benztropine

Warnings	Classification anticholinergic anti-Parkinson's agent	Alternate Names COGENTIN benztropine mesylate

Indications

- symptomatic treatment of parkinsonism including drug induced parkinsonism
- symptomatic relief of drug induced extrapyramidal side effects

Reconstitution and Stability

- stable at room temperature
- protect from light

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	if no other route available	Basic Monitoring
Intramuscular	YES	preferred route	Basic Monitoring
IV direct	YES	undiluted, 1 mg or less over 1 minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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benztropine

Dosage

Parkinsonism / Extra-pyramidal side effects:
- usual dose: 1 to 2 mg IM/IV/SUBCUT once daily (or may be divided BID); range: 0.5 to 6 mg daily
- maximum: 6 mg/day

Acute dystonic reactions:
- 1 to 2 mg IM/IV

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- use with caution in the elderly,
- use with caution in patients with renal, hepatic or cardiac disorders, obstructive diseases of GI tract, hypotension and prostatic hypertrophy

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- adverse effects are dose related and include signs of cholinergic blockade such as dry mouth, blurred vision, urinary retention, tachycardia, drowsiness, mental confusion

Other
- IM route preferred over IV, as no significant difference in onset of effect.
- reduce dose of both drugs when used concomitantly with levodopa

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benzylpenicilloyl polylysine

Warnings	Classification diagnostic agent	Alternate Names PRE-PEN

Indications

- diagnostic aid for detection of penicillin sensitization (i.e. **one component of penicillin allergy skin testing protocols**)

Reconstitution and Stability

- store in a refrigerator (2 to 8° C),
- If inadvertently left at room temperature, it is stable for 24 hours only and then must be discarded.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intracutaneous (prick, puncture, scratch)	YES	by practitioner with advanced skills in how to administer and interpret the test on the inner volar aspect of the forearm	Basic Monitoring
Intradermal	YES	by practitioner with advanced skills in how to administer and interpret the test administer only if prick/puncture/scratch test is negative	Basic Monitoring

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benzylpenicilloyl polylysine

Dosage

PRE-PEN is one component of penicillin allergy skin testing protocols.

Intracutaneous (prick/ puncture/ scratch):
- 1 drop of PRE-PEN (prick x 3). Watch for development of wheal over the next 10 minutes.
- Interpret test as:
  - *Positive*: wheal of 5 mm or more
  - *Negative*: no wheal or wheal of less than 5 mm

Intradermal test:
- Administer only if puncture test is negative.
- Inject 0.03 mL of PRE-PEN at one site, and 0.03 mL histamine (positive control) and 0.03 mL sterile water (negative control) each at separate sites. Watch for development of wheal over the next 15 minutes.
- Interpret test as:
  - *Positive*: wheal of 5 mm or more to PRE-PEN
  - *Indeterminate*: wheal of less than 5 mm to PRE-PEN **and** wheal less than 5 mm to histamine control. Consider POSITIVE if further detailed history suggestive and depending on setting (e.g. ICU vs. ward)
  - *Negative*: no wheal or wheal of less than 5 mm to PRE-PEN **and** a wheal of 5 mm or more to histamine control

Potential Hazards of Parenteral Administration

- all precautions should be taken for handling anaphylaxis, including having epinephrine and antihistamines available

Important Implications

Contraindications/Cautions
- Contraindicated: in those who have exhibited either a systemic or marked local reaction to previous administration of PRE-PEN. Patients who have had a severe life-threatening allergic reaction to penicillin (eg. Stevens-Johnson syndrome) should not be skin tested.
- Caution: penicillin skin testing must involve reagents of **both** the major antigenic determinant (penicilloyl-polylysine) and minor determinants (penicilloate or penilloate). **Benzylpenicilloyl polylysine (PRE-PEN) alone does not identify those patients who react to a minor antigenic determinant**. Penicillin skin testing does not predict the occurrence of late reactions (eg, type II, III, IV or idiopathic reactions).

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- occasionally, intense local inflammatory response
- rarely, systemic allergic reaction: includes generalized erythema, pruritus, dyspnea, hypotension, and anaphylaxis

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betamethasone

Warning	Classification	Alternate Names
	corticosteroid	BETAJECT, CELESTONE SOLUSPAN betamethasone sodium phosphate; betamethasone acetate suspension

Indications

- for antenatal use in pregnant persons who are 24+0 to 34+6 weeks gestation and at increased risk for preterm delivery within 7 days; given to reduce the risk of respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC) and death in the neonate

Reconstitution and Stability

- store at room temperature; protect from light
- shake well before use

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	inject deeply into gluteal muscle	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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betamethasone

Dosage

- 12 mg IM every 24 hours for 2 doses

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- avoid injection within an infected area
- caution in patients with active peptic ulcers, active/latent infections (i.e. tuberculosis, fungal or viral infections)

Side effects
- sodium and fluid retention, hypokalemia, hyperglycemia
- hypertension
- increased susceptibility to and masked signs of infection
- CNS depression, euphoria

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bivalirudin

Warnings	Classification	Alternate Names
	direct thrombin inhibitor; anticoagulant	ANGIOMAX

Indications

- anticoagulant, indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- reconstitute 250 mg vial with 5 mL sterile water for injection to yield a 50 mg/mL solution

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	bolus dose and IV infusion administered from the same bag **standard solution concentration:** 5 mg/mL: 250 mg in 50 mL *rate must be controlled with an IV infusion pump*	Advanced Monitoring see site-specific restrictions

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bivalirudin

Dosage

Anticoagulation during PCI (from REPLACE-2 trial):

- if creatinine clearance (CrCl) is 30 mL/minute or greater: give 0.75 mg/kg IV bolus over a few seconds followed by 1.75 mg/kg/hour continuous IV infusion for duration of the procedure
- dose reduction in renal impairment:
  - if CrCl is less than 30 mL/minute: give 0.75 mg/kg IV bolus over a few seconds followed by 1 mg/kg/hour continuous IV infusion for duration of procedure
  - for hemodialysis patients (off dialysis during administration): give 0.75 mg/kg IV bolus over a few seconds followed by 0.25 mg/kg/hour continuous IV infusion for duration of procedure
- monitor activated clotting time (ACT);
  - maintain at approximately 350 seconds;
  - if ACT is 250 seconds or less: re-bolus and double the infusion rate
  - If ACT is between 250 and 300 seconds: just re-bolus
- switching from unfractionated heparin (UFH): wait 30 minutes after last UFH dose, then start bivalirudin
- switching from low molecular weight heparin (LMWH): wait 8 hours after last LMWH dose, then start bivalirudin

Anticoagulation in patients with Heparin-induced thrombocytopenia:

- CrCl of greater than 60 mL/minute: 0.15 to 0.2 mg/kg/hour; adjust to PTT 1.5 to 2.5 times patient baseline or normal range
- dose reduction in renal impairment:
  - CrCl of 30 mL/minute to 60 mL/minute: 0.08 to 0.12 mg/kg/hour; titrate to achieve target PTT of 1.5 to 2.5 times patient baseline or normal range
  - CrCl of less than 30 mL/minute: 0.04 to 0.07 mg/kg/hour; titrate to achieve target PTT of 1.5 to 2.5 times patient baseline or normal range
  - hemodialysis: initial 0.04 to 0.08 mg/kg/hour; titrate to achieve target PTT of 1.5 to 2.5 times patient baseline or normal range
  - continuous renal replacement therapy (CRRT): initial 0.03 to 0.07 mg/kg/hour; titrate to achieve target PTT of 1.5 to 2.5 times patient baseline or normal range

Potential Hazards of Parenteral Administration

- hemorrhage: ranging from minor to major
- overdose: hemorrhage (no specific antidote; FFP may be indicated)
- elevated PTT, INR, ACT - coagulation times should return to normal range 1 to 2 hours after discontinuation

Important Implications

Contraindications/Cautions

- contraindicated in patients with active bleeding, blood dyscrasias, active peptic ulcer disease, cerebral hemorrhage, recent neurological procedure or trauma, bacterial endocarditis, and patients receiving epidural or spinal anesthesia
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hypotension, pain, headache, nausea, hemorrhage

Monitoring

- ACT, PTT

Other

- increased risk of major bleeding events when used in combination with heparin, warfarin or thrombolytics has been reported
- may be used in patients with heparin-induced thrombocytopenia (HIT)

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black widow spider antivenin

Warnings	Classification Antidote, antivenin	Alternate Names Latrodectus Mactans antivenin

Indications

- Patients should be considered for antivenin therapy if they develop regional or systemic toxicity beyond the black widow spider bite site and are not responding to analgesics and benzodiazepines.
- Available through Health Canada **Special Access Program**; contact pharmacy

- If not available from on-site pharmacy, obtain supply from Antidote Depots:
  - St. Paul's hospital pharmacy 604-682-2344 local 62173 or
  - Vancouver General Hospital pharmacy 604-875-4077

Contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911

Reconstitution and Stability

- store unused kit in refrigerator
- each kit contains: 1 vial normal horse serum (skin test), 1 vial antivenin powder (antidote)
- reconstitute vial of antivenin powder with 2.5 mL sterile water for injection
- reconstituted solution can range from a light straw to a dark tea color

Compatibility

- compatible with D5W or NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intradermal Skin test	YES	**by physician only** Inject 0.02 mL normal horse serum	Basic Monitoring; After test dose given, interpret result in 10 minutes: a positive reaction is an urticarial wheal surrounded by a zone of erythema
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	Give antivenin only after physician has evaluated skin test results and indicated that it is safe to proceed with antivenin. further dilute antivenin in D5W 100 mL Infuse over 60 minutes (rate may be increased if patient shows no adverse effects after first 20 to 30 minutes)	Advanced Monitoring
Continuous IV infusion	NO		

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black widow spider antivenin

Dosage

- **First,** administer skin test (normal horse serum): 0.02 mL intradermally
  (the skin test is not 100% sensitive but if positive, consider withholding antivenin)

- Antivenin: 1 vial (containing not less than 6000 antivenin units) via IV intermittent.
  A second dose may be required (but uncommon).

Potential Hazards of Parenteral Administration

- may cause hypersensitivity reactions including anaphylaxis
- acute allergic reactions usually occur within 30 minutes of infusion, however serum sickness reactions may occur later. Pre-treatment with antihistamines may decrease incidence or severity of allergic reactions.

Important Implications

Caution

- Antivenin is of equine origin and may cause hypersensitivity reactions including anaphylaxis

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- Observe for serum sickness (e.g. joint pain, malaise, swollen lymph nodes) for an average of 8 to 12 days following antivenin administration.

Other

- Generally, black widow spider bites are not life-threatening

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bleomycin

Warnings	Classification	Alternate Names
hazardous drug group 1 high alert medication	antineoplastic	BLENOXANE

Indications

- treatment of certain carcinomas (head and neck, skin, kidneys), testicular carcinoma, soft tissue and other sarcomas, non-Hodgkin's and Hodgkin's lymphoma.
  - for *all* oncological indications see BC Cancer benefit drug list
- Restricted to:
  - indications outlined in the BC Cancer Benefit Drug List AND patients who are registered with BC Cancer
  - use as a sclerosing agent for vascular malformations

Reconstitution and Stability

- diluted solutions stable for 8 hours in D5W and for 24 hours in NS at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with sterile water for injection, D5W, NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give slowly over 10 minutes	Intermediate monitoring or according to protocol
IV intermittent	YES	dilute in 50 mL NS (preferred) or D5W give over 10 to 15 minutes *rate must be controlled with an IV pump*	Intermediate monitoring or according to protocol
Continuous IV infusion	NO		
Intra-arterial	YES	**by interventional radiologists only**	Intermediate monitoring or according to protocol See site-specific restrictions
Intralesional	YES	**by interventional radiologists only**	Basic monitoring or according to protocol See site-specific restrictions

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bleomycin

Dosage

oncological indications:

Follow specific protocol; dose and schedule depend on protocol and patient response.

- Usual dose 5 to 10 units/m^2 or 30 units IV repeat doses and cycle length vary per protocol.
- Maximum lifetime dose is 400 units (less for patients with renal or pulmonary function impairment).
- Dosage in renal failure: CrCL 10 to 50 mL/minute give 75% of normal dose; CrCL less than 10 mL/minute give 50% of normal dose.
- Refer to BCCA Cancer Drug Manual

sclerotherapy (vascular malformations):

- intralesional or intra-arterial: maximum total dose is 15 units

Potential Hazards of Parenteral Administration

- hypersensitivity reactions occur in 1% of lymphoma patients, this anaphylactic reaction can include hypotension, fever, chills, mental confusion and wheezing. Occurs immediately or may be delayed. Usually occurs after the first or second dose.
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant
  - VCH see: Hazardous Drugs- Administration and Handling
  - PHC see: extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- febrile reactions - occur within a few hours after large single doses and last for 4 to 12 hours; they become less frequent with continued use of the drug
- pulmonary toxicity is a major and delayed toxicity that appears to be dose and age-related (especially over 70 years); it usually does not occur if the cumulative dose is below 150 units/m^2, the incidence increases to 55% if total dose is 283 units/m^2, and 66% if 360 units/m^2
  - oxygen or radiation therapy in patients who have taken bleomycin is associated with a higher incidence of lung toxicity
- dermatologic effects (including mucositis/stomatitis) are the most frequent adverse effects, occurring in 50% of patients usually occurring 2 to 4 weeks after initiation of therapy. Mucocutaneous effects (including erythema and rash) appear to be dose related, usually occurring after 150 to 200 units of bleomycin.
  - Discontinuation of therapy due to these toxicities occurs in about 2% of patient
- anorexia and weight loss are common and may persist after the discontinuance of bleomycin

Monitoring

- pulmonary status should be monitored with pulmonary function tests and X-rays

Other

- NOTE: myelosuppression (uncommon, mild)

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blinatumomab

Warnings	Classification	Alternate Names
hazardous drug group 2 high alert medication	antineoplastic, monoclonal antibody	BLINCYTO

Indications

- acute lymphoblastic leukemia
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- see Preparation and Administration

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs-Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute all doses in NS • 9 mcg / 24 hours is provided as 10.375 mcg/bag, infuse at **10 mL/hour for 24 hours**, then discard remaining solution in bag. • 28 mcg / 24 hours is provided as 32.5 mcg/bag, infuse at **10 mL/hour for 24 hours**, then discard remaining solution in bag. • 112 mcg / 96 hours is provided as 134 mcg/bag, infuse at **2.5 mL/hour for 96 hours,** then discard remaining solution in bag • administer via CADD pump, use 0.2 micron in-line filter, use DEHP-free tubing • prime lines with blinatumomab solution only, via CADD pump	Intermediate monitoring or according to protocol
Continuous IV infusion	NO		

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blinatumomab

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Acute lymphoblastic leukemia (relapsed or refractory Philadelphia chromosome negative disease):
- Cycle 1: 9 mcg/day by continuous IV infusion on days 1 to 7, followed by 28 mcg/day on days 8 to 28
- Cycles 2 to 5: 28 mcg/day by continuous IV infusion on days 1 to 28
- Cycle length: 6 weeks

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity reaction - during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *Haematology*: anemia, febrile neutropenia, lymphopenia
- *GI*: nausea; pancreatitis; increase in ALT, AST& bilirubin
- *CNS*: Neurological events can occur in half of adult patients with a median onset of 9 days. Examples: headache, tremor, cognitive disorders, confusion, convulsion, encephalopathy
- Cytokine release syndrome and tumour lysis syndrome have occurred in patients with high tumour burden. Dexamethasone premedication is recommended prior to each cycle to prevent infusion reactions.
- *other*: asthenia, pyrexia

Monitoring
- CBC, electrolytes, uric acid, phosphate, calcium, urea, creatinine, ALT, ALP, GGT, bilirubin, albumin, LDH

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bortezomib

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	ACTAVIS,VELCADE

Indications

- primary use : multiple myeloma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store syringes at room temperature and administer within 8 hours of preparation
  - subcutaneous doses are provided as a 2.5 mg/mL concentration
  - intravenous doses are provided as a 1 mg/mL concentration
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS only

Preparation and Administration

- **intrathecal injection absolutely contraindicated; fatal if given intrathecally**

- Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs-Administration and Handling for all routes of administration.
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	rotate sites on thighs and abdomen	Basic Monitoring or according to protocol
Intramuscular	NO		
IV direct	YES	over 3 to 5 seconds	Basic Monitoring or according to protocol
IV intermittent	NO		
Continuous IV infusion	NO		

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bortezomib

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

multiple myeloma example: 0.7 to 1.5 mg/m^2 subcutaneous weekly

Refer to BC Cancer Drug Manual Monographs

- Dosage adjustment may be required under the following conditions (Consult specific protocol or BCCA monograph as linked above)
  - hematological toxicities
  - hepatic failure
  - neuropathy
  - diarrhea
  - other non-hematologic toxicities
- Renal Failure: has been given safely to patients on hemodialysis; ideally give dose after dialysis or on non-dialysis day (if absolutely necessary, may be given at least 2 hours or more before dialysis).

Potential Hazards of Parenteral Administration

- Hypersensitivity reactions, rare (less than 1%)
- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- *contraindication*: avoid green tea/green tea preparations throughout entire course as bortezomib efficacy severely decreased if not obliterated
- *caution*:
  - drugs which may potentially increase toxicity of bortezomib (inhibit metabolism): erythromycin, clarithromycin , ketoconazole
  - drug which may potentially decrease efficacy of bortezomib (enzyme inducers): phenytoin
  - an increased risk of peripheral neuropathy may occur when bortezomib is used concomitantly with other drugs associated with peripheral neuropathy; (e.g., amiodarone, antiviral agents, isoniazid, nitrofurantoin, and HMG-CoA reductase inhibitors.)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- See monitoring parameters below for side effects to be monitored for BEFORE each dose

Monitoring

- monitor CBC prior to each dose - thrombocytopenia nadir day 11
- evaluate patients for possible toxicities as listed below BEFORE each dose:
  - *major toxicities* include peripheral neuropathy (pain, burning sensation, numbness), cardiovascular effects (orthostatic hypotension, CHF, myocardial infarction), GI effects (nausea, diarrhea, constipation, vomiting), hematologic (thrombocytopenia, neutropenia, anemia)
  - *most common adverse effects* include painful sensations or numbness and tingling in hands or feet (may not resolve after discontinuation), nausea, diarrhea, decreased appetite, constipation, vomiting, fever, thrombocytopenia and anemia, fatigue, malaise, weakness, cough, rash, musculoskeletal pain
  - *less common* include deterioration of liver or renal function, severe bleeding, tumour lysis syndrome

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brentuximab vedotin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	ADCETRIS

Indications

- Primary uses: Hodgkin's and non-Hodgkin's lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- NS, D5W, lactated ringers

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 100 mL NS infuse over 30 minutes central vein preferred; or peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa *rate must be controlled with an IV infusion pump*	Intermediate monitoring or according to protocol
Continuous IV infusion	NO		

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brentuximab vedotin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Example of a dosing schedule:
Treatment of Hodgkin Lymphoma and anaplastic cell lymphoma (ULYBRENTUX):
- 1.8 mg/kg (to a maximum of 180 mg) and repeat every 21 days. Maximum 16 cycles, discontinue if definite progression at any time.
- Dosage adjustments required in patients who have developed peripheral neuropathy or neutropenia despite filgrastim support.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Infusion-related reactions, including anaphylaxis, have been reported. Reactions may be immediate or delayed. Symptoms include chills, nausea, dyspnea, pruritus, pyrexia and cough. Severe reactions present as wheezing, difficulty breathing, hives, itching, and swelling. Stop infusion if infusion-related reactions occur.
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Contraindications*: patients with a diagnosis of progressive multifocal leukoencephalopathy (PML) or a history of PML
- *Caution*:
  - patients with rapidly proliferating tumour and high tumour burden are at risk of tumour lysis syndrome
  - potential for drug interactions, particularly with regard to CYP3A4 and CYP3A5 enzymes, consult interaction texts

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *Blood/lymphatic system*: anemia, neutropenia, thrombocytopenia
- *Nervous system*: peripheral sensory neuropathy, progressive multifocal leukoencephalopathy
- *Dermatologic*: Rash and pruritis. Steven Johnson Syndrome has been reported.

Monitoring
- CBC, platelets, bilirubin, AST, ALT

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BUPivacaine

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	local anesthetic	MARCAINE bupivacaine HCl

Indications

- peripheral nerve block, sympathetic blockade, pudendal nerve block
- spinal, caudal and epidural anesthesia
- intra-articular infiltration for pain control after orthopedic surgery
- restrictions apply

Reconstitution and Stability

- solutions that are cloudy, discoloured or contain crystals should be discarded
- protect solutions containing epinephrine from exposure to direct sunlight
- epidural, peripheral nerve block and intrathecal standard solutions are prepared by pharmacy only

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Local injection	YES	**by physician only**	Intermediate Monitoring
Epidural (bolus)	YES	intermittent doses **by physician only** use preservative free solutions	Intermediate Monitoring as per specific site epidural protocols
Continuous epidural infusion	YES	infusion initiated **by physician only** **standard solution concentrations**: 1.25 mg/mL: in NS 250 mL 2 mg/mL: in NS 250 mL *rate must be controlled with an epidural infusion pump*	Intermediate Monitoring and Perinatal Monitoring as per specific site epidural protocols
Continuous Peripheral Nerve Block	YES	infusion initiated **by physician only** **standard solution concentrations**: 1.25 mg/mL: in NS 250 mL 2 mg/mL: in NS 250 mL *rate must be controlled with a peripheral nerve block infusion pump*	Intermediate Monitoring as per specific site protocols
Intra-articular infiltration	YES	infusion initiated **by physician only** use preservative free solutions *infusion rate must be controlled with closed elastomeric device (eg. PAINBUSTER)*	Intermediate Monitoring as per specific site protocols
Intrathecal	YES	infusion initiated **by physician only** **standard solution concentration**: 0.25 mg/mL: in NS 50 mL 0.5 mg/mL: in NS 50 mL	Intermediate Monitoring as per specific site protocols

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BUPivacaine

Dosage

- Local injection: individualized, varying with anesthetic procedure, degree of anesthesia required and patient response.
  - Maximum *single* dose: 175 mg (225 mg if combined with epinephrine). Dose may be repeated at intervals of not less than 3 hours
  - Maximum *daily* dose: 400 mg

- Post-operative intra-articular infiltration: 5 mL/hour via PAINBUSTER Infuser

- Epidural: 6.25 to 50 mg bolus dose, then continuous infusion at usual rate of 3.1 to 25 mg/hour. Dose is adjusted to patient response. (maximum 400 mg/day)

- Dosage adjustments: should be considered in patients with severe liver disease

Potential Hazards of Parenteral Administration

- repeated or high doses or inadvertent intravascular injection may cause serious CNS effects such as excitation, tremors, convulsions, or drowsiness, coma and respiratory arrest, and cardiovascular effects such as myocardial depression, hypotension, and ventricular arrhythmias
- rarely, tissue necrosis and sloughing may occur at injection site
- antidote for BUPivacaine toxicity: fat emulsion (INTRALIPID 20%)
- high alert medication when given by these routes: epidural infusions, continuous peripheral nerve block (perineural infusion), intrathecal

Important Implications

Contraindications/Cautions
- contraindicated if known allergy to local anesthetics of the amide type
- solutions containing epinephrine should not be used in the presence of peripheral vascular disease or in areas with limited blood supply (i.e. digits, ears, nose, penis)
- when solutions containing epinephrine are used the usual cautions for epinephrine apply

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- epidural administration may result in hypotension, paresthesia and urinary retention

Monitoring
- pain level, motor function, heart rate, temperature

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buprenorphine long acting

Warnings	Classification opiate partial agonist, analgesic	Alternate Names SUBLOCADE, buprenorphine extended-release injection

Indications

- management of moderate to severe opioid use disorder

Reconstitution and Stability

- store prefilled syringes (in original packaging) in refrigerator (2 to 8°C)
- syringes (in original package) if left out of fridge at room temperature, are stable for 7 days
- supplied as a clear, viscous, colourless to yellow solution

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous ONLY	YES	▪ allow to reach room temperature prior to injection (at least 15 minutes at room temperature) ▪ administer into the abdomen only; do NOT rub the injection area; rotate injection sites	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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buprenorphine long acting

Dosage

Patients must be stabilized on a transmucosal buprenorphine-containing product, delivering the equivalent of 8 to 24 mg/day of buprenorphine for a minimum of 7 days, before starting injectable as follows:

initial: 300 mg subcutaneous monthly for 2 months

maintenance:
- 100 mg subcutaneous monthly
- dose may be increased to a maximum of 300 mg monthly

A minimum interval of 26 days is required between consecutive doses.

Potential Hazards of Parenteral Administration

- **only for SUBCUT use** [injected as a liquid that forms a solid mass(depot)]; *serious harm/death if given IV*
- hypersensitivity reactions including anaphylaxis, bronchospasm, edema, rash, hives, or pruritus
- injection site reactions (pain, pruritus, erythema)
- **confirm resuscitative equipment is readily available**
- lump may form at injection site which will decrease over several weeks - advise patient not to rub site

Important Implications

Contraindications/Cautions
- *contraindicated* in patients with:
  - severe respiratory insufficiency
  - severe CNS depression, increased CSF or intracranial pressure, head injury or seizure disorder
  - severe hepatic impairment; acute alcoholism
  - gastrointestinal obstruction or surgical abdomen (eg. acute appendicitis or pancreatitis)
  - use of monoamine oxidase inhibitors (MAOIs) within 14 days
  - increased risk for prolonged QT interval (e.g. hypokalemia, hypomagnesemia, hypocalcemia or congenital long QT syndrome)
- *caution* in debilitated or elderly patients; increased risk of adverse effects
- concomitant use with other CNS depressants may produce additive CNS depression

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- respiratory depression, circulatory depression, orthostatic hypotension
- headache, drowsiness
- nausea, vomiting, constipation
- elevated liver enzymes

Monitoring
- liver function tests

Other:
- if the depot must be removed, it can be surgically excised under local anesthesia within 14 days of injection

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busulfan

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic, alkylating agent	BUSULFEX

Indications

- used in combination with cyclophosphamide as a conditioning regimen prior to allogenic hematopoietic stem cell transplantation
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- diluted solutions in D5W or NS stable for 8 hours at room temperature (inclusive of administration time); diluted solutions in NS stable for 12 hours in refrigerator (inclusive of administration time)
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	CENTRAL ROUTE ▪ dilute to 0.5 mg/mL final concentration ▪ administer 0.8 mg/kg dose over 2 hours ▪ administer 3.2 mg/kg dose over 3 hours ▪ flush tubing after administration to ensure all drug infused *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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busulfan

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

BMT:
- 0.8 mg/kg IV Q6H for 4 consecutive days for a total of 16 doses
- 3.2 mg/kg IV daily for 4 consecutive days for a total of 4 doses

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Extravasation risk: vesicant
  - VCH see: Hazardous Drugs-Administration and Handling
  - PHC see: Extravasation management

Important Implications

Contraindications/Cautions
- itraconazole decreases busulfan clearance by up to 25% and may produce higher AUC in some patients, thus, use an alternative agent if possible
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CNS*: adverse nervous system effects include anxiety, insomnia, headache, dizziness, blurred vision, loss of consciousness, myclonic and generalized tonic clonic (grand mal) seizures
  - seizure prophylaxis with an anticonvulsant is recommended during busulfan administration and 24 hours after completion of the last dose
- *CVS*: mild or moderate tachycardia may occur as well as mild vasodilation manifested as flushing and hot flashes
- *GI*: nausea, mucositis, vomiting, anorexia, diarrhea, abdominal pain, hyperbilirubinemia and hepatic veno-occlusive disease has occurred using the preconditioning regimen
- *blood/bone marrow* : profound myelosuppression in 100% of patients at the recommended dose and schedule; includes granulocytopenia, thrombocytopenia, anemia or a combined loss of formed elements of the blood; usually dose related and reversible after discontinuation of the drug
- *respiratory*: fatal pulmonary effects (busulfan lung) have been reported in patients receiving long-term busulfan therapy, with onset of symptoms at an average of 4 years following initiation of therapy
- *renal*: hyperuricemia may occur; in some patients uric acid nephropathy, renal stones and acute renal failure may result; minimze these effects with adequate hydration, alkalinization of the urine and/or using xanthine oxidase inhibitor
- *other*: fever, rash

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calcitonin

Warnings	Classification Hypercalcemia treatment bone resorption inhibitor	Alternate Names CALCIMAR; CALTINE calcitonin salmon

Indications

- treatment of symptomatic Paget's disease of the bone
- early treatment of hypercalcemic emergencies along with other appropriate agents when a rapid decrease in serum calcium is required
- pain relief for osteoporotic vertebral fractures

Reconstitution and Stability

- refrigerate

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	do not exceed 2 mL per injection site	Basic Monitoring
Intramuscular	YES	*IM preferred* if volume more than 2 mL; use multiple injection sites (rotate sites)	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intradermal	YES	Skin test dilution: ○ starting with *100 unit/mL* injectable: dilute 10 units (0.1 mL) to 1 mL; mix thoroughly and discard 0.9 mL ○ starting with *200 unit/mL* injectable: dilute 10 units (0.05 mL) to 1 mL; mix thoroughly and discard 0.9 mL	Basic Monitoring

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calcitonin

Dosage

- Paget's Disease: 100 units subcutaneous or IM initially, maintenance 50 to 100 units daily or every other day based on therapeutic response.
- Hypercalcemia: 4 units/kg subcutaneous or IM, every 12 hours. After one or two days, if necessary, the dose may be increased to 8 units/kg every 12 hours. If the response remains unsatisfactory after two more days the dose may be increased to 8 units/kg every six hours.
- Osteoporotic Bone Pain: 50 to 100 units subcutaneous daily
- Skin Test: 1 unit (0.1 mL) intradermally on the inner forearm.

Potential Hazards of Parenteral Administration

- inflammatory reaction at the injection site

Important Implications

Contraindications/Cautions

- contraindicated for use in patients with hypersensitivity to calcitonin salmon
- *Caution*: potential for systemic allergic reactions (i.e. bronchospasm, swelling of tongue and throat, anaphylactic shock) and hypocalcemic tetany
- **skin test** is recommended in patients with suspected fish allergies as they are at higher risk of being sensitive to calcitonin salmon. The appearance of more than mild erythema or a wheal within 15 minutes is considered a positive response.
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, facial flushing, tingling of hands, unpleasant metallic taste

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calcitriol

Warnings	Classification	Alternate Names
	Vitamin D analog	CALCIJEX cholecalciferol, 1,25-dihydroxycholecalciferol

Indications

- management of hypocalcemia or hyperparathyroidism in patients undergoing renal dialysis when oral vitamin D analogues cannot be used
- restrictions apply

Reconstitution and Stability

- ampoules are stored at room temperature and protected from light

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted over 15 seconds; flush to ensure all drug is delivered	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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calcitriol

Dosage

- Management of hypocalcemia or hyperparathyroidism:
  - Initial dose: 0.5 mcg (0.01 mcg/kg) three times a week; increase by 0.25 to 0.5 mcg every 2 to 4 weeks
  - Maintenance dose: 0.5 to 3 mcg three times a week

Potential Hazards of Parenteral Administration

- rare cases of hypersensitivity reactions (including anaphylaxis) have been reported.

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- overdose or chronic administration may lead to hypercalcemia, hypercalciuria and hyperphosphatemia. Signs and symptoms of hypercalcemia include bone/muscle pain, constipation, dry mouth, headache, metallic taste, nausea, weakness, confusion or delirium and cardiac arrhythmias.

Monitoring

- monitor calcium, phosphorus, albumin & PTH levels

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calcium chloride

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section) **vesicant**	electrolyte	BRAND NAMES

Indications

- for emergency use during cardiac resuscitation
- for emergency use to treat life threatening cardiac arrhythmias associated with hyperkalemia
- treatment of hypocalcemia
- emergency management of calcium channel blocker (CCB) and beta-blocker overdose

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS and combination dextrose and saline solutions

Preparation and Administration

- * central line preferred;
  or if given peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	▪ **cardiac arrest** : give undiluted over 10 to 20 seconds ▪ cardiac arrhythmias in hyperkalemia: give undiluted over 10 minutes maximum rate : 100 mg/minute ▪ CCB and Beta-Blocker Overdose: give undiluted over 5 minutes	Advanced Monitoring See site-specific restrictions
IV intermittent*	YES	dilute 1 g in 50 mL maximum concentration: 20 mg/mL infuse over 30 minutes maximum rate: 50 mg/minute *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion*	YES	CCB and beta-blocker overdose **Standard solution concentration:** 100 mg/mL: transfer 5000 mg (5 g) to an empty sterile bag (obtain empty bag from pharmacy) *rate must be controlled with an IV infusion pump*	Full Monitoring

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calcium chloride

Dosage

Cardiac resuscitation in cardiac arrest:
- 1 g IV direct

Cardiac arrhythmias associated with hyperkalemia:
- 1 g IV direct (in emergency / urgent situation); may repeat dose as needed

Hypocalcemia:
- 0.5 to 1 g IV intermittent; may repeat every 4 to 6 hours as needed

Calcium Channel Blocker and Beta-Blocker Overdose:
- 1 to 2 g IV over 5 minutes; may repeat every 10 to 20 minutes for 3 to 4 doses
- if a response is obtained, consider IV infusion of 20 to 50 mg/kg/hour titrated to improve BP and contractility; close monitoring of serum or ionized calcium recommended (Q2H), and continuous ECG to avoid significant hypercalcemia

Potential Hazards of Parenteral Administration

- too rapid IV administration may cause hypotension, bradycardia, arrhythmias, and cardiac arrest
- extravasation risk: vesicant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- high alert medication:10% concentration (i.e. undiluted injectable)
- antidote for overdose: IV magnesium sulfate

Important Implications

Contraindications/Cautions
- caution in patients on digoxin: do not exceed 50 mg/minute (0.5 mL/minute)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- tingling sensation, flushing, sweating (with rapid IV administration)
- local thrombophlebitis
- nausea, vomiting, chalky taste

Monitoring
- monitor IV site for pain, redness or swelling
- serum ionized calcium levels

Other
- calcium chloride 10% prefilled syringe contains 1 g/10 mL = 100 mg/mL
- calcium chloride 10 % provides 273 mg = 7 mmol elemental calcium per 10 mL

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calcium gluconate

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section) **vesicant**	electrolyte	

Indications

- treatment of acute hypocalcemia
- treatment of cardiac arrhythmias associated with hyperkalemia
- adjunctive treatment of hypermagnesemia
- emergency management of calcium channel blocker (CCB) and beta-blocker overdose

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, dextrose solutions, dextrose-saline solutions and lactated ringers

Preparation and Administration

- *central line preferred; peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	▪ cardiac arrhythmias in hyperkalemia: give undiluted over 2 to 5 minutes ▪ CCB and Beta-Blocker Overdose: give undiluted over 5 minutes ▪ hypermagnesemia: give undiluted slowly over at least 7 minutes	Advanced Monitoring See site-specific restrictions Advanced Monitoring Perinatal Monitoring
IV intermittent*	YES	o dilute up to 3 g in 50 mL; infuse over 15 minutes o dilute greater than 3 g to 4 g in 100mL; infuse over 30 minutes **or** o dilute 3 to 5 g in 250 mL; infuse over 3 to 12 hours maximum rate : 200 mg/minute *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion*	YES	CCB and beta-blocker overdose: **Standard solution concentration:** 100 mg/mL: transfer 12,000 mg (12 g) to an empty sterile bag (obtain empty bag from stores or pharmacy) hypocalcemia: **Standard solution concentration:** 20 mg/mL: remove 100 mL from 500 mL bag; then add 10 g to the bag (see site specific protocol) apheresis / plasma exchange (PLEX): o 8 mg/mL: add 2 g to NS 250 mL (see site specific protocol) o 40 mg/mL: remove 40 mL from NS 100 mL bag; then add 4 g to the bag (see site specific protocol) stem cell collection: o 16 mg/mL: remove 80 mL from NS 500 mL bag; then add 8 g to the bag (see site specific protocol) *rate must be controlled with an IV infusion pump*	Full Monitoring Intermediate Monitoring Intermediate Monitoring

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calcium gluconate

Dosage

Hypocalcemia:

- 1.5 g to 3 g IV intermittent; may follow with 3 to 5 g IV intermittent infusion
- 1 g/hour continuous IV infusion initially, then adjusted based on serum calcium levels (see site specific protocol)
- apheresis / plasma exchange (PLEX) / stem cell collection: 0.6 g to 2 g/hour IV infusion (see site specific protocols)

Cardiac arrhythmias associated with hyperkalemia:
1 g IV direct (in emergency/ urgent situation) or IV intermittent; may repeat dose if needed

Hypermagnesemia (e.g. magnesium sulfate overdose during pre-eclampsia / eclampsia treatment):
1 g IV direct

Calcium Channel Blocker and Beta-Blocker Overdose:

- 3 to 6 g IV over 5 minutes; may repeat every 10 to 20 minutes for 3 to 4 doses
- if a response is obtained, consider IV infusion of 60 to 150 mg/kg/hour titrated to improve BP and contractility; close monitoring of serum or ionized calcium recommended (Q2H), and continuous ECG to avoid significant hypercalcemia

Potential Hazards of Parenteral Administration

- too rapid IV administration may cause hypotension, bradycardia, arrhythmias, and cardiac arrest
- extravasation risk: vesicant (undiluted 10% solution) irritation, tissue necrosis;
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- high alert medication: 10% concentration (i.e. undiluted injectable)
- antidote for overdose: IV magnesium sulfate

Important Implications

Contraindications/Cautions

- caution in patients on digoxin
- caution in patients with renal disease, severe hypokalemia, severe hyperphosphatemia

- safe for use in pregnant and lactating women; refer to Lexicomp or Micromedex

Side effects

- tingling sensation, flushing, sweating (with rapid IV administration)
- local thrombophlebitis
- nausea, vomiting, chalky taste

Monitoring

- serum calcium levels and albumin; ionized calcium may be preferred in acute situations
- serum potassium, phosphate and magnesium

Other

- 10 mL of calcium gluconate 10% injection = 1 g calcium gluconate = 2.3 mmol calcium = 93 mg calcium

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candida skin test

Warnings	Classification	Alternate Names
	diagnostic agent	candidia albicans skin test

Indications

- the test is used to establish the absence of cell-mediated immunity (anergy)

Reconstitution and Stability

- supplied as 1000 PNU/mL (1000 units/mL)
- refrigerate (2 to 8°C)
- stable for 20 minutes only once drawn up in syringe - administer immediately

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intradermal ONLY	YES	**physician only** or practitioner with advanced skills in how to administer and interpret the test preferred site is anterior surface of the upper and lower arm if giving candida, trichophyton and tuberculin at the same time: candida and trichophyton sites must be well marked (i.e. circled and lettered and separated by at least 20 cm on one arm, and tuberculin test given on the other forearm)	Basic Monitoring After intradermal dose administered: *Interpretation*: • read test site in 48 to 72 hours • a response of more than 5 mm induration is considered an intact cutaneous delayed-type hypersensitivity response and the patient should be considered non-anergic

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candida skin test

Dosage

- 100 units (0.1 mL) intradermal

Potential Hazards of Parenteral Administration

- vesiculation, ulceration or necrosis may appear at the test site in highly sensitive individuals; application of ice packs may provide symptomatic relief
- hypersensitivity reaction (urticaria, shortness of breath, anaphylaxis); all precautions should be taken for handling anaphylaxis, including having epinephrine and antihistamines available

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- anergy testing utilizes those antigens to which an individual has likely been exposed in the past and to which a positive reaction would be expected
- there is a possible loss of reactivity in elderly patients, those with suppressed immune systems due to illness (HIV) or medications (corticosteroids, chemotherapy), or recent administration of viral vaccines
- topical steroids should be discontinued at the skin test site for at least 2 to 3 weeks before skin testing
- topical local anesthetics may suppress the flare response and should be avoided in skin test sites

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carbetocin

Warnings	Classification	Alternate Names
hazardous drug group 2	long acting, synthetic oxytocic agent nonapeptide analogue of oxytocin	DURATOCIN

Indications

- prevention of uterine atony and post-partum hemorrhage
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- see safe work procedures to prepare doses, unless dose provided by pharmacy
- vials: store at room temperature
- single use, any remaining drug must be discarded

Compatibility

- compatible with NS

Preparation and Administration

- **VCH** – refer to Hazardous Drugs- Administration and Handling
- **PHC** – refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	give undiluted over one minute	Intermediate Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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carbetocin

Dosage

After delivery of the infant:

- Prevention of uterine atony and post-partum hemorrhage: 100 mcg IV/IM for one dose

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- **do not administer prior to delivery of infant**
- contraindicated: hypersensitivity to carbetocin or oxytocin
- extreme caution in patients with vascular disease (especially coronary artery disease or chronic hypertension)

Side effects
- cardiovascular: mild hypotension, transient tachycardia
- gastrointestinal: abdominal pain, nausea and vomiting
- central nervous system; headache, tremor, dizziness, anxiety
- miscellaneous: flushing, feeling of warmth, metallic taste, pruritus

Other
- following IV administration: onset of action is within 2 minutes; duration is 60 minutes
- following IM administration: onset of action is within 2 minutes; duration is 120 minutes
- compatible with breast feeding (very small amounts transferred to breast milk)

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CARBOplatin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	PARAPLATIN PARAPLATIN-AQ

Indications

- treatment of ovarian cancer, non Hodgkin's lymphoma, germ cell tumours
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute to 0.5 to 10 mg/mL in an appropriate volume of NS or D5W infuse over 15 to 60 minutes • do not use aluminum containing IV needles, syringes or sets to administer • flush IV line before and after administration *rate must be controlled with an IV infusion pump*	Advanced Monitoring for 1st dose, then Intermediate Monitoring or according to protocol
Continuous IV infusion	NO		

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CARBOplatin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Examples:
- Ovarian Cancer:
  300 mg/m^2 (range 200 to 400 mg/m^2) IV **or** calculate using Calvert formula: Dose (mg)= AUC x (CrCl +25)
  The Area under the time-concentration curve (AUC) is usually 5 or 6. Repeat dose every 2 to 4 weeks
- Non-Hodgkins Lymphoma (ULYRICE):
  Use Calvert formula: Dose (mg) = 5 x (CrCl + 25); maximum dose is 800 mg
- Germ Cell Tumours: 550 mg/m^2 IV daily for three days

A reduced dosage is recommended in impaired renal function, elderly and patients who have received previous chemotherapy.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity reaction - wheezing, tachycardia, hypotension and anaphylactic reactions have been reported and may occur within minutes of administration
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- contraindicated in patients with known hypersensitivity to carboplatin, other platinum agents (eg, cisplatin) or mannitol

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- dose-related nausea or vomiting occurs commonly, usually starting 6 to 12 hours after administration and seldom lasting longer than 24 hours (usually manageable with standard antiemetics)
- neurotoxicity is usually limited to paresthesia and decreased deep tendon reflexes. The frequency and intensity of this side effect increase in patients previously treated with CISplatin.
- the dose-limiting toxicity is myelosuppression, predominantly thrombocytopenia; leukopenia, neutropenia and anemia also occur with relatively high frequency; factors possibly causing increased risk of myelosuppression include increased age, renal impairment and concurrent or previous chemotherapy

Monitoring
- serum creatinine and CBC

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carboprost

Warnings	Classification	Alternate Names
	prostaglandin	HEMABATE carboprost tromethamine

Indications

- control of severe bleeding postpartum
- treatment of hemorrhagic cystitis in stem cell transplant recipients

Reconstitution and Stability

- store in refrigerator
- solutions diluted in NS are stable for 60 minutes

Compatibility

- compatible with NS only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	undiluted, deep into muscle mass	Advanced Monitoring See site-specific restrictions blood pressure every15 minutes and temperature hourly, during treatment and for four hours after the last dose
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Bladder instillation	YES	dilute in normal saline 50 mL; administer within 60 minutes of preparation	Intermediate Monitoring
Intramyometrial	YES	**by physician only**	Intermediate Monitoring

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carboprost

Dosage

- Control of hemorrhage:
  250 mcg IM or intramyometrially; additional doses may be administered between 15 and 90 minutes apart if needed
  Total dose should not exceed 2 mg

- Hemorrhagic Cystitis:
  400 to 500 mcg diluted in NS 50 mL and **instilled into the bladder**. Clamp catheter and allow solution to dwell for 60 minutes; repeat every 6 hours until response. Patient should reposition every 15 minutes while carboprost is in bladder

Potential Hazards of Parenteral Administration

- increased blood pressure, tachycardia
- bronchoconstriction, pulmonary hypertension
- allergic reactions, fever, chills
- erythema at injection site

Important Implications

Contraindications/Cautions

- *Contraindicated* in patients with cardiac, pulmonary, renal, or hepatic disease, or pelvic inflammatory disease
- *Caution:*
  - in patients with a history of asthma; therapy may cause transient bronchoconstriction
  - uterine rupture following administration of IM carboprost and IV oxytocin has been reported

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting and diarrhea are common and can be controlled with concomitant administration of antiemetics and antidiarrheals
- abdominal pain, myalgia, flushing, headache, dyspnea, sweating, and leukocytosis

- Bladder spasm may occur with carboprost via bladder instillation.

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carfilzomib

Warnings	Classification	Alternate Names
hazardous drug group 2 **high alert medication**	antineoplastic, proteasome inhibitor	KYPROLIS

Indications

- primary use: multiple myeoloma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- solution stable for 4 hours at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs-Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 100 mL **D5W only** infuse over 10 to 30 minutes (per specific protocol / pre-printed order) lines may be flushed with either NS or D5W before and after administration *rate must be controlled with an IV infusion pump*	Intermediate monitoring or according to protocol
Continuous IV infusion	NO		

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carfilzomib

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Example of a multiple myeloma protocol:
UMYCARDEX:
Once every 28 days dosing:
- CYCLE 1*: 20 mg/m^2 IV on day 1, then 70 mg/m^2 IV on days 8 and 15
- CYCLE 2* onward: 70 mg/m^2 IV on days 1, 8 and 15

*(cap Body Surface Area at 2.2 m^2)

- Dosage adjustments required for myelosuppression, hepatic and renal impairment.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- infusion reactions are common (43%), but are generally low grade with dexamethasone premedication: symptoms include fever, chills, arthralgia, myalgia, facial flushing, shortness of breath, hypotension
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Caution*:
  - pre-existing cardiac conditions (congestive heart failure, angina, arrhythmia, recent MI, conduction abnormalities) or hypertension.
  - pre-existing pulmonary or respiratory diseases
  - pre-existing hepatic or renal insufficiency
  - reconstituted product contains 7 mg/mL sodium, consider sodium content for controlled sodium diets

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CVS*: cardiac failure (5 to 21%), hypertension (15%), hypertensive emergencies have occurred, hemorrhage
- *Hematology*: anemia (27 to 56%), thrombocytopenia (27 to 38%)
- *GI*: diarrhea (22 to 27%); nausea (15 to 35 %); hepatic failure (rare)
- *Renal*: acute renal failure (5 to 10 %)
- *Respiratory*: dyspnea (15 to 42 %)
- *CNS*: headache (15 to 24 %); posterior reversible encephalopathy syndrome (rare)
- *Other*: fatigue (24 to 41%), peripheral edema (11 to 20%), fever (15 to 30%)

Monitoring
- CBC, ALT or AST, bilirubin, creatinine, and electrolytes
- cardiac function and blood pressure
- ensure adequate oral and intravenous hydration prior to each treatment to mitigate the risk of renal toxicity and decrease the incidence and intensity of infusion reactions

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carmustine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic, alkylating agent	BICNU BCNU

Indications

- induction therapy pre-stem cell transplant
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- store in refrigerator, protect bag from light

Compatibility

- compatible with NS and D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ use administration sets with polyethylene-lined (low sorbing)(PVC free) tubing; protect tubing from light ▪ supplied by pharmacy in glass bottle or polyolefin container (PVC free) **Central line only:** dilute in 500 mL infuse over 1 to 2 hours *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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carmustine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

- Prior to stem cell transplant: 300 to 500 mg/m^2 IV [Note: doses fatal without bone marrow/stem cell transplant]
- Dosage modification required for myelosuppression
- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- intense flushing of the skin lasting up to 4 hours after administration
- Extravasation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- major bone marrow toxicity (delayed 4 to 6 weeks after drug administration and cumulative)
- severe nausea and vomiting occur frequently shortly after administration; premedication with antiemetics may be indicated
- nephrotoxicity can occur after large cumulative doses (doses of 1000 mg/m^2 or more) or after prolonged therapy
- pulmonary fibrosis and pulmonary infiltrates can occur, more common with prolonged therapy and with cumulative doses greater than 1,400 mg/m^2
- mild, reversible hepatotoxicity may occur when high doses are used
- skin contact causes transient brown staining

Monitoring
- pulmonary function tests at baseline and throughout treatment, renal and liver function

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ceFAZolin

Warnings	Classification antibiotic, cephalosporin Beta-lactam antibiotic	Alternate Names ceFAZolin sodium ANCEF, KEFZOL

Indications

- treatment of systemic infections caused by susceptible strains of microorganisms
- Group B Streptococcus, maternal prophylaxis for prevention of neonatal disease

Reconstitution and Stability

- powder is stable at room temperature, protect from light
- for IV administration, reconstitute with sterile water for injection or NS:
  500 mg vial: add 2.3 mL to provide 200 mg/mL solution
  1 g vial: add 4.5 mL to provide 200 mg/mL solution

- for **IM administration**, reconstitute with sterile water for injection:
  500 mg vial: add 2 mL to provide 225 mg/mL solution
  1 g vial: add 2.5 mL to provide 330 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle	Basic Monitoring
IV direct	YES	dilute in at least 10 mL SWFI or NS; administer over 3 to 5 minutes	Basic Monitoring
IV intermittent	YES	dilute: • 2 g or less in 50 mL • more than 2 g in 100 mL administer over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		
Intraperitoneal	YES	*preferred route for peritonitis in continuous ambulatory peritoneal dialysis (CAPD) patients:* add to dialysate bag; dwell for at least 6 hours	Basic Monitoring

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ceFAZolin

Dosage

- Usual dose: 1 to 2 g IV or IM every 8 hours
- Dose adjustments are necessary in renal dysfunction, see table below:

Creatinine Clearance	Dose
30 to 50 mL/minute	1 to 2 g IV or IM Q12H
Less than 30 mL/minute	1 to 2 g IV or IM Q12H to Q24H
Hemodialysis	1 to 2 g IV on dialysis days only (give after dialysis or over last 15 minutes of dialysis); **or** 0.5 to 1 g IV Q24H
Continuous Ambulatory Peritoneal Dialysis	0.5 g IV Q12H

- Surgical prophylaxis: 1 to 3 g IV once pre-op
- Group B Streptococcus, maternal prophylaxis for prevention of neonatal disease: 2 g IV as a single dose at onset of labour or pre-labour rupture of membranes, then 1 g every 8 hours until delivery
- Peritoneal dialysis-related peritonitis:
  - Intraperitoneal (IP) instillation (preferred route): 1 to 2 g IP with one exchange once daily

Potential Hazards of Parenteral Administration

- pain at IM injection site
- thrombophlebitis after IV use
- allergic reactions

Important Implications

Contraindications/Cautions

- Refer to Beta-lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- can cause false positive DAT test in uremic patients
- 1 g ceFAZolin contains 2 mmol (48.3 mg) sodium

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cefEPIME

Warnings	Classification antibiotic (cephalosporin) Beta-lactam antibiotic	Alternate Names MAXIPIME; cefEPIME hydrochloride

Indications

- Treatment of systemic infections caused by susceptible strains of microorganisms. Broad spectrum of activity against gram-positive aerobes (excluding MRSA) and gram-negative aerobes (including pseudomonas).
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- powder is stable at room temperature; protect from light
- for IV administration reconstitute with D5W, NS, or sterile water for injection (SWI) as follows:
  1000 mg vial: add 10 mL to provide 100 mg/mL solution
  2000 mg vial: add 10 mL to provide 160 mg/mL solution

- for **IM administration** reconstitute with D5W, NS, or SWI as follows:
  1000 mg vial: add 2.4 mL to provide 280 mg/mL solution

Compatibility

- compatible with D5W, NS and dextrose-saline solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle	Basic Monitoring
IV direct	YES	give undiluted over 3 to 5 minutes	Basic Monitoring
IV intermittent	YES	dilute in 50 mL; administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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cefEPIME

Dosage

- Febrile neutropenia or cystic fibrosis: 2 g IV Q8H

- Dose adjustment required in renal impairment:

Creatinine Clearance	Dose
30 to 50 mL/minute	2 g IV or IM Q12H
less than 30 mL/minute	2 g IV or IM Q24H

- Hemodialysis: 2 g IV on dialysis days only or 1 g IV Q24H; administer dose after dialysis

- Continuous Ambulatory Peritoneal Dialysis: 1 g IV Q24H

Potential Hazards of Parenteral Administration

- injection site pain (with IM administration)
- phlebitis, pain, inflammation at injection site (with IV administration)
- hypersensitivity: fever, rash, urticaria, pruritus, anaphylaxis

Important Implications

Contraindications/Cautions

- Refer to Beta-lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin

- Pregnancy /Lactation: refer to Lexicomp or Micromedex

Side effects

- diarrhea, nausea, vomiting, colitis,
- eosinophilia, neutropenia, thrombocytopenia,
- transient increase in liver function tests, serum creatinine, BUN

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cefoTAXime

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antibiotic (cephalosporin) Beta-lactam antibiotic	CLAFORAN; cefoTAXime sodium

Indications

- treatment of systemic infections caused by susceptible strains of microorganisms

Reconstitution and Stability

- powder is stable at room temperature, protect from light
- for IV administration reconstitute with sterile water for injection (SWI) as follows:
  500 mg vial: add 2.3 mL to provide 200 mg/mL solution
  1000 mg vial: add 4.6 mL to provide 200 mg/mL solution
  2000 mg vial: add 9 mL to provide 200 mg/mL solution
- for **IM administration** reconstitute with SWI as follows:
  500 mg vial: add 1.3 mL to provide 330 mg/mL solution
  1000 mg vial: add 2.5 mL to provide 330 mg/mL solution
  2000 mg vial: add 5 mL to provide 330 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle no more than 1 g at a single site	Basic Monitoring
IV direct*	YES	further dilute with 10 mL SWI; administer over 3 to 5 minutes	Basic Monitoring
IV intermittent*	YES	*preferred route* dilute in 50 mL; administer over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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cefoTAXime

Dosage

- Systemic infection: 1 to 2 g IV or IM Q8H

- Meningitis/ CNS infection: 2 g IV or IM Q4H to Q6H (maximum 12 g/day)

- Dose adjustments required in renal impairment:

Creatinine Clearance	systemic infection - dose	meningitis/ CNS infection - dose
greater than 50 mL/minute	1 to 2 g IV or IM Q8H	2 g IV or IM Q6H
10 to 50 mL/minute	1 to 2 g IV or IM Q8H to Q12H	2 g IV or IM Q8H
less than 10 mL/minute	1 to 2 g IV or IM Q24H	2 g IV or IM Q12H

- Hemodialysis: 1 to 2 g IV on dialysis days only or 1 to 2 g IV Q24H; administer dose after dialysis or over the last 15 minutes of dialysis

- Continuous Ambulatory Peritoneal Dialysis: 1 g IV Q24H

Potential Hazards of Parenteral Administration

- thrombophlebitis
- pain, hardening, tenderness at IM injection site
- allergic reactions
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Refer to Beta-lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- diarrhea, nausea, vomiting, colitis
- rash, pruritus, fever
- may cause mild reversible leukopenia, granulocytopenia, thrombocytopenia
- may cause transient elevation of hepatic enzymes, BUN, serum creatinine

Other

- 1 g cefoTAXime contains 2.2 mmol (50.5 mg) sodium

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cefOXitin

Warnings	Classification antibiotic (cephalosporin) Beta-lactam antibiotic	Alternate Names MEFOXIN; cefOXitin sodium

Indications

- treatment of systemic infections caused by susceptible strains of bacteria.
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store vials at room temperature and protect from light
- reconstituted solutions vary in colour from clear to light amber

- for IV administration reconstitute with sterile water for injection (SWI), NS or D5W as follows:
  1 g vial: add 4.5 mL to provide 200 mg/mL solution
  2 g vial: add 8.9 mL to provide 200 mg/mL solution

- for **IM administration** reconstitute with SWI or lidocaine 1% (plain) or as follows:
  1 g vial: add 2 mL to provide approximately 400 mg/mL solution
  2 g vial: add 4 mL to provide approximately 400 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle no more than 1 g at a single site	Basic Monitoring
IV direct	YES	further dilute with 10 mL SWI; administer over 3 to 5 minutes	Basic Monitoring
IV intermittent	YES	*preferred route* dilute in 50 mL; administer over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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cefOXitin

Dosage

- Usual: 1 to 2 g IV or IM Q6H to Q8H (maximum 12 g/day)

- Pelvic inflammatory Disease:
  - *in-patient:* 2 g IV Q6H in combination with doxycycline 100 mg orally Q12H for 14 days.
  - *out-patient:* 2 g single dose IM plus a single oral dose of probenecid 1 g, plus doxycycline 100 mg orally twice daily for 14 days

- Dose adjustment required in renal impairment:

Creatinine Clearance	Dose
30 to 50 mL/minute	1 to 2 g IV or IM Q8H
less than 30 mL/minute	1 to 2 g IV or IM Q12H to Q24H

- Hemodialysis: 1 to 2 g IV on dialysis days only or 1 g IV Q24H; administer dose after dialysis or over the last 15 minutes of dialysis on dialysis days

- Continuous Ambulatory Peritoneal Dialysis: 1 g IV Q24H

Potential Hazards of Parenteral Administration

- anaphylaxis
- thrombophlebitis
- pain, hardness and erythema at injection site, pain with IM injection

Important Implications

Contraindications/Cautions

- Refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- rash, urticaria, pruritis
- diarrhea

Other

- 1 g cefOXitin contains 2.3 mmol (53.8 mg) sodium

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cefTAZidime

Warnings	Classification antibiotic (cephalosporin) Beta-lactam antibiotic	Alternate Names FORTAZ, MAGNACEF, TAZIDIME; cefTAZidime pentahydrate

Indications

- treatment of systemic infections caused by susceptible strains of microorganisms
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- powder in vial stable at room temperature and protected from light

IMPORTANT NOTE: before reconstituting, insert a venting needle inside vial to release pressure and CO_2 created during reconstitution.

- for IV administration reconstitute with sterile water for injection (SWFI) as follows:
  1 g vial: add 4.4 mL to provide 200 mg/mL solution
  2 g vial: add 8.8 mL to provide 200 mg/mL solution

- for **IM administration** reconstitute with SWFI or 1% lidocaine (plain) as follows:
  1 g vial: add 3 mL to provide 280 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle	Basic Monitoring
IV direct	YES	dilute to 10 mL with SWFI; administer over 3 to 5 minutes	Basic Monitoring
IV intermittent	YES	*preferred route* dilute doses: o up to 2 g in 50 mL o over 2 g in 100 mL administer over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		
Intraperitoneal	YES	*preferred route for peritonitis in continuous ambulatory peritoneal dialysis (CAPD) patients:* add to dialysate bag; dwell for at least 6 hours	Basic Monitoring

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cefTAZidime

Dosage

- 1 to 2 g IV or IM Q8H

- Dose adjustment required in renal impairment:

Creatinine Clearance	Dose
30 to 50 mL /minute	1 to 2 g IV or IM Q12H
less than 30 mL/minute	1 to 2 g IV or IM Q12H to Q24H
Hemodialysis	1 to 2 g IV on dialysis days only (give after dialysis or over last 15 minutes of dialysis); **or** 0.5 to 1 g IV Q24H
Continuous Ambulatory Peritoneal Dialysis	0.5 to 1 g IV Q24H

- Peritoneal dialysis-related peritonitis:
  - Intraperitoneal (IP) instillation (preferred route):1 to 2 g IP with one exchange once daily

Potential Hazards of Parenteral Administration

- thrombophlebitis at IV site
- pain and tenderness at IM injection site
- hypersensitivity reactions

Important Implications

Contraindications/Cautions

- Refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- 1 g cefTAZidime contains 2.3 mmol (54 mg) sodium

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cefTRIAXone

Warnings	Classification antibiotic (cephalosporin) Beta-lactam antibiotic	Alternate Names ROCEPHIN; ceftriaxone disodium

Indications

- treatment of systemic infections caused by susceptible strains of microorganisms

Reconstitution and Stability

- powder in vial stable at room temperature, protect from light
- for IV administration reconstitute with sterile water for injection (SWI) as follows:
  1 g vial: add 9.6 mL to provide 100 mg/mL solution
  2 g vial: add 19.2 mL to provide 100 mg/mL solution
- for IM administration reconstitute with SWI or 1% lidocaine (plain) as follows:
  250 mg vial: add 0.9 mL to provide 250 mg/mL solution
  1 g vial: add 2.2 mL to provide 350 mg/mL solution
  2 g vial: add 4.4 mL to provide 350 mg/mL solution
- for subcutaneous administration *(palliative care patients only)*, use IM reconstitution above

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Palliative Care Monitoring
Intramuscular	YES	administer deeply into large muscle no more than 1 g at a single site	Basic Monitoring
IV direct	YES/	no further dilution (100 mg/mL); administer over 5 minutes	Basic Monitoring
IV intermittent	YES	*preferred route* dilute in 50 mL; administer over 20 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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cefTRIAXone

Dosage

- Usual: 1 to 2 g Q24H
- Meningitis: 2 g IV Q12H
- Uncomplicated gonorrhea: 250 mg IM (single dose)

Daily dose should not exceed 4 g

Potential Hazards of Parenteral Administration

- hypersensitivity allergic reactions
- thrombophlebitis and inflammation
- pain at IM injection site
- subcutaneous necrosis with slow healing has been reported with subcutaneous administration

Important Implications

Contraindications/Cautions

- Adults (*additionally, see pregnancy information below)*:
  - **AVOID** administering ceftriaxone simultaneously with IV calcium-containing solutions including continuous infusions (e.g. parenteral nutrition, lactated ringers) through the same IV administration line via Y-site
  - cefTRIAXone and IV calcium-containing solutions MAY be administered sequentially, provided the lines are thoroughly flushed between infusions
  - cefTRIAXone and IV calcium-containing solutions MAY be administered simultaneously via separate IV lines or via separate lumens of the same central venous catheter
- **AVOID use in pregnant people with anticipated delivery within days**. Therapeutic levels are achieved in fetal umbilical cord blood, amniotic fluid and placenta; if **neonates** are previously exposed to **cefTRIAXone and receive calcium-containing IV solutions** (e.g. TPN) within 48 hours, there is a risk of precipitation causing damage to lungs and kidneys; neonate deaths have occurred.
- Refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hypoprothrombinemia and alterations in INR may occur rarely.
- vitamin K administration (10 mg weekly) may be necessary if the INR is prolonged before or during treatment

Other

- 1 g cefTRIAXone contains 3.6 mmol (83 mg) sodium

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cefuroxime

Warnings	Classification antibiotic (cephalosporin) Beta-lactam antibiotic	Alternate Names ZINACEF; cefuroxime sodium

Indications

- Prevention or treatment of systemic infections caused by susceptible strains of microorganisms

Reconstitution and Stability

- powder in vial is stable at room temperature
- for IV administration reconstitute with sterile water for injection (SWI) as follows:
  750 mg vial: add 5.7 mL to provide 125 mg/mL solution
  1.5 g vial: add 11.3 mL to provide 125 mg/mL solution
- for **IM administration** reconstitute with SWI as follows:
  750 mg vial: add 3 mL to provide 220 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle	Basic monitoring
IV direct	YES	no further dilution; administer over 3 to 5 minutes	Basic monitoring
IV intermittent	YES	*preferred route* dilute in 50 mL; administer over 15 to 30 minutes	Basic monitoring
Continuous IV infusion	NO		

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cefuroxime

Dosage

- Usual: 750 to 1500 mg IV or IM every 8 to 12 hours

- Dose adjustment required in renal impairment:

Creatinine Clearance	Dose
30 to 50 mL/minute	750 to 1500 mg IV or IM Q8H to Q12H
less than 30 mL/minute	750 to 1500 mg IV or IM Q12H

- Hemodialysis: 750 to 1500 mg IV Q24H; administer dose after dialysis or over the last 15 minutes of dialysis on dialysis days

- Continuous Ambulatory Peritoneal Dialysis: 750 to 1500 mg IV Q24H

Potential Hazards of Parenteral Administration

- thrombophlebitis, stiffness and or an inflammatory reaction at the injection site
- pain at IM injection site
- hypersensitivity reactions

Important Implications

Contraindications/Cautions

- Refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult Pharmacy if patient has an allergy to penicillins or another cephalosporin

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- 1 g cefuroxime contains 2.4 mmol (54.2 mg) sodium

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chloramphenicol

Warnings	Classification	Alternate Names
hazardous drug group 1	antibiotic	CHLOROMYCETIN; chloramphenicol sodium succinate

Indications

- for the treatment of serious infections where chloramphenicol would be considered the antibiotic of choice when potentially less toxic antibiotics are ineffective or contraindicated
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- powder is stable at room temperature, protect from light
- for IV administration reconstitute 1 g vial with 10 mL sterile water for injection to provide 100 mg/mL solution
- do NOT use if solution is cloudy

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	no further dilution; administer over at least 1 minute	Basic Monitoring
IV intermittent	YES	*preferred route* dilute doses up to 2 g in D5W 50 mL administer over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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chloramphenicol

Dosage

- Usual: 50 mg/kg/day IV in equally divided doses Q6H
- Severe infections: up to 100 mg/kg/day
- dose adjustments may be required in renal or hepatic disease

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions

- contraindicated if known hypersensitivity to chloramphenicol
- **contraindicated during pregnancy and lactation**; chloramphenicol is life threatening to newborn and premature infants (gray syndrome)
- use with caution in patients with renal and hepatic disease
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- blood dyscrasias, bone marrow suppression, aplastic anemia; **discontinue** if myelosuppression occurs
- may cause hemolysis in G-6-PD deficient patients
- nausea, vomiting, glossitis, stomatitis, diarrhea, enterocolitis
- bitter taste after IV administration
- blurred vision

Monitoring

- frequent monitoring of CBC with differential is required

Other

- 1 g chloramphenicol contains 2.25 mmol (52 mg) sodium

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ciprofloxacin

Warnings	Classification	Alternate Names
	antibiotic (quinolone)	CIPRO

Indications

- Treatment of infections caused by susceptible strains of microorganisms

Reconstitution and Stability

- solution stable at room temperature
- commercially available in premixed bags: 200 mg/100 mL D5W; 400 mg/200 mL D5W

Compatibility

- compatible with NS, D5W, dextrose-saline solutions, Ringer's and Lactated Ringer's solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	peripheral line: administer into a large vein over 60 minutes central line: administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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ciprofloxacin

Dosage

- Usual: 200 to 400 mg IV Q12H
  Maximum recommended dose: 400 mg IV Q8H
- Dose adjustment required in renal impairment (CrCl less than 30 mL/minute): 200 to 400 mg IV Q24H
- Hemodialysis: 200 to 400 mg IV once daily, after dialysis
- Peritoneal dialysis: 200 to 400 mg IV once daily

Potential Hazards of Parenteral Administration

- allergic reaction
- pain at injection site (peripheral infusions)

Important Implications

Contraindications/Cautions

- contraindicated in patients who have hypersensitivity to ciprofloxacin or other quinolone antibiotics
- caution in patients with pre-existing neurological disease, patients receiving theophylline preparations or any condition which may lower the seizure threshold (e.g. alcoholism)
- caution in patients with or at risk for QT prolongation as ciprofloxacin may prolong QT interval
- not approved for use in those 18 years or younger, however has selective uses in children and adolescents; use with caution in prepubertal patients
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- CNS stimulation leading to tremor, restlessness, lightheadedness, confusion and rarely hallucinations or convulsive seizures
- rash, diarrhea, abdominal pain

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cisatracurium

Warnings	Classification	Alternate Names
high alert medication	nondepolarizing skeletal neuromuscular blocking agent; nondepolarizing skeletal muscle relaxant	NIMBEX cisatracurium besylate

Indications

- for use in mechanically ventilated patients
- adjunct to general anesthesia
- to facilitate endotracheal intubation
- to provide skeletal muscle relaxation during surgery or mechanical ventilation
- severe acute respiratory distress syndrome that is refractory to conventional therapy

Reconstitution and Stability

- store vials in refrigerator; unopened vials are stable for 21 days at room temperature

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted over 5 to 10 seconds	Intensive Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration** 0.8 mg/mL ▪ 80 mg/100 mL: remove 40 mL from 100 mL bag; then add 80 mg cisatracurium to the bag ▪ 200 mg/ 250 mL: remove 100 mL from 250 mL bag; then add 200 mg cisatracurium to the bag *rate must be controlled with an infusion pump*	Intensive Monitoring See site-specific restrictions

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cisatracurium

Dosage

As adjunct to general anesthesia:

- Initial Dose: 0.15 to 0.2 mg/kg IV direct
- Maintenance Dose:
  - 0.03 mg/kg IV direct administered after signs of spontaneous recovery (40 to 50 minutes following an initial dose of 0.15 mg/kg or 50 to 60 minutes following an initial dose of 0.2 mg/kg); may repeat as determined by clinical response; **or**
  - 1 to 3 mcg/kg/minute (0.06 to 0.18 mg/kg/hour) continuous IV infusion following initial dose, after early evidence of spontaneous recovery
  - Dose reduction: reduce cisatracurium dose by 30 to 50% if administered during isoflurane, sevoflurane, or desflurane anesthesia

Skeletal muscle relaxation during mechanical ventilation in intensive care:

- Loading dose: 0.1 to 0.15 mg/kg IV direct
- Maintenance dose: 0.1 to 0.2 mg/kg/hour (range 0.03 to 0.6 mg/kg/hour) continuous IV infusion adjusted to maintain a single twitch on the Train-of-Four using a peripheral nerve stimulator

Severe acute respiratory distress syndrome that is refractory to conventional therapy:

- Loading dose: 0.2 mg/kg IV direct
- Maintenance dose: 0.1 to 0.5 mg/kg/hour continuous IV infusion titrated to achieve adequate ventilator synchrony at the lowest effective dose.

Potential Hazards of Parenteral Administration

- acetylcholinesterase reversal agents (neostigmine, pyridoSTIGmine) in conjunction with an anticholinergic agent such as atropine should be readily available

- facilities for intubation, artificial respiration and oxygen must be immediately available

Important Implications

Contraindications/Cautions

- Caution:
  - may have a profound effect in patients with myasthenia gravis or other neuromuscular disease
  - hypokalemia or concomitant use of aminoglycosides, lithium, magnesium salts, procainamide or quiNIDine may enhance the neuromuscular blocking effects

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- continuous infusions may be monitored using a peripheral nerve stimulator
- reposition and provide skin, mouth and eye care every 2 to 3 hours while paralyzed

Other

- favourable intubating conditions (during fentanyl/proPOFol/nitrous oxide/isoflurane anesthesia) are achieved in 2 to 3 minutes following 0.1 mg/kg IV direct; 1.5 to 2 minutes following 0.15 mg/kg IV direct; and 1.5 minutes following 0.2 mg/kg IV direct; thus the drug should not be used for rapid induction and intubation

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CISplatin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	PLATINOL cis-diamine, dichloroplatinum

Indications

- treatment of solid tumors (e.g. testicular, ovarian, bladder, lung), non-Hodgkin's lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- store at room temperature

Compatibility

- compatible with NS, dextrose 5% in sodium chloride 0.9%, dextrose 5% in sodium chloride 0.45%

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in NS 100 to 500 mL infuse over 30 to 60 minutes alternatively diluted in 1 to 2 L IV solution (mannitol may be added) infuse over 1 to 6 hours • do not use aluminum containing IV needles, syringes or sets to administer • flush IV line with NS before and after administration *rate must be controlled with an IV infusion pump*	Advanced Monitoring for 1st dose, then Intermediate Monitoring or according to protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	
intraperitoneal	YES	**by physician** at VGH only	Basic Monitoring or according to protocol

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CISplatin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

- doses range up to 100 mg/m^2 IV as a single dose every 2 to 4 weeks
- or 20 to 30 mg/m^2 IV daily for 3 to 5 days every 3 to 4 weeks
- Dosage adjustment required for eGFR less than 60 mL/minute

- Intraperitoneal (IP): 50 mg/m^2 (Refer to peritoneal mesothelioma chemotherapy orders; to be used with Belmont hyperthermia pump)

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- anaphylaxis is immediate but rare; other hypersensitivity reactions: facial edema, wheezing, tachycardia and hypotension
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant (irritant)
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- *Caution*:
    - pre-existing renal impairment, myelosuppression or hearing impairment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- bone marrow depression - mild, transient and usually occurs about 1 week after drug administration
- severe nausea and vomiting occuring within a few hours of drug administration may be reduced with antiemetics and by giving the drug as a 24 hour infusion
- nephrotoxicity can be severe and irreversible; usually occurs 1 to 2 weeks after drug administration
- ototoxicity (can be irreversible), tinnitus, high frequency hearing loss, and occasional deafness
- neuropathy (peripheral neuropathies eg. parathesias of extremities)
- electrolyte disturbances

Monitoring

- CBC, electrolytes, serum creatinine
- monitor serum magnesium
- monitor auditory function during therapy
- hydration is required to minimize nephrotoxicity; typically the patient should be pre-hydrated with 1 to 2 litres of fluid 8 to 12 hours before therapy; continue IV hydration for at least 24 hours post therapy. Refer to protocol by which patient is being treated. Numerous hydration regimens exist.

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cladribine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	LEUSTATIN 2-chlorodeoxyadenosine, 2-CDA, CDA

Indications

- oncological:
  - hairy cell leukemia, low grade non-Hodgkin's lymphomas
  - for *all* indications see BC Cancer benefit drug list
  - restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- treatment of multiple sclerosis

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- store at room temperature

Compatibility

- NS only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	IV route preferred	Basic monitoring or according to protocol
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in NS 100 to 1000 mL infuse over 2 hours *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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cladribine

Dosage

Oncology:

Follow specific protocol; dose and schedule depend on protocol and patient response:

- Hairy Cell Leukemia: 0.14 mg/kg/day for 5 consecutive days
- Dose adjustments required for bone marrow suppression
- Dose adjustments required for renal impairment; do not use if creatinine clearance is less than 30 mL/minute

- Refer to BC Cancer Drug Manual Monographs

Multiple sclerosis:

- only use if eGFR is greater than 60 mL/minute
- 0.11 mg/kg/day IV intermittent ; for 4 days

Potential Hazards of Parenteral Administration

- injection site reactions include redness, swelling, pruritis and pain
- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- fever - patients should be maintained well hydrated during treatment
- severe bone marrow suppression, including neutropenia, anemia and thrombocytopenia is most notable within the first month following treatment
- mild neurologic toxicities, specifically paresthesia and dizziness, may rarely occur
- with high tumour burden, tumour lysis syndrome and subsequent hyperuricemia may occur (rare); consider prophylaxis with allopurinol and hydrate accordingly
- rash

Monitoring

- hematologic status must be monitored closely
- in patients at high-risk for hyperuricemia, monitor uric acid ,electrolytes, calcium, phosphate, renal function, and LDH

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clindamycin

Warnings	Classification	Alternate Names
	antibiotic	DALACIN C clindamycin phosphate

Indications

- treatment of serious infections caused by susceptible strains of anaerobic and gram-positive microorganisms when oral therapy is not feasible
- Group B Streptococcus, maternal prophylaxis for prevention of neonatal disease (alternative agent)

Reconstitution and Stability

- vials stable at room temperature (15°C to 25°C)
- may be supplied as premixed bags of 300 mg, 600 mg or 900 mg in D5W 50 mL, stable at room temperature

Compatibility

- compatible with NS, D5W, dextrose-saline solutions and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	administer deeply into large muscle; (injections greater than 600 mg should be divided into separate sites)	Basic Monitoring
IV direct	NO		
IV intermittent	YES	dilute doses: o up to 600 mg in 50 mL; infuse over 20 minutes o 900 mg in 50 mL; infuse over 30 minutes o 1200 mg in 100 mL; infuse over 40 minutes	Basic Monitoring
Continuous IV infusion	NO		

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clindamycin

Dosage

- Moderate infections: 300 to 600 mg IM/IV every 8 hours
- Severe infections: 600 to 900 mg IV every 8 hours
- Maximum dose: 4800 mg/day (life-threatening infections)

Group B Streptococcus, maternal prophylaxis for prevention of neonatal disease:
- 900 mg at onset of labour or pre-labour rupture of membranes, then every 8 hours until delivery (for people with allergies to first line therapy and there is documented susceptibility to clindamycin)

Reduce dose if liver function is severely impaired

Potential Hazards of Parenteral Administration

- thrombophlebitis, erythema, swelling and pain at IV injection site
- pain, induration, and sterile abscess at IM injection site
- cardiac arrest may result if administered undiluted

Important Implications

Contraindications/Cautions:
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- some cases of severe and persistent diarrhea have been reported (risk of pseudomembranous colitis)

Other
- does not cross blood-brain barrier even in the presence of inflamed meninges

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cloxacillin

Warnings	Classification penicillin antibiotic, Beta-lactam antibiotic	Alternate Names ORBENIN, TEGOPEN, BACTOPEN; cloxacillin sodium

Indications

- treatment of infections due to susceptible beta-lactamase producing staphylococci and mixed infections of penicillin-resistant organisms

Reconstitution and Stability

- powder is stable at room temperature
- reconstitute with sterile water for injection as follows:
  - 250 mg vial: add 0.9 mL to provide 250 mg/mL solution
  - 500 mg vial: add 1.8 mL to provide 250 mg/mL solution
  - 1000 mg vial: add 3.4 mL to provide 250 mg/mL solution
  - 2000 mg vial: add 6.8 mL to provide 250 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	give deeply into muscle	Basic Monitoring
IV direct	YES	dilute to 100 mg/mL; administer slowly over 2 to 4 minutes	Basic Monitoring
IV intermittent	YES	*preferred route* dilute doses: o 1000 mg in 50 mL; o greater than 1000 mg in100 mL give over 30 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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cloxacillin

Dosage

- usual:1000 mg every 4 to 6 hours
- severe infections: 2000 mg every 4 hours

Potential Hazards of Parenteral Administration

- thrombophlebitis
- hypersensitivity reactions: urticaria, rash, anaphylaxis

Important Implications

Contraindications/Cautions

- *contraindicated* if allergy to penicillin antibiotics; refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult pharmacist if patient has an allergy to a cephalosporin
- *caution*: possibility of seizures when large doses are given to elderly patients or to patients with renal impairment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- renal, hepatic, and hematopoetic functions with prolonged use

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colistimethate

Warnings	Classification	Alternate Names
	antibiotic	COLY-MYCIN M; colistimethate sodium, colistin sodium methanesulfonate

Indications

- treatment of infections caused by susceptible strains of gram-negative organisms when the organism is resistant to or contraindications exist to using other formulary alternatives.
- restrictions apply

Reconstitution and Stability

- powder stable at room temperature
- reconstitute 150 mg vial with 2 mL sterile water for injection to provide 75 mg/mL of colistin base
- swirl gently to avoid frothing

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Basic Monitoring
IV direct	NO		
IV intermittent	YES	dilute dose in D5W 50 mL; administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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colistimethate

Dosage

- all dosing in this section is for **colistin base**.
- use ideal body weight (or actual body weight if lower)

- Cystic fibrosis:
  - 3 to 8 mg/kg/day IV divided into 3 doses (maximum 360 mg/day)
  - Nebulized (inhalation therapy): 150 mg Q12H

- Severe systemic infections in critically ill patients:
  - Loading dose is 300 mg IV
  - Maintenance dose is 150 mg IV Q12H (starting 12 hours after loading dose).
    If patient is less than 60 kg give 2.5 mg/kg IV Q12H

- Dose adjustment for renal impairment: give loading dose 300 mg IV, then give:

Creatinine Clearance	Dose
10 to 50 mL/minute	150 mg (or 2.5 mg/kg if less than 60 kg) IV Q24H
less than 10 mL/minute	150 mg (or 2.5 mg/kg if less than 60 kg) IV Q48H

- Hemodialysis (HD): 100 mg IV post HD or if less than 60 kg give 1.5 mg/kg IV post HD (3 times weekly)

Potential Hazards of Parenteral Administration

- paresthesia, tingling of extremities or tongue, generalized itching or urticaria

Important Implications

Contraindications/Cautions
- Caution:
  - neuromuscular block can occur if used with other neuromuscular blockers leading to apnea and possibly respiratory arrest
  - nephrotoxic and/or neurotoxic side effects may be additive if drugs with similar potential toxicity (e.g. aminoglycosides) are given concurrently
  - in myasthenia gravis and patients with depressed neuromuscular transmission (e.g. post-op)

- Pregnancy/Lactation*:* refer to Lexicomp or Micromedex

Side effects
- may cause nephrotoxicity
- drug fever, gastrointestinal upset, vertigo, slurring of speech; side effects may be alleviated by decreasing dose

Monitoring
- monitor kidney function

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cosyntropin

Warnings	Classification adrenocorticotropic hormone, synthetic diagnostic agent, adrenocortical insufficiency	Alternate Names CORTROSYN

Indications

- diagnosis of adrenocortical insufficiency (adrenal function tests)

Reconstitution and Stability

- stable at room temperature
- reconstitute 0.25 mg vial with 1 mL NS
- if reconstituted solution is diluted in NS or dextrose solutions, the diluted solution is stable for 12 hours at room temperature

Compatibility

- compatible with dextrose and saline solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Basic Monitoring
IV direct	YES	preferred route for rapid screening dilute in NS to a total volume of 2 to 5 mL give over 2 minutes	Basic Monitoring
IV intermittent	YES	dilute dose in 250 mL infuse over 8 hours	Basic Monitoring
Continuous IV infusion	NO		

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cosyntropin

Dosage

Rapid screening for adrenocortical insufficiency:
- 250 mcg (0.25 mg) IV direct over 2 minutes
- IV route preferred, however IM route can be used
- measure baseline plasma cortisol levels immediately before and 30 and 60 minutes after IV injection
- normal adrenal function is indicated by an increase in plasma cortisol level by at least 250 nmol/L above baseline

Prolonged screening for adrenocortical insufficiency:
- 250 mcg IV daily (over 8 hours) for three consecutive days followed by cortisol measurements

Cosyntropin 0.25 mg is approximately equivalent to 25 units of corticotropin (ACTH)

Potential Hazards of Parenteral Administration

- transient local induration and pain after IM injection
- serious allergic reactions

Important Implications

Contraindications/Cautions
- Numerous exogenous glucocorticoids (eg. cortisone, hydrocortisone, predniSONE, methylPREDNISolone) interfere with the analysis of cortisol by immunoassay. With the exception of dexamethasone, all pre-test doses of glucocorticoids must be held.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- prolonged use may result in hypothalamic-pituitary insufficiency. However, short term administration of cosyntropin, even in large doses, is unlikely to produce harmful effects

Monitoring
- fewer hypersensitivity reactions than with ACTH, however patients should be monitored for at least 1 hour after administration

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cotrimoxazole

Warnings	Classification antibiotic	Alternate Names BACTRIM, SEPTRA; sulfamethoxazole - trimethoprim

Indications

- treatment of infections due to susceptible organisms
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- available as 5 mL ampoule; contains sulfamethoxazole 80 mg/mL and **trimethoprim 16 mg/mL**
- store at room temperature
- MUST be diluted prior to use
- discard if there is cloudiness or precipitation

Compatibility

- compatible with D5W (preferred), NS, dextrose-saline solutions, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute dose (of trimethoprim) as follows: o up to 400 mg in D5W 250 mL o 401 mg to 800 mg in D5W 500 mL infuse over 30 to 60 minutes. *fluid restriction:* dilute each 80 mg trimethoprim in D5W 45 mL (dilute each 5 mL drug with D5W 45 mL)	Basic Monitoring
Continuous IV infusion	NO		

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cotrimoxazole

Dosage

Dose calculation is based on **trimethoprim component** (of cotrimoxazole):

- *Pneumocystis jiroveci* (formerly known as *Pneumocystis carinii*) pneumonia (PCP):
  5 mg/kg trimethoprim IV every 6 hours

- *Burkholderia (Pseudomonas) cepacia* in cystic fibrosis:
  5 mg/kg trimethoprim IV every 6 hours

- Gram-Negative Sepsis:
  2.5 mg/kg trimethoprim IV every 6 hours

- Dosage interval must be lengthened in renal impairment: 2.5 to 5 mg/kg/dose

Creatinine Clearance	Dosage Interval
30 to 50 mL/minute	every 8 hours
less than 30 mL/minute	every 12 hours

Potential Hazards of Parenteral Administration

- hypersensitivity reactions
- pain, local irritation, inflammation, and rarely thrombophlebitis (increased evidence with higher concentrations)

Important Implications

Contraindications/Cautions

- Contraindicated in patients with known hypersensitivity to trimethoprim or sulfonamides (sulfa allergy), or with documented megaloblastic anemia secondary to folate deficiency
- Caution in patients with impaired renal or hepatic function or with possible folate or G-6-PD deficiency

- Pregnancy/Lactation*:* refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting
- hematologic toxicity: neutropenia, thrombocytopenia, agranulocytosis, aplastic anemia

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COVID-19 mRNA vaccine

Warnings	Classification vaccine	**Alternate Names** COMIRNATY OMICRON XBB.1.5; SPIKEVAX XBB.1.5 (andusomeran mRNA vaccine); COVID-19 mRNA vaccine, monovalent (XBB.1.5 Variant))

Indications

- active immunization against coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2)
- indications and / or prescribing restrictions apply
- refer to BC Centre for Disease Control (BCCDC) COVID-19 vaccine eligibility

Reconstitution and Stability

COMIRNATY OMICRON XBB.1.5 - manufactured by Pfizer-BioNTech **information presented here is for multiple dose vials**		
STORAGE of frozen vials	**THAWING of frozen vials** **(do *not refreeze* thawed vials)**	**Preparation for administration**
stored in original package to protect from light • in ultra-low temperature freezer (- 90°C to - 60°C) ***or*** • storage up to 30 days in a validated thermal container (- 90 to - 60°C) with dry ice; [requires re-icing with 20 to 23 kg of new dry ice every 5 days, if opened twice daily]	in original package to protect from light thaw frozen vials: • in refrigerator (2°C to 8°C), a carton of 10 vials may take up to 6 hours to thaw • at room temperature (up to 25°C), takes 30 minutes to thaw stability of thawed vials: • stored in refrigerator: 10 weeks • room temperature: 12 hours *prior to* puncturing vial	• prior to use and after thawing, gently invert the vial 10 times to mix, **DO NOT SHAKE** (provides a white to off white suspension) • handle in room light (but avoid direct sunlight or ultraviolet light) • *after* vial is punctured, vials or prepared doses in syringes are stable for 12 hours in fridge or at room temperature

SPIKEVAX XBB.1.5 (andusomeran mRNA vaccine) – manufactured by Moderna		
STORAGE of frozen vials	**THAWING of frozen vials** **(do *not* refreeze thawed vials)**	**Preparation for administration**
stored in original package to protect from light • only in freezer (- 50°C to - 15°C)	in original package to protect from light thaw frozen vials: • in refrigerator, a vial requires 2 hours to thaw, then allow at least 15 minutes at room temperature prior to administration • at room temperature a vial requires 45 minutes to thaw stability of thawed vials: • stored in refrigerator (2°C to 8°C): 30 days • room temperature (up to 25°C): 24 hours (cumulative)	• supplied as white to off-white suspension • swirl vial gently after thawing and prior to each withdrawal, **DO NOT SHAKE** • after puncturing vial, the vaccine must be used within 24 hours ▪ can be pre-loaded into a syringe for up to 24 hours from first vial puncture ▪ may be stored at room temperature for up to 24 hours (cumulative)

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intramuscular only	YES	▪ refer to reconstitution and stability section above ▪ administer into deltoid muscle	Basic Monitoring (observe for at least 15 minutes after vaccination in case of allergic reaction)

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COVID-19 mRNA vaccine

Dosage

- 1 dose of COMIRNATY OMICRON XBB.1.5 = 0.3 mL IM, see table for number of doses and interval between doses
- 1 dose of SPIKEVAX XBB.1.5 = 0.5 mL IM, see table for number of doses and interval between doses
- at least 1 dose of either COVID-19 mRNA (XBB.1.5 Variant) vaccine is recommended for everyone

Population	COVID-19 vaccination history, *prior to* XBB.1.5 variant vaccines	Number of doses of either vaccine	Recommended interval between doses*
adults	regardless of previous vaccination	1 dose	**6 months after last dose** (minimum of 3 months if necessary)
	no previous vaccination	1 dose	N/A
moderately to severely immunosuppressed adults (refer to COVID-19 vaccine eligibility)	*previously vaccinated with*: ▪ 3 or more doses	1 dose**	**6 months after last dose** (minimum of 8 weeks if necessary)
	▪ 2 doses	1 dose**	**8 weeks after last dose** (minimum of 28 days if necessary)
	▪ 1 dose	2 doses**	**8 weeks after last dose *and* 8 weeks between doses** (minimum of 28 days if necessary)
	no previous vaccination	3 doses**	**8 weeks between doses** (minimum of 28 days if necessary)

*for optimal response, the recommended interval should be observed
**SPIKEVAX XBB.1.5 is preferred

- for additional information: refer to Part 4 - Biological Products BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- epinephrine must be available in case of an anaphylactic reaction
- injection site reactions (pain, swelling, redness)

Important Implications

Contraindications/Cautions:

- Caution in patients with a history of anaphylactic reaction to a previous dose of the vaccine or to any component of the vaccine; see package insert/manufacturer's product monograph for list of components
  - another dose may be given, only on the advice of an allergist (or another appropriate physician), observe for at least 30 minutes after vaccination
- for those with suspected hypersensitivity or non-anaphylactic allergy to vaccine or components of vaccine, administer with an extended period of observation post-vaccination of at least 30 minutes
- should not be administered during acute severe febrile illness
- rare cases of myocarditis and/or pericarditis have been seen in adult males 29 years or younger, with prior formulations; more often seen after the 2nd dose
  - further doses of any type of COVID-19 vaccine should be deferred in those who experience myocarditis or pericarditis (with no other cause identified); exceptions exist: refer to the BCCDC link above
- rare cases of facial paralysis/Bell's palsy have been reported
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- fatigue, headache, myalgia, chills, arthralgia, fever, nausea and vomiting.
- SPIKEVAX: axillary lymphadenopathy; delayed injection site reactions (redness, pain) mainly after the 1st dose in a small percentage of vaccine recipients, with onset on or after day 8 post vaccination

Other

- COVID-19 vaccines can be administered concomitantly or at any time before or after the administration of another inactivated or live vaccine
- the vaccine may be offered to individuals (without contraindications) who have recovered from SARS-CoV-2 infection.
- for people diagnosed with Multisystem Inflammatory Syndrome (MIS-A), delay vaccine until recovered from illness and for 90 days after the date of diagnosis

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crotalidae polyvalent immune Fab (ovine)

Warnings	Classification snake antivenin	Alternate Names crotaline Fab antivenom, rattle snake antivenin; CROFAB

Indications

- for patients who develop signs of progressive envenomation (e.g. worsening local injury, coagulation abnormality, or systemic signs) who have been bitten by rattlesnakes, copperheads and water moccasins including Crotalinae (previously known as Crotalidae), Agkistrodon and Sistrurus spp.
- available through Health Canada **Special Access Program**; contact pharmacy

- If not available from on-site pharmacy, obtain supply from Antidote Depots:
  BC Children's and Women's Hospital pharmacy: 604-875-3282 **or** Surrey Memorial Hospital pharmacy: 604-585-5576 or 604-614-8257

Contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911

Reconstitution and Stability

- store vials in refrigerator.
- reconstitute each vial with 18 mL NS (mix by gently swirling).
- the reconstituted and diluted product must be infused within 4 hours of preparation

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**Physician must be present** for first 10 minutes of initial infusion Dilute dose in NS to a total volume of 250 mL: ▪ *2 vial dose*: remove 36 mL from NS 250 mL bag, then add entire contents of both vials to bag ▪ *4 vial dose*: remove 72 mL from NS 250 mL bag, then add entire contents of all vials to bag ▪ *6 vial dose*: remove 108 mL from NS 250 mL bag, then add entire contents of all vials to bag initial dose: infuse at 50 mL/hour for 10 minutes; if no reaction, infuse remaining dose over 50 minutes subsequent doses: infuse over 1 hour	Advanced Monitoring
Continuous IV infusion	NO		

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crotalidae polyvalent immune Fab (ovine)

Dosage

Give as soon as possible after rattlesnake bite in patients with progressive swelling, severe bleeding, thrombocytopenia, or hemodynamic compromise

- Initial dose: give 4 to 6 vials IV intermittent
  - observe patient for one hour after first dose completed.
  - determine if symptom control has been achieved (complete arrest of progression of local swelling and clear improvement, not necessarily normalization, in coagulation tests and systemic signs).

- If symptoms have been controlled: give 2 vials IV Q6H for 3 doses, starting 6 hours following infusion of initial dose

- If initial dose *did not control* symptoms: give 4 to 6 vials IV intermittent, and repeat this dose in succession until symptoms are controlled. Wait 6 hours, and then give 2 vials IV Q6H for 3 doses.

Potential Hazards of Parenteral Administration

- anaphylaxis, anaphylactoid reactions and allergic reactions

Important Implications

Contraindications/ Cautions

- Contraindicated if known hypersensitivity to papaya or papain, unless benefits outweigh risks and appropriate anaphylactic management is readily available.
- Caution in patients:
  - allergic to sheep proteins (antivenin is of ovine origin)
  - allergic to the pineapple enzyme bromelain
  - with latex allergy

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- observe patient for one hour after first dose completed.
- determine if symptom control has been achieved, as follows: complete arrest of progression of local swelling and clear improvement, not necessarily normalization, in coagulation tests and systemic signs
- rattle snake venom disrupts blood coagulation. Monitor platelets, fibrinogen, PTT, INR, and signs of bleeding for at least one week

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cyclophosphamide

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic alkylating agent	CYTOXAN, PROCYTOX

Indications

- oncological: myeloproliferative and lymphoproliferative disorders, used for some solid malignancies
  - for *all* indications see BC Cancer benefit drug list
  - restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- glomerulonephritis
- idiopathic pulmonary fibrosis
- multiple sclerosis (MS)

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- store at room temperature

Compatibility

- compatible with NS, D5W, dextrose 5% in sodium chloride 0.9%

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	**Required Monitoring**
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	Oncology: each 100 mg or fraction thereof over at least one minute	
IV intermittent	YES	• dilute up to 1000 mg in 100 mL • for doses more than 1000 mg and up to 3600 mg, dilute in 250 mL o or doses greater than 2000 mg may be provided as reconstituted (undiluted 20 mg/mL drug) in a bag Oncology: infuse over 20 to 60 minutes • *Leukemia/SCT*: infuse over 20 minutes to 2 hours Glomerulonephritis: infuse over 30 minutes Idiopathic pulmonary fibrosis & Multiple sclerosis: infuse over 60 minutes ▪ doses should be administered before 1600H to decrease the amount of drug in the bladder overnight, to prevent bladder toxicity *rate must be controlled with an IV infusion pump*	Basic Monitoring or according to protocol
Continuous IV infusion	NO		

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cyclophosphamide

Dosage

Oncology:
Follow specific protocol; dose and schedule depend on protocol and patient response; examples:

- Leukemia/Myeloma/Lymphoma: 400 to 1200 mg/m^2 /dose; frequency of subsequent doses varies with protocol
- Stem Cell Transplant: 50 to 60 mg/kg for 2 to 4 doses
- Stem Cell Mobilization: 1.5 to 2.5 g/m^2 for 1 dose
- Refer to BC Cancer Drug Manual Monographs

Glomerulonephritis:

- *National Institute of Health protocol*: 500 to 1000 mg/m^2 IV over 30 minutes monthly for 3 to 6 doses depending on disease type, severity and response

Recommended dosing adjustment for age and renal function and/or decreased WBC	
eGFR less than 30 mL/min **or** age over 70 years	reduce dose by 25%
eGFR less than 30 mL/min **and** age over 70 years	reduce dose by 50%
WBC nadir less than 3.5 x 10^9/L	reduce subsequent doses by 25%

- *EUVAS vasculitis protocol*: give dose as per table below (maximum dose: 1200 mg) IV over 30 minutes every 2 weeks for 3 doses, then every 3 weeks for 3 to 6 more doses.

  Recommended doses based on age and renal function:

Age (years)	eGFR greater than 30 mL/min	eGFR 30 mL/min or less
less than 60	15 mg/kg	12.5 mg/kg
60 to 70	12.5 mg/kg	10 mg/kg
greater than 70	10 mg/kg	7.5 mg/kg

- *Euro-Lupus protocol (Lupus nephritis)*: 500 mg IV over 30 minutes every 2 weeks for 6 doses

Idiopathic Pulmonary Fibrosis: 500 to 1000 mg/m^2 IV over 1 hour

Multiple Sclerosis:

- Initial: 800 mg/m^2 IV over 1 hour
- Maintenance: dose adjusted up to 1600 mg/m^2 IV every 4 weeks, adjusted based on WBC mid-month nadir

Note: dose adjustments are required for renal impairment or myelosuppression

Potential Hazards of Parenteral Administration

- facial flushing, faintness, diaphoresis, and oropharyngeal sensation have occurred following IV administration (Nasal stuffiness or facial discomfort can occur with rapid injection. Slow the injection rate if this occurs.)
- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- bladder toxicity (hemorrhagic cystitis)
- nausea and vomiting (especially with high doses)
- delayed (1 to 2 weeks) myelosuppression, especially neutropenia; can be dose limiting
- interstitial pulmonary fibrosis can occur after chronic, long term therapy
- inappropriate ADH secretion has occurred, generally in patients receiving higher than normal doses.
- reversible alopecia frequently occurs (70 to 80%) within 1 to 3 months
- cardiotoxicity is rare; may occur with doses of 60 mg/kg or concomitant administration of other cardiotoxic drugs

Monitoring

- CBC, electrolytes, creatinine
- urine output should be closely followed; patients should receive more than 3 litres of fluid on the day of therapy to promote frequent urination and prevent bladder toxicity (hemorrhagic cystitis)

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cycloSPORINE

Warnings	Classification	Alternate Names
hazardous drug group 1	immunosuppressant	SANDIMMUNE

Indications

- prophylaxis of organ rejection in solid organ transplantation
- prophylaxis and treatment of graft versus host disease in bone marrow transplantation

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- store at room temperature
- dilute in glass or non-PVC container (i.e. PVC free and DEHP free; use polyolefin bag) to a final concentration between 0.2 mg/mL and 2.5 mg/mL
- solutions may be prepared in PVC bags for immediate administration if infused within 6 hours

Compatibility

- compatible with D5W and NS only

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use PVC free tubing (e.g. low sorbing, PVC-free, polyethylene lined) standard dilutions: o doses up to 50 mg in D5W 100 mL o 51 mg to 600 mg in D5W 250 mL infuse dose: o over 2 to 6 hours, or o over 24 hours (per protocol) *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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cycloSPORINE

Dosage

Usual: 3 to 5 mg/kg IV daily. **IV dose is one-third the oral dose*** (for those stabilized on oral cycloSPORINE)**.** Adjust dose to achieve therapeutic trough levels.

NOTE,* when converting IV to oral dosing for Graft versus host disease (GVHD) in Leukemia Bone Marrow Transplant (LBMT) patients: The oral dose is the same as or 1.5 times the IV dose.** For more information refer to Leukemia/BMT manual.

Potential Hazards of Parenteral Administration

- anaphylactic reactions rare
- hypersensitivity reactions may occur as a result of the polyethoxylated castor oil (CREMOPHOR EL) present in the parenteral formulation of cycloSPORINE

Important Implications

Contraindications/Cautions

- do not administer with TACrolimus (increased risk of nephrotoxicity); cycloSPORINE must be discontinued 24 to 48 hours before starting TACrolimus (and vice versa)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *dose related*: nephrotoxicity, hepatotoxicity, hypomagnesemia, hyperkalemia, paresthesia, tremor, headache, confusion and convulsions
- *NOT dose related*: hypertension, gum hyperplasia, acne and hirsutism

Monitoring

- cycloSPORINE blood levels must be monitored to achieve therapeutic trough levels of 150 to 450 ng/mL (whole blood RIA monoclonal assay);
  - should be drawn immediately before the dose, or
  - may be drawn at any time during a 24 hour infusion, but should be drawn at the same time each day
- renal function, electrolytes

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cytarabine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, antimetabolite	ARA-C, CYTOSAR cytosine arabinoside

Indications

- induction/consolidation therapy in leukemia, primarily acute myelogenous leukemia; also used in the treatment of Hodgkin's and non-Hodgkin's lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- store at room temperature, protect bag from light

Compatibility

- compatible with dextrose 5% in NS, D5W, lactated ringers, NS, dextrose 5% in lactated ringers

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	rotate injection sites	Basic monitoring or according to protocol
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ dilute dose in 100 to 250 mL; infuse over 0.5 to 3 hours depending on dose and protocol ▪ dilute in 500 mL for infusion over 24 hours *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	
Intrathecal	YES	by physician only	Basic monitoring or according to protocol

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cytarabine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Examples include:

- induction dose:100 mg/m^2/day IV over 24 hours for 7 days
- high dose: 1500 mg/m^2 IV Q12H or 3000 mg/m^2 IV daily for 6 days
- intermediate dose: 1000 mg/m^2 IV daily for 5 days
- low dose: 200 mg/m^2 IV daily for 5 to 7 days or 200 mg/m^2 IV BID for 3 days or 20 mg SUBCUT BID for 10 days
- INTRATHECAL: 50 mg, one time dose or frequency per protocol.

Dosage modification required for:

- myelosuppression
- high-dose therapy in patients with renal dysfunction (to minimize neurotoxicity)

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- pain, inflammation, thrombophlebitis or cellulitis may occur at the injection site
- hypersensitivity
- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *GI* : nausea and vomiting can occur a few hours after administration, may be more severe after rapid infusion of high dose; diarrhea; anorexia; oral and anal inflammation, ulceration; stomatitis commonly occurs within 7 to 10 days of starting therapy
- *Blood/bone marrow*: myelosuppression; biphasic decrease in leukocyte count; initial decrease begins within 24 hours with a nadir at 7 to 9 days; second nadir, greater than first, occurs at 15 to 24 days
- *Liver*: reversible hepatotoxicity, veno-occlusive disease
- *Skin*: reversible alopecia - more common with high dose therapy
- *cytarabine syndrome*: flu-like syndrome consisting of fever, myalgia, bone pain and rash
- high dose therapy is associated with additional adverse effects:
  - corneal toxicity and conjunctivitis - corticosteroid eye drops are indicated before starting therapy and must be given regularly throughout course of therapy (also recommended for intermediate doses)
  - CNS toxicity - cerebellar dysfunction, neuropathies (early signs include slow, slurred speech and loss of fine motor coordination)
  - pulmonary edema - may develop during therapy or within 30 days of discontinuing therapy
  - severe GI ulceration, necrotizing colitis
  - serious skin ulceration; generally limited to palms and sole
- INTRATHECAL administration may cause nausea, vomiting, fever and transient headaches; rarely meningism, paresthesia, paraplegia.

Monitoring

- monitor CBC, uric acid, periodic checks of liver and kidney function should be performed

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dacarbazine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, alkylating agent	DTIC

Indications

- Primary uses: Hodgkin's lymphoma, metastatic malignant melanoma, soft tissue sarcoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 250 to 1000 mL (to a concentration of 0.19 to 3 mg/mL) infuse over 1 to 2 hours *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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dacarbazine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Examples of dosing schedules:
- 375 mg/m^2 IV on days 1 and 15, repeat this cycle every 4 weeks
- 850 mg/m^2 IV, repeat every 3 weeks
- *High dose therapy*: 1000 to 1200 mg/m^2 , repeat every 3 to 4 weeks

Dose adjustment required for hematologic toxicity, renal or hepatic impairment.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- injection site pain: may be minimized by administration via central line, slow rate of infusion if irritation occurs
- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- leukopenia (typically occurs 14 days after treatment), thrombocytopenia (typically occurs 12 to 18 days after treatment)
- severe nausea and vomiting occur in more than 90% of patients generally within one hour of the dose, tolerance to GI effects usually develops
- "flu-like" syndrome may occur either during or after treatment (fever, myalgia and malaise)
- transient facial flushing and paresthesia may occur

Monitoring
- hematologic status

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dalteparin

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	anticoagulant Low Molecular Weight Heparin	FRAGMIN dalteparin sodium

Indications

- prevention and treatment of venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism
- management of unstable angina and non-ST-elevation myocardial infarction (NSTEMI)
- extended treatment and prevention of venous thromboembolism in patients with cancer
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	ideally administer in the anterolateral and posterolateral abdominal wall do not expel air bubble from prefilled syringe prior to injecting to ensure patient receives full dose	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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Dosage

Venous thromboembolism (VTE) prophylaxis:
- 40 kg or less: 2500 units subcutaneous Q24H until discharge
- 41 kg to 100 kg: 5000 units subcutaneous Q24H until discharge
- greater than 100 kg: 5000 units subcutaneous Q12H until discharge

Management of Acute Coronary Syndromes (unstable angina and non-ST-elevation MI):
- 120 units/kg subcutaneous Q12H (the manufacturer recommends a maximum dose of 10,000 units/12 hours; however, dose should be individualized and higher dosages may be administered)

Venous thromboembolism, extended treatment in cancer patients to reduce recurrence:
- 200 units/kg subcutaneous Q24H for 30 days; then 150 units/kg subcutaneous Q24H for up to 5 months

Treatment of VTE / pulmonary embolism and non-ACS indications (e.g. atrial fibrillation):
- 200 units/kg subcutaneous Q24H (the manufacturer recommends a maximum dose of 18,000 units/24 hours; however, dosage should be individualized and higher dosages may be administered)
- to adapt to single-dose prefilled syringes, the following weight intervals can be used:

Weight (kg)	Prefilled syringe size
45 to 56	10,000 units/0.4 mL
57 to 68	12,500 units/0.5 mL
69 to 77	15,000 units/0.6 mL
78 to 85	16,500 units/0.66 mL
86 to 92	18,000 units/0.72 mL
93 to 102	20,000 units (2 x 10,000 units/0.4 mL)
103 to 115	22,500 units (10,000 units/0.4 mL and 12,500 units/0.5 mL)
116 to 130	25,000 units (2 x 12,500 units/0.5 mL)
131 to 135	26,500 units (10,000 units/0.4 mL and 16,500 units/0.66 mL)
136 to 145	28,000 units (10,000 units/0.4 mL and 18,000 units/0.72 mL)

- if switching from heparin infusion to dalteparin, discontinue heparin, then give first dose of dalteparin

Dose adjustments prior to surgery:
- prophylaxis: do not give dose within 12 hours of surgery
- treatment: for Q24H dosing: do not give dose within 36 hours of surgery
  May give 50% of dose 24 hours pre-op in patients at high risk of thrombosis.
  for Q12H dosing: do not give dose within 24 hours of surgery

- *Obstetrics*
  - *pregnancy*:
    - prophylaxis: discontinue 12 hours prior to elective C-section, induction or neuraxial procedure
    - treatment: discontinue 24 hours prior to elective C-section, induction or neuraxial procedure
  - *postpartum:*
    - prophylaxis: wait 12 hours after neuraxial procedure and 4 hours after epidural catheter removal before initiating or restarting
    - treatment: wait 24 hours after neuraxial procedure and 4 hours after epidural catheter removal before initiating or restarting

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Potential Hazards of Parenteral Administration

- subcutaneous injection may cause hematoma, bruising and pain
- hemorrhage (antidote – protamine)
- high alert medication: dalteparin multi-dose vials

Important Implications

Contraindications/Cautions

- avoid IM injections; avoid non-steroidal anti-inflammatory drugs (NSAIDs) if possible
- contraindicated if hypersensitivity to pork products
- dalteparin Q12H dosing is contraindicated if patient requires epidural analgesia
- contraindicated if heparin allergy or heparin-induced thrombocytopenia: cross-reactivity to dalteparin possible
- contraindicated in active bleeding, blood dyscrasias, bacterial endocarditis, recent neurosurgical procedures
- caution in renal failure or hepatic dysfunction; *treatment* doses not recommended if CrCl less than 30 mL/min.
- Pregnancy/Lactation: refer to Lexicomp or Micromedex;
    - note: multi-dose vial contains benzyl alcohol and should be avoided in pregnancy/lactation

Side effects

- bleeding complications, thrombocytopenia and transient elevations in liver enzymes

Monitoring

- hemoglobin and platelets should be monitored at least twice weekly during treatment therapy
- anti-Xa levels may aid to guide dosing in obesity, pregnancy, renal impairment, abnormal coagulation/bleeding

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danaparoid

Warnings	Classification anticoagulant	Alternate Names ORGARAN danaparoid sodium, low molecular weight heparinoid

Indications

- for prophylaxis and treatment of venous thromboembolism (VTE) in patients with heparin induced thrombocytopenia (HIT)
- restrictions apply

Reconstitution and Stability

- store at room temperature; protect from light
- available as 750 units/0.6mL ampoule

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	NO		
IV direct	YES	undiluted over 10 to 20 seconds	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard concentration:** 9 units /mL: dilute 2250 units in D5W 250 mL 27 units/mL: dilute 6750 units in D5W 250 mL *rate must be controlled with an IV infusion pump*	Basic Monitoring

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danaparoid

Dosage

Venous thromboembolism (VTE) prophylaxis:
- up to 90 kg: current HIT or previous HIT: 750 units subcutaneous every 8 to 12 hours
- more than 90 kg: current HIT: 1250 units subcutaneous every 8 to 12 hours;
  previous HIT: 1250 units subcutaneous Q12H or 750 units Q8H

Venous thromboembolism (VTE) treatment:
- give **loading dose IV direct** according to weight:
  - less than 60 kg: 1500 units
  - 60 to 75 kg: 2250 units
  - 76 to 90 kg: 3000 units
  - more than 90 kg: 3750 units
- follow with **IV maintenance dose**: continuous IV infusion at 400 units/hour for 4 hours, then 300 units/hour for 4 hours, then 200 units/hour thereafter
  - if IV infusion stops: less than 12 hours: restart infusion at same rate as when stopped
    12 to 24 hours: restart infusion as per IV maintenance dose above
    more than 24 hours: give 750 units (weight below 55 kg) or 1250 units (55 kg or more) IV direct, then restart IV maintenance dose above
- or may follow with **subcutaneous maintenance dose** according to weight:
  - less than 55 kg: 1500 units Q12H
  - 55 to 90 kg: 2000 units Q12H
  - more than 90 kg: 1750 units Q8H
- maintenance dose reduction recommended in renal impairment (creatinine clearance less than 20 mL/minute)

Prevention of clotting in the extracorporeal hemodialysis circuit:
- give pre-dialysis: 750 units **IV** direct; increase by 750 units every run until adequate patency (maximum dose 3750 units); (see applicable patient care guidelines)
- monitor anti-factor Xa levels prior to fourth dose, 1 week after a dose increase or if clinical evidence of bleeding (goal: anti-factor Xa level less than 0.35 units/mL)

Maintenance of Interdialytic Central Venous Catheter (CVC) Patency:
- dilute 375 units (0.3 mL) with normal saline to volume of each CVC lumen

Potential Hazards of Parenteral Administration

- hemorrhage - no antidote
- pain, tingling at injection site; transient rash - particularly at injection site

Important Implications

Contraindications/Cautions
- avoid IM injections; avoid non-steroidal-anti-inflammatory drugs (NSAIDs) if possible
- contraindicated: patients allergic to sulfites, active bleeding, blood dyscrasias, bacterial endocarditis, recent neurosurgical procedure, or active peptic ulcer disease
- caution in patients with severe liver dysfunction
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects: bleeding complications, thrombocytopenia (rare)

Monitoring
- CBC at baseline and at least every 2 days during therapy (if current HIT, should have daily platelet counts)
- anti-factor Xa levels
- danaparoid should not modify global clotting tests (ie. aPTT, INR, thrombin time)

Other
- cross-reactivity of danaparoid with heparin-induced antibodies ranges 0 to 20%; if platelets do not increase after 48 hours of danaparoid, consider alternative therapy (eg. fondaparinux, argatroban)
- the elimination half-life based on anti-Xa activity ranges from 17 to 28 hours (mean 25 hours)

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dantrolene

Warnings	Classification	Alternate Names
vesicant	management of malignant hyperthermia, skeletal muscle relaxant	DANTRIUM dantrolene sodium

Indications

- management of malignant hyperthermia crisis

Reconstitution and Stability

- reconstitute 20 mg vial by adding 60 mL of sterile water for injection; (do NOT use bacteriostatic water - large amounts of bacteriostatic diluent would be toxic)
- shake until solution is clear
- protect reconstituted solution from light, keep at room temperature
- use within 6 hours of reconstitution - discard unused portion

Compatibility

- ONLY compatible with sterile water for injection

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	give over 2 to 3 minutes	Advanced Monitoring See site-specific restrictions
IV intermittent*	YES	transfer dose to an empty IV bag (pharmacy to supply bag); infuse over 30 to 90 minutes	Full Monitoring See site-specific restrictions
Continuous IV infusion*	YES	**standard solution concentration:** 0.33 mg/mL; transfer solution to an empty IV bag; (pharmacy to supply bag)	Full Monitoring See site-specific restrictions

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dantrolene

Dosage

Management of malignant hyperthermia:

- Initial dose: 2.5 mg/kg IV direct; repeat dose until symptoms of malignant hyperthermia reversed. Cumulative dose of 10 mg/kg (rarely up to 30 mg/kg) may be required.

- Once malignant hyperthermia controlled: give 1 mg/kg IV intermittent every 4 to 6 hours **or** 0.25 mg/kg/hour continuous IV infusion for at least 24 hours (if patient cannot take orally)

Potential Hazards of Parenteral Administration

- extravasation risk: vesicant due to high pH (9.5);
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- caution in patients with previous liver disease or dysfunction, impaired pulmonary function, impaired cardiac function
- concurrent administration of IV dantrolene and verapamil has resulted in ventricular fibrillation, cardiovascular collapse and hyperkalemia; other calcium channel blockers may produce similar adverse effects

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- drowsiness, headaches, dizziness, vertigo, fatigue, giddiness, somnolence, nausea and vomiting, abdominal cramps, diarrhea

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daptomycin

Warnings	Classification	Alternate Names
	antibiotic, cyclic lipopeptide	CUBICIN RF

Indications

- treatment of severe infections caused by gram-positive organisms, when other formulary agents (eg. vancomycin, linezolid, or other beta-lactam antibiotics) cannot be used due to resistance, allergy or severe intolerance, or treatment failure
- daptomycin is **NOT** indicated for treatment of pneumonia.
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

BRAND & vial strength	Reconstitution	Provides reconstituted solution	Dilute in NS prior to IV intermittent administration, stability of dilution
CUBICIN RF 500 mg store at room temperature	10 mL sterile water for injection, rotate or swirl to dissolve	pale yellow to light brown 50 mg/mL	stable for 19 hours at room temperature
SANDOZ 500 mg refrigerate	▪ leave vials at room temperature for a few minutes prior to use; ▪ add 10 mL NS and allow to sit at room temperature for 10 minutes; ▪ swirl gently until clear (takes 5 to 15 minutes) ▪ to avoid foaming, do not shake	pale yellow to light brown 50 mg/mL	stable for 12 hours at room temperature

Compatibility

- NS and Lactated Ringer's solution
- NOT compatible with dextrose-containing solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted over 2 minutes	Basic Monitoring
IV intermittent	YES	dilute in NS 100 mL give over 30 minutes *hemodialysis patients*: give over 10 minutes, after dialysis	Basic Monitoring
Continuous IV infusion	NO		

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daptomycin

Dosage

- Bacteremia and invasive gram-positive infections, including endocarditis [vancomycin minimum inhibitory concentration (MIC) greater than 2 mcg/mL for MRSA; prolonged bacteremia greater than 7 days despite source control; other formulary agents are contraindicated because of allergy/severe intolerance; or vancomycin treatment failure]: 8 to 10 mg/kg Q24H

- VRE bacteremia and invasive infections, including endocarditis: 10 mg/kg IV Q24H;
  may increase to 12 mg/kg IV Q24H for *Enterococcus faecium* if severe infection reported as daptomycin susceptible dose dependent (SDD)

- Dosage adjustment for renal impairment: for creatinine clearance below 30 mL/minute, give dose Q48H

- Hemodialysis (HD):
  bacteremia and invasive infections, including endocarditis: 8 to 10 mg/kg IV post HD 3 times weekly

Potential Hazards of Parenteral Administration

- injection site irritation
- hypersensitivity reactions

Important Implications

Contraindications/Cautions
- Contraindicated: discontinue in those with signs and symptoms of myopathy in conjunction with an increase in CPK of greater than 5 times the upper limits of normal (ULN); or in asymptomatic patients with a CPK equal to or greater than 10 times ULN.
- Caution in patients receiving other drugs associated with myopathy (eg. HMG-CoA reductase inhibitors); manufacturer recommends stopping these and other drugs associated with rhabdomyolysis during daptomycin therapy.
- Pregnancy/Lactation*:* refer to Lexicomp or Micromedex

Side effects
- toxicity of chief concern is myopathy
- constipation, nausea/vomiting, diarrhea, sickle-cell crisis, dermatitis, myalgia, and CPK elevations

Monitoring
- obtain baseline and weekly serum creatinine, BUN, and CPK levels
- patients who have received recent prior therapy with an HMG-CoA reductase inhibitor (eg. simvastatin, atorvastatin), patients with renal insufficiency and patients who develop elevations in CPK should be monitored more frequently

Other
- Drug/lab interaction: daptomycin can cause a significant concentration-dependent false elevation of INR when certain recombinant thromboplastin reagents are used for the assay. Therefore, draw blood samples for INR immediately prior to next dose (i.e. daptomycin trough level)

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daratumumab (IV)

Warnings	Classification	Alternate Names
high alert medication	antineoplastic, monoclonal antibody	DARZALEX

Indications

- **This monograph is specific for intravenous daratumumab (DARZALEX)**
- daratumumab (IV) and daratumumab (subcutaneous) (*see separate monograph*) are **NOT** interchangeable
- amyloidosis, multiple myeloma
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the refrigerator and protect from light
- all doses are prepared by pharmacy

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
See page 2			

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daratumumab (IV)

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above).
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use infusion set with low sorbing, low protein-binding 0.2 micron in-line filter; (allow bag to come to room temperature, then use immediately - complete infusion within 15 hours) *Cycle 1 -> day 1 (full dose 16 mg/kg)* ***or*** *split dose (8 mg/kg) on days 1 and 2* ▪ dilute full dose (16 mg/kg) in 1000 mL NS **or** split dose (8 mg/kg) in 500 mL NS ▪ start at 50 mL/hour, if no reactions after 60 minutes, increase the rate by 50 mL/hour every 60 minutes until a maximum rate of 200 mL/hour *subsequent infusions (16 mg/kg), follow protocol or pre-printed order:* ▪ dilute in 500 mL NS ▪ If *no reaction or reaction is Grade 2 or less* for Cycle 1, day 1 (and 2), then use **rapid infusion**. **rapid infusion:** infuse 200 mL/hour x 30 minutes; if no reactions after 30 minutes, then increase rate to 450 mL/hour x 60 minutes ▪ If *there is a reaction that is Grade 3 or above* for Cycle 1 day 1 (and 2), use the **slow infusion**. **slow infusion:** Cycle 1 -> days 8 and 15: on day 8: start at 50 mL/hour, on day 15 start at 100 mL/hour, if no reactions after 60 minutes, increase the rate by 50 mL/hour every 60 minutes until a maximum rate of 200 mL/hour Subsequent **slow infusions**: infuse at 100 mL/hour; if no reactions after 60 minutes, increase the rate by 50 mL/hour every 60 minutes until a maximum rate of 200 mL/hour *rate must be controlled with an IV infusion pump*	Advanced Monitoring for Cycle 1, then Intermediate Monitoring Cycle 1 monitoring: monitor blood pressure, pulse, respiratory rate and temperature immediately before the start of the infusion, then Q30 MIN x 4, then every 1 to 2 hours until the end of infusion, then at 30 minutes after the end of infusion **or according to protocol**
Continuous IV infusion	NO		

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daratumumab (IV)

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Example:
- relapsed refractory multiple myeloma (UMYDARBD protocol):
  - *Cycle 1*: 16 mg/kg on day 1 **or** 8 mg/kg on days 1 and 2; 16 mg/kg on days 8, 15 and 22
  - *Cycle 2*: 16 mg/kg on days 1, 8, 15, 22
  - *Cycle 3 to 4*: 16 mg/kg on days 1 and 15
  - *Cycle 5 and subsequent*: 16 mg/kg on day 1
  - administer cycle every 28 days until progression

Dose modification required for hematological toxicities or hepatic dysfunction

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- nearly 50% of patients experience infusion-related reactions during the first infusion and in 2 to 4% of patients during subsequent infusions
  - occurs during administration or within four hours of completion
  - may include respiratory symptoms (e.g. cough, wheeze, larynx and throat irritation, nasal congestion), chills, nausea and vomiting
  - severe reactions including bronchospasm, hypertension and dyspnea have been reported
  - to minimize the risk of reaction, antihistamines, antipyretics and corticosteroids before the infusion and corticosteroids following the infusion are recommended
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant

Important Implications

Contraindications/Cautions
- *Caution*: patients with chronic obstructive pulmonary disease may require additional short and long acting bronchodilators plus inhaled corticosteroids post-infusion

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *Hematology*: anemia (27 to 45%, severe 17 to 19%), neutropenia (22 to 60%, severe 12 to 20%), thrombocytopenia (20 to 48%, severe 14 to 18%);
- *Respiratory*: bronchospasm (3%, severe 1%), cough (21%), productive cough (5%), dyspnea (5 to 15%) and pneumonia (11 %, severe 6%)

Monitoring
- CBC

Other
- daratumumab interferes with cross-matching and red blood cell antibody screening; type and screen patients prior to initiating daratumumab treatment if possible

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daratumumab (subcutaneous)

Warnings	Classification	Alternate Names
high alert medication	antineoplastic, monoclonal antibody	DARZALEX SC

Indications

- **This monograph is specific for subcutaneous daratumumab (DARZALEX SC)**
- daratumumab (subcutaneous) and daratumumab (IV) *(see separate monograph*) are **NOT** interchangeable
- amyloidosis, multiple myeloma
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store unopened vials in fridge
  - supplied as a colourless to yellow, clear to opalescent, preservative free subcutaneous injectable that also contains hyaluronidase
  - single use vial,1800 mg/15 mL (120 mg/mL), with overfill of approximately 1 mL, discard unused portion
  - bring vial to room temperature prior to use (maximum allowable time at room temperature is 24 hours)
- if supplied by pharmacy in a syringe, then stable for 24 hours in fridge plus 12 hours at room temperature
  - allow syringe to come to room temperature prior to use
- keep vial or syringe out of direct sunlight

Compatibility

Preparation and Administration

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	▪ undivided into a single injection site in the abdomen ▪ 1800 mg over 3 to 5 minutes ▪ pause or slow down delivery if patient reports pain; if pain not relieved by this, a second injection site (on the opposite side of the abdomen) may be used to administer remainder of dose	Basic* monitoring or according to protocol *Cycle 1, day 1: observe for 1 hour after injection; vital signs immediately prior to injection, at the end of the injection, and at the end of observation period
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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daratumumab (subcutaneous)

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Example:

MYDARCBDF (a multiple myeloma protocol):
Cycles† 1 and 2: 1800 mg SUBCUT on days 1, 8,15 and 22
Cycles† 3 to 6: 1800 mg SUBCUT on days 1 and 15
Cycles† 7 and subsequent: 1800 mg SUBCUT on day 1

† 1 cycle = 28 days

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- injection site reactions (7 to 8%); erythema, induration, pruritus
- administration - related systemic reactions with initial injection (8 to 13%), severe – less than 2%; with subsequent injections (less than 1%)
    - occurs during administration or within four hours of completion
    - may include respiratory symptoms (e.g. cough, wheeze, larynx and throat irritation, nasal congestion), chills, nausea and vomiting
    - severe reactions including anaphylaxis have rarely been reported
    - to minimize the risk of reaction, antihistamines, antipyretics and corticosteroids before the injection and corticosteroids following the injection are recommended
- during administration, resuscitation equipment and emergency drugs should be readily available
- Extravasation risk: non-vesicant

Important Implications

Contraindications/Cautions
- contraindicated if hypersensitivity to daratumumab or hyaluronidase
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *Hematology*: anemia (27 to 45%, severe 17 to 19%), neutropenia (22 to 60%, severe 12 to 20%), thrombocytopenia (20 to 48%, severe 14 to 18%);
- *Respiratory*: bronchospasm (3%, severe 1%), cough (21%), productive cough (5%), dyspnea (5 to 15%) and pneumonia (11%, severe 6%)

Monitoring
- CBC

Other
- hyaluronidase is an enzyme used to increase the dispersion and absorption of other drugs administered subcutaneously (eg. daratumumab), allowing for a larger injected volume, with limited swelling or pain; SUBCUT tissue returns to normal within 24 to 48 hours after injection
- administer other subcutaneous drugs into alternative sites
- subcutaneous daratumumab is the preferred route of administration due to decreased incidence of administration related systemic reactions and greater convenience when compared to the IV route
- daratumumab interferes with cross-matching and red blood cell antibody screening; type and screen patients prior to initiating daratumumab treatment if possible

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darbepoetin alfa

Warnings	Classification erythropoiesis regulating hormone	Alternate Names ARANESP darbepoetin, Nesp

Indications

- treatment of anemia associated with chronic renal dysfunction in both dialysis and non-dialysis patients
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator; syringes are stable out of fridge for up to 7 days and should be protected from light
- DO NOT SHAKE
- do not send via tube system (send by special messenger only)

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	into upper arms, abdomen, thighs, or upper outer areas of buttocks	Basic Monitoring
Intramuscular	NO		
IV direct	YES	undiluted into the venous cannula; administer over at least 1 minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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darbepoetin alfa

Dosage

Initial dose:
- 0.45 mcg/kg IV or subcutaneous weekly
- dose is adjusted in 25% increments every 4 to 6 weeks to target hemoglobin of 95 to 115 g/L, or follow BCPRA anemia protocol

Maintenance dose:
- given IV or subcutaneous and is individualized for each patient
- dose may be divided into weekly doses or given every 2 weeks

Conversion of erythropoietin (EPO) to darbepoetin:

Previous EPO dose (units/week)	Darbepoetin dose (mcg/week)	Dose Ratio Range
less than 8000	divide EPO dose by 200 and round to closest 10 mcg	200:1
8000 or greater	divide EPO dose by 300 and round to closest 10 mcg	300:1

Potential Hazards of Parenteral Administration

- skin rash and urticaria with subcutaneous use
- hypotension

Important Implications

Contraindications/Cautions
- caution in patients with uncontrolled hypertension; a rapid rise in hemoglobin (more than 10 g/L in 2 weeks) may be associated with an increased risk of hypertension, hypertensive encephalopathy or seizures
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hypertension, hypotension,
- peripheral edema, abdominal pain, dyspnea and cough

Monitoring
- hemoglobin biweekly at baseline and after any dose adjustment until stabilization of response (4 to 6 weeks)
- iron stores prior to and during therapy; transferrin saturation should be at least 20% and serum ferritin at least 100 mcg/L (in non-dialysis and peritoneal dialysis patients) and 200 mcg/L (hemodialysis patients)

Other
- response to darbepoetin: increased reticulocyte count within 10 days, followed by increases in hemoglobin usually within 2 to 6 weeks
- increased doses of heparin may be required during hemodialysis to prevent clotting of the artificial kidney

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DAUNOrubicin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic anthracycline	CERUBIDINE, daunomycin

Indications

- Primary uses: Ewing's sarcoma, leukemias and non-Hodgkin's lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, dextrose 5% in sodium chloride 0.9%, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO	peripheral route: via syringe using side arm method; ▪ dilute in 5 to 15 mL NS and infuse into tubing of a free flowing IV at a rate of 20 mg every 1 to 3 minutes ▪ use large vein in forearm; avoid hand, wrist or antecubital fossa	Basic monitoring or according to protocol
IV intermittent	YES	**central line only** infuse over 30 to 45 minutes *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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DAUNOrubicin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

- 30 to 60 mg/m^2 daily for 3 days (total dose per cycle 90 to 180 mg/m^2)
- maximum cumulative (lifetime) dose is 900 mg/m^2 with normal cardiac function (lower doses recommended if in combination with thoracic radiotherapy, pre-existing heart disease or prior anthracycline therapy).
- reduce dose by 50% if serum creatinine is more than 265 micromol/L
- reduce dosage if radiation or other cytotoxic agents are used concomitantly or in hepatic dysfunction. Adjust dosage in hepatic failure as given in table below:

serum bilirubin (micromol/L)	% of usual dose
26 to 51	75%
52 to 85	50%
more than 85	not recommended

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Flare reaction characterized by immediate red blotches, streaks and local wheals may occur.
- Extravasation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- bone marrow toxicity occurs 7 to 10 days after therapy and platelet support is frequently required
- cardiotoxicity (either acute or chronic): arrhythmias and conduction abnormalities can occur within minutes to hours of the infusion and are usually transient; chronic cardiomyopathy is related to the cumulative dose of the drug
- nausea and vomiting may occur a few hours after drug administration and may be alleviated by anti-emetics
- stomatitis may occur within a week of administration of the drug; it usually begins as a burning sensation with erythema of the oral mucosa leading to ulceration in 2 to 3 days
- alopecia almost always occurs; it is reversible with regrowth usually starting about 5 weeks after stopping therapy

Monitoring
- careful monitoring of cardiac function is necessary

Other
- DAUNOrubicin imparts red colour to the urine for 1 to 2 days (not clinically significant)

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DAUNOrubicin liposomal-cytarabine liposomal

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	VYXEOS DAUNOrubicin and cytarabine liposome

Indications

- primary use: acute myeloid leukemia
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in refrigerator (max combined storage time for reconstituted vial and diluted product is 4 hours in the fridge)
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- D5W, NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs – Administration and Handling for all routes of administration.
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	• before administration, gently invert to remix solution after refrigeration and use immediately • diluted in 500 mL • infuse over 90 minutes • by central line only *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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DAUNOrubicin liposomal-cytarabine liposomal

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

DAUNOrubicin liposomal-cytarabine liposomal is **dosed based on the DAUNOrubicin component**

- every 44 mg DAUNOrubicin also delivers 100 mg cytarabine
- a total cumulative dose of DAUNOrubicin (conventional) 550 mg/m^2 (400 mg/m^2 in patients with prior mediastinal radiation) has been associated with an increased incidence of heart failure; calculate the total lifetime cumulative anthracycline dose prior to each cycle of DAUNOrubicin liposomal-cytarabine liposomal

An example of a dosing regimen is BC Cancer's LKAMLDCYT:

- patients should have CrCl of 30 mL/minute or more; a total bilirubin of 50 micromol/L or less and a left ventricular ejection fraction (LVEF) of greater than 50%
  - *1st induction*: 44 mg/m^2 [DAUNOrubicin component] IV daily on Days 1, 3 and 5
  - *2nd induction (2 to 5 weeks after 1st induction,* if no remission*)*: 44 mg/m^2 [DAUNOrubicin component] IV daily on Days 1 and 3
  - *consolidation* (5 to 8 weeks after the start of the last induction, if remission was achieved with no unacceptable toxicity): 29 mg/m^2 [DAUNOrubicin component] IV daily on Days 1 and 3; repeat 5 to 8 weeks after the start of the first consolidation for 2 total cycles of consolidation

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Injection site reactions have been reported.
- Infusion related /hypersensitivity reactions are reported in up to 67% of patients. Monitor for rash, flushing, dyspnea, chest discomfort. Rash is most commonly reported, however, cases of anaphylaxis and fatal reactions have occurred. Depending on severity, reactions may be managed by interrupting the infusion, slowing the rate of infusion, or permanently discontinuing medication.
- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs – Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- *Cautions:*
  - this drug product is a fixed-dose drug combination (1:5 molar ratio) of DAUNOrubicin and cytarabine encapsulated by a liposomal coating; **note** this formulation is NOT interchangeable with any other DAUNOrubicin and/or cytarabine products
  - vials contains copper gluconate as a nonmedicinal ingredient; use caution in patients with copper-related metabolic disorders (e.g. Wilson's disease)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- induction only: risk of hyperuricemia secondary to rapid lysis of leukemia cells; adequate hydration and antihyperuricemic agents are essential
- DAUNOrubicin has a known risk of cardiotoxicity (non-conduction, cardiac arrhythmias, cardiac arrest); patients who have had prior therapy with anthracyclines, preexisting cardiac disease, previous radiotherapy to the mediastinum, or concomitant treatment with other cardiotoxic drugs may be at increased risk
- *vascular*: edema, hemorrhage; *bone marrow toxicity*: neutropenia and thrombocytopenia (severe, prolonged myelosuppression may occur); *GI*: abdominal pain, constipation, diarrhea, mucositis, nausea and vomiting; *constitutional disorders*: fatigue, headache, musculoskeletal pain

Monitoring

- baseline and prior to each cycle: MUGA or ECHO, ECG, careful monitoring of cardiac function is necessary
- CBC and differential, platelets, bilirubin, GGT, ALT, alkaline phosphatase, LDH, INR, creatinine, urea, electrolytes, calcium, phosphate, magnesium, albumin, uric acid

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deferoxamine

Warnings	Classification chelating agent	Alternate Names DESFERAL deferoxamine mesylate

Indications

- to facilitate removal of iron in acute iron toxicity and chronic iron overload
- treatment of aluminum toxicity in chronic renal failure

Reconstitution and Stability

- store at room temperature
- reconstitute 500 mg vial with 5 mL sterile water for injection to provide 95 mg/mL solution

Compatibility

- compatible with NS, D5W, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Continuous subcutaneous infusion	YES	maximum concentration: 210 mg/mL maximum rate: 15 mg/kg/hour *rate must be controlled with a subcutaneous infusion pump*	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute doses: o up to 2 g in D5W 50 mL o 2.1 to 4 g in D5W 100 mL o greater than 4 g in D5W 250 mL hemodialysis: dilute dose in NS 100 mL	Basic Monitoring
Continuous IV infusion	YES	**standard solution concentrations** 16 mg/mL: remove 40 mL from a D5W 250 mL bag; then add 4 g to the bag 24 mg/mL: remove 60 mL from a D5W 250 mL bag; then add 6 g to the bag maximum rate:15 mg/kg/hour *rate must be controlled with IV infusion pump*	Basic Monitoring
Intraperitoneal	YES		Basic Monitoring

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deferoxamine

Dosage

Acute iron toxicity

- 15 mg/kg/hour continuous IV infusion (preferred route); rates up to 35 mg/kg/hour have been tolerated in severe poisoning. Continue until resolution of clinical symptoms and metabolic acidosis (treatment beyond 24 hours is unlikely to be helpful).
- Maximum daily dose: the manufacturer recommends a maximum of 6 g/day; however higher doses are often required and up to 16 g/day and higher have been tolerated.

Chronic iron overload

- 20 to 60 mg/kg (1 to 4 g) IV intermittent or subcutaneous infusion over 8 to 12 hours, 5 to 7 nights per week

Aluminium toxicity or chronic iron overload

- Hemodialysis: 5 to 10 mg/kg IV over last hour of dialysis
- Intraperitoneal dialysis: 5 to 15 mg/kg added to overnight dwell

Potential Hazards of Parenteral Administration

- pain and induration at injection site
- following too rapid IV injection - hypotension, flushing, generalized erythema, tachycardia and shock
- local inflammation and irritation following subcutaneous injection if concentration is greater than 210 mg/mL

Important Implications

Contraindications/Cautions

- contraindicated in patients (not on dialysis) with severe renal failure or anuria
- long term therapy for chronic iron storage diseases may increase the risk of allergic type reactions (pruritus, rash, anaphylaxis)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- may cause a slight increase in sodium and calcium excretion
- ocular and auditory toxicities, abdominal discomfort, diarrhea, leg cramps, thrombocytopenia and increased risk of opportunistic infections

Monitoring

- serum iron (SI) and total iron binding capacity (TIBC) should be regularly monitored;
- following discontinuation of therapy, monitor for reappearance of symptoms or rebound of serum iron levels

Other

- 100 mg deferoxamine binds up to 8.5 mg iron and 4.1 mg aluminum·
- deferoxamine binds with iron to form ferrioxamine; this chelate imparts a reddish colour (vin rose) to the urine

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defibrotide

Warnings	Classification antiplatelet agent, antithrombotic agent	Alternate Names DEFITELIO defibrotide sodium

Indications

- Treatment of hepatic veno-occlusive disease (VOD), also known as sinusoidal obstruction syndrome (SOS), following hematopoietic stem cell transplantation (HSCT)
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- supplied as solution in single use vials stored at room temperature; discard partially used vials
- must be diluted in D5W or NS prior to administration; solution may vary from colourless to light yellow depending on type and amount of diluent used
- diluted solutions stable for 4 hours if stored at room temperature or 24 hours if refrigerated

Compatibility

- D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	• dilute dose to a final concentration of 4 to 20 mg/mL, mix gently • administer through a 0.2 micron in-line filter • infuse over 2 hours • flush line immediately before and after administration *rate must be controlled with an IV infusion pump*	
Continuous IV infusion	NO		

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defibrotide

Dosage

- **Note**: Use baseline body weight (prior to the preparative HSCT regimen) to calculate the dose. *Ensure that patients are hemodynamically stable (on no more than 1 vasopressor agent) and are not experiencing clinically significant bleeding prior to defibrotide administration*.
- 6.25 mg/kg IV every 6 hours for at least 21 days (until SOS resolution or hospital discharge).

Potential Hazards of Parenteral Administration

- Hypersensitivity reactions, including rash, urticaria, and angioedema have been reported in less than 2% of patients receiving defibrotide. Cases of anaphylaxis have been reported in patients who have previously received defibrotide.

Important Implications

Contraindications/Cautions

- *Contraindication*:
  - concomitant use with a systemic anticoagulant or fibrinolytic agent (not including use for routine maintenance or reopening of central venous lines)
  - anticoagulants and fibrinolytic agents should be discontinued prior to the initiation of defibrotide
  - may increase the risk of bleeding in patients with hepatic veno-occlusive disease (VOD), should not be initiated in patients with active bleeding
- *Caution*:
  - if a patient develops persistent, severe, or potentially life-threatening bleeding while receiving defibrotide therapy, the drug should be discontinued and supportive care initiated until bleeding has ceased
  - if recurrent clinically important bleeding occurs with defibrotide therapy, the drug should be permanently discontinued
  - discontinue defibrotide at least 2 hours prior to an invasive procedure

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- Most common*: hematologic*: hemorrhage; *CVS*: hypotension; *GI*: diarrhea, vomiting, nausea
- Other: *immunologic*: graft versus host disease

Monitoring

- Monitor for signs of bleeding

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degarelix long acting

Warnings	Classification	Alternate Names
hazardous drug group 2	antineoplastic, hormonal agent, gonadotropin-releasing hormone antagonist	FIRMAGON degarelix acetate

Indications

- prostate cancer
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- See safe work procedures to prepare doses, unless dose provided by pharmacy. Two hour expiry from time of reconstitution, store at room temperature.
  - **Starter pack** (store at room temperature):
    contains two vials of degarelix long acting 120 mg for injection (for a total of 240 mg) and two pre-filled syringes with 3 mL solvent (sterile water for injection); 2 vial adaptors, plunger rods & needles for SUBCUT injection. Follow package insert directions. AVOID SHAKING**.** After reconstitution, the concentration is 40 mg/mL. Use immediately.
  - **Maintenance pack** (store at room temperature):
    contains one vial of degarelix 80 mg long acting for injection and one pre-filled syringe with 4.2 mL solvent (sterile water for injection); 1 vial adaptor, plunger rod & needle for SUBCUT injection. Follow package insert directions. AVOID SHAKING. After reconstitution the concentration is 20 mg/mL. Use immediately.

Compatibility

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	forms a depot upon SUBCUT administration, must give as 3 or 4 mL per site as indicated below : ▪ 120 mg (40 mg/mL) dose = 3 mL per site ▪ 80 mg (20 mg/mL) dose = 4 mL per site o inject in abdominal region (avoid pressure areas, eg. waistband) o insert needle deeply at an angle of not less than 45 degrees o to reduce incidence of injection site reactions: inject slowly over 30 seconds; leave needle in place for 30 seconds after injection and then withdraw needle slowly	Basic monitoring or according to protocol
NO OTHER APPROVED ROUTES			

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degarelix long acting

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

adult males:
- starting dose: 240 mg SUBCUT(as two injections of 120 mg) on day 1, followed by
- maintenance dose: 80 mg SUBCUT (as a single injection) monthly, starting one month after starting dose.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- local: injection site reactions (35 to 44%, severe less than 2%), including pain, erythema, swelling and induration
- Extravasation risk: non-vesicant
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Contraindication*: use in women
- *Cautions*:
    - those with congenital long QT syndrome, consider drug interactions if concomitant use with other agents that prolong QT/QTc
    - has not been studied in patients with severe hepatic or severe renal impairment

Side effects
- *CVS*: atrio-ventricular first degree block, hypertension (6 to 7%), myocardial infarction (1%), QT/QTc interval prolongation (20%) and hot flashes (25 to 26%)
- *Increase in liver function tests*: gamma-glutamyltransferase, increase (10%, severe less than 1%) reversible; serum transaminases, increase (5 to 10%, severe less than1%), reversible
- *Others*: weight gain; osteoporosis or ostopenia; reproductive system: libido, decrease (100%) and erectile dysfunction/impotence (90%)

Monitoring
- screening ECG; electrolytes, at baseline
- monitor electrolytes; liver function tests

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desmopressin

Warnings	Classification antidiuretic hormone analogue antihemorrhagic	Alternate Names DDAVP desmopressin acetate

Indications

- antidiuretic hormone replacement therapy in primary and secondary central diabetes insipidus
- to control bleeding from trauma or during minor surgical procedures in patients with hemophilia A or Type I von Willebrand's disease
- reduction of excessive surgical blood loss (e.g. cardiopulmonary bypass surgery)
- petrosal sinus sampling
- prevention of overly rapid sodium correction in patients with chronic severe hyponatremia, adjunct to sodium chloride 3% (hypertonic saline 3%) infusion

Reconstitution and Stability

- refrigerate; protect from freezing

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	undiluted over 1 minute petrosal sinus sampling: undiluted over 2 to 3 minutes	Basic Monitoring
IV intermittent	YES	dilute in 50 mL NS; administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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desmopressin

Dosage

- diabetes insipidus: 1 to 4 mcg IV direct, subcutaneous or IM daily; in one or two doses

- hemophilia A and Type I von Willebrand's disease: 0.3 mcg/kg (or 10 mcg/m^2) IV over 30 minutes

- reduction of surgical blood loss: 0.3 mcg/kg (or 10 mcg/m^2) IV over 30 minutes

- petrosal sinus sampling: 10 mcg IV direct

- prevention of overly rapid sodium correction in patients with chronic severe hyponatremia, adjunct to sodium chloride 3% infusion: 1 to 2 mcg (maximum 4 mcg) IV direct or subcutaneous every 6 to 8 hours; titrate to response

Potential Hazards of Parenteral Administration

- local erythema
- swelling, burning, pain at injection site
- severe pain along the injected vein with large doses

Important Implications

Contraindications/Cautions

- avoid excessive fluid intake to prevent the antidiuretic effect of the drug from causing hyponatremia and water intoxication, especially in the elderly

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- headache, nausea, mild abdominal pain, vulval pain, facial flush, slight increase in blood pressure: these symptoms respond to decreasing the dose
- tachycardia, hypotension with large doses
- decreased urine output for 6 to 8 hours (monitor fluid input and output)

Other

- IV dose has approximately 10 times the antidiuretic effect of intranasal desmopressin when used for diabetes insipidus
- duration of effect is 8 to 12 hours

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dexamethasone

Warnings	**Classification** corticosteroid, systemic	**Alternate Names** HEXADROL, DECADRON dexamethasone sodium phosphate

Indications

- treatment of conditions responsive to steroid therapy including adrenocortical insufficiency, cerebral edema associated with brain tumors, allergic states, and inflammatory diseases
- prevention of cancer chemotherapy-induced nausea and vomiting

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with D5W and NS, dextrose-saline combinations and lactated Ringer's solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	give undiluted; over 3 to 5 minutes maximum rate: 8 mg/minute	Basic Monitoring
IV intermittent	YES	dilute dose in D5W 50 mL; infuse over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		
Intra-articular	YES	**by physician only**	Basic Monitoring

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dexamethasone

Dosage

- dose is individualized, varies with clinical disorder and ranges from 0.5 mg to 80 mg per day
- Cerebral edema:
  4 to 10 mg IM or IV every 6 hours
- Antiemetic for chemotherapy:
  10 to 20 mg IV 30 minutes prior to chemotherapy, followed by 4 to 8 mg IV every 6 to 12 hours as needed

Potential Hazards of Parenteral Administration

- post-injection flare following intra-articular use
- sterile abscesses
- arrhythmias with rapid IV administration or in cardiac patients receiving high doses
- anaphylactoid or hypersensitivity reactions (rare)

Important Implications

Contraindications/Cautions
- avoid injection into an infected site
- caution in patients with active peptic ulcer, active/latent infections (i.e. tuberculosis, fungal or viral infections)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- burning and tingling in the perineum after IV injection
- sodium and fluid retention, hypokalemia, hyperglycemia,
- hypertension
- increased susceptibility to and masked symptoms of infection
- psychosis

Other
- increased dose may be required in times of stress
- gradually tapering dose may be warranted when discontinuing therapy
- onset of action in cerebral edema is 6 to 48 hours and maximum effect in 3 to 4 days
- dexamethasone 0.75 mg is approximately equivalent to hydrocortisone 20 mg or methylPREDNISolone 4 mg

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dexmedeTOMidine

Warnings	**Classification** sedative, alpha 2 adrenergic agonist	**Alternate Names** PRECEDEX, dexmedeTOMidine HCl

Indications

- sedation of intubated and mechanically ventilated patients in the intensive care unit
- procedural sedation
- fiberoptic intubation
- palliative care sedation
- to decrease post electroconvulsive therapy (ECT) postictal agitation

Reconstitution and Stability

- store single-use unopened vials at room temperature

Compatibility

- compatible with NS (preferred), D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Continuous subcutaneous infusion	YES	**standard solution concentration:** 20 mcg/mL (VGH and PHC) (pharmacy to provide as patient specific supply) (refer to site specific protocol) *must control rate with a subcutaneous infusion pump*	Palliative Monitoring See site-specific restrictions
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**by anesthesiologist *only for post ECT postictal agitation*** o dilute dose to 4 mcg/mL and administer via syringe pump over 10 to 20 minutes	Intensive Monitoring See site-specific restrictions
Continuous IV infusion	YES	loading dose and IV infusion administered from the same bag **standard solution concentration**: 4 mcg/mL: o dilute: 200 mcg in NS 50 mL 400 mcg in NS 100 mL 1000 mcg in NS 250 mL 20 mcg/mL (*for fluid restricted patients only*): o remove 20 mL from NS 100 mL bag, then add 2000 mcg *only for palliative care sedation,* **standard solution concentration**: 20 mcg/mL (VGH and PHC) (pharmacy to provide as patient specific supply) (refer to site specific protocol) *rate must be controlled with an IV infusion pump*	Intensive Monitoring See site-specific restrictions Palliative Monitoring

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dexmedeTOMidine

Dosage

ICU sedation:
- Loading dose (optional): 1 mcg/kg IV infused over 10 minutes (loading dose may increase the risk of hemodynamic instability)
- Maintenance dose: 0.2 to 0.7 mcg/kg/hour IV infusion adjusted to desired level of sedation, titrated every 30 minutes; infusion rates up to 1.4 mcg/kg/hour have been reported.
- Infusions should not exceed 24 hours.

Procedural sedation:
- Loading dose of 0.5 to 1 mcg/kg IV infused over 10 minutes, followed by a maintenance IV infusion of 0.6 mcg/kg/hour, titrated to desired effect; usual range: 0.2 to 1 mcg/kg/hour.
- Infusions should not exceed 24 hours.

Fiberoptic intubation (awake):
- 1 mcg/kg IV loading dose infused over 10 minutes, followed by 0.7 mcg/kg/hour continuous IV infusion until endotracheal tube is secured.

Palliative care sedation (for intractable pain/delirium not responsive to other agents):
- initiate at 0.2 mcg/kg/hour continuous subcutaneous/intravenous infusion; may increase by 0.15 mcg/kg/hour every 30 minutes as needed to maximum dose 1.4 mcg/kg/hour. Continuous subcutaneous infusion is the preferred route.

To decrease post ECT postictal agitation:
- 0.1 to 0.5 mcg/kg IV intermittent over 10 to 20 minutes

Dose reduction may be required:
- with hepatic impairment and in the elderly
- when co-administered with anesthetics, sedatives, hypnotics or opioids

Potential Hazards of Parenteral Administration

- Episodes of bradycardia and sinus arrest have been reported. Only to be used by those skilled in the management of patients in the intensive care or operating room setting.
- Transient hypertension may occur during the loading dose because of initial peripheral vasoconstriction. Reduction of the loading dose infusion rate may be necessary.

Important Implications

Contraindications/Cautions
- Contraindication: hypersensitivity to dexmedeTOMidine or any component of formulation
- Caution: in patients with advanced heart block and/or severe ventricular dysfunction. DexmedeTOMidine decreases sympathetic nervous system activity, so hypotension and/or bradycardia may be more pronounced in patients with hypovolemia, diabetes mellitus, or chronic hypertension and in elderly patients.
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- most common: hypotension, bradycardia and dry mouth
- fever, dizziness, diarrhea, nausea, vomiting, acidosis, anemia, apnea, increased sweating
- if administered for 24 hours or more, abrupt discontinuation may result in withdrawal symptoms (nervousness, agitation, headache, rapid rise in blood pressure)

Other
- dexmedeTOMidine hydrochloride 118 mcg is equivalent to dexmedeTOMidine 100 mcg.
- Elimination half-life : 2 hours
- Onset of action: 5 to 10 minutes
- Peak effect : 15 to 30 minutes

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dexrazoxane

Warnings	Classification	Alternate Names
hazardous drug group 1	cardioprotective agent	ZINECARD

Indications

- cardioprotectant against anthracycline-induced (eg. DAUNOrubicin, DOXOrubicin, epirubicin) induced cardiotoxicity
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the fridge, stable for 4 hours refrigerated
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- ZINECARD is compatible with lactated ringers only

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ dilute in lactated ringers solution only to 1.3 to 3 mg/mL and infuse over 15 minutes ▪ administer DOXOrubicin within 30 minutes of the completion of the dexrazoxane *rate must be controlled with an IV infusion pump*	Basic monitoring
Continuous IV infusion	NO		

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dexrazoxane

Dosage

Follow protocol by which patient is being treated.

- 10:1 ratio of dexrazoxane : DOXOrubicin IV prior to each dose of DOXOrubicin
  (example: dexrazoxane 500 mg/m^2 IV with each dose of DOXOrubicin 50 mg/m^2 IV)
  Maximum dose is 1000 mg/m^2 every 3 weeks.

- dosage modification required for:
  - myelosuppression, see protocol
  - renal failure: reduce dose by 50% in patients with creatinine clearance less than 40 mL/minute
  - hepatic failure: reduce dexrazoxane proportionate to doxorubicin dose reduction in order to maintain the recommended 10:1 dosage ratio

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- injection site pain

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- dexrazoxane tolerability is difficult to assess given the morbidity in this patient population and the effect of concurrently administered DOXOrubicin and other chemotherapeutic agents. See side effects listed under the monographs for the other chemotherapeutic agents being used in the protocol with dexrazoxane.

Monitoring
- Cardiac monitoring should continue during dexrazoxane therapy; dexrazoxane and DOXOrubicin should be discontinued in patients who develop a decline in LVEF or clinical CHF.

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dextran

Warnings	Classification	Alternate Names
	Plasma volume expander	Low Molecular Dextran (LMD) 40

Indications

- to improve local circulation in various conditions, especially peripheral vascular occlusion or reconstruction
- plasma volume expansion during hypovolemic shock due to surgery or trauma
- prophylaxis of post-operative and post-traumatic thromboembolism

Reconstitution and Stability

- store at room temperature
- possibility of crystallization; do not use if crystals, particulate matter or discolouration are present

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use 0.2 micron in-line filter **dextran 40** in 500 mL bag (commercial product) infusion rate may vary	Intermediate Monitoring
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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dextran

Dosage

- Disturbances of arterial or venous circulation:
  500 to 1000 mL (~10 mL/kg) IV in first 24 hours; thereafter 500 mL IV every 1 to 2 days for up to 2 weeks

- Thromboembolism prophylaxis:
  500 to 1000 mL (~10 mL/kg) on day of surgery; follow with 500 mL daily for 2 to 3 days, then 500 mL every 2 to 3 days for up to 2 weeks

- Shock:
  Initially 500 to 1000 mL (~10 mL/kg) IV infused as rapidly as needed; may follow with additional dextran to a maximum of 20 mL/kg in first 24 hours; thereafter may give 10 mL/kg per day for up to 5 days

- dose adjustment may be necessary in patients with renal insufficiency

Potential Hazards of Parenteral Administration

- acute renal failure
- hemorrhage due to thrombocytopenia or interference with coagulation proteins
- hypersensitivity reactions including generalized urticaria, tightness of chest, wheezing, hypotension

Important Implications

Contraindications/Cautions
- contraindicated with marked thrombocytopenia or a bleeding diathesis
- caution if used with other anticoagulant drugs
- use caution in patients with heart failure or those patients at risk of overloading the circulation

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side Effects:
- nausea and vomiting

Monitoring
- CBC, SCr, PTT, INR
- urine output should be monitored
- monitor for signs of circulatory overload

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dextrose 50%

Warnings	Classification	Alternate Names
vesicant	caloric agent	glucose 50%

Indications

- hypoglycemia, diabetic coma
- hyperkalemia
- muscle cramps related to hemodialysis

Reconstitution and Stability

- stable at room temperature
- dextrose 50% syringe; discard unused portion

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	• give undiluted; at rate of 10 to 20 mL/minute • peripheral IV: use a large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	undiluted by **central line only** maximum rate (without producing glycosuria): 1 mL/kg/hour	Basic Monitoring

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dextrose 50%

Dosage

Dextrose 50% solution (1 mL) provides 0.5 g dextrose

Hypoglycemia:
12.5 g (25 mL) IV direct; may be repeated according to patient's response.

Hyperkalemia:
25 to 50 g dextrose (50 to 100 mL dextrose 50%) IV direct over 5 minutes, followed by 5 to 10 units insulin regular IV direct or as per treatment regimen. Monitor blood glucose at 30 and 60 minutes post-dose and PRN for 6 hours.

Muscle cramps related to hemodialysis: 50 mL IV direct; if necessary may repeat once in 5 minutes

Potential Hazards of Parenteral Administration

- thrombophlebitis, pain, vein irritation at injection site
- rapid injection may produce generalized flush which subsides within ten minutes
- extravasation risk: vesicant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- contraindication: hypersensitivity to corn or corn products
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hyperglycemia; glucosuria may occur as a result of the rate of administration or metabolic insufficiency, this can lead to dehydration, hyperosmolar coma and death
- changes in fluid and electrolyte balance and acid base balance (eg hypokalemia, hypophosphatemia and hypomagnesemia)

Other
- 100 mL dextrose 50% solution yields 170 calories

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diacetylmorphine

Warnings	Classification opioid analgesic	Alternate Names DIAPHIN, diacetylmorphine hydrochloride, diamorphine hydrochloride, heroin

Indications

- injectable opioid agonist treatment (iOAT) for opioid use disorder per BC Centre on Substance Use (BCCSU) and Canadian Research Initiative in Substance Misuse (CRISM) guidelines
- for use in patients on diacetylmorphine as part of a community based iOAT program prior to admission to acute care
- **non-formulary**
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store vial at room temperature, in original package to protect from light
- reconstitute 200 mg vial with 1.9 mL sterile water for injection, to provide 100 mg/mL clear, colourless to light beige solution
- use immediately after reconstitution

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	• may be used if IV access cannot be established or patient preference	Intermediate Monitoring and monitoring per PowerPlan / protocol / PPOs See site-specific restrictions
IV direct	YES	• administer undiluted, over at least 2 to 3 minutes • flush slowly over 2 to 3 minutes: with 10 mL NS flush (for peripheral IV) with 20 mL NS flush (for central line e.g. PICC/CVC)	Intermediate Monitoring and monitoring per PowerPlan / protocol / PPOs See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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diacetylmorphine

Dosage

Dosing is individualized based on patient response and tolerance.

- Maximum recommended single dose is 400 mg and the maximum daily dose is 1000 mg.
- Recommended that no more than 3 doses are given daily (TID).
- Doses should be administered at least 3 hours apart.

Potential Hazards of Parenteral Administration

- seizures
- respiratory/circulatory depression and orthostatic hypotension (may be increased with rapid IV injection)
- pruritus and/or erythema may occur at the injection site
- antidote: naloxone
- **confirm resuscitative equipment is readily available**

Important Implications

Contraindications/Cautions

- *Contraindication:* avoid use in patients with severe renal dysfunction
- *Cautions:*
  - patients with convulsive disorders, cranial injuries, respiratory insufficiency, cardiac arrhythmias, reduced blood volume
  - geriatric or debilitated patients, patients with hepatic dysfunction or mild-moderate renal dysfunction and those on other CNS depressants should receive reduced doses and be carefully titrated
  - diacetylmorphine may enhance respiratory and circulatory depression if used in combination with other opioids, sedatives, phenothiazines or anaesthetics

- Pregnancy/Lactation: refer to Micromedex and BCCSU opioid use disorder guidelines
  - *pregnancy*: Very limited data is available. The potential harms of continuing diacetylmorphine during pregnancy should be weighed against the considerable risk of untreated opioid use disorder.
  - *lactation*: Careful evaluation is required on a case by case basis.

Side effects

- *CNS*: seizures, increased intracranial pressure, headaches, sedation, dizziness, sleep disorders, dysphoria
  Respiratory: respiratory depression
  CVS: histamine-mediated vascular dilatation causing orthostatic hypotension
  GI: nausea, vomiting, constipation, delayed gastric emptying
  GU: urinary retention
  Reproductive system: amenorrhea, sexual dysfunction (loss of libido)
  Skin: histamine-mediated hypersensitivity skin reactions (urticaria, pruritus)

Other

- 1 mg diacetylmorphine IV is approximately equal to 0.5 mg HYDROmorphone IV

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diazepam

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	anxiolytic-sedative, muscle relaxant, anticonvulsant	VALIUM, VIVOL

Indications

- acute anxiety or tension states
- alleviation of symptoms of acute alcohol withdrawal
- recurrent convulsive seizures and status epilepticus
- premedication for anesthesia, cardioversion or endoscopy

Reconstitution and Stability

- vial stable at room temperature
- solution becomes unstable when diluted

Compatibility

- compatible with NS, D5W, ringers or lactated ringers during IV direct administration of undiluted diazepam

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into muscle; absorption is delayed and unpredictable	Intermediate Monitoring
IV direct	YES	*preferred route* • undiluted into a large vein in forearm; if possible avoid hand, wrist or antecubital fossa or • administer into the tubing of a flowing *drug-free* IV solution as close as possible to the vein insertion give slowly up to a maximum rate of 5 mg/minute	Advanced Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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diazepam

Dosage

- Acute anxiety, alcohol withdrawal, premedication: 2 to 20 mg IV direct/ IM; may be repeated hourly, although every 3 to 4 hours may be satisfactory

- Status epilepticus: 5 to 10 mg IV direct; repeat if necessary every 10 to 15 minutes until a total of 30 mg has been given; repeat initial dose in 2 to 4 hours if necessary

- Dosage adjustments: may need to reduce dose in hepatic impairment

Potential Hazards of Parenteral Administration

- IM injection is irritating to tissue
- thrombophlebitis, pain, desquamation at injection site
- Extravasation risk: irritant (reports of vesicant effects)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- severe hypotension, bradycardia, respiratory depression and cardiac arrest may follow too rapid IV administration

- antidote or overdose treatment: flumazenil IV

Important Implications

Contraindications/Cautions
- contraindication: shock or coma
- caution: in patients with hepatic failure
- caution: CNS depressant effects are additive with other concomitant CNS depressants

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- sedation, dizziness, vertigo (more pronounced in the elderly), anterograde amnesia, depression and mental confusion
- may cause stimulation (disinhibition) in some patients

Monitoring
- notify physician if respiratory rate falls below 8 breaths per minute

Other
- injectable product may be given rectally

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digoxin

Warnings	Classification	Alternate Names
vesicant	cardiac glycoside	LANOXIN

Indications

- congestive heart failure, atrial fibrillation, atrial flutter and paroxysmal atrial tachycardia

Reconstitution and Stability

- stable at room temperature
- do not use discoloured solutions

Compatibility

- compatible with D5W, NS, sodium chloride 0.45% and lactated ringers

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	*painful; absorption is delayed and unpredictable* inject deeply into muscle followed by massage	Intermediate Monitoring
IV direct*	YES	dilute dose with 8 mL compatible solution; inject slowly over 5 minutes	Intermediate Monitoring
IV intermittent*	YES	dilute in 50 mL; give over 15 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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digoxin

Dosage

- individual variations can be expected depending on response
- Initial dose: 0.01 to 0.015 mg/kg (lean body weight) divided into 2 or 3 equal doses at 6 hour intervals
- Maintenance: 0.0625 to 0.5 mg daily as a single dose or in divided doses
- dose adjustment is necessary for renal insufficiency

Potential Hazards of Parenteral Administration

- extravasation risk: vesicant, may cause local irritation and sloughing
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- treatment of toxicity: discontinue digoxin, administer potassium and antiarrhythmics, digoxin immune Fab

Important Implications

Contraindications/Cautions
- use caution if administering calcium to patients on digoxin
- use with caution in patients with low serum potassium
- caution: quiNIDine, verapamil and amiodarone will increase serum digoxin level

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

Symptoms of toxicity include:
- anorexia, nausea, vomiting, diarrhea, abdominal discomfort or pain
- headache, fatigue, malaise, drowsiness, muscle weakness, neuralgic pain, visual disturbances
- ventricular premature ectopic activity, paroxysmal and non-paroxysmal nodal rhythms, atrioventricular dissociation, paroxysmal tachycardia with block, and slowing of pulse rate (i.e. below 50 beats/minute in patients not on beta-blockers)
- increasing atrioventricular block may proceed to complete heart block

Monitoring
- monitor the apical heart rate and blood pressure prior to each dose of digoxin
- notify physician (prior to subsequent dose) if there are significant changes in heart rhythm, heart rate, or other signs of digitalis toxicity
- serum digoxin levels for congestive heart failure (0.6 to 1 nmol/L); atrial fibrillation (1 to 2.5 nmol/L)
- levels should be drawn prior to the next dose or at least 8 to 12 hours after the last dose

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digoxin immune Fab

Warnings	Classification	Alternate Names
	digoxin antibody; antidote	DIGIFAB digoxin immune Fab (ovine)

Indications

- treatment of digoxin intoxication in the following situations:
  - serum digoxin level greater than 12.8 nmol/L in an acute ingestion or
  - acute ingestion of more than 10 mg in an adult or
  - serum potassium over 5.5 mmol/L in an acute ingestion or
  - cardiotoxicity including ventricular tachycardia or ventricular fibrillation; or progressive bradydysrhythmias such as severe sinus bradycardia, or second- or third-degree heart block not responsive to atropine

- Indications and / or prescribing restrictions apply.

Reconstitution and Stability

- store vials in refrigerator
- reconstitute each 40 mg vial with 4 mL sterile water for injection to provide 10 mg/mL solution .
- mix gently, and inspect vial to ensure no undissolved particulates
- use reconstituted solution immediately; otherwise, store in fridge for up to 4 hours.

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**by physician only** if cardiac arrest is imminent give undiluted; over 30 seconds	Full monitoring
IV intermittent	YES	dilute dose in NS 50 mL; infuse over 30 minutes	Full monitoring
Continuous IV infusion	NO		

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digoxin immune Fab

Dosage

- Each 40 mg DIGIFAB vial contains antibody (digoxin-specific Fab fragments) that bind approximately 0.5 mg digoxin.
- Calculate dose as follows and round dose to the nearest whole vial:

Acute ingestion:

a) **amount known:** Dose (number of vials) = $\frac{\text{total digoxin dose ingested (mg)} \times 0.8}{0.5 \text{ mg}}$

b) **known post-distribution serum digoxin concentration**: (must be at least 8 hours post ingestion)

Dose (number of vials) = $\frac{\text{serum digoxin concentration (nmol/L)} \times 0.78 \times \text{weight (kg)}}{100}$

c) **if both amount ingested and serum concentration known**: use formula (a) above

d) **unknown amount**: give 10 vials IV intermittent over 30 minutes; consult DPIC for further guidance

Toxicity during long-term digoxin therapy:
- 3 to 4 vials IV intermittent over 30 minutes; consult DPIC for further guidance
- if known serum digoxin concentration: use formula (b) above

refer to the *Poison Management Manual* for further detail or contact:
Drug and Poison Information Centre (DPIC):604-682-5050 or 1-800-567-8911

Potential Hazards of Parenteral Administration

- anaphylaxis, hypersensitivity or febrile reactions are rare
- rapid IV injection associated with increased risk of allergic reactions

Important Implications

Contraindications/Cautions
- Caution:
  - patients with a history of allergy to papain, chymopapain or other papaya extracts, may have an increased risk for allergic reactions
  - patients with severe renal failure should be monitored for a prolonged period for possible recurrence of digoxin toxicity
- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Monitoring
- baseline potassium, calcium, magnesium, BUN and creatinine should be determined
- monitor serum potassium every 2 hours x 3 after antidote administration, as hypokalemia may occur
- monitor vital signs and ECG for a minimum of 2 to 3 days following digoxin overdose
- digoxin immune fab interferes with serum digoxin assay; levels should not be repeated until antidote is eliminated (3 to 4 days if normal renal function; more than 1 week for renal failure)

Other
- hyperkalemia and cardiac dysrhythmias begin to respond within 15 to 60 minutes, and complete response is usually noted within 4 hours

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dihydroergotamine

Warnings	Classification	Alternate Names
hazardous drug group 2	vasoconstrictor, vascular headache therapy	DIHYDROERGOTAMINE-SANDOZ DHE, dihydroergotamine mesylate

Indications

- to stop acute onset of migraine and related vascular headaches where rapid control is required or when other routes of administration are not feasible

Reconstitution and Stability

- see safe work procedures to prepare doses, unless dose provided by pharmacy
- store at room temperature
- protect from light and heat
- discoloured solutions should be discarded

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	give undiluted; over at least 1 minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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dihydroergotamine

Dosage

Acute Migraine:
- 1 mg subcutaneous or IM at first sign of migraine. If necessary, repeat at 30 to 60 minute intervals to a total of 3 mg/day **or**
- 0.5 to 1 mg IV direct at first sign of migraine and repeat if necessary after 1 hour
- Usual maximum recommended weekly dose is 6 mg

Intractable Migraine:
- 0.5 to 1 mg IV direct every 8 hours on Day 1, then 0.5 mg IV direct three times daily for 2 days, then 0.5 mg IV direct twice daily for 2 days, then 0.5 mg IV direct once in the morning for 1 day
- Maximum recommended weekly dose: 20 mg

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- contraindicated in patients with peripheral vascular disease, coronary artery disease, severe hypertension, myocardial infarction, prolonged hypotension or shock, sepsis, and hypersensitivity to ergot alkaloids
- contraindicated in pregnancy
- avoid use of dihydroergotamine in patients with renal and/or hepatic impairment
- continuous use should be avoided
- concomitant use of potent CYP 3A4 inhibitors: protease inhibitors (e.g. ritonavir, nelfinavir, indinavir), macrolide antibiotics (e.g. erythromycin, clarithromycin), and antifungal agents (e.g. ketoconazole, itraconazole) is contraindicated. Serious and/or life-threatening ischemia including fatalities and cases of gangrene, have resulted from such concomitant use

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- arterial vascular spasm, localized edema and itching, transient tachycardia or bradycardia, dizziness, nausea and vomiting
- with high dose or prolonged use, symptoms of ergotism (cold skin, muscle pain, vascular stasis, gangrene, angina-like pain, tachycardia, bradycardia, hypotension or hypertension), paresthesia of the extremities, headache, confusion and convulsions can occur

Monitoring
- blood pressure, heart rate
- inform physician of symptoms of muscle pain in the extremities, numbness and tingling of fingers and toes, or precordial distress or pain

Other
- psychological dependence can occur with continuous use

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dilTIAZem

Warnings	Classification calcium channel blocker antiarrhythmic	Alternate Names CARDIZEM dilTIAZem hydrochloride

Indications

- temporary control of rapid ventricular rate in atrial fibrillation or atrial flutter
- rapid conversion of paroxysmal supraventricular tachycardia (PSVT) to sinus rhythm
- prevention of arterial spasm

Reconstitution and Stability

- refrigerate

Compatibility

- compatible with D5W, NS, dextrose-saline combinations

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted over 2 minutes	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations:** 250 mcg/mL dilute 25 mg in D5W 100 mL 1 mg/mL: remove 20 mL from D5W 100 mL bag, then add 100 mg to the bag *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions

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diltIAZem

Dosage

Treatment of paroxysmal supraventricular tachycardia (PSVT):
- 0.25 mg/kg (usual up to 20 mg) IV direct. If response inadequate after 15 minutes, may give 0.35 mg/kg (usual up to 25 mg) IV direct.
- for continued reduction of ventricular rate in patients with atrial flutter or fibrillation, give 5 to 10 mg/hour continuous IV infusion. Increase rate by 5 mg/hour up to 15 mg/hour as needed. Infusions longer than 24 hours or greater than 15 mg/hour are not recommended.

Prevention of arterial spasm:
- 0.2 mg/kg IV direct over 2 minutes
- 5 mg/hour continuous IV infusion for 12 to 24 hours

Potential Hazards of Parenteral Administration

- bruising or burning at injection site
- hypotension, vasodilation (flushing), arrhythmias, AV block

Important Implications

Contraindications/Cautions
- contraindicated in sick sinus syndrome, marked AV conduction disturbances, cardiogenic shock, severe hypotension, ventricular tachycardia
- IV diltiazem and IV beta-blockers should not be administered within a few hours of each other
- use with caution in patients with impaired renal or hepatic function

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other
- onset of action: immediate; peak effect: about 2 to 7 minutes; duration of action: 1 to 3 hours (single dose)
- switch to oral therapy when tolerated

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dimenhyDRINATE

Warnings	Classification	Alternate Names
	antiemetic, antihistamine, antivertigo	GRAVOL

Indications

- prevention or relief of motion sickness, radiation sickness, postoperative vomiting, and drug-induced nausea and vomiting
- vertigo due to Meniere's disease and other labyrinthine disturbances
- hyperemesis gravidarum

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with dextrose solutions, NS, ringers, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES	pain and irritation at IM injection site - rotate sites	Basic Monitoring
IV direct	YES	dilute 50 mg (1 mL) in 9 mL NS; give slowly over 2 minutes	Basic Monitoring
IV intermittent	YES	dilute dose in 50 mL; infuse over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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dimenhyDRINATE

Dosage

Usual dose:
- 25 to 50 mg IM, IV or subcutaneous; may repeat every 4 hours
- maximum total daily dose: 400 mg

Post-anesthetic, post-surgical nausea and vomiting:
- 25 to 50 mg preoperatively, 25 to 50 mg immediately after surgery and every 4 hours for 3 doses

Post radiation nausea and vomiting:
- 50 mg administered 30 to 60 minutes before treatment; repeat 1.5 and 3 hours after

Dose reduction:
- reduce dose in patients who are elderly, debilitated, or have hepatic insufficiency

Potential Hazards of Parenteral Administration

- undiluted solution is irritating to veins and may cause sclerosis

Important Implications

Contraindications/Cautions
- contraindicated: in patients allergic to diphenhydrAMINE
- caution: may exacerbate narrow-angle glaucoma or prostate enlargement

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- CNS depression; sedation is common and is additive with other CNS depressants
- dry mouth, urinary retention

Monitoring
- supervise ambulation because of possible sedation, dizziness, weakness, and incoordination

Other
- may mask symptoms of ototoxicity caused by other drugs (e.g. aminoglycosides, vancomycin)

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dimercaptopropane sulfonic acid

Warnings	Classification	Alternate Names
	heavy metal antagonist	UNITHIOL DIMAVAL DMPS

Indications

- treatment of heavy metal poisoning (chelates select heavy metals *including* arsenic, lead and mercury), when oral therapy cannot be used
- available through Health Canada **Special Access Program**; contact pharmacy
- pharmacy to obtain supply from Lower Mainland Pharmacy Services antidote depots if not stocked on site

Contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911

Reconstitution and Stability

- store ampoules at room temperature
- supplied as a clear, colourless solution

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	inject deeply	Advanced Monitoring
IV direct	NO		
IV intermittent	YES	▪ use immediately after dilution ▪ dilute dose in NS 100 mL ▪ infuse over 20 minutes	Advanced Monitoring
Continuous IV infusion	NO		

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dimercaptopropane sulfonic acid

Dosage

- 3 to 5 mg/kg, to a maximum of 250 mg/dose, IV (preferred) or IM every 4 hours
- frequency may be reduced or patient may be switched to oral therapy after a few days, once the patient's gastrointestinal and cardiovascular systems have stabilized

Potential Hazards of Parenteral Administration

- rapid IV administration is associated with vasodilation, hypotension, nausea, dizziness or weakness
- pain at injection site

Important Implications

Contraindications/Cautions

- *Contraindication*: patients with history of hypersensitivity to DMPS or any component of formulation
- *Caution*:
    - in patients with impaired renal function (serum creatinine > 220 micromol/L).
    - ensure patients are adequately hydrated with good urine output
    - increased side effects observed in patients with severe allergies or asthma

- Pregnancy/Lactation: refer to DPIC or Micromedex

Side effects

- shivering, fever
- skin: rash urticarial (common), Stevens-Johnson syndrome (rare)
- hepatic: transient elevation of transaminases
- sulfur odour (rare)
- bronchoconstriction (in asthmatic patients; very rare)

Monitoring

- monitor renal and hepatic function, serum zinc; blood and/or urine levels of heavy metal

Other:

- DMPS-metal complexes are excreted in the urine.

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diphenhydrAMINE

Warnings	Classification	Alternate Names
	antihistamine	BENADRYL

Indications

- prevention and treatment of vertigo, nausea and vomiting
- prevention of transfusion and drug allergic reactions
- treatment of allergic reactions
- treatment of anaphylaxis (adjunct to epinephrine)
- treatment of extrapyramidal side effects

Reconstitution and Stability

- store at room temperature
- protect from light (darkens on exposure to light)

Compatibility

- compatible with dextrose solutions, NS, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into large muscle mass	Basic Monitoring
IV direct	YES	undiluted or may dilute with NS; maximum rate: 25 mg/minute	Basic Monitoring
IV intermittent	YES	dilute dose in 50 mL; infuse over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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diphenhydrAMINE

Dosage

Usual dose:
- 10 to 50 mg IV or IM every 4 to 6 hours regularly or PRN
- maximum single dose: 50 mg
- maximum daily dose: 400 mg

- reduce dose in the elderly

Potential Hazards of Parenteral Administration

- pain and irritation at IM injection site; rotate sites

Important Implications

Contraindications/Cautions
- contraindicated in patients allergic to dimenhyDRINATE
- contraindicated in patients with narrow angle glaucoma, prostatic hypertrophy and urinary retention
- caution in patients with hypertension or cardiac disease
- caution: potentiates anticholinergics and CNS depressants

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- CNS depression; sedation is common and is additive with other CNS depressants
- dry mouth, urinary retention
- hypotension, palpitations

Monitoring
- monitor for dizziness, ataxia, drowsiness, slurred speech; side effects are more common in the elderly
- supervise ambulation

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dipyridamole

Warnings	Classification	Alternate Names
	platelet aggregation inhibitor	PERSANTINE

Indications

- induce pharmacologic vasodilation for myocardial perfusion imaging

Reconstitution and Stability

- store at room temperature; protect from light

Compatibility

- compatible with D5W and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	large vein preferred (due to acidic pH) myocardial perfusion imaging dilute dose as follows: • with D5W to 30 mL (total volume) in syringe (for use with syringe driver); **or** • in D5W 50 mL bag infuse over 4 minutes *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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dipyridamole

Dosage

Myocardial perfusion imaging:

- 0.56 mg/kg IV intermittent over 4 minutes (0.14 mg/kg/minute). Maximum recommended dose is 70 mg.

Potential Hazards of Parenteral Administration

- bronchospasm; hypotension, ventricular arrhythmias or chest pain may occur following rapid IV administration
  - can be reversed or modified by giving aminophylline 50 to 100 mg IV direct over 1 minute
  - **aminophylline injection and resuscitative equipment should be readily available**
- do not give undiluted, may cause vein irritation

Important Implications

Contraindications/Cautions

- contraindicated: hypersensitivity to dipyridamole or any components of the product
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- abnormal ECG, hypotension, dizziness, headache, nausea
- angina pain, myocardial infarction (rare), ventricular arrhythmia (rare), bronchospasm (rare)

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DOBUTamine

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	inotrope; sympathomimetic	DOBUTREX DOBUTamine hydrochloride (HCl)

Indications

- treatment of cardiac decompensation due to heart disease or following cardiac surgery
- pharmacologic stress for diagnostic myocardial perfusion imaging

Reconstitution and Stability

- store at room temperature
- slight pink colour does not indicate a significant loss in potency

Compatibility

- compatible in D5W, NS, dextrose-saline combinations and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
subcutaneous	NO		
intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa (peripheral route advisable for short term only) **standard solution concentrations:** 1 mg/mL: dilute 100 mg in 100 mL dilute 250 mg in 250 mL 5 mg/mL: remove 40 mL from 100 mL bag; then add 500 mg to the bag myocardial perfusion imaging: dilute 125 mg in NS 250 mL *rate must be controlled with an IV infusion pump*	Intensive Monitoring See site-specific restrictions (Full Monitoring may be used short term when treatment is initiated and transfer for hemodynamic monitoring is imminent)

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DOBUTamine

Dosage

- start at 2.5 mcg/kg/minute continuous IV infusion; adjust infusion rate by increments of 2.5 to 5 mcg/kg/minute to achieve desired response
- usual range: 2.5 to 10 mcg/kg/minute (up to 40 mcg/kg/minute may be required)
- for stress echocardiograms: follow applicable PPOs or power plans; dosing range as above but the accelerated ischemia protocol uses 50 mcg/kg/minute as a starting dose

Potential Hazards of Parenteral Administration

- subcutaneous infiltration may cause local pain without local ischemia
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- contraindicated in the presence of tachycardia or ventricular fibrillation
- contraindicated in the presence of pheochromocytoma
- caution:
  - in patients with pre-existing hypertension (increased risk of exaggerated pressor response)
  - in patients with atrial fibrillation (risk of developing rapid ventricular response)
  - in the presence of hyperthyroidism, anesthetic agents or other sympathomimetics
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- tachycardia, increase in premature ventricular beats, angina, elevation in blood pressure
- may cause renal vasoconstriction especially with pre-existing hypertension

Monitoring
- urine output
- mixed venous oxygenation, lactate, echocardiography may be monitored

Other
- onset of action: 1 to 10 minutes; peak effect: 10 to 20 minutes
- formulation contains sodium bisulfite

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DOPamine

Warnings	Classification	Alternate Names
vesicant	inotrope; sympathomimetic	INTROPIN, REVIMINE DOPamine hydrochloride (HCl)

Indications

- to increase cardiac output for shock due to myocardial infarction, sepsis, trauma, cardiac surgery, spinal cord injury and chronic congestive heart failure

Reconstitution and Stability

- store premixed bags in protective overwrap at room temperature
- discard if solution is discoloured

Compatibility

- compatible with D5W, NS, dextrose 5% in sodium chloride 0.9%, lactated ringers and mannitol

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations** 1600 mcg/mL : 400 mg in D5W 250 mL premixed bag 3200 mcg/mL: 800 mg in D5W 250 mL premixed bag **infuse by central line** ▪ peripheral infusion (max : 5 mcg/kg/MIN) for urgent/emergency situation pending insertion of central line; use large vein in forearm, if possible avoid hand, wrist or antecubital fossa *rate must be controlled with an infusion pump*	Intensive monitoring See site-specific restrictions (Full monitoring may be used short term when treatment is initiated and transfer for hemodynamic monitoring is imminent)

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DOPamine

Dosage

- 1 to 5 mcg/kg/minute; increase rate by 1 to 4 mcg/kg/minute at 10 to 30 minute intervals as required.
- usual range: up to 20 mcg/kg/min
- maximum rate: 50 mcg/kg/minute

Potential Hazards of Parenteral Administration

- prolonged treatment at high doses or use in patients with occlusive vascular disease has led to gangrene
- inadvertent bolus administration could be fatal – disconnect tubing from patient if flushing is required.
- extravasation risk: vesicant, tissue necrosis
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
    - treat with phentolamine (administer within 12 hours), refer to phentolamine monograph

Important Implications

Contraindications/Cautions

- contraindicated for patients with pheochromocytoma
- caution in patients with tachyarrhythmia or ventricular fibrillation and ischemic heart disease
- caution in patients with pre-existing vascular disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, ectopic beats, tachycardia, angina, dyspnea, vasoconstriction, hypertension, hypotension, headache

Monitoring

- urine flow, colour and temperature of extremities
- serial lactate levels
- if given peripherally, monitor site Q1H and PRN for blanching, redness, swelling

Other

- Onset of action: 5 minutes; Duration of action: less than 10 minutes

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DOXOrubicin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic anthracycline	ADRIAMYCIN

Indications

- treatment of certain solid tumors, Hodgkin's and non-Hodgkin's lymphomas, certain leukemias, squamous cell carcinomas, carcinomas of the (testes, prostate and uterus), multiple myeloma refractory to alkylating agents
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS, dextrose 3.3%-sodium chloride 0.3%, lactated ringers

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

- aluminum-containing administration items must NOT be used

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	peripheral route: ▪ via syringe using side arm method; into the tubing of a free flowing IV of D5W or NS over 3 to 5 minutes ▪ use large vein in forearm; avoid hand, wrist or antecubital fossa	Basic monitoring or according to protocol
IV intermittent	YES	**central line only** dilute in 50 to 100 mL infuse over 10 to 30 minutes *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		
Intraperitoneal	YES	**by physician** (used at VGH only)	Basic monitoring or according to protocol

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DOXOrubicin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Dosing schedules include:

- 30 to 75 mg/m^2 IV once on day 1 (total dose per cycle 30 to 75 mg/m^2) ; repeat cycle per protocol

Suggested **maximum cumulative** doses: 3 week cycle: 550 mg/m^2 If cardiotoxic risk factors present, [including: previous use of anthracyclines or anthracenediones, radiotherapy to the mediastinal/pericardial area, heart disease, concommitant chemotherapy eg. cyclophosphamide, PACLitaxel] then maximum cumulative dose for 3 week cycle is 400 to 450 mg/m^2

Dosage modification in hepatic failure

ALT/AST		Bilirubin (micromol/L)	Dose
2 to 3 times ULN		----------	75%
greater than 3 times ULN	OR	20 to 50	50%
----------		51 to 85	25%
----------		greater than 85	Do not administer

Intraperitoneal: 15 mg/m^2 (Refer to peritoneal mesothelioma chemotherapy orders; to be used with Belmont hyperthermia pump.)

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- erythematous streaking along the vein proximal to the injection site, facial flushing; mainly with too rapid infusion
- anaphylaxis is extremely rare - an immediate reaction
- Extravasation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- Severe bone marrow depression is a major toxicity and may be dose-limiting; maximum effect is usually within 10 days to 2 weeks
- Cardiac cells are the most sensitive to the effects of DOXOrubicin. Cardiotoxicity can either be an acute, transient type with abnormal ECG findings and/or a chronic, cumulative, dose-dependent type leading to CHF and cardiorespiratory decompensation.
- Stomatitis and mucositis occurs frequently
- Nausea and vomiting usually occur on the day the drug is given (premedicate with antiemetics)
- Complete alopecia usually occurs; regrowth begins 2 to 3 months after therapy is discontinued.
- radiation recall reaction (hypersensitivity to irradiated skin)

Monitoring

- evaluate hepatic dysfunction before beginning therapy
- monitor for lifetime dose
- monitor cardiac function closely, especially when the cumulative dose reaches 300 mg/m^2

Other

- imparts a red colour to urine with the first few voidings (no clinical significance)

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DOXOrubicin pegylated liposomal

Warnings	Classification	Alternate Names
hazardous drug group 1 high alert medication	anthracycline, antineoplastic	pegylated liposomal DOXOrubicin, CAELYX

Indications

- Primary uses: breast cancer, ovarian cancer, Kaposi's sarcoma
- for *all* indications see BC Cancer benefit drug list
- **DOXOrubicin is available in different liposomal preparations that are not interchangeable. This monograph is specific for CAELYX**
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**central line preferred** less than 90 mg dilute in D5W 250 mL 90 mg or more dilute in D5W 500 mL ▪ infuse initial dose at 1 mg/minute or less; if no infusion reaction, subsequent infusions may be given over 60 minutes **or** ▪ infuse over 60 minutes *rate must be controlled with an IV infusion pump*	Advanced monitoring for 1st dose, then Intermediate monitoring or according to protocol
Continuous IV infusion	NO		

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DOXOrubicin pegylated liposomal

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

- Examples:
  KSLDO: 20 mg/m^2 every 2 weeks
  UGOOVBEVLD: 40 mg/m^2 every 4 weeks

- Dosage adjustments required for:
  - hematological toxicities
  - non-hematological toxicities eg. palmar-plantar erythrodysesthesia (PPE), stomatitis
  - hepatic dysfunction, refer to protocol or as follows:

Total bilirubin (micromol/L)	Dose for breast or ovarian cancer
less than 21	100%
21 to 51	75%
greater than 51	50%

Total bilirubin (micromol/L)	Dose for Kaposi's sarcoma
less than 21	100%
21 to 51	50%
greater than 51	25%

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- acute infusion reactions (5 to 10 %); allergic reaction, anaphylaxis (1 to 5 %); the lipid component is likely the agent that causes this response
- during administration, resuscitation equipment and emergency drugs should be readily available
  Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *blood/bone marrow*: anemia (6 to 74%); reaching nadir 10 to14 days after treatment; neutropenia (12 to 62%)
- *CVS*: cardiac toxicity has been seen, at cumulative doses both above and below 550 mg/m^2, although at a lower frequency than with DOXOrubicin. Caution should be observed in patients who have received other anthracyclines or anthracenediones and in patients who have a history of cardiovascular disease.
- *skin*: palmar-plantar erythrodysesthesia (PPE) [i.e. hand-foot skin reaction characterized by redness, swelling and sometimes desquamation of the skin on the hands and feet]; rash
- *GI*: stomatitis (5 to 41%)

Monitoring
- cardiac function
- PPE: monitor for numbness or tingling and manage appropriately; early measures to prevent or minimize PPE include avoiding the following for 3 days after therapy: tape on skin, tight clothing/jewelry, pressure or friction on skin, sun exposure and hot water- beginning 24 hours before treatment
- monitor for lifetime dose

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doxycycline

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antibiotic	VIBRAMYCIN IV; doxycycline hyclate

Indications

- treatment of severe systemic infections caused by susceptible organisms when oral route cannot be used
- available through Health Canada **Special Access Program**; contact pharmacy

Reconstitution and Stability

- store vials at room temperature and protect from light
- reconstitute each 100 mg vial with 10 mL sterile water for injection, D5W or NS to provide 10 mg/mL solution
- protect solution from direct sunlight during infusion

Compatibility

- compatible with D5W, NS, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute 100 mg in 100 mL infuse over 1 to 4 hours use large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Basic Monitoring
Continuous IV infusion	NO		

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doxycycline

Dosage

- 100 mg IV every 12 hours

Potential Hazards of Parenteral Administration

- Burning at site of infusion, phlebitis; may be reduced by using a more dilute solution or by increasing infusion duration
- Prolonged IV administration may cause thrombophlebitis
- hypersensitivity: urticaria, non-specific rash; anaphylactoid reaction (rare): bronchospasm, hypotension, edema.
- Extravasation risk: irritant (reports of vesicant effects)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Contraindicated:
    - hypersensitivity to doxycycline (tetracycline derivative) or other tetracyclines
    - severe hepatic dysfunction

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- photosensitivity
- gastrointestinal: anorexia, nausea, vomiting

Monitoring

- monitor peripheral IV site for pain, redness or swelling prior to initiating infusion and every 30 minutes until completion. Ask patients to report burning/stinging/pain at IV site promptly

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enalaprilat

Warnings	Classification angiotensin converting enzyme (ACE) inhibitor	Alternate Names VASOTEC

Indications

- treatment of hypertension when oral route not practical

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with dextrose and saline solutions, Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted or dilute dose in NS 9 mL; give over at least 5 minutes	Full Monitoring See site-specific restrictions
IV intermittent	YES	dilute in D5W 50 mL; infuse over 15 to 30 minutes	Advanced Monitoring with blood pressure and pulse following administration and Q15 MIN x 3 for the first 2 doses after starting or increasing
Continuous IV infusion	NO		

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enalaprilat

Dosage

- usual dose: start at 1.25 mg IV Q6H (maximum 5 mg IV Q6H)

- patients with congestive heart failure, hyponatremia or receiving diuretics:
  start at 0.625 mg IV; if inadequate response 1 hour later, repeat 0.625 mg IV. Give 1.25 mg IV Q6H thereafter

- renal impairment (GFR up to 30 mL/minute):
  start at 0.625 mg IV Q6H

Potential Hazards of Parenteral Administration

- hypotension

Important Implications

Contraindications/Cautions
- contraindicated in patients with a history of angioedema to any ACE inhibitor
- avoid in patients with unstable heart failure or acute myocardial infarction
- caution: increased risk of hypotension in patients who are volume depleted by diuretic therapy, dietary sodium restriction, dialysis, diarrhea or vomiting

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea, headache, rash, deterioration in renal function (increase in BUN and serum creatinine), acute renal dysfunction with bilateral or transplant renal artery stenosis
- may cause hyperkalemia
- dry cough in 5 to 10% of patients

Monitoring
- serum creatinine, potassium

Other
- onset of action:15 minutes; peak effect: 1 to 4 hours; duration of action: approximately 6 hours
- conversion from IV to oral therapy:
  - enalaprilat 0.625 mg IV Q6H converts to ramipril 1.25 mg PO daily
  - enalaprilat1.25 mg IV Q6H converts to ramipril 2.5 mg PO daily

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enoxaparin

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	Anticoagulant Low Molecular Weight Heparin	LOVENOX, LOVENOX HP REDESCA, REDESCA HP INCLUNOX, INCLUNOX HP NOROMBY, NOROMBY HP enoxaparin sodium

Indications

- management of unstable angina and non-ST and ST elevation myocardial infarction
- prevention of thromboembolism
- treatment of venous thromboembolism [deep vein thrombosis (DVT) or pulmonary embolism (PE)]

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	preferred injection sites are the anterolateral and posterolateral abdominal wall, given while the patient is lying down do not expel air bubble from prefilled syringe prior to injecting to ensure patient receives full dose	Basic Monitoring
Intramuscular	NO		
IV direct	YES	ST-elevation myocardial infarction (STEMI): rapid IV bolus in cardiac catheterization laboratory: **by physician only** flush lines with NS before and after administration	Advanced Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

Dosage

Management of unstable angina and non-ST elevation MI:
- 1 mg/kg subcutaneous every 12 hours (round dose to nearest 5 mg)
- manufacturer recommends a maximum dose of 100 mg/12 hours; however, dosage should be individualized and higher dosages may be administered
- if currently receiving IV heparin infusion, discontinue heparin and give first dose of enoxaparin one hour later
- eGFR less than 30 mL/minute: 1 mg/kg subcutaneous once daily

As part of STEMI protocol, when used with fibrinolysis:
- *75 years or younger and eGFR of 30 mL/minute or more*:
  30 mg **IV** rapid bolus, then 1 mg/kg (maximum of 100 mg) **subcutaneous** Q12H; give first subcutaneous dose at the same time as the IV bolus

Prevention of thromboembolism following major orthopedic surgery, or spinal cord injury:
- 30 mg subcutaneous twice daily
- eGFR less than 30 mL/minute: 30 mg subcutaneous once daily

This monograph has 3 pages

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enoxaparin

Dosage continued

Prophylaxis of VTE: medical, surgical, obstetrics:

Patient Weight	eGFR greater than or equal to 30 mL/min	eGFR 10 to 29 mL/min	eGFR less than 10 mL/min or on dialysis
Less than 41 kg	30 mg subcutaneous once daily	30 mg subcutaneous once daily	enoxaparin is not used, (please refer to heparin monograph)
41 to 100 kg	40 mg subcutaneous once daily	30 mg subcutaneous once daily	
101 to140 kg	40 mg subcutaneous BID	40 mg subcutaneous once daily	
Greater than 140 kg	60 mg subcutaneous BID	60 mg subcutaneous once daily	

Prophylaxis of VTE: Trauma (excludes Traumatic Brain Injury, Spinal Cord Injury):

Patient Weight	eGFR greater than 60 mL/min	eGFR 30 to 60 mL/min	eGFR 10 to 29 mL/min	eGFR less than 10 mL/min or on dialysis
Less than 41 kg	30 mg SUBCUT BID	40 mg SUBCUT once daily	30 mg SUBCUT once daily	enoxaparin is not used, (please refer to heparin monograph)
41 to 100 kg	40 mg SUBCUT BID	30 mg SUBCUT BID	30 mg SUBCUT once daily	
101 to 140 kg	60 mg SUBCUT BID	40 mg SUBCUT BID	40 mg SUBCUT once daily	
Greater than 140 kg	80 mg SUBCUT BID	60 mg SUBCUT BID	60 mg SUBCUT once daily	

Treatment of thromboembolism (DVT or PE):

- 1 mg/kg subcutaneous Q12H **or** 1.5 mg/kg subcutaneous Q24H (for uncomplicated thromboembolic disorder)
- manufacturer recommends a maximum dose of 100 mg/12 hours or 180 mg/24 hours; however, dose should be individualized and higher doses may be given
- to adapt to single-dose prefilled syringes, the following weight intervals can be used:

Patient Weight (kg)	eGFR greater than or equal to 30 mL/min	eGFR 10 to 29 mL/min
35 to 45	60 mg/0.6 mL subcutaneous once daily	40 mg/0.4 mL subcutaneous once daily
46 to 59	80 mg/0.8 mL subcutaneous once daily	60 mg/0.6 mL subcutaneous once daily
60 to 72	100 mg/ 1 mL subcutaneous once daily	60 mg/0.6 mL subcutaneous once daily
73 to 88	120 mg/0.8 mL subcutaneous once daily	80 mg /0.8 mL subcutaneous once daily
89 to 100	150 mg / 1 mL subcutaneous once daily	100 mg/ 1 mL subcutaneous once daily
101 to 114	100 mg/ 1 mL subcutaneous BID	100 mg/ 1 mL subcutaneous once daily
115 to 139	120 mg/0.8 mL subcutaneous BID	120 mg/0.8 mL subcutaneous once daily
140 to 160	150 mg/ 1 mL subcutaneous BID	150 mg/ 1 mL subcutaneous once daily

This monograph has 3 pages

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enoxaparin

Dosage continued

Dose adjustments prior to surgery:
- prophylaxis: do not give dose within 12 hours of surgery
- treatment: for Q12H dosing: do not give dose within 24 hours of surgery
  for Q24H dosing: do not give dose within 36 hours of surgery
  May give 50% of dose 24 hours pre-op in patients at high risk of thrombosis
- *Obstetrics*
  - *pregnancy*:
    - prophylaxis: discontinue 12 hours prior to elective C-section, induction or neuraxial procedure
    - treatment: discontinue 24 hours prior to elective C-section, induction or neuraxial procedure
  - *postpartum:*
    - prophylaxis: wait 12 hours after neuraxial procedure and 4 hours after epidural catheter removal before initiating or restarting
    - treatment: wait 24 hours after neuraxial procedure and 4 hours after epidural catheter removal before initiating or restarting

Potential Hazards of Parenteral Administration

- subcutaneous injection may cause hematoma, bruising and pain
- hemorrhage (antidote: protamine)
- high alert medication: enoxaparin multi-dose vials

Important Implications

Contraindications/Cautions
- contraindicated if heparin allergy and heparin-induced thrombocytopenia due to potential for cross-reactivity
- contraindicated in active bleeding, blood dyscrasias, bacterial endocarditis, recent neurosurgical procedures
- enoxaparin Q12H dosing is contraindicated if patient requires epidural analgesia
- avoid IM injections; if possible, avoid non-steroidal anti-inflammatory drugs (NSAIDs)
- caution in hepatic impairment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex
  - note: multi-dose vial contains benzyl alcohol and should be avoided in pregnancy/lactation

Side effects
- bleeding complications, thrombocytopenia (incidence less than 3%), and transient elevation in liver enzymes

Monitoring
- hemoglobin and platelets should be monitored at least twice weekly during treatment therapy
- anti-Xa levels may aid to guide dosing in obesity, pregnancy, renal impairment, abnormal coagulation/bleeding

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ePHEDrine

Warnings	Classification sympathomimetic	Alternate Names ePHEDrine sulphate

Indications

- to counteract the hypotensive effects of spinal anesthesia
- treatment of shock

Reconstitution and Stability

- do not use discoloured solutions
- stable at room temperature; protect from light

Compatibility

- compatible with dextrose, saline, dextrose-saline combinations, Ringer's and lactated Ringer's solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Full Monitoring Perinatal Monitoring
Intramuscular	YES		Full Monitoring Perinatal Monitoring
IV direct	YES	dilute 50 mg (1 mL) in 9 mL NS to provide 5 mg/mL concentration calculated dose to be given at a maximum rate: 10 mg/minute	Full Monitoring Perinatal Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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ePHEDrine

Dosage

IM or subcutaneous: 25 to 50 mg (range 10 to 50 mg)

IV direct: 5 to 25 mg; may repeat in 5 to 10 minutes (maximum: 150 mg per 24 hours)

Potential Hazards of Parenteral Administration

- excessive doses may cause sudden, severe hypertension sufficient to produce cerebral hemorrhage
- repeated injections may cause contraction of the bladder sphincter and interfere with voluntary urination
- large doses may cause confusion, delirium and hallucinations or euphoria

Important Implications

Contraindications/Cautions

- use with caution in patients with cardiac disease, hypertension, hyperthyroidism, narrow angle glaucoma, and diabetes mellitus urinary retention

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nervousness, anxiety, agitation, dizziness
- angina may occur in patients with ischemic heart disease
- cardiac arrhythmias may occur in patients with organic heart disease or those receiving drugs that may sensitize the heart to arrhythmias (e.g. digoxin, halothane)

Other

route	onset of action	duration of action
IV	immediate	5 to 10 minutes
IM or subcutaneous	10 to 20 minutes	30 to 60 minutes

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epinephrine

Warnings	Classification	Alternate Names
vesicant	sympathomimetic	ADRENALIN epinephrine hydrochloride (HCl)

Indications

- treatment of bronchospasm; treatment of hypersensitivity reactions and anaphylactic shock
- to restore cardiac rhythm in cardiac arrest
- treatment of hypotension or poor perfusion

Reconstitution and Stability

- storage requirements vary: check product label or packaging; protect ampoules from light
- do not use discoloured solutions

Compatibility

- compatible with D5W, NS, dextrose-saline combinations, lactated ringers and ringers

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	use **1 mg/mL**	Advanced Monitoring
Intramuscular	YES	use **1 mg/mL** route of choice for anaphylaxis do NOT inject into buttocks	Advanced Monitoring
IV direct*	YES	cardiac arrest: ▪ **1 mg/10 mL prefilled syringe** (PFS) [if PFS unavailable, use **1 mg/mL** ampoule: dilute 1 mg with 9 mL NS to provide 1 mg/10 mL syringe] ▪ give over a few seconds cardiac failure / hypotension: ▪ use **1 mg/mL** ampoule; ▪ dilute 1 mg in NS 100 mL to provide 10 mcg/mL concentration ▪ administer calculated dose over 1 minute	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion*	YES	use **1 mg/mL** **standard solution concentrations:** 12 mcg/mL: dilute 3 mg in 250 mL 20 mcg/mL: dilute 5 mg in 250 mL 60 mcg/mL: dilute 30 mg in 500 mL **administer by central line** may give peripherally into a large vein until a central line can be inserted; or short term as per site specific treatment protocol *rate must be controlled with an infusion pump*	Intensive Monitoring (Full Monitoring may be used short term when treatment is initiated) See site-specific restrictions
Intracardiac	YES	**by physician only**	Full Monitoring
Endotracheal	YES	**by physician only ;** use **1 mg/mL** dilute 2 to 2.5 mg with NS 10 mL	Full Monitoring
Inhalation	YES	use **1 mg/mL** nebulize dose over 10 to 15 minutes	Intermediate Monitoring

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epinephrine

Dosage

Anaphylaxis:
- 0.3 to 0.5 mg IM (preferred) or subcutaneous; repeat every 5 minutes up to 3 doses if required
- if response is inadequate, give 0.005 mg/kg IM (maximum 0.5 mg per dose); repeat at 5 to15 minute intervals

Asthma or reversible bronchospasm:
- 0.3 to 0.5 mg subcutaneous every 20 minutes PRN (maximum: 3 doses)
- 5 mg nebulized over 10 to 15 minutes; may repeat dose in 3 hours

Cardiac arrest:
- 1 mg IV direct every 3 to 5 minutes PRN, **or**
- 2 to 2.5 mg via endotracheal route, **or**
- 1 to 4 mcg/minute continuous IV infusion; adjust dose to response (usual range:1 to 20 mcg/minute)

Cardiac failure / hypotension:
- 5 to 20 mcg IV direct every 2 to 5 minutes

Potential Hazards of Parenteral Administration

- peripheral vasoconstriction leading to hypertension and pulmonary edema
- inadvertent IV injection of subcutaneous or IM doses may result in hypertension, myocardial infarction, cerebrovascular hemorrhage/infarction
- Extravasation risk: vesicant (necrosis due to vascular constriction)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
    - treat with phentolamine (administer within 12 hours), refer to phentolamine monograph

Important Implications

Contraindications/Cautions
- contraindicated in narrow angle glaucoma, arrhythmias, tachyarrhythmias, organic brain syndrome
- use with caution in patients with cardiovascular disease, hypertension, diabetes, hyperthyroidism, cerebrovascular disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hypertension, tachycardia, dysrhythmias, myocardial ischemia
- anxiety, restlessness, headache, dizziness
- tremor, weakness, pallor
- respiratory difficulty and renal failure

Monitoring
- urine output; serial serum potassium and glucose

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epirubicin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	anthracycline, antineoplastic	PHARMORUBICIN, ELLENCE

Indications

- treatment of metastatic breast carcinoma, non-Hodgkin's lymphoma, Hodgkin's disease, ovarian cancer, gastric cancer and small-cell lung cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in the refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	Peripheral route: via syringe using side arm method; into the tubing of a free flowing IV into a large vein; over at least 3 to 5 minutes	Basic monitoring or according to protocol
IV intermittent	NO		
Continuous IV infusion	NO		

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epirubicin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

- 50 to 100 mg/m^2 every 3 weeks or frequency according to protocol.
- Combination therapy with other antineoplastic agents, lower dosages should be used: 50 to 75 mg/m^2
- Suggested maximum cumulative doses: 720 to 1000 mg/m^2

- Dosage adjustments required for:
  - myelosuppression
  - hepatic dysfunction as follows:

AST		bilirubin micromoL/ L	dose
2 to 4 times ULN	or	21 to 51	50%
greater than 4 times ULN	or	greater than 51	25%

- lower starting dose in severe renal impairment (serum creatinine is greater than 442 micromoL/L)

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- facial flushing or erythematous streaking and/or transient urticaria along the vein proximal to the site of injection especially with too rapid administration
- Extravasation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- dose limiting toxicities are myelosuppression (primarily leukopenia, nadir at 10 to 14 days) and cardiotoxicity
  - myocardial toxicity with delayed congestive heart failure may be encountered as the cumulative dose approaches 1000 mg/m^2 (may occur at lower cumulative doses in patients receiving prior anthracycline, mitomycin C or anthracene therapy and/or mediastinal radiotherapy and in those with a history or presence of cardiac disease)
  - CHF and/or cardiomyopathy may be encountered several weeks after discontinuation of epirubicin
- stomatitis and esophagitis may occur 5 to10 days after drug administration
- moderate nausea and vomiting occurs in most patients a few hours after drug administration
- reversible partial or complete alopecia occurs in most patients
- radiation recall reaction resulting in skin and organ (primarily heart and GI tract) toxicity may occur

Monitoring
- cardiac function should be monitored
- monitor for maximum lifetime dose

Other
- epirubicin imparts red color to the urine for 1 to 2 days after administration

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epoetin alfa

Warnings	Classification	Alternate Names
	erythropoiesis regulating hormone	r-HuEPO-α, EPREX erythropoietin (recombinant human), EPO

Indications

- treatment of anemia associated with chronic renal dysfunction
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator; pre-filled syringes may be stored at room temperature for 7 days
- DO NOT SHAKE; do not send via tube system (send by special messenger only)
- protect from light

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	into upper arms, abdomen, thighs or upper outer areas of buttocks	Basic Monitoring
Intramuscular	NO		
IV direct	YES	*preferred route for hemodialysis patients* undiluted into the venous cannula; administer over at least 1 minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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epoetin alfa

Dosage

Chronic renal failure:
- initial dose: 50 to 100 units/kg/week IV or subcutaneous, divided one to three times a week
- dose is adjusted in 25% increments every 4 to 6 weeks to target hemoglobin of 95 to 115 g/L , or follow BCPRA anemia protocol

Potential Hazards of Parenteral Administration

- flu-like symptoms; may be alleviated by slowing rate of IV administration
- mild skin rash and pruritus

Important Implications

Contraindications/Cautions
- contraindicated in patients with hypersensitivity to albumin
- caution in patients with uncontrolled hypertension; a rapid rise in hemoglobin (more than 20 g/L in 4 weeks) may be associated with an increased risk of hypertension, hypertensive encephalopathy or seizures (risk is greatest in the first 90 days of therapy)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hypertension, headache, fever, cough, arthralgia, pruritus, nausea, vomiting
- pure red cell aplasia (erythroblastopenia) after months to years of treatment in patients with chronic renal failure has been noted, particularly when administered via the subcutaneous route (IV route preferred for hemodialysis patients)

Monitoring
- hemoglobin should be monitored biweekly upon initiation of therapy and after any dose adjustment until stabilization of response (4 to 6 weeks)
- iron stores should be monitored prior to and during therapy; transferrin saturation should be at least 20% and serum ferritin at least 100 mcg/L (in non-hemodialysis patients) and 200 mcg/L (hemodialysis patients)

Other
- increased doses of heparin may be required during hemodialysis to prevent clotting of the artificial kidney
- response to erythropoietin is first noted by an increase in the reticulocyte count within 10 days, followed by increases in the red cell count, hemoglobin and hematocrit, usually within 2 to 6 weeks
- dosage requirements may be less when the drug is administered subcutaneous versus IV

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epoprostenol

Warnings	Classification	Alternate Names
	prostaglandin-vasodilator	CARIPUL, FLOLAN, epoprostenol sodium, prostacyclin, PGI_2

Indications

- long term treatment of pulmonary arterial hypertension (PAH) despite optimal medical therapy
- Indications and/or prescribing restrictions apply

Reconstitution and Stability

Note: CARIPUL and FLOLAN have different reconstitution, stability and compatibility information.
- for both brands, vials are stored at room temperature and protected from light
- for both brands, reconstituted solutions may be refrigerated; solutions are stable for at least 24 hours at room temperature, even after being refrigerated; solutions must be protected from light

CARIPUL: Reconstitute vial(s) with NS (use 100 mL NS bag) **or** SWFI (2 x 50 mL vials supplied by Pharmacy). Remove 5 mL of NS (from bag) or use 5 mL SWFI for each CARIPUL vial to be reconstituted. Withdraw the required amount of reconstituted solution (see table below) and add to a sufficient volume of diluent to make a total of 100 mL. For SWFI, obtain empty sterile bag, from stores or pharmacy.

FLOLAN: Reconstitute vial(s) **only** with diluent provided. Reconstitute each vial with 5 mL of the supplied diluent. Withdraw required amount of reconstituted solution (see table below) and add to a sufficient volume of diluent to make a total of 100 mL. Prepare in empty sterile bag, obtain from stores or pharmacy.

- *IV infusion devices*: If using the patient's CADD Solis pump and cassette, reconstitute CARIPUL with SWFI. If using a hospital infusion pump, reconstitute CARIPUL with either NS or SWFI.

reconstitute vials and prepare standard solutions as follows:
(see **Dosage** section for standard concentration to choose when initiating therapy)

epoprostenol vial size	volume of diluent to add to vial	withdraw from reconstituted vial	final concentration of standard solutions	bag size
1 x 0.5 mg	5 mL	1 mL	1000 ng/mL	100 mcg/100 mL
1 x 0.5 mg	5 mL	2.5 mL	2500 ng/mL	250 mcg/100 mL
1 x 0.5 mg	5 mL	5 mL (entire contents)	5000 ng/mL	500 mcg/100 mL
1 x 1.5 mg	5 mL	5 mL (entire contents)	15,000 ng/mL	1500 mcg/100 mL
2 x 1.5 mg	5 mL to each vial	10 mL (entire contents)	30,000 ng/mL	3000 mcg/100 mL
3 x 1.5 mg	5 mL to each vial	15 mL (entire contents)	45,000 ng/mL	4500 mcg/100 mL

Compatibility

- CARIPUL: compatible with SWFI or NS
- FLOLAN: is compatible only with diluent provided

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Continuous IV infusion ONLY	YES	use a 0.2 micron in-line filter; give via central line ▪ in an emergency, may use peripheral line for 24 hours (use large vein in forearm; if possible avoid hand, wrist or antecubital fossa) until central line available prepare standard solutions as per the table in the Reconstitution and Stability section above *rate must be controlled with an IV infusion pump*	Advanced Monitoring Monitor BP, pulse, respiratory rate and O_2 saturation at baseline and Q15 MIN for 1 hour after each dose titration

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epoprostenol

Dosage

Dose and duration of treatment is dependent on patient response.

- initiate at 1 to 2 ng/kg/minute continuous IV infusion and increase dose by 1 to 2 ng/kg/minute every 15 minutes as tolerated or as directed by pulmonary hypertension specialist

VCH: Bag concentration to use based on dose and weight

dose	60 kg and below	61 to 100 kg	101 kg and above
10 ng/kg/minute or less	5000 ng/mL	15,000 ng/mL	15,000 ng/mL
11 to 19 ng/kg/minute	15,000 ng/mL	30,000 ng/mL	30,000 ng/mL
20 ng/kg/minute and above	15,000 ng/mL	30,000 ng/mL	45,000 ng/mL

Note: concentration may need to be changed as dose is increased

PHC: Bag concentration to use based on dose

dose	Bag concentration to make
1 to 3 ng/kg/minute	1000 ng/mL
4 to 7 ng/kg/minute	2500 ng/mL
8 to 15 ng/kg/minute	5000 ng/mL
15 ng/kg/minute and above	5000 ng/mL

Note: concentration may need to be changed as dose is increased

- dose reduction or discontinuation :
  - do not discontinue abruptly as rebound pulmonary hypertension may occur
  - guidelines recommend dose reduction of 2 ng/kg/minute every 15 minutes or longer

- Infusion Charts

Potential Hazards of Parenteral Administration

- dose related increases in heart rate and hypotension; bradycardia and fainting have also been reported
- myocardial ischemia may occur in patients with severe coronary artery disease
- Extravasation risk: irritant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- contraindicated in patients with congestive heart failure due to severe left ventricular systolic dysfunction
- epoprostenol is a potent inhibitor of platelet aggregation; use with caution in patients with other risk factors for bleeding

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- dose-limiting effects:
  - flushing, headache, dizziness, hypotension, tachycardia
  - nausea, vomiting, diarrhea and abdominal pain
  - chest pain, jaw pain, myalgia; anxiety, agitation, tremor
- for diabetic patients: elevations in plasma glucose

Other

- half life is 6 minutes
- epoprostenol is available as two different brands: FLOLAN and CARIPUL; they are not interchangeable
- in an emergency, if a patient is stabilized on one BRAND, the alternate BRAND may be substituted; monitor BP, HR, side effects, pH changes (presyncope, dyspnea) closely for 4 hours as follows: Q15 MIN x 4, then Q30 MIN x 2, then Q1H x 2

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eptifibatide

Warnings	Classification	Alternate Names
	platelet inhibitor (GP IIb/IIIa receptor antagonist)	INTEGRILIN

Indications

- adjunctive treatment in patients undergoing percutaneous coronary intervention (PCI)
- treatment of high risk patients with unstable angina (UA) or non-Q-wave (non ST-elevation) myocardial infarction (NSTEMI), including those patients who may subsequently undergo percutaneous transluminal coronary angioplasty (PTCA)
- management of acute thromboembolic event complicating cerebral aneurysm coil embolization

Reconstitution and Stability

- store vials in refrigerator; stable for 2 months at room temperature; protect from light
- single use vials

Compatibility

- compatible with NS, D5W, dextrose 5% in sodium chloride 0.9%

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	• use 20 mg/10 mL vial (2 mg/mL) or • 75 mg/ 100 mL vial (0.75 mg/mL) *may administer via Alaris bolus feature* give bolus dose undiluted over 1 to 2 minutes	Advanced Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration**: 0.75 mg/mL: use 75 mg/100 mL vial administer undiluted from vial *rate must be controlled with an IV infusion pump*	Advanced Monitoring See site-specific restrictions
Intra-arterial	YES	**by physician only** administer undiluted	Full Monitoring See site-specific restrictions

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eptifibatide

Dosage

Refer to site-specific pre-printed orders.

Percutaneous Coronary Intervention (PCI):
- immediately before PCI: give bolus dose 180 mcg/kg IV direct (maximum 22.6 mg), followed by 2 mcg/kg/minute continuous IV infusion (to a maximum of 15 mg/hour);
- after 10 minutes, repeat with a second bolus dose 180 mcg/kg IV direct (maximum 22.6 mg)
- continue infusion for up to 18 to 24 hours (minimum of 12 hours)

Unstable Angina (UA)/Non-ST Elevation Myocardial Infarction (NSTEMI):
- give bolus dose 180 mcg/kg IV direct (maximum 22.6 mg), followed by 2 mcg/kg/minute continuous IV infusion (to a maximum of 15 mg/hour); continue infusion for up to 72 hours
- If a patient is to undergo PCI, the infusion should be continued for up to 18 to 24 hours after the PCI procedure (to a maximum total duration of 96 hours of therapy).

Management of acute thromboembolic event complicating cerebral aneurysm coil embolization:
- bolus dose: 180 mcg/kg (maximum 22.6 mg), intra-arterial or IV direct
- may follow with 2 mcg/kg/minute continuous IV infusion (to a maximum of 15 mg/hour); continue infusion for up to 18 to 24 hours

Dose reduction in renal impairment: (creatinine clearance (CrCl) or eGFR 20 to 50 mL/minute)
- no change to bolus dosing
- reduce continuous IV infusion to 1 mcg/kg/minute (maximum of 7.5 mg/hour)

Potential Hazards of Parenteral Administration

- hemorrhage: severe bleeding may occur; thrombocytopenia.

Important Implications

Contraindications/Cautions
- contraindicated if CrCl or eGFR is less than 20 mL/minute
- active bleeding or history of bleeding diathesis within the previous 30 days
- major surgery or severe trauma within the preceding month
- thrombocytopenia (platelet count less than 100 x 10^9/L)
- severe uncontrolled hypertension (SBP greater than 180 mmHg or DBP greater than 110 mmHg)
- aortic dissection, acute pericarditis, vasculitis
- history of stroke within 30 days or any history of hemorrhagic stroke
- intracranial neoplasm or AV malformation or aneurysm
- clinically significant liver disease; elevated baseline INR
- known hypersensitivity to any component of the product

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- CBC at baseline, 4 hours after the bolus dose, then daily during treatment; repeat CBC at 24 hours after discontinuation of infusion or prior to discharge, whichever is first
- inform physician if platelet count drops below 100 x 10^9/L. Platelet transfusion may be required if platelet count drops below 50 x 10^9/L
- baseline aPTT and INR
- maintain bleeding precautions (i.e. avoid unnecessary arterial and venous punctures, no IM injections, avoid automatic blood pressure cuffs)

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ergonovine

Warnings	Classification	Alternate Names
hazardous drug group 2	oxytocic	ERGOTRATE ergonovine maleate, ergometrine maleate

Indications

- Prevention and treatment of postpartum or post-abortion hemorrhage caused by uterine atony. Ergonovine is used in the third and fourth stage of labour; use is contraindicated during pregnancy.

Reconstitution and Stability

- see safe work procedures to prepare doses, unless dose provided by pharmacy
- refrigerate ampoules, protect from light

Compatibility

- compatible with NS, D5W, dextrose and dextrose saline combinations, lactated ringers and ringers

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	For emergency use only **physician must be present** dilute dose in NS to 5 mL and give over at least 1 minute	Intermediate Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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ergonovine

Dosage

- 0.2 mg or 0.25 mg IM or IV. May repeat dose in 2 to 4 hours if needed. Severe uterine bleeding may require repeated doses (maximum of 5 doses is usually not exceeded)

Potential Hazards of Parenteral Administration

- hypertension, palpitations, myocardial infarction, shock;
- intense vasoconstriction (ergotism) resulting in peripheral vascular ischemia. Usually associated with overdose or prolonged chronic use; do not exceed dosing guidelines and avoid prolonged administration.
- allergic reactions

Important Implications

Contraindications/Cautions

- *Contraindications*:
  - allergy to ergot preparations (ergonivine is an ergot derivative)
  - concomitant use with other ergot alkaloids
  - potent CYP3A4 inhibitors such as macrolide antibiotics (e.g. erythromycin, clarithromycin), protease inhibitors (e.g. indinavir, lopinavir/rotinavir, nelfinavir), or azole antifungals (e.g. fluconazole, ketoconazole, voriconazole) cause elevated levels of ergot alkaloids leading to ergotism.
  - pre-eclampsia or eclampsia; hypertension; threatened spontaneous abortion; use prior to third stage of labour; use prior to delivery of the placenta
  - pregnancy

- *Cautions*:
  - With IV use there is a risk of inducing sudden hypertensive and cerebrovascular accidents.
  - too rapid injection may cause severe nausea and vomiting.
  - renal or hepatic impairment
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting;
- dyspnea;
- weakness of legs, muscle pains

Monitoring

- uterine contractions
- character and amount of vaginal bleeding.
- adverse reactions, including ergotamine toxicity (eg, headache, ringing in ears, nausea and vomiting, diarrhea, numbness or coldness of extremities, confusion, hallucinations, dyspnea, chest pain, convulsions).
- Hypocalcemia: uterine response may be poor in calcium-deficient patients. Responsiveness can be restored with IV calcium replacement

Other

- IM administration causes uterine contractions to begin in 2 to 3 minutes, with uterine effects lasting 3 hours
- IV administration causes uterine contractions to begin in 1 minute or less, with uterine effects lasting 45 minutes

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ertapenem

Warnings	Classification Beta-lactam, carbapenem antibiotic	Alternate Names IVANZ

Indications

- treatment of documented or suspected infections involving multi-drug resistant organisms
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- For IV administration: reconstitute 1 g vial with 10 mL sterile water for injection or normal saline to yield 100 mg/mL solution. Further diluted solutions are stable for 6 hours at room temperature.
- For **IM administration**: reconstitute 1 g vial with 3.2 mL 1% lidocaine (plain) to yield 280 mg/mL solution. Shake well. Administer within 1 hour of reconstitution.

Compatibility

- compatible with normal saline

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into a large muscle (eg. gluteal muscle or lateral part of thigh)	Basic Monitoring
IV direct	NO		
IV intermittent	YES	dilute dose in NS 50 mL; infuse over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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ertapenem

Dosage

- 1000 mg IM or IV Q24H (for 3 to 14 days)
- Dose adjustment in renal impairment as per table below:

Creatinine Clearance (Adults)	Dose
less than 30 mL/minute	500 mg IV Q24H
Hemodialysis	500 mg IV on dialysis days only; for severe infections, may increase to 1000 mg IV on dialysis days only (give after dialysis) **or** 500 mg IV Q24H (give dose after dialysis on dialysis days)
Continuous Ambulatory Peritoneal Dialysis	500 mg IV Q24H

Potential Hazards of Parenteral Administration

- extravasation, phlebitis or thrombophlebitis
- hypersensitivity reactions, including anaphylaxis

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to other carbapenem antibiotics (eg. imipenem, meropenem)
- Caution: in patients with CNS disorders
- Pregnancy/Lactation*:* refer to Lexicomp or Micromedex

Side effects

- seizures, headache, altered mental status (e.g. agitation, confusion, drowsiness, stupor),
- nausea, vomiting, diarrhea, constipation, abdominal pain, pseudomembranous colitis, vaginitis

Monitoring

- monitor the following periodically for patients on prolonged therapy: hematology profile, renal function, and hepatic function

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erythromycin

Warnings	Classification	Alternate Names
	antibiotic	ERYTHROCIN erythromycin lactobionate

Indications

- treatment of infections caused by susceptible strains of microorganisms
- short-term gastrointestinal prokinetic agent
- antibiotic prophylaxis to prolong latency in pregnancies with preterm pre-labour rupture of membranes (PPROM)

Reconstitution and Stability

- store vial at room temperature
- reconstitute with sterile water for injection as follows:
  - 500 mg vial: add 10 mL to provide 50 mg/mL solution
  - 1000 mg vial: add 20 mL to provide 50 mg/mL solution

Compatibility

- compatible with NS, lactated ringers
- stable in D5W for **2 hours**

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute doses: o 125 mg in NS 50 mL o 250 mg in NS 100 mL o 500 mg in NS 100 mL o 1000 mg in NS 250 mL maximum concentration: for peripheral line: 5 mg/mL for central line: 10 mg/mL administer over 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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erythromycin

Dosage

- Antibacterial**:** 250 to 1000 mg IV every 6 hours; severe infections: up to 4 g/day.
- Prokinetic Agent:
  - 250 mg IV every 6 hours for 4 doses, then reassess
  - post Whipple procedure: 125 mg IV every 6 hours for 72 hours
- Antibiotic prophylaxis to prolong latency in pregnancies with PPROM: 250 mg IV every 6 hours for 48 hours

Potential Hazards of Parenteral Administration

- hypersensitivity reactions, anaphylaxis
- venous irritation or thrombophlebitis with extravasation
- pain along the vein with rapid administration

Important Implications

Contraindications/Cautions

- Contraindicated: hypersensitivity to erythromycin or any macrolide antibiotics
- Caution:
  - in patients with impaired liver function
  - inhibitor of CYP3A4 enzyme and may prolong QT interval; multiple drug interactions exist, consult interaction references
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, abdominal cramping may occur
- prolongation of the QT interval and development of ventricular arrhythmias (rare)

Monitoring

- monitor vein for phlebitis
- monitor liver function tests with prolonged therapy or high doses

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esmolol

Warnings	Classification	Alternate Names
vesicant	beta-blocker	BREVIBLOC

Indications

- supraventricular tachycardia and atrial fibrillation / flutter
- perioperative management of tachycardia and hypertension in patients with cardiovascular disease
- hypertensive emergencies (including aortic dissection)
- reversal of DOBUTamine side effects during myocardial perfusion imaging

Reconstitution and Stability

- store vials and esmolol 2500 mg in 250 mL sodium chloride 0.59% premix bags, at room temperature
- solution is colourless to light yellow

Compatibility

- compatible with D5W, NS and lactated ringers

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	give undiluted, over 30 to 60 seconds for reversal of DOBUTamine side effects: give undiluted, over 15 seconds	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion*	YES	**standard concentration:** 10 mg/mL: 2500 mg in 250 mL premix bag *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions

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esmolol

Dosage

Supraventricular tachycardia and atrial fibrillation / flutter:
- 0.5 mg/kg IV direct over 1 minute (optional), then 0.05 mg/kg/minute continuous IV infusion; if the response is inadequate, titrate upward in 0.05 mg/kg/minute increments (increase no more frequently than every 4 minutes)
- maximum rate: 0.2 mg/kg/minute

Pre-operative tachycardia and hypertension:
- 1.5 mg/kg (maximum 100 mg) IV direct over 30 seconds, 1 to 2 minutes before intubation

Perioperative tachycardia and hypertension:
- 1.5 mg/kg (maximum 100 mg) IV direct over 30 seconds, may follow with 0.15 mg/kg/minute continuous IV infusion (adjust infusion rate to maintain heart rate and blood pressure)
- maximum rate: 0.3 mg/kg/minute

Hypertensive emergencies (including aortic dissection): Loading dose: 0.5 to 1 mg/kg over 1 minute IV direct, followed by a 0.05 mg/kg/minute infusion. For additional blood pressure control, repeat loading dose and increase infusion by 0.05 mg/kg/minute increments up to a maximum of 0.2 mg/kg/minute

Reversal of DOBUTamine side effects during myocardial perfusion imaging:
- 0.3 mg/kg IV direct

Potential Hazards of Parenteral Administration

- phlebitis at site of injection
- hypotension, bradycardia
- bronchospasm
- may precipitate or potentiate heart failure
- Extravasation risk: vesicant
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- contraindicated in patients with sinus bradycardia, second or third degree heart block, right ventricular failure secondary to pulmonary hypertension
- caution in patients with asthma, bronchospastic disease, sinus-node dysfunction, or uncontrolled diabetes mellitus

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other
- onset of action: 2 to 5 minutes
- duration of action: 10 to 30 minutes

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estrogens, conjugated

Warnings	Classification	Alternate Names
hazardous drug group 1	estrogenic hormones	PREMARIN

Indications

- dysfunctional uterine bleeding due to hormonal imbalance

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet. See approved safe work procedures for preparation outside of a BSC.
- refrigerate vials
- reconstitute vial with 5 mL sterile water for injection to provide 5 mg/mL solution (straw coloured)
- add diluent slowly, letting it flow against the side of the vial, **agitate gently**

Compatibility

- compatible with D5W, D10W, dextrose-saline solutions and NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	only when IV route not feasible	Basic Monitoring
IV direct	YES	administer each 5 mg or less over 1 minute (eg. 25 mg over 5 minutes)	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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estrogens, conjugated

Dosage

- Dysfunctional uterine bleeding: 25 mg by direct IV; repeat in 6 to 12 hours if necessary

Potential Hazards of Parenteral Administration

- flushing, nausea, vomiting if injected too rapidly

Important Implications

Contraindications/Cautions

- Contraindicated in patients with hepatic dysfunction or disease (especially of the obstructive type), active thrombophlebitis or thromboembolic disorders
- Contraindicated in pregnancy
- Lactation: refer to Lexicomp or Micromedex

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ethacrynic acid

Warnings	Classification	Alternate Names
	diuretic	EDECRIN, SODIUM EDECRIN ethacrynate sodium

Indications

- when rapid diuresis is required

Reconstitution and Stability

- store at room temperature
- reconstitute 50 mg vial with 50 mL D5W to provide 1 mg/mL solution; discard if solution is hazy or opalescent

Compatibility

- compatible with D5W, NS, dextrose 5% in sodium chloride 0.9%, Lactated Ringers and Ringers solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	use reconstituted solution maximum rate: 10 mg/minute	Intermediate Monitoring
IV intermittent	YES	transfer dose into empty sterile bag (obtain bag from pharmacy); infuse over 20 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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ethacrynic acid

Dosage

0.5 to 1 mg/kg IV (maximum dose: 100 mg)

Potential Hazards of Parenteral Administration

- extravasation risk: if given peripherally, use a large vein in the forearm
- may cause thrombophlebitis, pain and irritation; if a second dose is required, it is recommended to use an alternate site
- too rapid IV injection may cause hearing loss, ringing in the ears, or dizziness

Important Implications

Contraindications/Cautions

- avoid in patients with anuria, hypotension, severe watery diarrhea, dehydration with hyponatremia, or severe hypokalemia
- use with caution if patient is receiving the following treatment:
  - aminoglycosides: ototoxicity (additive)
  - corticosteroids: hypokalemia (additive)
  - lithium: decreased lithium excretion

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- anorexia, malaise, abdominal discomfort or pain, dysphagia, nausea, vomiting, diarrhea
- electrolyte disturbances (hypokalemia, hyponatremia, metabolic alkalosis)
- fluid depletion, hyperuricemia, hyperglycemia, hypotension
- hearing changes

Monitoring

- daily weight, fluid intake and output, electrolytes, serum glucose in diabetic patients

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ethyl alcohol

Warnings	Classification	Alternate Names
	neurolytic analgesic; antidote	ethanol

Indications

- methyl alcohol and ethylene glycol poisoning – fomepizole is preferred antidote
- therapeutic neurolysis of nerves or ganglia for relief of intractable pain

Reconstitution and Stability

- stable at room temperature
- 100% ethyl alcohol is also known as absolute alcohol or dehydrated alcohol

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	loading dose and IV infusion administered from the same bag **Standard solution concentration**: 10% (volume/volume) solution: remove 100 mL from D5W 1 L bag; then add 100 mL ethyl alcohol 100% to bag infuse loading dose over 60 minutes then start maintenance infusion *rate must be controlled with an infusion pump*	Intermediate Monitoring
Nerve block	YES	**by physician only** undiluted	Advanced Monitoring
Subarachnoid injection	YES	**by physician only** undiluted	Advanced Monitoring

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Dosage

nerve or ganglion block: 0.05 to 0.5 mL

subarachnoid injection: 0.5 to 1 mL

methanol and ethylene glycol poisoning:

- *loading dose:* 7.5 mL/kg IV to achieve a blood ethanol level of 22 mmol/L; then start maintenance infusion
- *maintenance dose*: 0.8 to 1.5 mL/kg/hour continuous IV infusion (1.5 to 2 mL/kg/hour for patients with history of high alcohol consumption) to achieve a blood ethanol level of 22 to 32 mmol/L
- *maintenance dose (during dialysis)*: 2 to 3.5 mL/kg/hour continuous IV infusion (3 to 4 mL/kg/hour for patients with history of high alcohol consumption)

- use lower end of dosing range for patients that either do not drink alcohol or have alcohol-related liver disease
- continue infusion until methanol blood level is less than 6 mmol/L or ethylene glycol blood level is less than 3 mmol/L and metabolic acidosis has resolved
- usual treatment duration: 2 to 3 days for methanol poisoning;1 to 2 days for ethylene glycol poisoning; 24 hours if dialysis is used

- Refer to *Poison Management Manual* for further detail

Potential Hazards of Parenteral Administration

- extravasation risk
- phlebitis, flushing, hypotension from IV administration
- level of consciousness may decline rapidly, particularly during the IV loading dose
  Be prepared to maintain airway
- following nerve or ganglion block, post-injection neuritis with persistent pain, hyperesthesia and paresthesia have occurred
- celiac ganglion injection: severe hypotension may occur

Important Implications

Contraindications/Cautions

- If the patient is switched to fomepizole, discontinue ethanol promptly

- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects

- IV administration: hypoglycemia, nausea and vomiting
- subarachnoid neurolysis and lumbar sympathetic block may be followed by motor paralysis, bladder or bowel incontinence, and impotence
- symptoms of intoxication are common in the therapeutic range, including decreased level of consciousness, disinhibited behaviour, dizziness, ataxia, headache

Monitoring

- monitor serum ethanol level at the end of the loading dose, every 2 to 4 hours until stabilized, then every 6 to 8 hours for the duration of therapy.
- monitor serum ethanol level every 2 hours during hemodialysis and upon completion
- serum ethanol may take several hours to reach steady state after changing infusion rate and large fluctuations in serum level may occur after reaching steady state
- monitor serum methanol or ethylene glycol levels periodically to assess elimination and osmole gap
- blood glucose

Other

- 100% ethyl alcohol has a specific gravity of 0.79 (solution contains 790 mg/mL)

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etomidate

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	General anesthetic	TOMVI

Indications

- induction or supplementation of general anesthesia for surgical/diagnostic procedures
- induction agent for rapid-sequence intubation (RSI)
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- single use vials, discard unused portion

Compatibility

- compatible with NS, dextrose solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**physician must be present** undiluted over 30 to 60 seconds, in fractions if required use large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Full monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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etomidate

Dosage

- Induction of General anaesthesia: 0.3 mg/kg (range: 0.2 to 0.6 mg/kg) IV over 30 to 60 seconds

- Rapid sequence intubation (induction): 0.3 mg/kg IV; consider 0.2 mg/kg in hemodynamically unstable patients

- Supplementation to subpotent anesthetic agents: administer smaller increments during short operative procedures to supplement subpotent anesthetic agents, such as nitrous oxide; individualize dosage (usually smaller than the original induction dose)

do not exceed a total dose of 60 mg

Dosage adjustments:
- 65 years or older: 0.15 to 0.2 mg/kg, further adjust dose according to response
- dose should be reduced with liver cirrhosis and titrated to effect.

Potential Hazards of Parenteral Administration

- facilities for assisting respiration and circulation are necessary
- local pain during injection
- Extravasation risk: irritant (reports of vesicant effects)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- *Contraindication:* hypersensitivity to etomidate, propylene glycol
- *Caution:* in patients with underlying cortico-adrenal insufficiency

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- involuntary muscle movements (eg. myoclonus)
- inhibits the adrenocortical biosynthesis of steroids (eg. reduced cortisol plasma levels)
- transient drop in blood pressure
- respiratory depression and apnea
- nausea and vomiting

Other
- Following induction, onset of hypnosis occurs within 1 minute, duration is 3 to 5 minutes.
- etomidate has no analgesic properties.

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etoposide

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, podophyllotoxin, topoisomerase II inhibitor	

Indications

- select indications: treatment of lung carcinomas, some leukemias, lymphomas, ovarian cancer, GI and testicular tumours
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature or refrigerator (depending on concentration); follow pharmacy label
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling.
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use DEHP-free or polyethylene-lined (low sorbing) tubing and 0.2 micron in-line filter dilute to final concentration of 0.2 to 0.4 mg/mL ▪ infuse over at least 45 minutes ▪ for infusions over 24 hours, tubing should be changed halfway through infusion to prevent precipitation *rate must be controlled with an IV infusion pump*	Intermediate monitoring or according to protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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etoposide

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

- Usual dosing range: 50 to 100 mg/m^2 IV daily for 1 to 5 days; may be repeated every 3 to 4 weeks
- L/BMT induction or salvage: 1800 to 2400 mg/m^2 IV infused over 24 to 34 hours

Dosage adjustment for renal impairment:
Give 75% of dose for CrCl of 10 to 50 mL/minute and 50% of dose for CrCl less than 10 mL/minute.

Dosage adjustment for hepatic impairment:
Give 50% of dose for serum bilirubin of 25 to 50 µmol/L and 25% of dose for serum bilirubin 50 to 85 µmol/L.
If serum bilirubin is more than 85 µmol/L. do not use.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- severe hypotension if given too rapidly
- allergy: type 1 hypersensitivity reaction during or immediately after IV administration (1 to 3%)
- during administration resuscitation equipment and emergency drugs should be readily available
- the risk of vascular phlebitis may be reduced by dilution of the drug in a larger volume
- Extravasation risk: non-vesicant (irritant)
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- bone marrow depression: leukopenia may be dose-limiting; WBC nadir 7 to 14 days, platelet nadir 9 to 16 days, recover in 20 days.
- erythema and bronchospasm that can be relieved by antihistamines
- nausea and vomiting may occur 8 hours after dose, these may be alleviated by antiemetics;
  other gastrointestinal effects: anorexia, constipation, diarrhea, mucositis, stomatitis, taste alteration
- reversible alopecia
- fatigue

Monitoring
- monitor liver and kidney function

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famotidine

Warnings	Classification Histamine H_2 receptor antagonist	Alternate Names PEPCID

Indications

- Treatment of duodenal or gastric ulcers, GERD and pathological hypersecretory conditions (eg. Zollinger-Ellison syndrome) in patients who are unable to take oral medications.
- treatment of GI bleeds
- stress ulcer prophylaxis
- prevention of hypersensitivity and infusion related reactions

Reconstitution and Stability

- available as 10 mg/mL injectable, store in refrigerator (2 to 8°C) and protect from light

Compatibility

- Compatible with D5W, dextrose 10% (D10W), NS, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	palliative care patients	Palliative Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	dilute 20 mg with 5 to10 mL IV fluid; give over at least 2 minutes maximum rate: 10 mg/minute	Basic Monitoring
IV intermittent	YES	dilute dose in 100 mL; infuse over 15 minutes	Basic Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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famotidine

Dosage

Usual dose:
- 20 mg IV Q12H
- change to oral treatment as soon as practical
- adjust for renal impairment:
    - CrCl less than 50 mL/minute give 20 mg IV Q24H

Prevention of hypersensitivity and infusion related reactions: 20 mg IV once 30 minutes prior to chemotherapy

Use prior to specific nuclear medicine procedures: 20 mg IV intermittent once

Potential Hazards of Parenteral Administration

- transient irritation at the injection site
- hypersensitivity reactions: rash, anaphylaxis

Important Implications

Contraindications/Cautions
- should not be administered to patients with a history of famotidine hypersensitivity or hypersensitivity to other H_2 receptor antagonists (e.g. ranitidine)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- famotidine is usually well tolerated: *CNS*: headache; reversible confusion, usually clearing within 3 to 4 days; *Gastrointestinal:* diarrhea/constipation; *Cardiac:* ECG changes: prolonged QT interval has been reported in patients with renal dysfunction

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fat emulsion (CLINOLEIC 20%)

Warnings	Classification	Alternate Names
	caloric agent, IV nutrition	CLINOLEIC intravenous lipids

Indications

- **This monograph is specific for CLINOLEIC brand**
- source of calories and essential fatty acids for patients requiring parenteral nutrition
- Indications and / or Prescribing restrictions apply

Reconstitution and Stability

- store at room temperature (15 to 30°C)
- do not use if emulsion appears to be oiling out (i.e. separation of oil); this will appear as brown streaks or a brown layer in the bag

Compatibility

- compatible with concurrently administered dextrose and amino acid solutions infused into the same central or peripheral vein via a Y-connector set

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
IV direct	NO		
IV intermittent	YES	maximum rate 60 mL/hour maximum hang time is 12 hours *use 1.2 micron filter and DEHP-free or polyethylene-lined (low-sorbing) tubing* *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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fat emulsion (CLINOLEIC 20%)

Dosage

Caloric source (with Parenteral Nutrition):
(up to 40% of total calories daily): IV intermittent; maximum dose 2.5 g/kg/day

Potential Hazards of Parenteral Administration

- thrombophlebitis due to vein irritation when concurrently administered with hypertonic solutions
- immediate allergic reactions: dyspnea, cyanosis, flushing, dizziness, headache, sleepiness, nausea, vomiting, hyperthermia, sweating, chest and back pain

Important Implications

Contraindications/Cautions
- contraindicated in those with hypersensitivity to egg, soybean protein or olive oil

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- adverse reactions with long term use include hypertriglyceridemia, hepatomegaly, jaundice, splenomegaly, transient increases in liver enzymes, anemia, thrombocytopenia, leukopenia

Monitoring
- hemoglobin, hematocrit, WBC, blood coagulation, platelet count, liver function, plasma lipid profile and serum triglycerides

Other
- Fat emulsion, as part of 3-in-1 PN, must be filtered. For all PN information, refer to applicable nursing care standards and patient care guidelines.
- CLINOLEIC 20 % = refined olive oil 16% w/w and refined soybean oil 4% w/w; see product monograph for list of excipients; caloric content = 2 kcal / mL
- contains a minimal amount of vitamin K_1

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fat emulsion (INTRALIPID 20%)

Warnings	Classification	Alternate Names
	caloric agent, IV nutrition	INTRALIPID 20% intravenous lipids

Indications

- **This monograph is specific for INTRALIPID brand**
- source of calories and essential fatty acids for patients requiring parenteral nutrition
- to prevent fatty acid deficiency when prolonged parenteral nutrition is required
- treatment of cardiac arrest or cardiovascular collapse associated with accidental intravascular injection of a local anesthetic (e.g. bupivacaine, ROpivacaine), overdose of a lipophilic beta-blocker / calcium-channel blocker or cardiotoxic medication (e.g. cyclic antidepressants, bupropion, lamotrigine, carbamazepine, hydroxychloroquine, flecainide, haloperidol, and quetiapine) that is unresponsive to standard resuscitation measures
- Indications and / or Prescribing restrictions apply

Reconstitution and Stability

- store at room temperature (25°C)
- do not use if emulsion appears to be oiling out (i.e. separation of oil); this will appear as brown streaks or a brown layer in the bag

Compatibility

- compatible with concurrently administered dextrose and amino acid solutions infused into the same central or peripheral vein via a Y-connector set

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
IV direct	YES	**by physician** or under supervision of physician used as antidote (lipid rescue) over 1 minute	Basic Monitoring See site-specific restrictions
IV intermittent	YES	maximum rate 60 mL/hour maximum hang time is 12 hours *use 1.2 micron filter and DEHP-free or polyethylene-lined (low-sorbing) tubing* *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	YES	antidote during cardiac arrest: see Lipid Rescue Protocol in DOSAGE section for rate of administration; (for patients above 67 kg or if rate exceeds 999 mL/hour use gravity with pressure bag) *use 1.2 micron filter and DEHP-free or polyethylene-lined (low-sorbing) tubing if available and IV infusion pump if feasible*	Basic Monitoring

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fat emulsion (INTRALIPID 20%)

Dosage

Caloric source (with Parenteral Nutrition):
(up to 40% of total calories daily): IV intermittent; maximum dose 2.5 g/kg/day

Prevention of essential fatty acid deficiency : 250 mL IV intermittent twice weekly

Lipid rescue protocol for cardiac arrest / cardiovascular collapse **refractory to resuscitation measures**:

- Ideal dose and regimen is unknown. BC Drug and Poison Information Centre (DPIC) suggests:

LIPID RESCUE PROTOCOL	
Continue chest compression and standard therapies, lipid must circulate	
Dose	**Example for 70 kg person**
• 1.5 mL/kg IV bolus (direct) over 1 minute	Give 100 mL IV direct over 1 minute
• immediately follow with continuous infusion of 0.25 mL/kg/minute	Start 17.5 mL/minute (1050 mL/hour) continuous IV infusion [i.e. run remaining 400 mL over 20 minutes]
• may repeat 1.5 mL/kg bolus twice at 5 minute intervals in asystolic patients	May repeat 100 mL IV direct twice at 5 minute intervals in asystolic patients
• increase infusion rate to 0.5 mL/kg/minute if blood pressure remains low	May increase infusion rate to 35 mL/minute (2100 mL/hour) if BP is low
• continue infusion for at least 10 minutes after hemodynamic stability restored	
• **total maximum recommended dose (boluses and infusion) is 10 to 12 mL/kg** over 30 to 60 minutes.	Maximum dose 700 to 840 mL

- For additional information, consult DPIC at 604-682-5050 or 1-800-567-8911 or www.lipidrescue.org

Potential Hazards of Parenteral Administration

- thrombophlebitis due to vein irritation when concurrently administered with hypertonic solutions
- immediate allergic reactions: dyspnea, cyanosis, flushing, dizziness, headache, sleepiness, nausea, vomiting, hyperthermia, sweating, chest and back pain

Important Implications

Contraindications/Cautions
- contraindicated in those with hypersensitivity to egg, soybean or peanut protein

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- adverse reactions with long term use include hypertriglyceridemia, hepatomegaly, jaundice, splenomegaly, transient increases in liver enzymes, anemia, thrombocytopenia, leukopenia

Monitoring
- hemoglobin, hematocrit, WBC, blood coagulation, platelet count, liver function, plasma lipid profile and serum triglycerides

Other
- Fat emulsion, as part of 3-in-1 PN, must be filtered. For all PN information, refer to applicable nursing care standards and patient care guidelines.
- INTRALIPID 20% = soybean oil 20%, purified egg phospholipids 1.2%; caloric content= 2 kcal/mL
- contains vitamin K_1: 133 mcg/250 mL

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fat emulsion (SMOFLIPID 20%)

Warnings	Classification	Alternate Names
	caloric agent, IV nutrition	SMOFlipid intravenous lipids

Indications

- **This monograph is specific for SMOFLIPID brand**
- source of calories and essential fatty acids for patients requiring parenteral nutrition
- Indications and / or Prescribing restrictions apply

Reconstitution and Stability

- store at room temperature (25°C)
- do not use if emulsion appears to be oiling out (i.e. separation of oil); this will appear as brown streaks or a brown layer in the bag

Compatibility

- compatible with concurrently administered dextrose and amino acid solutions infused into the same central or peripheral vein via a Y-connector set

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
IV direct	NO		
IV intermittent	YES	maximum rate 60 mL/hour maximum hang time is 12 hours *use 1.2 micron filter and DEHP-free or polyethylene-lined (low-sorbing) tubing* *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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fat emulsion (SMOFLIPID 20%)

Dosage

Caloric source (with Parenteral Nutrition):
(up to 40% of total calories daily): IV intermittent; maximum dose 2.5 g/kg/day

Potential Hazards of Parenteral Administration

- thrombophlebitis due to vein irritation when concurrently administered with hypertonic solutions
- immediate allergic reactions: dyspnea, cyanosis, flushing, dizziness, headache, sleepiness, nausea, vomiting, hyperthermia, sweating, chest and back pain

Important Implications

Contraindications/Cautions
- contraindicated in those with hypersensitivity to egg, fish, soybean or peanut protein

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- adverse reactions with long term use include hypertriglyceridemia, hepatomegaly, jaundice, splenomegaly, transient increases in liver enzymes, anemia, thrombocytopenia, leukopenia

Monitoring
- hemoglobin, hematocrit, WBC, blood coagulation, platelet count, liver function, plasma lipid profile and serum triglycerides

Other
- Fat emulsion, as part of 3-in-1 PN, must be filtered. For all PN information, refer to applicable nursing care standards and patient care guidelines.
- SMOFlipid 20 % = soybean oil 6%, medium chain triglycerides 6%, olive oil 5%, and fish oil 3% (w/v), egg phospholipids 1.2%; caloric content = 2 kcal / mL
- contains a minimal amount of vitamin K_1

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fentanyl

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	opioid analgesic	SUBLIMAZE fentanyl citrate

Indications

- analgesic agent used peri-operatively and post-operatively
- used as an adjunct in the induction and maintenance of anesthesia
- analgesic for relief of severe pain or as part of procedural sedation
- may be given sublingually for the management of incident pain
- management of opioid withdrawal in patients with opioid use disorder
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- stable at room temperature, protect from light

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Continuous subcutaneous infusion	YES	**standard solution concentrations:** 10 mcg/mL: remove 20 mL from 100 mL bag, then add 1000 mcg to bag 50 mcg/mL: transfer 1250 mcg, 2500 mcg or 5000 mcg to an empty sterile bag (obtain empty bag from stores or pharmacy) *rate must be controlled with a SUBCUT infusion pump*	Palliative Monitoring See site-specific restrictions
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	Undiluted or may dilute with NS Give slowly over at least 1 minute High-dose fentanyl for opioid withdrawal ➔➔ • IV doses must be given undiluted • flush slowly over 2 to 3 minutes: with 10 mL NS flush (for peripheral IV) with 20 mL NS flush (for central line e.g. PICC/CVC)	Intermediate Monitoring Perinatal Monitoring See site-specific restrictions and monitor per PPO, order set, Power Plan or protocol
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations:** 2 mcg/mL: dilute 500 mcg in 250 mL 10 mcg/mL: o remove 20 mL from 100 mL bag, then add 1000 mcg to bag o remove 50 mL from 250 mL bag, then add 2500 mcg to bag. 50 mcg/mL: transfer 1250 mcg, 2500 mcg or 5000 mcg to an empty sterile bag (obtain empty bag from stores or pharmacy) *rate must be controlled with an IV infusion pump*	Intermediate Monitoring

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Preparation and Administration

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Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Patient Controlled Analgesia (PCA)	YES	**syringe standard solution concentration**: 30 mcg/mL in NS; *rate must be controlled with a PCA pump* BC Women's Hospital: 10 mcg/mL in NS; *via CADD pump*	Intermediate Monitoring or per PCA site protocol
Epidural	YES	**bolus by physician only** or per epidural site protocol continuous epidural infusion - **initiated by physician** (use preservative free solutions) *rate must be controlled with an epidural pump*	Intermediate Monitoring or per epidural site protocol Perinatal Monitoring
Intrathecal	YES	**initiated by physician** (use preservative free solution) **standard solution concentration:** 25 mcg/mL: dilute 2500 mcg with NS 50 mL 50 mcg/mL: transfer 5000 mcg solution to an empty sterile bag (obtain empty bag from stores or pharmacy)	Intermediate Monitoring or per intrathecal site protocols
Spinal	YES	**by physician only** (use preservative free solution)	Intermediate Monitoring
Sublingual	YES	give injectable solution sublingually	Intermediate monitoring (sedation scale and respiratory rate every 5 to 10 minutes for 30 minutes after each dose)

Dosage

Adjunct to general anesthesia:
- *low dose:* 1 to 2 mcg/kg IV direct
- *high dose:* 4 to 20 mcg/kg IV bolus, then 2 to 10 mcg/kg/hour continuous IV infusion (up to 50 mcg/kg total)

Usual doses for severe pain:
Dose should be individualized based on patient response and tolerance.
- **IV direct***:* 10 to 25 mcg every 6 to 10 minutes until analgesia achieved (usual maximum is 150 mcg/hour) or 50 to 100 mcg every 60 minutes as needed, up to a total cumulative dose of 300 mcg.
- **subcutaneous:** 25 to 75 mcg every 1 to 3 hours
- **continuous IV infusion***:* Initiate at 5 to 50 mcg/hour and titrate to effect; (in critically ill patients may initiate at 25 to 100 mcg/hour and titrate to effect)
- **continuous subcutaneous infusion** *:* Initiate at 5 to 50 mcg/hour and titrate to effect
- **epidural***:* 25 to 100 mcg (single dose) may provide adequate relief for up to 8 hours; or 25 to 100 mcg/hour continuous epidural infusion
- **Intrathecal:** 5 to 20 mcg (single dose).

Analgesia in critically ill intubated patients: 25 to 50 mcg IV Q5MIN PRN

Part of procedural sedation, regimens vary – follow site specific protocols and pre-printed orders (order sets), examples are:
- Interventional radiology procedural sedation: 25 to 50 mcg IV Q3MIN PRN sedation
- GI endoscopy procedural sedation: 25 to 100 mcg IV Q2MIN PRN pain to a maximum of 3 doses

This monograph has 3 pages

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Dosage continued

Incident pain:

- 10 to 50 mcg **sublingual** pre-procedure; instruct patients not to swallow for 5 minutes. Wait 10 minutes before attempting the procedure. Wait at least 50 minutes before giving fentanyl for the next procedure.
- **sublingual** administration: analgesic onset is 5 to 15 minutes; duration of action of 30 to 45 minutes

High-dose fentanyl for opioid withdrawal:

- dosing is individualized, see PPO, order set, PowerPlan or protocol; no maximum dose has been established

Dose adjustment: reduce dose in the elderly

Potential Hazards of Parenteral Administration

- skeletal and thoracic muscle rigidity, associated with rapid IV administration and high doses
- may cause life-threatening respiratory depression, even when used as recommended. Monitor closely, especially during initiation or when increasing dose.
- **resuscitation equipment must be readily available**
- antidote: naloxone
- high alert medication:
  - fentanyl vials or ampoules containing more than 100 mcg
  - when given by these routes: epidural infusions, intrathecal, patient controlled analgesia

Important Implications

Contraindications/Cautions

- caution in patients with debilitative diseases, liver dysfunction, COPD
- concomitant monoamine oxidase inhibitor (MAOI) therapy within 14 days could result in serotonin syndrome; avoid combination
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- respiratory, circulatory depression; bradycardia or tachycardia, hypotension or hypertension
- hallucinations, anxiety and seizures

Monitoring

- severity of pain, time and frequency of breakthrough pain

Other

- onset of action (IV): within 2 minutes; duration of action:30 to 60 minutes
- onset of action (epidural): 4 to 10 minutes; duration of action: 3 to 5 hours
- fentanyl 100 mcg IM/IV/subcutaneous is equianalgesic to morphine 10 mg IM/IV/subcutaneous

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ferric derisomaltose

Warnings	Classification hematinic, iron preparation	Alternate Names MONOFERRIC, iron isomaltoside

Indications

- treatment of iron deficiency anemia in those who are intolerant or unresponsive to oral therapy
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store vials at room temperature
- diluted solutions are stable for 8 hours at room temperature

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	Dilute: 500 mg in 50 mL NS 1000 mg in 100 mL NS 15 mL/hour for 20 minutes; then if no side effects, 120 mL/hour until completion* *rate must be controlled with an IV infusion pump*	Advanced Monitoring Monitor vitals at baseline; then blood pressure & heart rate 20 minutes into the infusion; and 30 minutes after end of infusion.
Continuous IV infusion	NO		

*to minimize infusion related reactions

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ferric derisomaltose

Dosage

Usual dose (of elemental iron):
- 500 to 2000 mg IV, not to exceed 20 mg/kg **total dose***
- Maximum single dose is 1000 mg*
- If greater than 1000 mg is required, divide into 2 doses and give these doses 7 days apart.

*dose differs from manufacturer's guidelines to minimize infusion-related reactions

Potential Hazards of Parenteral Administration

- anaphylactoid or hypersensitivity reactions have been reported (including urticaria, edema, bronchospasm, hypotension, cardiac arrest, loss of consciousness)
    - **stop infusion immediately for acute hypersensitivity reaction**
    - resuscitation equipment, epinephrine and an antihistamine must be readily available
- transient flushing and tightness or pain in chest and back
    - stop infusion; generally resolves without intervention;
    - call physician to assess as may consider re-initiation once symptoms resolve
- extravasation risk: irritation, pain, long lasting brown discolouration

Important Implications

Contraindications/Cautions
- contraindicated in patients with a history of:
    - hypersensitivity to other parenteral iron products or any component of this product (see manufacturer's product monograph)
    - multiple serious drug allergies (2 or more)
    - decompensated liver cirrhosis or active hepatitis

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- headache, nasopharyngitis, hypotension, nausea
- transient hypophosphatemia

Monitoring
- hemoglobin, hematocrit, reticulocyte count, iron studies one month after completion of dose(s)

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ferric gluconate

Warnings	Classification hematinic – blood forming agent; iron salt	Alternate Names FERRLECIT sodium ferric gluconate sodium ferric gluconate complex in sucrose injection

Indications

- treatment of iron deficiency anemia associated with chronic renal dysfunction
- restrictions apply

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS; use immediately after dilution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent only	YES	125 mg in NS 50 to 100 mL; infuse over at least 1 hour (reduce rate or stop infusion if hypotension occurs) maximum rate: 125 mg/hour for dialysis patients – refer to site specific protocols	Advanced Monitoring Monitor blood pressure Q1H during infusion and 30 minutes after the infusion
Continuous IV infusion	NO		

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ferric gluconate

Dosage

- 125 mg IV every dialysis session for 8 doses (total dose 1000 mg of elemental iron)
- maintenance therapy: use the lowest dose necessary to maintain iron parameters

Potential Hazards of Parenteral Administration

- hypersensitivity or anaphylactoid reactions (serious reactions are rare)
- infusion site reactions (pain or redness)
- rapid administration is associated with hypotension

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hypotension, hypertension, chest pain
- rash, hives, pruritus,
- nausea, vomiting, diarrhea,
- dizziness, headache, fever, flushing, weakness
- generalized muscle or abdominal cramps, pain

Monitoring
- hemoglobin, serum iron, total iron binding capacity (TIBC), serum ferritin, transferrin saturation

Other
- ferric gluconate may be used in patients intolerant of other IV iron preparations (iron dextran; iron sucrose)
- hold ferric gluconate for at least 1 week prior to iron studies as may lead to falsely elevated results

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filgrastim

Warnings	Classification hematopoietic agent	Alternate Names NEUPOGEN, GRASTOFIL G-CSF (granulocyte colony stimulating factor)

Indications

- to increase neutrophil count
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate; stable at room temperature for maximum 24 hours
- DO NOT SHAKE
- available as single use vials (NEUPOGEN) and prefilled syringes (GRASTOFIL)

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	*preferred route*	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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filgrastim

Dosage

Neutropenia:
- refer to patient-specific protocol
- 5 mcg/kg or 200 mcg/m^2 subcutaneous daily (round dose to nearest 300 or 480 mcg vial/prefilled syringe)
- treat for up to 2 weeks or until the ANC reaches 1 x 10^9/L following the expected nadir
- do not give within 24 hours before or after administration of myelosuppressive chemotherapy

For other indications: please refer to specialized protocols and/or references for dosing.

Potential Hazards of Parenteral Administration

- injection site reaction, rash (infrequent)

Important Implications

Contraindications/Cautions
- contraindicated in patients with known hypersensitivity to *E. coli* derived proteins
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- bone pain (can usually be managed with non-opioid analgesics)

Monitoring
- complete blood count (CBC) prior to therapy, and at least twice weekly during therapy

Other
- reversible increases in serum uric acid, lactic dehydrogenase, and serum alkaline phosphatase may occur

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fluconazole

Warnings	Classification	Alternate Names
hazardous drug group 2	antifungal	DIFLUCAN

Indications

- oropharyngeal and esophageal candidiasis
- systemic candidiasis
- cryptococcal meningitis
- prevention of recurrence of cryptococcal meningitis in AIDS patients
- prophylaxis of fungal infections in immunocompromised patients

Reconstitution and Stability

- stable at room temperature
- discard if cloudy or particulate matter present
- available as premixed bags: 200 mg/100 mL NS and 400 mg/200 mL NS

Compatibility

- compatible with NS, D5W and lactated ringers

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	supplied as premixed bags: 200 mg/100 mL and 400 mg/200 mL ▪ *peripheral line*: maximum rate: 200 mg/hour ▪ *central line*: maximum rate: 400 mg/hour	Basic Monitoring
Continuous IV infusion	NO		

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fluconazole

Dosage

Oropharyngeal candidiasis: 100 to 200 mg IV Q24H for 7 to14 days

Esophageal candidiasis: 200 to 400 mg IV Q24H for 14 to 21 days

Candidemia (no metastatic complications):
400 mg IV Q24H continued for 14 days after last negative culture. Can consider 800 mg IV loading dose on day 1

Invasive candidiasis: 400 mg IV Q24H. May consider 800 mg IV Q24H in severe cases

Prophylaxis in immunocompromised patients: 200 to 400 mg IV Q24H.

Cryptococcal meningitis:
Consolidation: 400 to 800 mg IV Q24H for 8 weeks
Maintenance: 200 mg IV Q24H for 6 to 12 months or longer

Dose adjustment is required in renal impairment:

Creatinine Clearance	Dose Adjustment
30 to 50 mL/minute	200 mg IV Q24H (400mg Q24H for more aggressive dosing)
less than 30 mL/minute	200 mg IV Q24H
Hemodialysis (HD)	200 mg IV Q24H dosed after dialysis on HD days **or** 400 mg IV post dialysis

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- Caution: hypersensitivity to other azoles (e.g. ketoconazole, itraconazole)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea, vomiting, headache, skin rash, elevated liver function tests, hypokalemia

Other
- *drug interactions:*
  - the addition of fluconazole to cycloSPORINE therapy can double cycloSPORINE concentrations
  - fluconazole may increase phenytoin blood levels and enhance the effect of warfarin
- fluconazole is well absorbed and should be given orally whenever possible

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fludarabine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, antimetabolite	FLUDARA fludarabine phosphate

Indications

- Select indications: chronic lymphocytic leukemia (CLL) or prolymphocytic leukemia, non-Hodgkin's lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 50 to 100 mL (to a maximum of 1 mg/mL) infuse over 20 to 60 minutes *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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fludarabine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Usual dose: 25 mg/m^2 IV once daily for 5 consecutive days; repeat in 28 days per protocol

L/BMT conditioning regimens: 30 to 50 mg/m^2 IV daily x 3 to 5 doses

Dosage reduction suggested if CrCl less than 70 mL/minute (follow protocol); contraindicated if CrCl is less than 30 mL/minute

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Contraindication*: decompensated hemolytic anemia; CrCl less than 30 mL/minute
- *Caution*:
  - immunodeficiency, or history of opportunistic infections.
  - concomitant therapy with corticosteroids, increases the risk of infections with opportunistic pathogens; the combination should be avoided.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *allergy/immunology*: autoimmune reactions; Evans' syndrome, pemphigus, immunosuppression
- *blood :* bone marrow suppression; neutropenia and thrombocytopenia are major toxicities that are dose-limiting; median nadir interval of 13 days (range 3 to 25) for granulocytes and 16 days (range 2 to 32) for platelets; delayed and/or severe opportunistic infections may occur
- *neurotoxicity* of delayed onset (21 to 60 days post initiation of therapy) characterized by confusion, visual disturbances, weakness, loss of hearing, paresthesias; more common with higher doses (greater than 100 mg/m^2 per treatment course)
- *GI*: nausea, vomiting, anorexia, diarrhea, and stomatitis
- *dermatology*: skin rash
- *Other*: fever, chills

Monitoring
- the patient's hematologic status must be monitored closely
- periodic neurologic assessments are recommended

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flumazenil

Warnings	Classification	Alternate Names
	benzodiazepine antagonist	ANEXATE

Indications

- complete or partial reversal of benzodiazepine-induced sedation
- for benzodiazepine, zopiclone, or zolpidem overdose

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS, D5W, Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted; give over 15 to 30 seconds	Advanced Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration** 0.02 mg/mL remove 20 mL from D5W 100 mL bag; then add 2 mg flumazenil to the bag *rate must be controlled with an infusion pump*	Advanced Monitoring

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flumazenil

Dosage

- Reversal of general anesthesia or conscious sedation:
  0.2 mg IV direct; may repeat at 1 minute intervals to a maximum total dose of 1 mg.

- Reversal of benzodiazepine overdose: (titrate slowly)
  - **Loading Dose:** 0.2 to 0.3 mg IV direct; may repeat at 1 minute intervals until desired response. Response is usually seen with total loading dose of 1 to 3 mg or less (rarely up to 5 mg)
  - For patients at increased risk for adverse reactions: lower the dose (e.g. 0.1 mg), slow the administration rate, and lengthen interval between doses.

  - **Maintenance Dose**: for recurrent sedation (use only if initial response is noted)
  - repeat IV direct doses as required up to maximum total dose of 1 mg, **or**
  - 0.1 to 0.5 mg/hour continuous IV infusion; titrate to response

Potential Hazards of Parenteral Administration

- pain at injection site, thrombophlebitis
- may precipitate withdrawal symptoms and seizures, particularly in patients with history of long term benzodiazepine usage or following overdose of tricyclic antidepressants
- **prepare to manage seizures**

Important Implications

Contraindications/Cautions:
- Contraindicated: for patients with seizure disorder
- Caution: abrupt termination of benzodiazepine effects (in benzodiazepine-dependent patients) results in increased sympathetic tone, which may worsen cardiovascular instability in susceptible patients.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- agitation, anxiety, or confusion on arousal
- nausea or vomiting
- hypertension, hypotension, tachycardia, bradycardia

Monitoring
- observe for re-sedation, agitation, anxiety, muscle twitching or rigidity, seizures

Other
- benzodiazepine antagonism onset within 1 to 2 minutes; peak effect: 6 to 10 minutes;
  duration of action: 1 to 5 hours (subsequent re-sedation is common) subsequent re-sedation usually occurs due to the short duration of action of flumazenil
- flumazenil reverses the sedative effects of benzodiazepines; however, reversal of respiratory depression is inconsistent.

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fluorescein

Warnings	Classification	Alternate Names
	diagnostic agent	fluorescein sodium

Indications

- a diagnostic aid in ophthalmic angiography, distinction between viable and nonviable tissue, observation of aqueous flow, differential diagnosis of malignant and nonmalignant tumour, determination of circulation time and adequacy

Reconstitution and Stability

- stable at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**physician only** or under physician supervision rapidly into antecubital vein	Basic Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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fluorescein

Dosage

- 500 mg (5 mL of 10% solution) IV rapidly into the antecubital vein **or**
- for Spectralis HRA machine: 170 mg (1.7 mL of 10% solution)

- dose may be repeated at intervals of several days

Potential Hazards of Parenteral Administration

- anaphylaxis, hypotension, cardiac arrest, ischemia, syncope, severe shock, convulsions
- emergency drugs including an antihistamine, epinephrine, and oxygen should be readily available
- thrombophlebitis at injection site

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, headache, dizziness, gastrointestinal distress, pyrexia, dyspnea, urticaria, pruritus, angioneurotic edema
- may cause temporary yellowish skin discolouration which fades in 6 to 12 hours
- urine attains bright yellow colour soon after administration; urine fluorescence fades within 24 to 36 hours.

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fluorouracil

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic; antimetabolite	ADRUCIL 5-fluorouracil; 5-FU

Indications

- primarily used for the treatment of bladder, breast , colorectal, gastric , head and neck, ovarian, pancreatic and prostate cancers)
- used in high risk fistulization procedures in glaucoma surgery
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W and NS
- slight discolouration does not affect potency or safety
- crystals formed can be redissolved by warming and shaking

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	into tubing of fast running IV, but may be given undiluted over 2 to 4 minutes	
IV intermittent	YES	dilute in 50 mL; infuse over 15 minutes *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		
Subconjunctival	YES	by physician only	Basic monitoring

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fluorouracil

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Various dosing regimens exist, examples include:
- 425 mg/m^2 **IV** once daily for 5 consecutive days given every 4 weeks.
- 400 mg/m^2 **IV** for one dose (administer intraoperatively 30 to 60 minutes prior to start of oxaliplatin perfusion)

Glaucoma surgery: 50 mg/mL in 2 mL syringe at time of surgery and immediately after surgery (subconjuctival administration)

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Caution*: Dihydropyrimidine dehydrogenase deficiency (DPD), a rare may result in life-threatening or fatal toxicity in patients receiving fluorouracil.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *blood/bone marrow*: bone marrow depression is a major toxicity; leukopenia can be dose limiting.
- *CVS*: cardiotoxicity
- *GI*:
  - severe nausea and vomiting during the first week of therapy can be alleviated by antiemetics; if intractable, may be dose limiting; nausea and vomiting subside 2 to 3 days post therapy.
  - stomatitis and severe diarrhea may occur within the first week.
- *dermatology*:
  - maculopapular rash; exposure to sunlight may intensify skin reaction
  - palmar-plantar erythrodysesthesia (PPE) also called hand-foot skin reaction, may occur in association with the continuous infusion of fluorouracil
  - alopecia is common but regrowth may begin before therapy is completed

Monitoring
- the patient's hematologic status must be carefully monitored
- patients must be closely observed for adverse GI effects

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flupentixol long acting

Warnings	Classification anti-psychotic	Alternate Names FLUANXOL DEPOT flupentixol decanoate, flupenthixol decanoate

Indications

- maintenance therapy of chronic schizophrenic patients

Reconstitution and Stability

- store at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into gluteus maximus	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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flupentixol long acting

Dosage

Initial dose:
- patients not previously treated with long acting depot neuroleptics : 5 to 20 mg IM
- patients who have previously tolerated long acting depot neuroleptics: 20 to 40 mg IM
- lower dose recommended in elderly, frail or cachectic patients, or in patients who are predisposed to extrapyramidal reactions

Maintenance dose: must be individualized.
- usual dose: 20 to 40 mg IM every 2 to 3 weeks.
- at higher doses, response may last for 4 weeks.

Potential Hazards of Parenteral Administration

- aspirate before injection to prevent inadvertent intravascular injection
- hypotension (antidote: NORepinephrine or PHENYLephrine; do **NOT** use epinephrine as may further lower blood pressure)

Important Implications

Contraindications/Cautions
- contraindicated:
  - in elderly patients with dementia-related psychosis
  - in patients with severe cardiovascular disease/circulatory collapse – may alter cardiac conduction and prolong QT interval
- caution:
  - may enhance sedative effects of other central nervous system depressants
  - may lower seizure threshold
  - in patients with Parkinson disease and narrow angle glaucoma
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- extrapyramidal symptoms: tremor, akathisia, dystonia; treat with an anticholinergic drug (e.g. benztropine)
- restlessness, insomnia, headache, drowsiness, convulsions,
- dry mouth, blurred vision, constipation
- orthostatic hypotension

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folic acid

Warnings	Classification	Alternate Names
	haemopoietic vitamin	FOLVITE pteroylglutamic acid, folate

Indications

- folate deficiency due to inadequate intake, absorption or utilization, or increased excretion
- methanol poisoning, enzymatic detoxification of formic acid (toxic metabolite of methanol) to nontoxic carbon dioxide

Reconstitution and Stability

- protect from light and heat

Compatibility

- compatible in dextrose solutions and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES	preferred route	Basic Monitoring
IV direct	YES	may give undiluted; or dilute with 5 to 8 mL NS or D5W infuse doses up to 5 mg over at least 1 minute	Basic Monitoring
IV intermittent	YES	dilute dose in 50 mL; infuse over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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folic acid

Dosage

- Folate deficiency treatment:
  1 mg IV/IM or subcutaneous daily

- Maintenance dose/prevention of folate deficiency:
  - 0.4 mg IV/IM or subcutaneous daily
  - larger doses may be required in certain populations (e.g. patients with history of excessive alcohol intake, hemolytic anemia)

- Megaloblastic anemia due to folate deficiency in patients with tropical sprue:
  3 to 15 mg IV/IM or subcutaneous daily

- Methanol poisoning, asymptomatic patients:
  50 mg IV or oral every 4 to 6 hours (IV route is preferred in acute poisoning, or if patient is vomiting)
  Optimum dose and duration of therapy not established. Continue treatment for 24 hours or until methanol and metabolites have been eliminated.

Potential Hazards of Parenteral Administration

- some slight flushing or feeling of warmth may occur

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- DO NOT use alone in pernicious anemia; use with vitamin B12
- toxic effects of folic acid antagonists (e.g. methotrexate, trimethoprim) are blocked by *folinic* acid (leucovorin) but **not** by folic acid

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fomepizole

Warnings	Classification	Alternate Names
	antidote	ANTIZOL

Indications

- treatment of methanol and ethylene glycol poisoning in the following situations:
  - serum methanol greater than 6 mmol/L or ethylene glycol greater than 3 mmol/L, **or**
  - documented methanol or ethylene glycol ingestion and osmole gap greater than 10, **or**
  - strong clinical suspicion of ingestion **plus** two of the following: osmole gap greater than 10, anion gap greater than 16, arterial pH less than 7.3, bicarbonate less than 20 mmol/L, and for ethylene glycol poisoning: oxalate crystals in the urine.
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store vials at room temperature
- each vial contains 1500 mg (1000 mg/mL)
- fomepizole will solidify at temperatures below 26°C with no effect on potency or stability
- to return to liquid state, run the vial under warm water or hold vial in your hand
- return all partially used or unused vials to Pharmacy

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	solution and supplies must be **warm** prior to and during preparation to prevent solidification o place fomepizole vial, D5W 100 mL bag, and syringe in a sealable plastic bag. o Immerse in hot tap water for several minutes o work quickly while supplies are still warm to prevent solidification dilute dose in 100 mL D5W bag; infuse over 30 minutes	Advanced Monitoring
Continuous IV infusion	NO		

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fomepizole

Dosage

- **WITHOUT hemodialysis:**
  - *Loading dose*: 15 mg/kg to maximum 1500 mg dose for patients weighing up to 150 kg.
    (limited experience with patients weighing more than 150 kg; adjust dose to provide 10 to 15 mg/kg)
  - *Maintenance dose*: 10 mg/kg IV Q12H starting 12 hours after loading dose.
    (Minor dose adjustments may be made to minimize drug wastage.)
    After 48 hours: if anion gap increases or serum bicarbonate declines, increase maintenance dose to 15 mg/kg or consider hemodialysis.

  Treatment endpoint: metabolic acidosis is resolved and serum methanol is less than 6 mmol/L or ethylene glycol is less than 3 mmol/L **or** osmole gap is less than 10 for two measurements at least 6 hours apart.

- **WITH hemodialysis (3 doses):**
  - *Dose 1 (Load, pre-dialysis)*: 15 mg/kg to maximum of 1500 mg for patients weighing up to 150 kg. Begin hemodialysis as soon as possible if significant acidosis or serious symptoms present, or within approximately 8 hours for clinically stable patients.
  - *Dose 2 (during dialysis)*: 10 mg/kg given 4 hours after start of dialysis. Continue dialysis until acidosis is corrected and methanol is less than 6 mmol/L or ethylene glycol is less than 3 mmol/L **or** osmole gap is less than 10 for two measurements at least 1 hour apart.
  - *Dose 3 (after dialysis)*: 10 mg/kg given immediately after completion of dialysis (provides antidote coverage for 12 hours or more). Additional doses are not usually required.
- refer to the *Poison Management Manual* for further detail or contact:
  Drug and Poison Information Centre (DPIC):604-682-5050 or 1-800-567-8911

Potential Hazards of Parenteral Administration

- venous irritation and/or phlebitis if given too rapidly or undiluted

Important Implications

Contraindications/Cautions

- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects

- transient rash
- rare: tachycardia, bradycardia, seizure, fever
- headache, nausea, dizziness, drowsiness, bad taste
- infrequently: eosinophilia, elevation of hepatic transaminases

Monitoring

- initial methanol and/or ethylene glycol serum level upon admission
- laboratory monitoring includes: simultaneous measurement of serum sodium, potassium, chloride, bicarbonate (total CO_2), glucose, urea, creatinine, osmolality.
- arterial blood gases if patient is symptomatic or acidemic
- monitor serum ethanol simultaneously with other blood work until undetectable
- calculate osmole gap and anion gap

Other

- Fomepizole will slow the ethanol elimination rate, but the presence of ethanol is NOT a contraindication for starting fomepizole. Discontinue ethanol when the first dose of fomepizole is given.

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fondaparinux

Warnings	Classification anticoagulant, synthetic antithrombotic	Alternate Names ARIXTRA fondaparinux sodium

Indications

- unstable angina (UA) or non-ST elevation myocardial infarction (NSTEMI)
- medically managed patients with ST elevation myocardial infarction (STEMI) [not treated with percutaneous coronary intervention (PCI)]
- prophylaxis and treatment of venous thromboembolism (VTE) in patients with heparin induced thrombocytopenia (HIT)
- anticoagulation of hemodialysis circuit in patients with HIT
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- single dose pre-filled syringes

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	do not expel air bubble before injection to ensure full dose is administered (see package insert for instructions)	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**for STEMI indication, first dose only** dilute in NS 25 mL: o withdraw 25 mL from NS 50 mL bag; then add 2.5 mg to bag (do not expel air bubble before injecting dose into NS to ensure full dose is administered) infuse over 2 to 3 minutes	Advanced Monitoring
Continuous IV infusion	NO		
IV into dialysis circuit	YES	**for anticoagulation of hemodialysis circuit only** o undiluted over 5 to 10 seconds, do not expel air bubble from syringe before injecting	Basic Monitoring

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fondaparinux

Dosage

Unstable angina (UA) / Non-ST elevation myocardial infarction (NSTEMI): 2.5 mg subcutaneous daily

ST elevation myocardial infarction (STEMI) [not treated with PCI]:
- 2.5 mg **IV** initially, followed by 2.5 mg subcutaneously every 24 hours
- continue treatment for up to 8 days or until hospital discharge

Venous thromboembolism (VTE) treatment :
- less than 50 kg: 5 mg subcutaneous daily
- 50 to 100 kg: 7.5 mg subcutaneous daily
- over 100 kg: 10 mg subcutaneous daily

Venous thromboembolism (VTE) prophylaxis:
- 2.5 mg subcutaneous daily.
- if being used post-surgery, 1st dose should not be given earlier than 6 hours post-surgery

Anticoagulation of hemodialysis circuit: 2.5 mg IV pre hemodialysis
- Monitor anti-Xa levels pre-dialysis before fourth dose and PRN if signs of bleeding (anti-Xa level should be less than 0.4 units/mL)

Potential Hazards of Parenteral Administration

- injection site reaction

Important Implications

Contraindications/Cautions
- contraindications:
  - serious hypersensitivity (eg anaphylaxis/anaphylactoid reactions, angioedema) to fondaparinux
  - thrombocytopenia associated with a positive in vitro test for anti-platelet antibody in the presence of fondaparinux
  - clinically significant active bleeding; acute bacterial endocarditis
  - patient weight less than 50 kg (for prophylaxis)
- avoid in severe renal impairment (CrCL less than 30 mL/minute): increased risk for major bleeding (if physician determines that benefits outweigh risks, use with caution)
- cautions, due to risk of bleeding:
  - elderly patients (those over 65 years)
  - patient weight less than 50 kg (decreased clearance of fondaparinux)
  - patients being treated concomitantly with other therapies/drugs that may increase risk of bleeding
- concurrent use with spinal/ epidural anesthesia increases risk of spinal or epidural hematoma
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- anemia (19.6 %), bleeding
- rash (7.5%)

Monitoring
- CBC; discontinue fondaparinux if platelets drop to less than 50,000/mm^3
- monitor renal function

Other
- pre-op dosing:
  - treatment dose: do not give dose within 48 hours before surgery
  - prophylactic dose: avoid dose within 24 hours before surgery
- after discontinuation, anticoagulant effects may persist for 2 to 4 days (or longer in renal impairment)

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fosaprepitant

Warnings	Classification antiemetic; neurokinin 1receptor antagonist	Alternate Names EMEND IV fosaprepitant dimeglumine

Indications

- adjuvant therapy for the prevention of nausea and vomiting associated with highly emetogenic chemotherapy as per approved BMT/Leukemia and British Columbia Cancer Agency (BCCA) protocols
- restrictions apply

Reconstitution and Stability

- store vials in fridge
- reconstitute 150 mg vial with NS 5 mL; add slowly, directing stream down side of the vial to prevent foaming. Swirl vial gently to combine.

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	give 30 to 60 minutes prior to chemotherapy dilute dose to 1 mg/mL: o remove 100 mL from NS 250 mL bag; then add 150 mg to the bag o gently invert bag 3 times to combine infuse over 20 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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fosaprepitant

Dosage

Prevention of nausea and vomiting associated with chemotherapy:

- 150 mg IV, on Day 1 of each treatment cycle (in conjunction with a 5-HT_3 antagonist and dexamethasone)

Potential Hazards of Parenteral Administration

- infusion site pain or induration, thrombophlebitis
- immediate hypersensitivity reactions: including anaphylaxis, dyspnea, pruritus, rash, urticaria (hives)

Important Implications

Contraindications/Cautions
- contraindicated: hypersensitivity to fosaprepitant or aprepitant
- contraindicated for patients taking pimozide
- caution: many potentially significant drug interactions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- fatigue, headache, weakness,
- anorexia, constipation, dyspepsia, hiccoughs
- elevated ALT

Other
- fosaprepitant 150 mg IV is equivalent to aprepitant 125 mg PO
- fosaprepitant is not removed by hemodialysis

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foscarnet

Warnings	Classification	Alternate Names
hazardous drug group 1	Antiviral	FOSCAVIR,VOCARVI foscarnet sodium

Indications

- cytomegalovirus (CMV) infection prophylaxis or preemptive therapy in hematopoietic cell transplant patients
- treatment of CMV infections in immunocompromised patients (including HIV and transplant patients)
- treatment of acyclovir-resistant herpes simplex virus (HSV) infections in immunocompromised patients
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- premixed bag 6000 mg/250 mL (24 mg/mL), stable at room temperature
- for any dose other than 6000 mg, prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.

Compatibility

- compatible in D5W and NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	central line : infuse undiluted • if dose less than 6 g, transfer dose to empty sterile bag (obtain from stores or pharmacy) peripheral line: dilute doses to a maximum concentration of 12 mg/mL: • remove volume equal to dose from IV diluent bag, then add drug dose to diluent bag from premixed bag: o up to 3 g in 250 mL o over 3 g to 6 g in 500 mL o over 6 g in 1000 mL infuse doses: • up to 60 mg/kg over at least 1 hour • more than 60 mg/kg over at least 2 hours *rate must be controlled with an infusion pump*	Basic Monitoring
Continuous IV infusion	NO		
Intravitreal injection	YES	**by physician only**	Basic Monitoring

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foscarnet

Dosage

CMV infection prophylaxis or preemptive therapy in hematopoietic cell transplant patients: 60 mg/kg IV Q8H or 90 mg/kg IV Q12H

CMV: 60 mg/kg IV Q8H or 90 mg/kg IV Q12H for 14 to 21 days

HSV: 40 mg/kg IV Q8H for 14 to 21 days

Dosage adjustments in renal dysfunction, as per table below:

CrCl (mL/minute/kg)	CMV	HSV
Greater than 1.4	60 mg/kg Q8H **or** 90 mg/kg Q12H	40 mg/kg Q8H
From greater than 1 to 1.4	45 mg/kg Q8H **or** 70 mg/kg Q12H	30 mg/kg Q8H
From greater than 0.8 to 1	50 mg/kg Q12H	35 mg/kg Q12H
From greater than 0.6 to 0.8	40 mg/kg Q12H or 80 mg/kg Q24H	25 mg/kg Q12H
From greater than 0.5 to 0.6	60 mg/kg Q24H	40 mg/kg Q24H
From 0.4 to 0.5	50 mg/kg Q24H	35 mg/kg Q24H
Less than 0.4	not recommended	

Hemodialysis: 45 to 60 mg/kg IV post dialysis, 3 times/week (approx. 38% of dose removed during dialysis)
Peritoneal dialysis: HSV: 60 mg/kg IV every 48 to 72 hours; higher doses may be necessary for herpes encephalitis

Intravitreal injections for treatment and maintenance of CMV retinitis (alternative to IV therapy):
- *Induction*: doses of 1200 mcg/0.05 mL to 2400 mcg/0.1 mL intravitreally 2 to 3 times weekly for 1 to 3 weeks have been used
- *Maintenance*: 1200 mcg/0.05 mL to 2400 mcg/0.1 mL intravitreally once weekly

Potential Hazards of Parenteral Administration

- if hypocalcemia or adverse nervous system effects (e.g. perioral tingling, numbness in the extremities or paresthesias) develop during administration , infusion should be stopped, at least temporarily

Important Implications

Contraindications/Cautions
- *Caution*: adequate hydration is essential; 0.5 to 1 L NS IV is recommended with each foscarnet infusion to minimize risk of renal toxicity
- Pregnancy/Lactation*:* refer to Lexicomp or Micromedex

Side effects
- renal insufficiency (reversible) may occur; consider risk of increased renal toxicity when used with other nephrotoxic drugs
- alterations in serum electrolytes may occur: hypokalemia, hypocalcemia, hypomagnesemia and hyperphosphatemia or hypophosphatemia;
- anemia, seizures, nausea, vomiting, diarrhea, headache, genital mucosal ulceration and fever

Monitoring
- regular monitoring of serum creatinine and electrolytes is recommended during foscarnet therapy (every 2 days initially)

Other: 1 g of foscarnet yields 0.23 g sodium

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furosemide

Warnings	Classification diuretic	Alternate Names LASIX frusemide

Indications

- edema associated with congestive heart failure, hepatic or renal disease
- acute pulmonary or cerebral edema
- hypercalcemia

Reconstitution and Stability

- store at room temperature, protect from light
- discard if solution is yellow

Compatibility

- compatible with D5W, NS, D5NS, Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Palliative Monitoring
Intramuscular	YES	give deeply	Intermediate Monitoring
IV direct	YES	undiluted; up to 120 mg maximum rate: 40 mg/minute	Intermediate Monitoring See site-specific restrictions
IV intermittent	YES	dilute doses: ○ up to 250 mg in D5W 50 mL; give over 15 to 20 minutes ○ above 250 mg in D5W 100 mL; maximum rate: 4 mg/minute	Intermediate Monitoring
Continuous IV infusion	YES	**standard solution concentrations:** 1 mg/mL: dilute 250 mg in D5W 250 mL 10 mg/mL: transfer 250 mg into empty sterile bag (obtain bag from pharmacy) maximum rate: 4 mg/minute *rate must be controlled with an infusion pump*	Intermediate Monitoring

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furosemide

Dosage

Diuresis

- 20 to 40 mg IV, IM, subcutaneous; may double dose every 2 hours as required (doses up to 500 mg may be administered in acute or chronic renal failure), **or**

- loading dose (recommended): 40 to 80 mg IV; then 5 to 40 mg/hour continuous IV infusion

Potential Hazards of Parenteral Administration

- pain at IM injection site
- temporary or permanent hearing loss, ringing in the ears, or dizziness with high doses, too rapid IV injection, or administration with other ototoxic drugs

Important Implications

Contraindications/Cautions

- caution in patients with cirrhosis and ascites, diabetes or gout
- caution in patients allergic to sulfonamides
- caution if patient is receiving the following treatment:
  - corticosteroids (additive hypokalemia)
  - lithium (decreased lithium excretion)
  - digoxin (increased risk of digoxin toxicity)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- excessive diuresis may result in hypovolemia, hypotension, circulatory collapse, vascular thrombosis and embolism

Monitoring

- monitor fluid and electrolyte balance; especially sodium, potassium and metabolic alkalosis
- daily weight, fluid intake and output
- serum creatinine

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ganciclovir

Warnings	Classification	Alternate Names
hazardous drug group 1 **irritant** (reports of vesicant effects)	antiviral	CYTOVENE DHPG, ganciclovir sodium

Indications

- treatment of cytomegalovirus (CMV) infections in immunocompromised patients
- prophylaxis of CMV disease in transplant patients
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS, ringers and lactated ringers solutions

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa dilute doses: o up to 500 mg in 50 mL o greater than 500 mg in 100 mL infuse over 1 hour *rate must be controlled with infusion pump*	Basic Monitoring
Continuous IV infusion	NO		
Intravitreal injection	YES	**by ophthalmologist only**	Basic Monitoring

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ganciclovir

Dosage

CMV retinitis:
- *Induction:* 5 mg/kg IV Q12H for 14 to 21 days
- *Maintenance:* 5 mg/kg IV Q24H or 6 mg/kg once daily for 5 days each week
- Re-induction is recommended if CMV retinitis progresses during maintenance treatment

CMV esophagitis/colitis in HIV: 5 mg/kg IV Q12H for 3 to 6 weeks; may switch to oral valganciclovir if symptoms improve and patient tolerates oral therapy

Other CMV infections:
- *Induction:* 5 mg/kg IV Q12H for 14 to 21 days
- *Maintenance:* 5 mg/kg IV Q24H or 6 mg/kg once daily for five days each week

CMV prophylaxis in solid organ transplant (SOT): 5 mg/kg IV Q24H

Dose reductions are required in patients with impaired renal function:

Creatinine Clearance (mL/min)	Treatment (induction) Dose	SOT prophylaxis dosing or maintenance dosing
70 or higher	5 mg/kg Q12H	5 mg/kg Q24H
50 to 69	5 mg/kg Q24H or 2.5 mg/kg Q12H	2.5 mg/kg Q24H
25 to 49	2.5 mg/kg Q24H	1.25 mg/kg Q24H
10 to 24	1.25 mg/kg Q24H	0.625 mg/kg Q24H
Less than 10 or intermittent hemodialysis	1.25 mg/kg 3 times/week; if on dialysis, dose post dialysis	0.625 mg/kg 3 times/week; if on dialysis, dose post dialysis

Intravitreal injections as an alternative to IV therapy for treatment and maintenance of CMV retinitis:
- *Induction:* doses of 1200 mcg/0.05 mL to 2000 mcg/0.05 mL intravitreally have been used 2 to 3 times weekly for 1 to 3 weeks
- *Maintenance:* 1200 mcg/0.05 mL to 2000 mcg/0.05 mL intravitreally as a weekly injection

Potential Hazards of Parenteral Administration

- Phlebitis and pain at infusion site.
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- Contraindication*:* pregnant women and in patients who are hypersensitive to ganciclovir or acyclovir
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hematological toxicity (e.g. anemia, neutropenia, leukopenia, thrombocytopenia)
- chills, neuropathy, fever, diaphoresis, infection
- diarrhea, anorexia, nausea/vomiting
- nephrotoxicity, azotemia, mild to moderate increases in serum creatinine

Monitoring
- renal dysfunction predisposes patients to hematological toxicity; regularly monitor serum creatinine
- neutrophil and platelet counts every 2 days during induction and at least weekly during maintenance. Ganciclovir should be discontinued if:
  - absolute neutrophil count less than 0.5 x 10^9/L until recovery to more than 0.75 x 10^9/L
  - platelet count less than 25 x 10^9/L until recovery to 50 x 10^9/L or greater

Other
- concomitant administration of ganciclovir and zidovudine may cause additive or synergistic myelosuppression

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gemcitabine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic; anti-metabolite	GEMZAR

Indications

- select indications: treatment of pancreatic, lung (non-small cell) and bladder cancer; other uses include lymphoma, breast ovarian and cervical cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 250 mL NS infuse over 30 to 60 minutes *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		
Intravesical (bladder instillation)	Yes	dilute 2000 mg in NS 100 mL (supplied as two 1000 mg/50 mL syringes) retain for 1 to 2 hours after instillation	Basic monitoring or according to protocol See site-specific Restrictions

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gemcitabine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Examples:
- relapse/refractory aggressive non-Hodgkin's lymphoma (LYGDP): 1000 mg/m^2 IV on days 1 and 8 of a 21 day cycle
- bladder cancer (GUBGEM):
  - intra-operative: 2000 mg intravesically (bladder instillation) once
  - induction/treatment: 2000 mg via bladder instillation, once weekly for 6 weeks
  - maintenance: 2000 mg via bladder instillation, monthly for 9 doses

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- mild-moderate skin rash with or without pruritus; anaphylaxis rare
- toxicity increased with infusion times greater than 60 minutes
- Extravasation risk: non-vesicant (irritant)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- caution in renal dysfunction

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- flu-like syndrome characterized by headache, chills, cough, rhinitis, myalgia, fatigue, sweating and insomnia may occur; symptoms are usually mild and transient, and rarely dose limiting
- fever, usually mild (41%)
- emetogenic potential is low moderate
- dose-limiting side effects are anemia, leukopenia and neutropenia (nadir 7 to 10 days, recovery within 7 days); thrombocytopenia may also occur (nadir 7 to 10 days, recovery within 7 days)
- haemolytic uremic syndrome, characterized by microangiopathic haemolytic anemia, thrombocytopenia and renal failure, has been infrequently reported during or shortly after therapy
- transient and reversible elevations of liver enzymes (rarely clinically significant)
- acute dyspnea, usually self-limiting, may occur; however, severe pulmonary toxicities have been reported (more typically seen after several cycles)

Monitoring
- CBC, hepatic and renal function
- may increase anticoagulant effect of warfarin; monitor INR carefully during and for 1 to 2 months after gemcitabine therapy

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gemtuzumab ozogamicin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	MYLOTARG

Indications

- treatment of previously untreated, de novo CD33-positive acute myeloid leukemia (AML)
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- diluted solution stable for 6 hours at room temperature or 12 hours if refrigerated
- protect solution from light during storage and administration; protect administration line ONLY if hang time will be longer than 2 hours
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible in NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ protect bag from light (supplied with cover) ▪ dilute to 0.075 mg to 0.234 mg/mL in NS (usual dose in NS 50 mL) ▪ if refrigerated, bring bag to room temperature over 1 hour prior to administration ▪ infuse over 2 hours; use 0.2 micron inline filter *rate must be controlled with an IV infusion pump*	Advanced monitoring or according to protocol/ preprinted order (PPO)/ power plan *Induction Day 1*:vital signs immediately prior to start of infusion, Q15MIN for first 30 minutes, then Q30MIN until at least 1 hour after infusion completed (or until infusion reactions resolve) *Subsequent doses*: vital signs immediately prior to start of infusion, then Q30MIN until at least 1 hour after infusion completed (or until infusion reactions resolve)
Continuous IV infusion	NO		

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gemtuzumab ozogamicin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

CD33-positive acute myeloid leukemia:
- Induction: 3 mg/m^2 (up to 4.5 mg) IV on days 1, 4, and 7
- Consolidation : 3 mg/m^2 (up to 4.5 mg) IV on day 1

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- infusion-related reactions (8%): fever, chills, rigors, flushing, rash, pruritus, chest pain, tachycardia, hypotension or hypertension and breathing difficulties and anaphylaxis may occur during the infusion or within 24 hours following the infusion. Follow pre-printed orders /protocol/ power plan for pre-medications and drugs that should be readily available on ward to treat infusion reactions.
- Extravasation risk: non-vesicant
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Caution*:
    - QT prolongation has been reported
    - hepatic veno-occlusive disease/sinusoidal obstruction syndrome (VOD/SOS) may occur, patients with moderate or severe hepatic impairment are at increased risk

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *bone marrow*: profound and prolonged myelosuppression can occur, anemia (27%), febrile neutropenia (19%), pancytopenia (5%), thrombocytopenia (49%) - prolonged thrombocytopenia may result in bleeding/hemorrhagic events (23 to 67%); careful hematologic monitoring is required
- *GI*: nausea (71%) and vomiting (61%)
- tumour lysis syndrome

Monitoring
- baseline ECG (if not done within prior 96 hours)
- per pre-printed orders /protocol/ power plan, depending upon cycle: CBC with differential, bilirubin (total and direct), LFTs, albumin, INR, calcium, magnesium, electrolytes, urea, creatinine
- Monitor for VOD/SOS e.g. weight gain, bilirubin, hepatomegaly, ascites

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gentamicin

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antibiotic - aminoglycoside	GARAMYCIN; gentamicin sulfate

Indications

- treatment of serious infections caused by susceptible microorganisms (primarily gram negative)
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- stable at room temperature
- administration of gentamicin and beta-lactams (penicillins) must be separated with complete flushing of IV line between doses

Compatibility

- compatible with D5W, NS, dextrose-saline solutions and lactated ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	give deeply into muscle	Basic Monitoring
IV direct	NO		
IV intermittent	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa dilute doses: o up to 80 mg in NS 50 mL o greater than 80 mg in NS 100 mL except in dialysis patients: dilute all doses in NS 50 mL administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		
Intrathecal or Intraventricular	YES	**by physician only** pharmacy to prepare syringe with gentamicin 80 mg/50 mL (1.6 mg/mL) preservative free pre-mixed bag allow cerebral spinal fluid to mix with drug in syringe; infuse over 3 to 5 minutes	Basic Monitoring

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gentamicin

Dosage

- Dose based on ideal body weight (IBW), not total body weight (TBW).
- If TBW more than 125% IBW, dosing weight is IBW + 0.4 (TBW - IBW).
- If actual body weight is *less than* IBW, use actual body weight for dosing.
- If pregnant use TBW. If TBW is more than 125% IBW, dosing weight is IBW + 0.4 (TBW - IBW).

Contact pharmacy for dosing guidelines.

Once Daily IV Dosing: pre-dose serum level recommended (less than 1 mg/L)

Creatinine Clearance	Dose
60 mL/minute or greater	Usual 6 mg/kg (range 5 to 7 mg/kg) Q24H
40 to 59 mL/minute	Usual 6 mg/kg (range 5 to 7 mg/kg) Q36H
less than 40 mL/minute	*aminoglycosides not recommended*; contact pharmacy for dosing recommendations and/or Infectious Diseases for alternate antibiotic therapy

Exclusions to once daily dosing*:* burns greater than 20%, dialysis, septic shock

Conventional Multiple Daily IV Dosing:

- Normal renal function (CrCl 60 mL/minute or greater): loading dose of 2 mg/kg, followed by maintenance dose of 1 to 2 mg/kg every 8 hours.

Dosing adjustments are necessary in renal impairment – contact pharmacy for dosing guidelines.

- serum levels recommended around the third dose following initial therapy or with any change in dose:
  - Pre-dose level: 0 to 30 minutes before next dose (should be less than 2 mg/L)
  - Post-dose level: 30 minutes after completion of an IV infusion (should be less than 10 mg/L)

Hemodialysis (HD): serum levels suggested prior to second maintenance dose

- Loading Dose: 2 mg/kg IV
- Maintenance Dose: 1.5 mg/kg IV (target pre-HD level: less than 3.5 mg/L)
- Synergy Dosing: 1 mg/kg IV (target pre-HD level: less than 2 mg/L)
- Give after HD or over last 15 minutes of dialysis

Bacterial meningitis or an infected CSF shunt which cannot be removed:

- 4 to 8 mg Intrathecal or Intraventricular per 24 hours

Potential Hazards of Parenteral Administration

- erythema, irritation, pain, thrombophlebitis, hematoma at injection site
- hypersensitivity reactions
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Contraindicated: patients with known hypersensitivity to gentamicin or other aminoglycosides
- Caution:
  - apnea/respiratory paralysis may result if combined with anesthetics or other neuromuscular blockers
  - in patients with myasthenia gravis or in patients on skeletal muscle relaxants - can cause neuromuscular blockade & muscular paralysis
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- ototoxicity: ataxia, dizziness, permanent hearing loss. Tinnitus or vertigo may be indications of vestibular injury and impending bilateral irreversible damage; **discontinue** treatment if symptoms of ototoxicity develop.
- nephrotoxicity and neurotoxicity (potentiated by other ototoxic, nephrotoxic, or neurotoxic drugs)

Monitoring

- monitor serum creatinine twice weekly and renal function; serum drug levels (see DOSAGE section)
- monitor auditory function; if treatment duration greater than 14 days, consider baseline and weekly audiometry and dynamic illegible E-test (DIE)

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glucagon

Warnings	Classification hyperglycemic agent, glycogenolytic agent, antidote,hypoglycemia, diagnostic agent	Alternate Name GLUCAGEN

Indications

- counteracts severe hypoglycemic reactions in diabetic patients
- treatment of bradycardia and hypotension as a result of beta blocker overdose or an adjunctive agent in calcium channel blocker overdose
- relaxation of the gastrointestinal tract during radiologic examinations

Reconstitution and Stability

- Eli Lilly brand glucagon: store vials at room temperature;
  - 1 mg vial: reconstitute by adding diluent provided (1 mL of glycerin 1.2%) to yield 1 mg/mL clear solution; use immediately - discard any remaining solution
  - if diluted after reconstitution use immediately

- GLUCAGEN or GLUCAGEN HYPOKIT IM injectable - may be given IV or SUBCUT: store in fridge in original container to protect from light;
  - 1 mg vial: reconstitute by adding 1.1 mL of diluent provided (sterile water for injection) to yield 1 mg/mL clear solution; use immediately-discard any remaining solution
  - if diluted after reconstitution use immediately

Compatibility

- mix with D5W only; however, the risk of precipitation (opaque gel) increases with infusion duration.

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	give undiluted give 1 mg or less over 1 minute beta blocker or calcium channel blocker overdose: give loading dose over 1 minute	Advanced Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration**: 0.1 mg/mL: o add 10 mg to D5W 100 mL o add 25 mg to D5W 250 mL *rate must be controlled with an infusion pump*	Advanced Monitoring

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glucagon

Dosage

- Hypoglycemia:
  - 1 mg subcutaneous, IM, IV direct; if no response within 15 minutes, may repeat dose
  - IV dextrose should be administered as soon as it is available; if patient fails to respond to glucagon, IV dextrose *must* be given

- Radiologic exam: 0.25 to 2 mg IV direct or 1 to 2 mg IM administered 5 to 10 minutes prior to procedure.

- Beta blocker or calcium channel blocker overdose:
  - Loading dose: 5 to 10 mg IV direct
  - If response noted, maintenance dose: 1 to 5 mg/hour continuous IV infusion, titrated to the patient's response; (up to 15 mg/hour has been used)

Potential Hazards of Parenteral Administration

- check infusion solution frequently to ensure solution remains clear of precipitate (opaque gel)
- hypersensitivity reactions
- possible thrombophlebitis with prolonged infusion

Important Implications

Contraindications/Cautions

- Contraindications:
  - in patients with glucagonoma
  - in patients with pheochromocytoma; may provoke severe hypertension
  - in patients with insulinoma; may induce hypoglycemia due to its insulin-releasing effect

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea, vomiting, hypokalemia
- hypotension, especially with large dose
- hyperglycemia with excessive dosage

Monitoring
- blood glucose, serum potassium

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glycopyrrolate

Warnings	Classification anticholinergic; antimuscarinic	Alternate Names ROBINUL

Indications

- management of gastrointestinal disorders amenable to anticholinergic therapy or for rapid anticholinergic effect
- pre-anesthetic antimuscarinic agent
- to reduce upper airway secretions in palliative patients

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, D10W and ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	undiluted or may dilute dose with NS 5 mL; give over 1 to 2 minutes	Advanced Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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glycopyrrolate

Dosage

- Gastrointestinal disorders:
  0.1 mg IM every 4 hours (3 or 4 times daily).
  0.2 mg IM for more profound effect

- Pre-operatively:
  0.005 mg/kg IM, 30 to 60 minutes prior to induction

- Intra-operatively, to prevent cholinergic effects:
  0.1 mg IV direct , repeated every 2 to 3 minutes as needed

- Block muscarinic effects of anticholinesterase agents when these are used to reverse the neuromuscular blockade of curariform agents:
  0.2 mg for each 1 mg neostigmine or 5 mg of pyridoSTIGmine; administer IV direct simultaneously (or a few minutes prior) to the anticholinesterase agent

- To reduce upper airway secretions in palliative patients:
  0.4 mg subcutaneous initial dose, then 0.2 to 0.4 mg subcutaneous every 1 to 4 hours PRN; maximum 1.8 mg/day

Potential Hazards of Parenteral Administration

- burning sensation at injection site
- ventricular arrhythmias may result if used during cyclopropane anesthesia

Important Implications

Contraindications/Cautions

- Contraindicated : patients with acute glaucoma, cardiospasm, achalasis of the esophagus, prostatic hypertrophy, pyloric or duodenal obstruction, stenosing peptic ulcer, urinary or gastric retention, obstruction at the bladder neck
- Caution:
  - In patients with cardiac disease or incipient glaucoma
  - lowers the opening pressure of the esophageal sphincter leading to passive regurgitation and aspiration

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- most adverse effects are related to the anticholinergic effects: dry mouth, blurred vision, urinary retention, abdominal distention, constipation, headache, dizziness, flushing, tachycardia

Other

- onset of action: 15 to 30 minutes (subcutaneous or IM); 1 minute (IV)
- peak effect: 30 to 45 minutes (IM)
- duration of vagal effect: 2 to 3 hours
- inhibition of salivation: up to 7 hours

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gonadorelin acetate

Warnings	Classification	Alternate Names
hazardous drug group 2	diagnostic agent	LUTREPULSE synthetic gonadotropin releasing hormone (GnRH), lutenizing hormone releasing hormone (LH-RH)

Indications

- diagnostic test for evaluation of pituitary component of the hypothalamus-pituitary-gonadal axis

Reconstitution and Stability

- see safe work procedures to prepare doses, unless dose provided by pharmacy
- powder is stable at room temperature, use only the diluent provided
- reconstitute 0.8 mg vial with 8 mL NS (provided) and shake for a few seconds to make a 100 mcg/mL clear solution

Compatibility

- Compatible with NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	NO		
IV direct	YES	100 mcg over 1 minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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gonadorelin acetate

Dosage

- 100 to 200 mcg subcutaneous or IV
- Baseline FSH and LH, repeat at 30 and/or 60 minutes post dose

Potential Hazards of Parenteral Administration

- rarely local swelling, redness, pruritus at injection site, especially when subcutaneous route is used

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other
- test should be done in the absence of other drugs which directly affect the pituitary secretion of the gonadotropins

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goserelin

Warnings	Classification	Alternate Names
hazardous drug group 2	Luteinizing hormone – releasing agonist (LHRH analog) antineoplastic	ZOLADEX 3.6 mg ZOLADEX LA (= 10.8 mg) goserelin acetate

Indications

- primary use: breast cancer or prostate cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- see approved safe work procedures for preparation outside of a biological safety cabinet; dispensed to ward in ready to use format: one implantable dose consisting of 1 cylindrical rod, available in a pre-filled syringe
- store at room temperature in the original container, protect from light and moisture
- 3.6 mg (1-month) depot and 10.8 mg (3-month) depot

Compatibility

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	use immediately after opening foil pouch follow procedure in the package insert into the anterior abdominal wall below the navel	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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goserelin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Breast cancer:
- 3.6 mg SUBCUT every 4 weeks until response established, then may be switched to 10.8 mg every 12 weeks

Prostate cancer (GUPLHRH):
- 3.6 mg SUBCUT every month or 10.8 mg every 3 months

Dosage adjustments for myelosuppression: modify according to protocol by which patient is being treated.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Extravasation risk: none

Important Implications

Contraindications/Cautions
- *contraindication*: undiagnosed abnormal vaginal bleeding
- *caution*: heart disease, cardiovascular risk factors (i.e. hypertension, high cholesterol, smoking), long QT syndrome, stroke, diabetes

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CVS*: myocardial infarction (male 0.3%); sudden cardiac death (male 0.4%); anemia (1 to 10%), males at increased risk
- *neurology*: depression, memory loss
- *endocrine and metabolic*: drug-induced disease flare; hot flashes (male 62%, female 96%)
- *sexual reproduction/genitourinary*: vaginitis (75%), amenorrhea (100%), breast enlargement (females 18%), impotence (90%), libido, decreased (male 100%, female 61%)
- *musculoskeletal*: decreased bone mineral density (male more than 5%); osteoporosis (male more than 5%); fracture (male more than 5%); loss of muscle mass, males at increased risk
- *other*: fatigue, weight gain

Monitoring
- bone mineral density, calcium, CBC, blood glucose,

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haemophilus b conjugate vaccine

Warnings	Classification	Alternate Names
	vaccine	Act-HIB,HIBERIX haemophilus influenza vaccine, Hib

Indications

- immunization against *Haemophilus influenza b* for unimmunized or incompletely immunized people; including anatomic or functional asplenia; sickle cell disease; immunosuppression related to disease or therapy; after solid organ or islet cell transplant; after cochlear implant; and for re-immunization following hematopoietic stem cell transplant
    - for complete list of special populations refer to BCCDC link in dosage section
- individuals who are at high risk during a cluster/outbreak as determined by the regional medical health officer in consultation with the provincial health officer and BCCDC
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C)
- add 0.5 mL of diluent provided to the freeze-dried vaccine. Shake vial gently until clear, avoid foaming.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES	preferred route deltoid muscle or anterolateral mid-thigh preferred	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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haemophilus b conjugate vaccine

Dosage

0.5 mL IM once

For additional information: refer to Part 4 - Biological Products BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- local redness, pain, swelling and induration at injection site.

Important Implications

Contraindications/Cautions

- Contraindications:
  - vaccine should not be administered to people with acute, febrile illness
  - history of anaphylactic reaction to a previous dose of a Hib-containing vaccine or to any component of Act-HIB or HIBERIX, including tetanus protein

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- fever, irritability, anorexia, vomiting within 6 to 24 hours may occur

Other

- may be given at same time as MMR, hepatitis B, pneumococcal or meningococcal vaccines, but at different sites
- give vaccine at least 14 days prior to elective splenectomy, or if not possible, 14 or more days post splenectomy. If there is a concern that the patient may not present later for immunization, give vaccine before discharge.

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haloperidol

Warnings	Classification antipsychotic, antiemetic	Alternate Names HALDOL haloperidol lactate

Indications

- management of acute and chronic psychosis
- prevention and control of severe nausea and vomiting

Reconstitution and Stability

- store at room temperature
- protect from light

Compatibility

- compatible with D5W

Preparation and Administration

- Haloperidol lactate IM injectable may be given IV or subcutaneously
  (Haloperidol decanoate [HALDOL–LA, haloperidol long acting] is a different product indicated ONLY for IM use; see separate haloperidol long acting monograph.)

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Continuous Subcutaneous infusion	YES		Palliative monitoring
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	dilute with 5 mL sterile water for injection or D5W give slowly up to a maximum rate of 5 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	YES	dilute in D5W 50 mL; infuse over 30 minutes	Advanced Monitoring
Continuous IV infusion	NO		

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haloperidol

Dosage

Psychoses:
- 2.5 to 5 mg IM/subcutaneous every 1 to 8 hours until symptoms controlled

Nausea/vomiting:
- 0.5 to 2 mg IV/IM/subcutaneous Q6H to Q12H PRN

Rapid symptom control (agitation/delirium):
- 1 to 10 mg IV/IM/subcutaneous Q1H to Q4H PRN.
- most patients respond to a total dose of 5 to 30 mg within the first 24 hours

Continuous subcutaneous infusion in palliative care:
- initial dose: 5 mg over 24 hours; range 1.25 to 10 mg over 24 hours

Potential Hazards of Parenteral Administration

- hypertension, hypotension, tachycardia, QTc prolongation

Important Implications

Contraindications/Cautions
- contraindicated in severely depressed or comatose patients, Parkinsonian patients
- caution: may potentiate other CNS depressants; may lower seizure threshold

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- arrhythmias, hypotension, hypertension, tachycardia, QTc prolongation
- hyperthermia, drowsiness, dry mouth, urinary retention
- syndrome of inappropriate antidiuretic hormone secretion (S IADH)
- dystonic reactions, tardive dyskinesia
- extrapyramidal symptoms (with high doses); symptoms usually respond to treatment with an anticholinergic drug (eg. benztropine)

Other
- if hypotension occurs, NORepinephrine or phenylephrine may be used; epinephrine should NOT be used as haloperidol causes a reversal of epinephrine's pressor effect and a further lowering of blood pressure

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haloperidol long acting

Warnings	Classification	Alternate Names
	antipsychotic	HALDOL-LA haloperidol decanoate

Indications

- management of chronic schizophrenia

Reconstitution and Stability

- use undiluted
- store at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into the gluteus maximus Z-track injection technique recommended	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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haloperidol long acting

Dosage

Chronic schizophrenia:

- initial dose: 50 mg IM or 10 to 20 times previous oral dose (10 to 15 times previous oral dose if elderly or debilitated); maximum initial dose: 100 mg
- administer dose every 4 weeks; dose and dosing interval may be adjusted as needed and tolerated Clinical experience with doses larger than 450 mg is limited.
- elderly and debilitated: lower initial doses and more gradual titration is recommended
- can be supplemented with oral haloperidol during dose adjustments or symptom exacerbation

Potential Hazards of Parenteral Administration

- pain with large volume injection: use lower volume of more concentrated preparation if possible
- avoid inadvertent intravascular injection; aspirate prior to injection

Important Implications

Contraindications/Cautions

- contraindicated: comatose states and in patients with Parkinson's disease
- caution: may lower seizure threshold, may potentiate other CNS depressants

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- extrapyramidal side effects are common
- tachycardia and hypotension
- QTc prolongation

Other

- onset of action occurs within a few days; therapeutic effect continues for 2 to 4 weeks
- may antagonize action of epinephrine and other sympathomimetics

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heparin

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	anticoagulant	heparin sodium, unfractionated heparin

Indications

- prevention or treatment of thrombi and emboli
- management of acute coronary syndrome (ACS) and atrial fibrillation
- prevention of clotting during dialysis and continuous renal replacement therapy (CRRT)
- to maintain patency of central venous access devices

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with D5W, NS, dextrose-saline combinations, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	**use 5000 units/ 0.5 mL vial** undiluted, deeply into lower abdomen; rotate sites	Basic Monitoring
Intramuscular	NO		
IV direct	YES	**use 10,000 units/ 10 mL vial** undiluted, over 1 to 2 minutes	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration:** 100 units/mL 25,000 units in D5W 250 mL premix bag *rate must be controlled with an infusion pump*	Basic Monitoring
Intra-arterial	YES	**standard solution concentration:** 100 units/mL 25,000 units in D5W 250 mL premix bag *rate must be controlled with an infusion pump*	Advanced Monitoring
Intraperitoneal	YES	500 to 1000 units per 2 L of dialysate	Basic Monitoring
Intra-cannula dwell	YES	**standard solution concentrations:** 10 units/mL prefilled syringe; **or** 100 units/mL prefilled syringe as per site protocol to maintain patency of IV access devices	Basic Monitoring
IV into dialysis circuit	YES	**use 10,000 units/ 10 mL vial** as per dialysis protocols	Basic Monitoring

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heparin

Dosage

Refer to the site specific heparin nomograms when adjusting the dose for continuous heparin infusions

Treatment of venous thrombosis, pulmonary embolism, peripheral arterial thrombosis (Therapeutic PTT Target):

- 75 to 100 units/kg IV loading dose, then 15 to 18 units/kg/hour continuous IV infusion
- adjust dose to prolong the PTT to 1.5 to 2.5 times the control value or according to site specific nomogram (see pre-printed orders)

Acute Coronary Syndrome/ STEMI/ NSTEMI (Low PTT Target):

- 60 to 70 units/kg IV loading dose, maximum 8000 units (maximum 4000 units if used with tenecteplase for acute MI), followed by 12 to 15 units/kg/hour continuous IV infusion
- adjust dose to prolong the PTT as per site specific heparin nomogram (see pre-printed orders)

Continuous Renal Replacement Therapy (CRRT):

- 10 units/kg IV loading dose then 6 to 8 units/kg/hour continuous IV infusion
- adjust dose to prolong the PTT as per site specific heparin nomogram (see pre-printed orders)

Catheter-Directed Thrombolysis for Acute Arterial Thrombosis:

- 200 to 1000 units/hour continuous IV or intra-arterial infusion for 6 to 72 hours

Prophylaxis of venous thromboembolism:

- 5000 units subcutaneous every 8 to 12 hours
  - higher doses may be required during pregnancy as pregnancy advances
- in surgical patients: 5,000 units subcutaneous 2 hours prior to surgery, and then every 8 to 12 hours for 5 to 7 days or until ambulatory
- trauma patients (*excludes Traumatic Brain Injury and Spinal Cord Injury patients*) with renal failure :

Patient Weight	eGFR less than 10 mL/minute or on dialysis
less than 41 kg	2500 units subcutaneous Q8H
41 to 100 kg	5000 units subcutaneous Q8H
101 kg or more	7500 units subcutaneous Q8H

Timing around neuraxial blockade in obstetrics:

- Pregnancy:
  - *Prophylaxis*:
    - Low dose (5000 units SUBCUT every 8 to 12 hours): wait 4 to 6 hours after heparin administration before neuraxial procedure
    - Intermediate dose (7500 to10,000 units SUBCUT Q12H): wait 12 hours after heparin administration and assess coagulation status before neuraxial procedure
  - *Treatment*:
    - SUBCUT (greater than 10,000 units per dose or greater than 20,000 units per day): wait 24 hours after heparin administration and assess coagulation status before neuraxial procedure
    - IV: Discontinue IV heparin infusion 4 to 6 hours and verify normal coagulation status prior to neuraxial procedure
- Postpartum:
  - *Prophylaxis or treatment*; wait 1 hour after neuraxial procedure and after catheter removal before initiating or restarting

NOTE: if switching from Low Molecular Weight Heparin (LMWH) to heparin, wait 24 hours after last dose of once daily LMWH **or** 12 hours after last dose of twice daily LMWH if using for same indication

Prevention of clotting during dialysis: refer to dialysis protocols

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heparin

Potential Hazards of Parenteral Administration

- overdose – hemorrhage (antidote: see protamine)
- subcutaneous injection may cause local irritation, pain, hematoma or cutaneous and subcutaneous necrosis
- histamine-like reactions at injection site
- hypersensitivity reactions: fever, urticarial, asthma, rhinitis, arthralgia, anaphylaxis
- high alert medication: heparin for injection containing 10,000 units or more per container

Important Implications

Contraindications/Cautions

- contraindicated in patients with active bleeding, blood dyscrasias, subacute bacterial endocarditis, recent neurosurgical procedures, known hypersensitivity to heparin, or heparin-induced thrombocytopenia

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- reversible thrombocytopenia may develop within 1 to 15 days after start of therapy; **not dose related**
- hemorrhage, ranging from minor to major

Monitoring

- monitor platelet counts at least twice weekly; discontinue heparin if platelet count drops below 100 x 10^9/L; (platelet counts usually return to baseline within 4 days after discontinuing heparin)
- CBC, PTT as per pre-printed orders
- signs of bleeding

Other

- for non-prophylactic therapy: avoid IM injections; avoid non-steroidal anti-inflammatory drugs if possible

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hepatitis A vaccine

Warnings	Classification	Alternate Names
	vaccine	HAVRIX VAQTA

Indications

- active immunization against hepatitis A infection in subjects at risk of exposure to hepatitis A
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C)
- shake well prior to use to obtain a slightly opaque, white suspension

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deltoid muscle is preferred site; avoid gluteal region	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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hepatitis A vaccine

Dosage

Dosing units vary by BRAND:

- HAVRIX 1440 (1440 Elisa Units/mL):
  - 18 year old: 0.5 mL IM, repeat in 6 months for a total of 2 doses
  - 19 years old and older: 1 mL IM, repeat in 6 months for a total of 2 doses
- VAQTA (adult formulation 50 Units/mL) : 1 mL IM, repeat in 6 months for a total of 2 doses

For additional information: refer to Part 4 - Biological Products BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- hypersensitivity reactions including anaphylaxis to hepatitis A antigen, aluminium hydroxide or neomycin
- local redness, soreness, tenderness, pain or warmth at site of injection

Important Implications

Contraindications/Cautions

- Contraindicated:
  - HAVRIX: history of an anaphylactic reaction to a previous dose of any hepatitis A vaccine, or to any component (see package insert) of the formulations.
    VAQTA: history of an anaphylactic reaction to a previous dose of any hepatitis A vaccine, latex, or to any component (see package insert) of the formulations.
- Contraindicated: hepatitis A vaccine should be postponed in subjects with acute febrile illness

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- systemic side effects are mild and do not usually last more than 24 hours: headache, fatigue, fever, malaise, nausea, loss of appetite

Other

- may give with other vaccines or immune globulin, separately at different injection sites
- typhoid, yellow fever, cholera, or tetanus vaccines do not interfere with hepatitis vaccine immune process
- concomitant administration of immune globulin (human) may be considered in patients at risk of being exposed to hepatitis A before adequate anti-hepatitis A virus antibody titres can be reached
- antineoplastic or immunosuppressive therapy can decrease the immunological response to the hepatitis A vaccine. Immunization should be deferred until completion of the immunosuppressive therapy.
- immunocompromised patients may not mount the expected immune response; additional doses of vaccine may be required
- hepatitis A vaccine is an inactivated vaccine

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hepatitis B vaccine

Warnings	Classification	Alternate Names
	vaccine	RECOMBIVAX HB; ENGERIX-B hepatitis B vaccine (recombinant)

Indications

- prevention of hepatitis B virus infection
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in the refrigerator (2 to 8°C)
- shake well before using

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	use *only* in persons at risk of hemorrhage from an IM injection (e.g. hemophiliacs).	Basic Monitoring
Intramuscular	YES	preferred route the deltoid muscle is the preferred site	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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hepatitis B vaccine

Dosage

DOSING VARIES ACCORDING TO BRAND USED

NOTE: When switching brands mid-course, either one of the following two options may be used:
- switch to the frequency and regimen of the new vaccine **OR**
- continue with the frequency and regimen of the previous vaccine

If a second series is required, continue with the regimen of the new vaccine

Vaccination schedule for **RECOMBIVAX HB** BRAND

	THREE dose schedule	THREE dose schedule chronic kidney disease (CKD)
	18 to 19 years: 5 mcg/dose	predialysis/dialysis: 40 mcg/dose (use dialysis formulation)
	20 years or older: 10 mcg/dose	predialysis/dialysis: 40 mcg/dose (use dialysis formulation)
1st dose	zero time	zero time
2nd dose	1 month after 1st dose	1 month after 1st dose
3rd dose	6 months after 1st dose	6 months after 1st dose

Vaccination schedule for **ENGERIX-B** BRAND

	THREE dose standard schedule	FOUR dose schedule chronic kidney disease (CKD)
	18 to 19 years: 10 mcg/dose	predialysis/dialysis: 40 mcg/dose
	20 years or older: 20 mcg/dose	
1st dose	zero time	zero time
2nd dose	1 month after 1st dose	1 month after 1st dose
3rd dose	6 months after 1st dose	2 months after 1st dose
4th dose	----------	6 months after 1st dose

Hepatitis B vaccine higher dose schedule required for immunocompromised individuals as indicated within this link from BC Centre for Disease control, Immunization manual.

For additional information: refer to Part 4 - Biological Products BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- soreness, erythema and swelling at the injection site
- subcutaneous administration of aluminum-adsorbed vaccines has an increased incidence of local reactions including subcutaneous nodules

Important Implications

Contraindications/Cautions

- *Contraindications*:
  - vaccine should not be administered to people with acute febrile illness
  - contraindicated if history of anaphylactic reaction to previous dose of any hepatitis B vaccine or to any component of BRAND being administered
- *Caution*: Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects: fever, headache, dizziness, fatigue and nausea may occur

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histamine

Warnings	Classification diagnostic agent	Alternate Names histamine acid phosphate histamine diphosphate, histamine phosphate

Indications

- positive control for allergy skin testing

Reconstitution and Stability

- stable at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	**physician only** or practitioner with advanced skills in how to administer and interpret the test	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intradermal	YES	**physician only** or practitioner with advanced skills in how to administer and interpret the test	Basic Monitoring

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histamine

Dosage

- positive control for allergy skin testing: 0.03 mL of histamine 0.1 mg/mL intradermal

Potential Hazards of Parenteral Administration

- inadvertent IV or IM injections may cause severe reactions including marked hypertension or hypotension, vasomotor collapse, shock and death
- antidote: epinephrine and antihistamine; phentolamine mesylate may be used to treat severe hypertension
- local reactions with erythema and edema at injection site

Important Implications

Contraindications/Cautions

- contraindicated in patients with history of hypersensitivity to histamine
- contraindicated in patients with hypotension, severe hypertension, bronchial asthma, urticaria, or severe cardiac or pulmonary disease
- caution: may precipitate severe asthmatic attacks in patients with bronchial disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- excessive subcutaneous doses may cause severe occipital headache, anginal pain, blurred vision, cyanosis of the face, and a very rapid drop in blood pressure

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human papillomavirus vaccine

Warnings	Classification	Alternate Names
	vaccine, active immunizing agent	nonavalent (9-valent) human papillomavirus vaccine GARDASIL 9

Indications

- vaccine indicated in women and men, for the prevention of infection caused by the Human Papillomavirus (HPV) types 6, 11, 16, 18, 31, 33, 45, 52 and 58 and the diseases associated with the HPV types included in the vaccine
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C) and protect from light
- shake well until a cloudy white suspension results prior to administration

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	into the deltoid region of the upper arm or in the higher anterolateral area of the thigh	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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human papillomavirus vaccine

Dosage

- 0.5 mL IM as 3 separate doses according to the following schedule:
  - First dose: at elected date
  - Second dose: 2 months after the first dose
  - Third dose: 6 months after the first dose

- For additional information refer to Part 4 – Biological Products*:* Human Papillomavirus Vaccine (GARDASIL 9) monograph at BC Centre for Disease Control Immunization Manual

Potential Hazards of Parenteral Administration

- anaphylaxis (epinephrine and diphenhydrAMINE should be readily available)
- mild to moderate pain, redness, swelling at site

Important Implications

Contraindications/Cautions

- History of anaphylactic reaction to a previous dose of HPV vaccine, or to any component of GARDASIL 9 (amorphous aluminum hydroxyphosphate sulfate, L-histidine, polysorbate 80, sodium borate).

- Pregnancy/Lactation: **contraindicated in pregnancy**
  Refer to Lexicomp or Micromedex.

Side effects

- headache

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hydrALAZINE

Warnings	Classification antihypertensive	Alternate Names APRESOLINE hydrALAZINE HCl

Indications

- hypertensive emergency
- treatment of severe hypertension when oral route is not feasible
- treatment of severe hypertension in obstetrics

Reconstitution and Stability

- store at room temperature and protect from light

Compatibility

- compatible with NS, sodium chloride 0.45%, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into a large muscle	Advanced Monitoring Perinatal Monitoring
IV direct	YES	undiluted or dilute dose in NS 20 mL; rate: 1 mg/minute maximum rate: 5 mg/minute	Full Monitoring Perinatal Monitoring See site-specific restrictions
IV intermittent	YES	dilute in NS 50 mL give over 15 minutes *rate must be controlled with an infusion pump*	Advanced Monitoring with blood pressure and pulse rate following administration and Q15 MIN x 3 Perinatal Monitoring
Continuous IV infusion	NO		

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hydrALAZINE

Dosage

Hypertensive emergency:
5 to 10 mg IM or IV direct Q15MIN PRN, contact prescriber if BP not controlled after 3 doses

Severe hypertension in obstetrics:
- 5 mg IM or IV; then 5 to 10 mg every 20 to 30 minutes as necessary (recommended maximum cumulative dose: 20 mg)

Treatment of severe hypertension:
- 20 mg IM or IV

Dose adjustments are recommended in renal impairment

Potential Hazards of Parenteral Administration

- fall in blood pressure may be dramatic during and after IV use; patients should lay down for 30 to 60 minutes following each dose
- rescue for excessive hypotension: DOPamine, NORepinephrine or PHENYLephrine

Important Implications

Contraindications/Cautions
- contraindicated in patients with acute dissecting aortic aneurysm, coronary artery disease, tachycardia, idiopathic systemic lupus erythematosis
- use with caution in patients with increased intracranial pressure

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- early adverse effects (usually transient) include hypotension, tachycardia, palpitations, headache, dizziness

Other
- onset of action: 5 to 20 minutes (IV) and 20 to 40 minutes (IM)
- peak effect:10 to 80 minutes
- duration of action: of 2 to 6 hours
- 20 mg IV dose is approximately equivalent to 75 mg oral dose

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hydrocortisone

Warnings	Classification	Alternate Names
	corticosteroid, systemic	SOLU-CORTEF hydrocortisone sodium succinate; cortisol sodium succinate

Indications

- treatment of conditions responsive to steroid therapy including adrenal insufficiency, allergic reactions, dermatologic conditions, disseminated lupus erythematosis, inflammatory bowel disease and status asthmaticus
- prophylaxis of allergic reactions

Reconstitution and Stability

- reconstitution instructions vary with brand. Refer to each vial for the volume of sterile water for injection to be added and resulting concentration of the reconstituted solution.
- use immediately following reconstitution

Compatibility

- Compatible in dextrose, saline, dextrose-saline combinations, Ringer's and lactated Ringer's solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Basic Monitoring
IV direct	YES	*preferred route* administer undiluted; ○ doses up to 499 mg: maximum rate 200 mg/minute ○ doses 500 mg or greater: give over 10 minutes	Basic Monitoring
IV intermittent	YES	further dilute all doses in D5W 50 mL; infuse over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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hydrocortisone

Dosage

- Individualized depending on disease being treated and degree of patient response.
- Usual dose: 100 to 500 mg IM or IV; may repeat every 2 to 6 hours

Potential Hazards of Parenteral Administration

- thrombophlebitis, burning, itching at IV sites
- do not inject into the deltoid muscle - high incidence of subcutaneous atrophy

Important Implications

Contraindications/Cautions

- avoid injection into locally infected site
- Caution in patients with active peptic ulcers, active/latent infections (i.e. tuberculosis, fungal or viral infections)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *short term effects (early onset)*: sodium and fluid retention, hypokalemia, hyperglycemia, hypertension, increased susceptibility to and masked signs of infection.
- *long term effects include*: osteoporosis, thrombocytopenia, Cushing's syndrome, muscle weakness, loss of muscle mass, peptic ulcer

Other

- equivalent anti-inflammatory dose: 4 mg hydrocortisone IV = 1 mg predniSONE oral
- increased dosage may be required in times of stress

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HYDROmorphone

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	opioid analgesic	DILAUDID

Indications

- symptomatic relief of severe pain
- treatment of opioid use disorder
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature. A yellowish discolouration may develop; this has not been associated with a loss of potency

Compatibility

- compatible with D5W, NS, dextrose-saline combinations and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	*opioid use disorder*: ▪ doses less than 25 mg, use 10 mg/mL vial ▪ doses of 25 mg or more, use 50 mg/mL vial	Intermediate Monitoring
Continuous Subcutaneous Infusion	YES	**standard solution concentration**: 2 mg/mL: 100 mg in 50 mL; 200 mg in 100 mL 10 mg/mL: o remove 10 mL from 50 mL bag, then add 500 mg to bag o remove 20 mL from 100 mL bag, then add 1000 mg to bag 50 mg/mL: transfer 2500 mg to an empty sterile bag (empty bag obtained from stores or pharmacy) *rate must be controlled with a SUBCUT infusion pump*	Intermediate Monitoring
Intramuscular	YES	*opioid use disorder*: ▪ doses less than 25 mg, use 10 mg/mL vial ▪ doses of 25 mg or more, use 50 mg/mL vial	Intermediate Monitoring

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HYDROmorphone

continuation of Preparation and Administration table

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
IV direct	YES	1 mg or less: dilute 2 mg (1 mL from 2 mg/mL vial) with 9 mL NS or SWFI to make a 0.2 mg/mL concentration; discard excess volume in syringe before administration of calculated dose. doses greater than 1 mg: use either 2 mg/mL or 10 mg/mL vial; dilute dose to 5 mL with NS or SWFI administer slowly over at least 2 to 3 minutes o *opioid naïve patients,* doses of 0.5 mg or greater should be administered IV intermittent o *highly opioid tolerant patients*, 50 mg/mL vial may be used on a case specific basis o *opioid use disorder*: ▪ IV doses must be given IV direct ▪ doses less than 25 mg, use 10 mg/mL vial ▪ doses of 25 mg or more, use 50 mg/mL vial ▪ administer undiluted, flush slowly over 2 to 3 minutes: with 10 mL NS flush (for peripheral IV) with 20 mL NS flush (for central line e.g. PICC/CVC)	Intermediate Monitoring
IV intermittent	YES	dilute in 50 mL; infuse over 15 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	YES	**standard solution concentrations**: 0.5 mg/mL: 50 mg in 100 mL 2 mg/mL: 100 mg in 50 mL; 500 mg in 250 mL; 1000 mg in 500 mL 10 mg/mL: o remove 10 mL from 50 mL bag, then add 500 mg to bag o remove 20 mL from 100 mL bag, then add 1000 mg to bag 50 mg/mL; transfer 2500 mg or 5000 mg to an empty sterile bag (empty bag obtained from stores or pharmacy) *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Patient Controlled Analgesia (PCA)	YES	**syringe standard solution concentration:** 0.6 mg/mL in NS; *rate must be controlled with a PCA pump* **BC Women's Hospital**: 0.2 mg/mL in NS; *via CADD pump*	Intermediate Monitoring or per PCA site protocol
Epidural	YES	**bolus by physician only** or per epidural site protocol continuous epidural infusion - **initiated by physician** (use preservative-free solution) **standard solution concentration:** 10 mcg/mL: in NS 250 mL *rate must be controlled with an epidural pump*	Intermediate Monitoring or per epidural site protocol
Intrathecal	YES	**initiated by physician** (use preservative-free solution) **standard solution concentrations:** 0.1 mg/mL: 10 mg in NS 100 mL 0.2 mg/mL: 20 mg in NS 100 mL	Intermediate Monitoring or per intrathecal site protocol

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HYDROmorphone

Dosage

Dosing is individualized based on patient response and tolerance.

Usual dosing for opioid naïve patient:

- **IV direct**: 0.1 to 0.4 mg every 6 to 10 minutes until analgesia achieved; usual maximum 2 mg/hour
- **subcutaneous and IM**: 0.5 to 1 mg every 3 to 4 hours
- **IV intermittent**: 0.5 to 1 mg every 3 to 4 hours
- **continuous IV infusion or continuous subcutaneous infusion**: 0.1 to 0.6 mg/hour titrated to response; there is no maximum dose (palliative patients may require greater than 20 mg/hour)
- **epidural**: 0.5 to 2 mg; may follow with epidural infusion of 0.1 to 0.2 mg/hour as per site specific protocol
- **intrathecal**: dose as per site protocol.

Opioid tolerant patient:

- *opioid use disorder:*
  - Single doses up to 200 mg or higher IV Direct/IM/SUBCUT and daily total doses of up to 500 mg or higher have been used.
  - Dose is determined based on previous use, and no maximum dose has been established.

Switching from oral to parenteral routes:

- subcutaneous or IM dose is one-half the oral immediate release dose given at the same interval
- continuous IV or subcutaneous infusion dose is one-half the oral dose per 24 hours

Potential Hazards of Parenteral Administration

- respiratory/circulatory depression and orthostatic hypotension (may be increased with rapid IV injection)
- pain and/or burning at the subcutaneous injection site
- mild erythema may occur at the IM injection site
- antidote: naloxone
- **confirm resuscitative equipment is readily available**
- high alert medication:
  - HYDROmorphone vials or ampoules containing more than 2 mg
  - when given by these routes: epidural infusions, intrathecal, patient controlled analgesia

Important Implications

Contraindications/Cautions

- caution in patients with convulsive disorders, cranial injuries, respiratory insufficiency, cardiac arrhythmias, reduced blood volume,
- geriatric or debilitated patients, patients with hepatic dysfunction or severe renal dysfunction and those on other CNS depressants should receive reduced doses and carefully titrated.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- respiratory depression, circulatory depression and orthostatic hypotension
- restlessness, nightmares, tremors, euphoria, dizziness, confusion
- nausea, vomiting, constipation, pruritis

Monitoring

- severity of pain, time and frequency of breakthrough pain

Other

- HYDROmorphone is at least 5 times more potent than morphine.

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hydroxocobalamin

Warnings	Classification Antidote	Alternate Names CYANOKIT

Indications

- antidote for cyanide poisoning

Reconstitution and Stability

- Using the sterile transfer device supplied with each CYANOKIT, reconstitute:
  - each 2.5 g vial with normal saline 100 mL, or
  - 5 g vial with normal saline 200 mL (25 mg/mL)
- gently rock or invert 2.5 g vial for at least 30 seconds (5 g vial for 1 minute) prior to infusion.
- reconstituted solution is dark red and stable at room temperature for up to 6 hours

Compatibility

- compatible with D5W, NS, Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	give initial dose over 15 minutes; if another dose is indicated: o infuse over 15 minutes if patient is extremely unstable; otherwise o increase infusion duration (15 minutes to 2 hours) Use the IV tubing provided with the kit; it includes an appropriate filter	Advanced Monitoring
Continuous IV infusion	NO		

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hydroxocobalamin

Dosage

- 5 g IV intermittent. Additional doses are generally not required. Optimal regimen for subsequent doses has not been established – given in 2.5 g increments.

- refer to the *Poison Management Manual* for further detail or contact:
  Drug and Poison Information Centre (DPIC):604-682-5050 or 1-800-567-8911

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- Caution: rare allergic reactions. Pustular rash may be seen 7 to 28 days after treatment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- transient hypertension and bradycardia.
- red urine within 2 hours of IV infusion; may last up to 6 weeks.
- harmless red discolouration of skin and mucous membranes; may begin 10 to 15 minutes after start of treatment and last several days.

Other
- Laboratory: red colour of hydroxocobalamin may interfere with results of certain lab tests including AST, bilirubin, serum creatinine, magnesium, iron, and co-oximetry (carboxyhemoglobin, methemoglobin, and oxyhemoglobin).
- Hemodialysis: red colour may interfere with hemodialysis procedure; report of dialysis machine repeatedly alarming and shutting down due to *"blood leak".*

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hydroxyzine

Warnings	Classification	Alternate Names
vesicant	antihistamine, anxiolytic	ATARAX

Indications

- allergic reactions
- as pre-and post-operative adjunctive medication to control anxiety and emesis
- anxiety withdrawal symptoms and delirium tremens associated with alcoholism

Reconstitution and Stability

- stable at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into large muscle (ventrogluteal or mid-lateral muscles of the thigh)	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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hydroxyzine

Dosage

Psychiatric and emotional emergencies, including alcoholism:
- 50 to 100 mg IM every 4 to 6 hours if needed

Pre and post-operative adjunctive therapy:
- 25 to 100 mg IM

Potential Hazards of Parenteral Administration

- irritation at injection site, including necrosis
- **avoid** inadvertent IV or subcutaneous injection (contraindicated): vesicant

Important Implications

Contraindications/Cautions
- caution in patients with seizure disorders: increased incidence of seizures has been reported
- caution: potentiates other CNS depressants and potentiates anticholinergic effects
- caution: may increase QTc interval

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- drowsiness
- at higher doses dryness of the mouth and involuntary motor activity have occurred

Other
- NOTE: when hydroxyzine is used as pre-and post-operative adjunctive medication, opioid requirements may be reduced by as much as 50%

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hyoscine BUTYLbromide

Warnings	Classification antispasmodic	Alternate Names BUSCOPAN scopolamine BUTYLbromide

Indications

- relief of smooth muscle spasm of the gastrointestinal and genitourinary systems
- smooth muscle relaxation in medical imaging

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Intramuscular	YES	PRN or regularly scheduled orders one time dose for smooth muscle relaxation prior to procedure	Intermediate Monitoring Basic Monitoring
IV direct	YES	PRN or regularly scheduled orders give undiluted; maximum rate: 20 mg/minute one time dose for smooth muscle relaxation prior to procedure	Advanced Monitoring Basic Monitoring (See site-specific restrictions)
IV intermittent	YES	dilute dose in D5W 50 mL; infuse over 15 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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hyoscine BUTYLbromide

Dosage

- Relief of smooth muscle spasm of the gastrointestinal and genitourinary systems:
  10 to 20 mg IM, subcutaneous or IV 3 to 4 times daily PRN

- Smooth muscle relaxation in medical imaging (diagnostic medical imaging examinations):
  10 to 20 mg IM / IV direct

Potential Hazards of Parenteral Administration

- tachycardia

Important Implications

Contraindications/Cautions
- contraindicated in glaucoma
- use with caution in prostatic hypertrophy

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- dry mouth, decreased perspiration, mydriasis, increased intra-ocular pressure

Other
- hyoscine BUTYLbromide and hyoscine HYDRObromide (scopolamine HYDRObromide) cannot be interchanged.

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icatibant

Warnings	Classification	Alternate Names
hazardous drug group 2	Selective Bradykinin B_2 Receptor Antagonist	FIRAZYR

Indications

- Treatment of acute attacks of hereditary angioedema (HAE) in adults with C1-esterase inhibitor deficiency
- Indications and /or prescribing restrictions apply

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- Store pre-filled syringes in fridge or at room temperature (2 to 25 ºC)

Compatibility

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	• use abdominal area, • give over at least 30 seconds	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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icatibant

Dosage

- 30 mg subcutaneously into the abdominal area
- may repeat every 6 hours if response is inadequate or symptoms recur, to a maximum of 3 doses / 24 hours
- safety of more than 8 doses in a month has not been investigated

Potential Hazards of Parenteral Administration

- Local reactions: irritation, erythema, swelling, burning, itching, pain

Important Implications

Contraindications/Cautions

- Caution: may diminish the antihypertensive effect of Angiotensin-Converting Enzyme (ACE) Inhibitors.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- CNS: headache, dizziness
- Hepatic: increase in transaminases (AST and ALT)

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idaruCIZUmab

Warnings	Classification antidote for dabigatran, antihemorrhagic agent	Alternate Names PRAXBIND

Indications

- **reversal of dabigatran** anticoagulant effects in patients:
  - presenting with life threatening or uncontrolled bleeding or
  - who require emergency surgery/invasive procedures within 8 hours, where normal hemostasis is required

Reconstitution and Stability

- keep in refrigerator; protect from light
- do not shake

Compatibility

- line must be flushed with NS, but do not administer NS (or any other fluid) in parallel via the same IV access as idaruCIZUmab

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	flush line before and after with NS undiluted, give both vials consecutively; over a minimum of 2 to 3 minutes	Basic Monitoring
IV intermittent	YES	flush line before and after with NS undiluted, give both vials consecutively; infuse each vial over 5 to 10 minutes	Basic Monitoring
Continuous IV infusion	NO		

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idaruCIZUmab

Dosage

Reversal of **dabigatran only**:
5 g IV (administered as two consecutive 2.5 g doses no more than 15 minutes apart)

Potential Hazards of Parenteral Administration

- hypersensitivity (including bronchospasm, hyperventilation, rash, and pruritus)

Important Implications

Contraindications/Cautions
- caution: contains 4 g of sorbitol per dose; in patients with hereditary fructose intolerance, increased risk of hypoglycemia, metabolic acidosis, and acute liver failure has occurred from IV administration of sorbitol
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- delirium, headache; constipation; hypokalemia, fever, pneumonia, thromboembolic events

Monitoring
- baseline CBC, INR/PTT, thrombin time (TT), fibrinogen, SCr
- repeat PTT and TT at 4, 12, and 24 hours post idaruCIZUmab administration

Other
- dabigatran treatment can be restarted 24 hours after administration of idaruCIZUmab, if patient is clinically stable and adequate hemostasis has been achieved

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ifosfamide

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic; alkylating agent	IFEX, isophosphamide, iphosphamide

Indications

- select indications: cervical and testicular cancer, soft tissue sarcoma, leukemia, non-Hodgkin's lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store refrigerated
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W, dextrose-saline solutions and lactated ringers

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	• dilute in 500 mL (final concentration of 0.6 to 20 mg/mL) infuse over 1 to 20 hours • Advanced soft tissue sarcoma (SAAI protocol) (infuse over 24 hours): total dose divided into 3 x 1000 mL bags; infuse each 1000 mL over 8 hours. *rate must be controlled with an IV infusion pump*	Basic Monitoring or according to protocol
Continuous IV infusion	NO	This IV infusion, formerly known as continuous, has been reclassified as IV intermittent	

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ifosfamide

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples:
- Burkitt's Lymphoma/Leukemia (LYIVACR protocol): 1.5 g/m^2 (=1500 mg/m^2) IV daily for 5 days.
- B-cell non-Hodgkin's lymphoma (ULYRICE protocol): 1.667 g/m^2 (=1667 mg/m^2) IV daily for 3 days.
- SAAI protocol: 5 g/m^2 (= 5000 mg/m^2): Total dose divided equally between three 1 L bags, with each litre run over 8 hours, for a total infusion time of 24 hours. Repeat every 21 days.

- Dose adjustment required in renal failure

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- anaphylaxis rare
- Extravasation risk: non-vesicant (irritant)
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- hypersensitivity to ifosfamide
- patients with advanced cerebral arteriosclerosis

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- myelosuppression (onset around 5 days, nadir 7 to 14 days, recovery 14 to 21 days)
- bladder toxicity – hematuria, dysuria, frequency, hemorrhagic cystitis; because of its urotoxic effect, **ifosfamide should be administered with a uroprotective agent such as mesna, especially at higher doses (1.2 g/m^2 or more)**
- nephrotoxicity due to renal parenchymal and tubular necrosis. SIADH has also been reported.
- encephalopathy reported in 10 to 50% of patients. May be reversible by discontinuing ifosfamide.
- nausea and vomiting (onset few hours, duration 3 days)
- reversible alopecia
- cardiotoxicity: including arrhythmias, cardiomyopathy at high doses (rare)
- may interfere with normal wound healing

Monitoring
- urine output should be closely followed; patients should receive prophylactic hydration of at least 2 L/day on the day of therapy to promote frequent urination and prevent toxic metabolites from "sitting" in the bladder. The drug should be administered before 1600H to decrease the amount of metabolite remaining in the bladder overnight.
- monitor CBC

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imipenem-cilastatin

Warnings	Classification beta-lactam, carbapenem antibiotic	Alternate Names PRIMAXIN

Indications

- treatment of moderate to severe infections caused by susceptible organisms
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- powder stable at room temperature
- colour of reconstituted solution may range from colourless to yellow
- some vials may be connected to the Minibag plus system; use immediately following reconstitution

- Reconstitute both 250 mg and 500 mg vials with 10 mL diluent from a minibag. Shake vial well to form a suspension. Transfer the suspension to the minibag. Rinse vial by adding 10 mL from the minibag back to the empty vial, shake and then transfer again to the minibag. This procedure ensures that all vial contents are transferred to the minibag.

Compatibility

- compatible with NS (preferred), D5W and dextrose-saline solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute doses: o 250 mg in NS 100 mL o 500 mg in NS 100 mL o 1000 mg in NS 250 mL infuse doses: - up to 500 mg over 20 to 30 minutes - greater than 500 mg over 40 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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imipenem-cilastatin

Dosage

- 500 to 1000 mg IV every 6 to 8 hours
  maximum daily dose: 4 g or 50 mg/kg, whichever is less

- dose adjustment required in renal dysfunction:

Creatinine Clearance	Dose
25 to 50 mL /minute	500 mg IV Q8H
Less than 25 mL/minute	500 mg IV Q12H
Hemodialysis	250 to 500 mg IV Q12H after dialysis on dialysis days
Continuous Ambulatory Peritoneal Dialysis	250 to 500 mg IV Q12H

Potential Hazards of Parenteral Administration

- anaphylaxis
- phlebitis/thrombophlebitis
- nausea and vomiting, sometimes accompanied by hypotension, dizziness, or sweating; may be caused rapid infusion rate

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to other carbapenem antibiotics (eg. ertapenem, meropenem)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- seizures occur rarely; incidence may increase with large doses (greater than 2g/day) and in patients with renal insufficiency; use with caution in patients with history of seizures
- elevated liver enzymes, eosinophilia

Monitoring
- periodic renal and hepatic function tests and hematology during prolonged therapy

Other
- 500 mg imipenem/cilastatin contains 1.6 mmol (37.5 mg) sodium

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inFLIXimab

Warnings	Classification biological response modifier	Alternate Names REMICADE INFLECTRA (biosimilar) RENFLEXIS (biosimilar)

Indications

- for treatment of severe immune-mediated enterocolitis associated with check-point inhibitors (e.g. ipilimumab) unresponsive to steroid therapy
- **NON – FORMULARY** includes B.C. Pharmacare Special Authority approved indications
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- vials are stored in refrigerator
- reconstitute 100 mg vial with 10 mL sterile water for injection; do not shake, swirl gently to dissolve and allow to stand for 5 minutes

Compatibility

- compatible with NS only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use infusion set with low sorbing, low protein-binding in-line filter, 1.2 microns or less (i.e. use Alaris tubing with 1.2 or 0.2 micron filters) dilute dose in NS 250 mL; for **initial** and repeat infusions (if tolerated), give over a **minimum of 2 hours** using a gradual infusion rate: o 10 mL/hour for 15 minutes, then o 20 mL/hour for 15 minutes, then o 40 mL/hour for 15 minutes, then o 80 mL/hour for 15 minutes, then o 150 mL/hour for 30 minutes, then o increase to 250 mL/hour until completed *or* an accelerated infusion may be used in those with ankylosing spondylitis, psoriatic arthritis or rheumatoid arthritis o administer dose over 1 hour **ONLY if 3 doses infused over 2 hours were free of any infusion reactions** o start infusion at 40 mL/hour for 15 minutes, then infuse at 300 mL/hour until completed or as per site specific protocol *rate must be controlled with an IV infusion pump*	Advanced Monitoring blood pressure (BP), pulse and temperature prior to infusion and Q30MIN during infusion and continue for 1 hour after infusion *1st infusion*: as indicated above *subsequent infusions:* o as indicated above, if reactions occur during the infusion o if no infusion reactions occur, then end of infusion assessment can be shortened to 30 minutes after the end of the infusion or monitoring per site specific protocol
Continuous IV infusion	NO		

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Dosage

enterocolitis associated with check-point inhibitors: 5 mg/kg IV; may give a second dose after 2 weeks if needed

Non-formulary indications: 3 to 5 mg/kg IV at 0, 2 and 6 or 8 weeks thereafter, per protocol (refer to indication specific order set)

Note: pre-medication with acetaminophen, antihistamines and/or corticosteroids may help prevent or lessen infusion reactions

Potential Hazards of Parenteral Administration

- significant risk of anaphylactic or infusion reactions; can occur during or within 1 to 2 hours of infusion:
  - headache, vasodilation, flushing, pruritus, rash, hives, respiratory distress, swelling of the lips or larynx, hypotension, abdominal pain, hypoxemia, and flu-like symptoms
  - the patient must be closely monitored and treatment for anaphylactic reactions must be available

  mild reactions: (no respiratory or vascular instability)
  - slow infusion to 10 mL/hour or stop infusion; may give acetaminophen, diphenhydrAMINE, dimenhyDRINATE, or hydrocortisone if needed
  - monitor vital signs Q15 MIN; if symptoms clear, restart infusion at *half* previous rate and slowly increase

  severe reactions: (anaphylaxis, vascular instability, SBP change of 40 points or more, rigors)
  - stop infusion and contact prescriber
  - give diphenhydrAMINE, hydrocortisone, epinephrine (if anaphylaxis) or salbutamol nebulized PRN
  - monitor vital signs every 2 to 5 minutes until within normal limits; continue monitoring patient for a minimum of 2 to 4 hours or longer as necessary

Important Implications

Contraindications/Cautions
- contraindicated in patients with:
  - hypersensitivity to infliximab, murine proteins or any component of the formulation
  - severe infections (e.g. sepsis, abscesses, tuberculosis and opportunistic infections)
  - moderate or severe heart failure (NYHA class III/IV)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- flu-like symptoms, headache, transient fever, chills, rhinitis, dizziness
- skin rash, hypertension, bronchitis, infection
- arthralgia, myalgia, chest pain
- nausea, vomiting, abdominal pain

Monitoring
- for signs of infusion reactions
- for signs and symptoms of infection

Other
- inFLIXimab biosimilars are not interchangeable

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influenza virus vaccine, seasonal

Warnings	Classification vaccine	**Alternate Names** FLUAD (trivalent inactivated influenza virus vaccine-adjuvanted); **[**FLULAVAL TETRA, FLUZONE QUADRIVALENT; FLUZONE HIGH-DOSE QUADRIVALENT; quadrivalent inactivated influenza vaccine, influenza virus vaccine quadrivalent types A and B (split virion)**]**

Indications

- is indicated for immunization against influenza caused by the strains of influenza virus contained in the vaccine
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C); store in original package to protect from light

age group	recommended vaccine	product description and comments
18 to 64 years	FLULAVAL TETRA FLUZONE QUADRIVALENT	• FLULAVAL TETRA is an opalescent translucent to off-white suspension available as multidose vials • FLUZONE QUADRIVALENT is a clear to opalescent suspension available as multidose vials or single use pre-filled syringes • multidose vials contain thimerosal; once punctured, discard vial after 28 days
65 years or older *who are residents of long term care or assisted living or First Nations communities*	FLUZONE HIGH-DOSE QUADRIVALENT	• clear to opalescent suspension, single use prefilled syringes • if FLUZONE HIGH-DOSE QUADRIVALENT is unavailable, FLUAD should be used • if neither of these products are available, any BRAND listed in the 18 to 64 year age group (i.e. row above) may be used
65 years or older *residing in the community*	FLUAD	• milky white suspension, single use prefilled syringes • if FLUAD is unavailable, any BRAND listed in the 18 to 64 year age group (i.e.1st row above) may be used

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intramuscular only	YES	shake well to form suspension; give into deltoid muscle	Basic Monitoring (observe for 15 minutes after vaccination in case of allergic reaction)

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influenza virus vaccine, seasonal

Dosage

Adults (18 years or older):
- FLULAVAL TETRA and FLUZONE QUADRIVALENT: 0.5 mL IM once

Adults (65 years or older, populations as specified in table under reconstitution and stability section):
- FLUAD: 0.5 mL IM once
- FLUZONE HIGH-DOSE QUADRIVALENT: 0.7 mL IM once

For additional information: refer to Part 4 - Biological Products BC Centre for Disease Control Immunization.

Potential Hazards of Parenteral Administration

- allergic reactions including hives, angioedema, allergic asthma, anaphylaxis
- epinephrine must be available in case of an anaphylactic reaction
- pain, swelling, redness at site of injection

Important Implications

Contraindications/Cautions

Contraindicated:
- if history of anaphylactic reaction to a previous dose of any type of influenza vaccine or components of these vaccines (see package inserts for full lists).
- should not be administered during acute febrile illness (38ºC or higher)
- if history of Guillain-Barré syndrome occurring within 8 weeks after receiving a dose of influenza vaccine

Caution:
- in individuals who have had SEVERE oculo-respiratory syndrome (ORS): includes wheezing, chest tightness, difficulty breathing, or severe throat constriction or difficulty swallowing, beginning within 24 hours of prior vaccination. Such individuals who wish to receive influenza vaccine should consult with a physician.
- refer to BC Cancer influenza vaccine recommendations for adults with cancer

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- fever, headache, malaise, myalgia, chills, nausea, diarrhea, vomiting
- approximately 1 in 20 people may develop ORS: cough, sore throat, hoarseness or red eyes

Other
- the formulation for influenza strains changes each year to reflect expected viruses for next year
- may be given at same time as other vaccines, but must be given at separate sites (i.e. use separate limbs)
- individuals with egg allergy (including anaphylaxis following egg ingestion), may receive *these* vaccines in any setting where standard vaccine administration practices are followed
- FLUAD contains 15 mcg of hemaglutinin for each of the 3 strains of influenza in the annual vaccine and adjuvant =MF59C.1
- FLULAVAL TETRA or FLUZONE QUADRIVALENT contain 15 mcg of hemaglutinin for each of the 4 strains of influenza in the annual vaccine and FLUZONE HIGH-DOSE QUADRIVALENT contains 60 mcg of hemaglutinin for each of the 4 strains

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inotuzumab ozogamicin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	BESPONSA

Indications

- primary use: acute lymphoblastic leukemia
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature
- complete administration within 8 hours of reconstitution, pharmacy will indicate expiry on label
- protect container from light during storage and administration; protect administration line from light ONLY if hang time will be longer than 1 hour
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible in NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute to 0.01 to 0.1mg/mL in NS (usual dose in NS 50 mL) infuse over 60 minutes *rate must be controlled with an IV infusion pump*	Intermediate monitoring or according to protocol vital signs immediately prior to start of infusion, then for 1st infusion: at 1 and 2 hours post-infusion; subsequent infusions:1 hour post-infusion
Continuous IV infusion	NO		

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inotuzumab ozogamicin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Treatment of relapsed or refractory pre-B-cell acute lymphoblastic leukemia (ULKINOZ)
- Cycle 1: 0.8 mg/m^2 IV on day 1, then 0.5 mg/m^2 IV weekly for two doses
- Cycles 2 to 6: 0.5 to 0.8 mg/m^2 IV on day 1, then 0.5 mg/m^2 IV weekly for two doses
- Cycle length is 21 to 28 days

- Dose modification for hematologic, non-hematologic or hepatic dysfunction per protocol.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- infusion-related reactions (2%): fever, chills, rash, and breathing difficulties may occur (usually shortly after the end of the cycle one infusions). Follow pre-printed orders/protocol/power plan for pre-medications and drugs that should be readily available on ward to treat infusion reactions.
- Extravasation risk: non-vesicant
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *Caution*:
    - PR & QT interval prolongation; caution in patients with risk factors for developing QT prolongation or with pre-existing conduction abnormalities or rhythm disturbances. Avoid concurrent therapy with other drugs associated with PR/QTc prolongation, and/or drugs that disrupt electrolyte levels. If concurrent therapy is unavoidable, monitor for PR/QTprolongation and/or cardiac arrhythmia
    - venoocclusive disease/sinusoidal obstruction syndrome (VOD), sometimes fatal; risk factors for VOD include use of conditioning regimens with two alkylating agents, having elevated bilirubin immediately before SCT, and serious liver disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *blood/lymphatic/vascular*: anemia (30 to 36%), febrile neutropenia (27%), neutropenia (49%), thrombocytopenia (45 to 51%), pancytopenia(2%); hemorrhage (33%)
- *GI*: ascites (4%)
- *hepatobiliary*: hepatotoxicity (14%)
- with high tumour burden, tumour lysis syndrome and subsequent hyperuricemia may occur; consider prophylaxis with allopurinol and hydrate accordingly

Monitoring
- baseline ECG (if not done within prior 96 hours)
- electrolytes, CBC & differential, bilirubin, liver function tests, uric acid

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insulin

Warnings	Classification	Alternate Names;
high alert medication (see Potential Hazards section)	hypoglycemic agent	different insulin types are NOT interchangeable

Indications

- treatment of diabetes mellitus
- diabetic ketoacidosis or coma
- intensive control of glucose in critical care patients
- treatment of severe hyperkalemia
- high-dose insulin antidote for hemodynamic support in some overdoses (e.g. calcium channel or beta blocker overdoses) contact **BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911**

Insulin products (single ingredient) - Onset and duration of action:

Insulin type	Generic name Insulin human (route)	Brand names	Onset of action	Peak effect	Duration of action	Administration timing
rapid acting	insulin lispro (subcutaneous)	HUMALOG	10 to 15 minutes	1 to 2 hours	3 to 5 hours	give just before meals
short acting	insulin regular (subcutaneous, IV)	HUMULIN-R NOVOLIN ge TORONTO	30 to 60 minutes	2 to 3 hours	6 to 8 hours	give 30 minutes before meals
intermediate acting	insulin NPH (subcutaneous only)	HUMULIN-N NOVOLIN ge NPH	1 to 3 hours	5 to 8 hours	up to 18 hours	as scheduled
long acting	insulin glargine (subcutaneous only)	LANTUS BASAGLAR	2 to 4 hours	no peak	20 to 24 hours	as scheduled

Reconstitution and Stability

- keep unopened vials refrigerated; do not freeze
- multidose vials may be stored for up to 28 days at room temperature
- insulin suspensions - gently shake before use

Compatibility

- insulin regular human is compatible with NS, dextrose, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	rotate injection sites	Basic Monitoring
Intramuscular	NO		
IV direct	YES	use insulin syringe with Luer Lock tip insulin regular only; undiluted over 1 minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	insulin regular only **standard solution concentration:** 1 unit/mL ▪ dilute 100 units in NS 100 mL ▪ *high-dose antidote indication*: dilute 100 units in NS 100 mL dilute 250 units in NS 250 mL *rate must be controlled with an IV pump*	Basic Monitoring *high-dose antidote* Full Monitoring See site-specific restrictions
intraperitoneal	YES	insulin regular only	Basic Monitoring

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insulin

Dosage

Diabetes Mellitus:

- subcutaneous dose is individualized according to blood glucose level
  - insulin regular: administer 30 minutes before each meal
  - insulin lispro: administer within 15 minutes of the meal
- continuous ambulatory peritoneal dialysis: insulin regular 5 to 15 units into each dialysis bag to maintain fasting blood glucose 5 to 8 mmol/L

Diabetic Ketoacidosis:(regimens may vary)
insulin regular 0.15 unit/kg IV direct (optional) followed by insulin regular 0.1 unit/kg/hour continuous IV infusion titrated to optimize blood glucose level

Intensive Control of Glucose in Critical Care:
initiate insulin regular continuous IV infusion per treatment protocol

Hyperkalemia: 25 to 50 g dextrose (50 to 100 mL dextrose 50%) IV direct over 5 minutes, followed by 5 to 10 units insulin regular IV direct or as per treatment regimen. Monitor blood glucose at 30 and 60 minutes post-dose and PRN for 6 hours.

High-dose insulin antidote for hemodynamic support in some overdoses:

- 1 unit/kg IV direct, followed by 0.5 to 1 unit/kg/hour continuous IV infusion. May take up to 60 to 90 minutes after initiation of therapy to see response. Doses as high as 10 units/kg/hour have been used.
- **must** be given with **dextrose**:
  - start dextrose infusion 0.5 g/kg/hour (e.g. 5 mL/kg/hour of D10W)
  - if initial blood glucose is less than 14 mmol/L give 25 g (50 mL of dextrose 50%) IV direct [see dextrose 50% monograph]
  - dextrose supplementation may be required for up to 24 hours after high-dose insulin is stopped.

Potential Hazards of Parenteral Administration

- lipodystrophy may occur at injection sites in up to 3% of users; rotate injection sites routinely and do not administer via subcutaneous butterfly
- high alert medication:
  - for continuous IV infusions of insulin
  - for insulin injections at concentrations above 100 units/mL

Important Implications

Contraindications/Cautions

- *Caution*: local allergic reactions (such as itching, redness, swelling, stinging or warmth at the injection site) may occur within the first 1 to 3 weeks and usually disappears within a few weeks; true insulin allergy is rare
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects: hypoglycemia

Monitoring:

- blood glucose, signs of hypoglycemia, potassium
- *high-dose antidote*
  - blood glucose Q15 to 30 MIN until stable, then Q1H until several hours after insulin discontinued
  - potassium Q1H for at least 4 hours, then Q2H until insulin discontinued; magnesium and phosphorus

Other

- insulin regular or lispro can be mixed with an intermediate acting insulin from the same manufacturer; draw up insulin regular or lispro first. Inject mixture immediately
- insulin glargine must never be mixed with any other insulins
- Fixed ratio combinations of rapid or short acting insulin with an intermediate acting insulin also available

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irinotecan

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic; topoisomerase I inhibitor	CAMPTOSAR

Indications

- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature and protect from light
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W (preferred), NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	• 50 mg/m^2 or less: dilute in D5W 250 mL; infuse over 30 minutes • all other doses: dilute in 500 mL D5W; infuse over 90 minutes (final concentration of 0.12 mg/mL to 2.8 mg/mL) *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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irinotecan

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples:
- 50 mg/m^2 IV on day 1 and day 8; repeat every 3 weeks
- 180 mg/m^2 IV every 2 weeks
- 200 to 350 mg/m^2 IV every 3 weeks

- Dose modification for myelosuppression, hepatic failure, Gilbert's syndrome or diarrhea

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- myelosuppression, neutropenia
- nausea, vomiting, early-onset or late-onset diarrhea
- fatigue
- alopecia
- bradycardia

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iron sucrose

Warnings	Classification	Alternate Names
	iron salt (hematinic – blood forming agent)	VENOFER iron saccharate iron sucrose complex

Indications

- treatment of iron deficiency

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	maximum rate*: o first dose 100 mg/hour o if no side effects to the first dose, subsequent doses can be infused at 150 mg/hour dilute as follows: o 100 mg in NS 50 mL; infuse over 1 hour o 200 mg in NS 100 mL; first dose: infuse over 2 hours, subsequent doses infuse over 1.5 hours o 250 to 300 mg in NS 250 mL; first dose infuse over 3 hours, subsequent doses infuse over 2 hours (reduce rate or stop infusion if hypotension occurs) for dialysis patients – refer to site specific protocols *rate must be controlled with an IV infusion pump*	Advanced Monitoring Monitor vitals at baseline, then blood pressure and heart rate Q1H during infusion and 30 minutes after end of infusion *(or monitor as described in protocols/power plans or pre-printed orders)* Perinatal Monitoring
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent.*	

* to minimize infusion related reactions

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iron sucrose

Dosage

Usual dose (of elemental iron):

- 100 to 300 mg IV per session, given as a total cumulative dose of 1000 mg over 14 days
- maximum daily dose: 300 mg*

*dose differs from manufacturer's guidelines to minimize infusion-related reactions

Potential Hazards of Parenteral Administration

- allergic or anaphylactoid reactions; epinephrine and an antihistamine must be readily available
- extravasation risk: if occurs, stop infusion, aspirate drug & blood from cannula, then remove cannula. Apply ice (cold compresses) to the area; do not massage area. Contact prescriber.
- hypotension may occur from rapid IV administration
- doses greater than 300 mg associated with significant hypotension

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- headache, fever
- hypotension
- metallic taste, nausea, vomiting
- muscular pain and cramps

Monitoring

- hemoglobin, serum iron, total iron binding capacity (TIBC), serum ferritin, transferrin saturation

Other

- iron sucrose may be used in patients who are intolerant of iron dextran
- hold iron sucrose for at least 1 week prior to iron studies as may lead to falsely elevated results

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isatuximab

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, monoclonal antibody	SARCLISA

Indications

- multiple myeloma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- all doses are prepared by pharmacy in a biological safety cabinet
- store in fridge
- once removed from fridge, stable for 8 hours at room temperature (includes infusion time)

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs – Administration and Handling.
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
IV intermittent only	YES	• dilute dose in 250 mL • mix by inverting bag gently; do NOT shake • administer with a 0.2 micron in-line filter *Cycle 1 Day 1:* 25 mL/hour; if no reactions after 60 minutes, increase by 25 mL/hour every 30 minutes until maximum rate of 150 mL/hour *Cycle 1 Day 8:* o if no reaction to *Cycle 1 Day 1*, or reaction is Grade 2* or less: 50 mL/hour; if no reaction after 30 minutes, increase by 50 mL/hour for 30 minutes, then increase by 100 mL/hour until maximum rate of 200 mL/hour o **or** if reaction to *Cycle 1 Day 1* is Grade 3*: 25 mL/hour; if no reactions after 60 minutes, increase by 25 mL/hour every 30 minutes until maximum rate of 150 mL/hour *Cycle 1 Day 15 & Day 22 & all subsequent infusions:* o if no reaction to previous infusion, or reaction is Grade 2* or less: infuse at 200 mL/hour o **or** if reaction to previous infusion is Grade 3*: 100 mL/hour; if no reactions after 60 minutes, increase by 50 mL/hour every 60 minutes until maximum rate of 200 mL/hour *rate must be controlled with an IV infusion pump*	Advanced Monitoring ▪ *Cycle 1 Day 1:* vital signs (pulse, blood pressure, respiratory rate & temperature) at baseline, then every 30 minutes x 4, then every 1 to 2 hours until 30 minutes after the end of the infusion Intermediate Monitoring ▪ *All other infusions*: vital signs at baseline, end of the infusion, and as needed or according to protocol

*for grading infusion-related reactions, see BC Cancer Drug Manual or specific protocol

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isatuximab

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Examples include:

- BC Cancer protocols UMYISAPOMD or UMYISACARD for relapsed/refractory multiple myeloma:
  Cycle 1: 10 mg/kg on Days 1, 8, 15 and 22
  Cycle 2, *onward*: 10 mg/kg on Days 1 and 15
  Repeat every 28 days until disease progression or unacceptable toxicity

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- infusion related reactions (dyspnea, cough, chills, bronchospasm, hypertension) occur in 46% of patients, usually during cycle 1; premedication with antihistamine, H2 antagonist or proton pump inhibitor, antipyretic, and corticosteroid is recommended to prevent/minimize infusion-related reactions
  - If BP falls to less than 80/50 mmHg or pulse increases to greater than 120 or if flushing, dyspnea, chills, rash, pruritus, vomiting, chest pain, throat tightness, cough, wheezing, or any other new acute discomfort occurs, stop isatuximab infusion and contact physician.
- extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- cardiovascular: hypertension, atrial fibrillation, arrhythmia
- hematologic: anemia, lymphopenia, neutropenia, thrombocytopenia
- gastrointestinal: diarrhea, nausea and vomiting
- CNS: fatigue, dizziness, headache

Monitoring

- CBC and differential, platelets

Other

- isatuximab interferes with cross-matching and red blood cell antibody screening; if possible, perform blood type and screening tests prior to initiating treatment

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isoproterenol

Warnings	Classification sympathomimetic	Alternate Names ISUPREL isoprenaline, isoproterenol HCl

Indications

- treatment and prevention of: Adams-Stokes syndrome - atrioventricular heart block, cardiac arrest, ventricular arrhythmias, carotid sinus hypersensitivity
- bradyarrhythmias unresponsive to atropine
- adjunct in shock

Reconstitution and Stability

- stable at room temperature
- do not use discoloured solutions

Compatibility

- D5W, NS, dextrose 5% in Lactated Ringer's, dextrose 5% in sodium chloride 0.9%, Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Full Monitoring
Intramuscular	YES		Full Monitoring
IV direct	YES	**by physician only** dilute 200 mcg with 9 mL NS or D5W give 20 mcg or less over 1 minute	Full Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration:** 4 mcg/mL: dilute 1000 mcg in D5W 250 mL 16 mcg/mL: dilute 4000 mcg in D5W 250 mL *rate must be controlled with an IV infusion pump*	Intensive Monitoring See site-specific restrictions (Full monitoring may be used short term when treatment is initiated and transfer for hemodynamic monitoring is imminent)
Intracardiac	YES	**by physician only**	Full Monitoring

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isoproterenol

Dosage

Cardiac standstill and Cardiac arrhythmias:
- 20 to 60 mcg IV direct, **or**
- 2 to 10 mcg/minute continuous IV infusion titrated to heart rate and rhythm
- In less urgent situations the subcutaneous or IM route may be used as follows:
  - 200 mcg subcutaneous, followed by 150 to 200 mcg subcutaneous if needed
  - 200 mcg IM, followed by doses ranging from 20 to 1000 mcg IM if needed

Potential Hazards of Parenteral Administration

- tachycardia, hypotension, arrhythmias

Important Implications

Contraindications/Cautions
- ventricular rate should not exceed 110 beats/minute; decrease rate of infusion as necessary
- DO NOT ADMINISTER CONCOMITANTLY WITH EPINEPHRINE; may be used alternately with epinephrine at 4 hour intervals
- caution in patients with coronary insufficiency, acute myocardial infarction or other cardiovascular disorders, hyperthyroidism, and diabetes mellitus

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nervousness, restlessness, insomnia, anxiety, tension, fear
- nausea, vomiting, headache

Monitoring
- urine output
- oxygenation, arterial blood gases, electrolytes, blood glucose

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ketamine

Warnings	Classification general anesthetic; analgesic (non-opioid)	Alternate Names KETALAR; ketamine HCl

Indications

- induction and maintenance of anesthesia
- anesthetic for diagnostic or surgical procedures
- relief of moderate to severe pain
- sedation
- adjunctive therapy for status asthmaticus
- major depressive episodes refractory to other drugs, psychotherapy, and ECT
- refractory status epilepticus
- severe agitation in Emergency Department

Indications and / or Prescribing restrictions apply

Reconstitution and Stability

- store at room temperature, protect from light

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	refractory depression: use *50 mg/mL vial*	Palliative Monitoring for palliative patients Advanced Monitoring for use in refractory depression See site-specific restrictions
Continuous Subcutaneous infusion	YES	**standard solution concentration**: 5 mg/mL [*prepare bags using 50 mg/mL vial*] dilute 250 mg in 50 mL *must control rate with a subcutaneous infusion pump*	Palliative monitoring See site-specific restrictions
Intramuscular	YES	**physician must be present** use *50 mg/mL vial*	Advanced Monitoring See site-specific restrictions
IV direct	YES	**physician must be present, unless otherwise stated in the site specific restrictions** give undiluted anesthesia: over at least 1 minute refractory status epilepticus: over 1 to 2 minutes pain or sedation: over 2 to 3 minutes	Advanced Monitoring See site-specific restrictions

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ketamine

Preparation and Administration

This table begins on page 1

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
IV intermittent	YES	dilute dose in 50 mL; give over 15 minutes refractory depression: give over 40 minutes **physician must be present** *rate must be controlled with an IV pump*	Advanced Monitoring or monitoring described in specific pain or sedation protocol See site-specific restrictions
Continuous IV infusion	YES	**standard solution concentration:** 5 mg/mL [*prepare bags using 50 mg/mL vial**] o dilute 250 mg in 50 mL o dilute 500 mg in 100 mL o or 5 mg/mL in NS syringes (syringes prepared and supplied by pharmacy only) (must use site-specific syringe pump) **where only 10 mg/mL vials available*: 5 mg/mL o 250 mg / 50 mL: remove 25 mL from 50 mL bag, then add 250 mg to bag o 500 mg / 100 mL: remove 50 mL from 100 mL bag, then add 500 mg to bag *for fluid restricted patients with asthma or status epilepticus only*: 10 mg/mL: [*prepare bags using 50 mg/mL vial*] remove 20 mL from 100 mL bag, then add 1000 mg to bag **SPH only** (*chronic neuropathic pain*) 1 mg/mL : 250 mg in D5W 250 mL; if dose is less than amount in bag, infuse dose, stop pump and discard remainder of bag *indication: pain* *all other indications* *rate must be controlled with an IV pump*	Advanced Monitoring or monitoring described in pain protocols/power plans or preprinted orders Full monitoring See site-specific restrictions

This monograph has 3 pages

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ketamine

Dosage

- use actual body weight for weight-based dosing, then titrate to clinical effect;
- for class 3 obesity (BMI equal to or over 40 kg/m^2), consider use of either adjusted body weight or ideal body weight, then titrate to clinical effect

Induction of anesthesia:
- 0.2 to 2 mg/kg IV direct (onset of action: within 30 seconds; duration: 5 to 10 minutes), or
- 4 to 6 mg/kg IM [*only if no IV access*] (onset of action: 3 to 4 minutes; duration of action: 12 to 25 minutes)

Maintenance of anesthesia:
- 0.25 to 0.35 mg/kg IV direct as required; may follow with continuous infusion of 10 to 30 mg/hour

Procedural sedation:
- 0.25 to 1 mg/kg IV direct every 10 to 15 minutes, or
- 2 to 4 mg/kg IM

Pain:
- regimens vary- follow site specific protocols and pre-printed orders, examples are:
  - 0.2 to 0.75 mg/kg IV direct or IV intermittent
  - 5 to 20 mg/hour continuous subcutaneous infusion or continuous IV infusion (per site specific pain protocol) Higher doses have been used to alleviate refractory pain.(per site specific pain protocol)
  - *chronic neuropathic pain*: 250 to 500 mg IV infused over 5 to 6 hours (dose is titrated in increments of 10 to 20 mg/hour to a maximum of 100 mg/hour (per site specific pain protocol)
  - palliative care patients, for pain that responds poorly to opioids: up to 20 mg SUBCUT/IV Q1H PRN

Emergency department: induction for endotracheal intubation and ongoing maintenance of analgo-sedation:
- 1.5 mg/kg IV direct (induction bolus), then 1 mg/kg/hour continuous IV infusion (range: 0.5 to 4 mg/kg/hour)
- if using a different induction agent both bolus and infusion are required for maintenance of analgo-sedation

ICU sedation: 10 to 100 mg/hour initially and titrate to desired sedation level (up to 200 mg/hour)

Adjunctive Management of Severe Exacerbation of Asthma in the Critical Care Setting:
- 0.75 to 1.5 mg/kg IV direct (bolus); then 0.15 to 0.5 mg/kg/hour continuous IV infusion (2.5 mg/kg/hour was administered in 1 case report)

Treatment of refractory depression:
- 0.5 mg/kg to 1 mg/kg IV intermittent **or**
- 0.25 to 0.75 mg/kg subcutaneous or IM

Refractory status epilepticus: 0.5 to 5 mg/kg IV direct; then usual 50 to 250 mg/hour IV infusion (up to 750 mg/hour)

Severe agitation in Emergency Department: 4 to 5 mg/kg IM for 1 dose

Potential Hazards of Parenteral Administration

- too rapid IV administration may produce respiratory depression and enhance pressor response (increase in heart rate and blood pressure)
- **Confirm resuscitative equipment is readily available**

Important Implications

Contraindications/Cautions
- Caution: cardiac function should be monitored continually during the procedure in patients found to have hypertension or cardiac decompensation
- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects
- laryngospasm, increased salivary secretion,
- may increase cerebral spinal fluid pressure; transient increase in blood pressure
- during recovery, emergence reaction may occur characterized by vivid dreams, confusion, excitement, irrational behaviour, and hallucinations
- spontaneous involuntary movements

Other:
- It is advisable to administer a benzodiazepine (e.g. diazepam or lorazepam) prior to ketamine administration to attenuate its cardiovascular stimulant effects and the emergence phenomenon.

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ketorolac

Warnings	Classification Non-steroidal anti-inflammatory drug (NSAID)	Alternate Names TORADOL

Indications

- short-term management of moderate to severe pain
- treatment of cancer pain in palliative care patients

Reconstitution and Stability

- Store at room temperature and protect from light.
- Solution is clear and has a slight yellow colour

Compatibility

- compatible with NS, D5W, D5NS, ringers and lactated ringers

Preparation and Administration

- ketorolac IM product may be given IV or subcutaneous

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Palliative Monitoring
Intramuscular	YES	slowly and deeply into muscle	Basic Monitoring
IV direct	YES	give undiluted; over at least 15 seconds	Basic Monitoring
IV intermittent	YES	o dilute 15 to 30 mg in D5W 50 mL; give over 15 to 30 minutes o dilute 90 mg in NS 1000 mL; give over 24 hours as per site protocol *rate must be controlled with an infusion pump*	Basic Monitoring or as per site specific protocol
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent.*	

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ketorolac

Dosage

Usual dose:
- 15 to 30 mg IM, IV direct or IV intermittent every 6 hours if needed (maximum of 5 days)
- 90 mg IV intermittent over 24 hours as per site specific protocol

Palliative care: 15 to 30 mg subcutaneously TID

Maximum dosage:
- 120 mg/day

Dose reduction:
- lower dose in elderly patients (older than 65 years), those weighing less than 50 kg, or patients with renal dysfunction (GFR less than 30 mL/minute).

Potential Hazards of Parenteral Administration

- pain at IM/subcutaneous injection site
- *hypersensitivity reactions*: bronchospasm, laryngeal edema, asthma, hypotension, flushing, rash, anaphylaxis

Important Implications

Contraindications/Cautions
- *Contraindications*:
  - patients who have hypersensitivities to aspirin or other non-steroidal anti-inflammatory drugs
  - history of or active peptic ulcer, GI bleed or perforation, coagulation disorders
  - advanced renal impairment (serum creatinine greater than 442 µmol/L).
- *Cautions*:
  - may cause acute renal failure, especially in patients with volume depletion or renal impairment.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- somnolence, headache, sweating, dizziness
- nausea, vomiting
- vasodilation
- gastric mucosal irritation and peptic ulceration

Monitoring
- serum creatinine, eGFR

Other
- may prolong the bleeding time
- onset of action: 10 to 15 minutes (IV); 20 to 30 minutes (IM)
- peak effect: 60 to 120 minutes
- duration of action: 4 to 6 hours

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labetalol

Warnings	Classification antihypertensive; beta-blocker agent	Alternate Names TRANDATE

Indications

- treatment of hypertensive emergency

Reconstitution and Stability

- stable at room temperature

Compatibility

- D5W, NS, dextrose-saline combinations, Lactated Ringers and Ringers solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted; Maximum rate: 10 mg/minute	Full Monitoring Perinatal Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations:** 2 mg/mL : remove 40 mL D5W from 100 mL bag, then add 200 mg to bag 5 mg/mL: 1000 mg / 200 mL transfer 1000 mg into empty sterile bag (obtain empty bag from pharmacy) maximum rate: 10 mg/minute *rate must be controlled with an infusion pump*	Full Monitoring Perinatal Monitoring See site-specific restrictions

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labetalol

Dosage

Hypertensive emergency:

- 10 to 20 mg IV direct over 2 minutes; may administer additional injections using double the dose (maximum of 80 mg/dose) at 10 minute intervals PRN until target Systolic BP is reached
  (maximum dose: 300 mg/24 hours) **or**

- 0.5 to 2 mg/minute continuous IV infusion; adjusted to desired response.

Peri-operative use in combination with anesthetics:

- 10 to 25 mg IV direct; then 5 to 10 mg as needed

Potential Hazards of Parenteral Administration

- postural hypotension and dizziness; patients should lay down during administration.
  Assess for orthostatic hypotension prior to ambulation, especially within 3 hours of dose.
- excessive and rapid reduction in blood pressure
- bradycardia, bronchospasm

Important Implications

Contraindications/Cautions

- contraindicated in patients with uncontrolled congestive heart failure, second and third degree heart block, cardiogenic shock, sinus bradycardia
- use with caution in patients with bronchospastic disease, hepatic insufficiency

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, paresthesia (especially scalp tingling) and fatigue
- elevation of hepatic transaminases; hepatic injury has occurred rarely

Other

- onset of action: significant reduction in blood pressure within 5 to 20 minutes
- duration of action: 3 to 6 hours
- transition to oral route when feasible

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lacosamide

Warnings	Classification	Alternate Names
	antiepileptic	VIMPAT

Indications

- adjunctive therapy for refractory status epilepticus or refractory partial onset epilepsy
- restrictions apply

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with D5W, NS and Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in D5W 50 mL; infuse over 30 to 60 minutes *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion	NO		

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lacosamide

Dosage

Partial onset seizures:
- 50 mg IV BID for 1 week then increase to 100 mg BID; may further increase dose by 50 mg BID weekly
- maximum recommended daily dose: 200 mg BID (400 mg/day)

Refractory status epilepticus:
- 200 mg to 400 mg IV over 30 minutes

Dosing in renal impairment (CrCl 30 mL/minute or less):
- titrate with caution
- maximum daily dose: 300 mg

Dosing in mild to moderate hepatic impairment:
- titrate with caution
- maximum daily dose: 300 mg

Potential Hazards of Parenteral Administration

- local reaction: pain or discomfort, irritation, erythema
- bradycardia and AV block may occur during IV infusion

Important Implications

Contraindications/Cautions
- Contraindications:
  - in patients with second or third degree AV block
  - in patients with severe liver dysfunction
- Cautions:
  - in patients with conduction problems (eg, first degree AV block, sick sinus syndrome without pacemaker), myocardial ischemia, heart failure, sodium channelopathies (Brugada syndrome), or with concurrent use with other drugs that prolong the PR interval
  - strong CYP2C9 and CYP3A4 inhibitors may increase the serum concentrations of lacosamide; carbamazepine, phenytoin and phenobarbital may decrease the serum concentrations of lacosamide
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- dizziness, ataxia, sedation, headache, depression, suicidal ideation, agitation, insomnia, hallucinations
- visual disturbances: blurred vision, diplopia, nystagmus
- bradycardia and AV block, increased PR & QRS interval, hypotension, palpitations
- neutropenia, agranulocytosis (rare) ;
- hyponatremia, increased ALT and creatinine; nausea, vomiting, diarrhea
- rash with multi-organ hypersensitivity reactions: DRESS (drug reaction with eosinophilia and systemic symptoms)

Monitoring
- ECG before initiating therapy and again at steady state is recommended in patients with conduction problems or severe cardiac disease
- if visual disturbances persist, dose reduction and discontinuation should be considered

Other
- switch patients to oral dose as soon as practical

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leucovorin

Warnings	Classification folic acid derivative, antidote	Alternate Names citrovorum factor, calcium folinate, folinic acid, leucovorin calcium

Indications

- treatment of megaloblastic anemia due to folate deficiency
- diminish toxicity of folic acid antagonists
- counteract the effect of overdose from folic acid antagonists
- treatment of megaloblastic anemia resulting from a congenital deficiency of dihydrofolate reductase
- enhance cytotoxicity of fluorouracil
- methanol poisoning, enzymatic detoxification of formic acid (toxic metabolite of methanol) to nontoxic carbon dioxide

Reconstitution and Stability

- store in refrigerator; protect from light

Compatibility

- D5W, NS, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	greater absorption from deltoid sites than gluteal sites; rotate sites	Basic Monitoring
IV direct	YES	undiluted, give slowly over at least 3 minutes maximum rate: 160 mg/minute (because of calcium content)	Basic Monitoring

IV intermittent	YES	• 500 mg or less in 50 mL;
		• doses greater than 500 mg:
		  ▪ give undiluted (10 mg/mL)
		  ▪ or dilute in an appropriate volume to a concentration of 0.05 to less than 10 mg/mL
		• infuse over 15 to 30 minutes
		
		leucovorin modulation of fluorouracil:
		dilute dose in 250 mL
		and infuse over 2 hours
			Basic Monitoring

Continuous IV infusion	NO		

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leucovorin

Dosage

- doses greater than 25 mg should be given IV

Folic Acid Antagonist overdose antidote:
- administer within 1 hour; usually ineffective if delayed for more than 4 hours
- dose varies according to protocol and the drug it is being used for (e.g. trimethoprim, pyrimethamine): 5 to 15 mg IV/IM daily
- refer to Drug and Poison Information Centre for other uses (604-682-5050)

Leucovorin rescue after methotrexate:
- methotrexate dose: 100 to 500 mg/m^2 may require leucovorin rescue
- methotrexate dose: over 500 mg/m^2 requires leucovorin rescue
- **It is essential to refer to protocol by which patient is being treated. Numerous dosing schedules exist, follow specific protocol**.

Example Leukemia/Stem cell transplant protocol (CODOX-M plus riTUXimab protocol (LYCODOXMR):
25 mg IV Q6H for first 24 hours *starting exactly 24 hours after the start of methotrexate*, followed by 25 mg PO Q6H for 3 days or until methotrexate level is less than 0.1 micromol/L.
Physician to adjust leucovorin rescue based on methotrexate level, refer to BC Cancer LYCODOXMR protocol or use this table:

methotrexate level micromol/L	leucovorin dose
less than 0.1	none
0.1 to 0.9	25 mg Q6H (PO /IV)
1 to 8	100 mg/m^2 Q6H IV
greater than 8	1000 mg/m^2 Q6H IV

Leucovorin modulation of fluorouracil :
- Fluorouracil is usually given after, or at the midpoint of a leucovorin infusion
- **It is essential to refer to protocol by which patient is being treated. Numerous dosing schedules exist, follow specific protocol**

Example GIFOLFOX, a palliative metastatic colorectal protocol uses oxaliplatin, fluorouracil, and leucovorin.
  - leucovorin 400 mg/m^2 IV intermittent in 250 mL D5W over 2 hours
  - repeat every 14 days for a maximum of 24 cycles

Megaloblastic anemia due to folate deficiency:
up to 1 mg IV/IM daily (doses greater than 1 mg daily have no greater efficacy)

Megaloblastic anemia resulting from a congenital deficiency of dihydrofolate reductase:
3 to 6 mg IV/IM daily

Methanol poisoning, symptomatic patients:
50 mg IV or oral every 4 to 6 hours (IV route is preferred in acute poisoning, or if patient is vomiting)
Optimum dose and duration of therapy not established. Continue treatment for 24 hours or until methanol and metabolites have been eliminated. May switch to folic acid after first dose.

Refer to BC Cancer Drug Manual monographs

Potential Hazards of Parenteral Administration

- allergic reactions have been reported

Important Implications

Contraindications/Cautions
- not for treatment of pernicious anemia and other megaloblastic anemias secondary to vitamin B12 deficiency
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other
- oral absorption is saturated at a dose of 25 mg

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leuprolide

Warnings	Classification	Alternate Names
hazardous drug group 2	gonadotropin-releasing hormone analog, antineoplastic	LUPRON, LUPRON DEPOT, ELIGARD **BRANDS are *not* interchangeable** leuprolide acetate

Indications

- primary use: breast cancer, prostate cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

BRAND NAME (DO NOT interchange)	RELEASE CHARACTERISTICS	STORAGE	PREPARATION
LUPRON	immediate release *for subcutaneous use*	refrigerate	Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
LUPRON DEPOT strengths include: 7.5 mg (1-month), 22.5 mg (3-month) 30 mg (4-month)	slow release depot* *for intramuscular use*	room temperature	Supplied to unit in original packaging. Final preparation required immediately prior to administration. Each pre-filled syringe contains one dose consisting of lyophilized microspheres of leuprolide; once activated use immediately**
ELIGARD strengths include: 22.5 mg (3-month), 45 mg (6-month)	slow release depot* *for subcutaneous use*	refrigerate (If inadvertently left at room temperature in the original package (syringes not mixed), it is stable at room temperature for 8 weeks)	Supplied to unit in original packaging. Final preparation required immediately prior to administration. Each package contains two separate pre-filled syringes; one syringe contains a polymeric delivery system, the other syringe contains lyophilized leuprolide, once syringes mixed, use immediately**

- *LUPRON DEPOT and ELIGARD are slow release depot injections that have different release characteristics.
- ** See approved safe work procedures for preparation outside of a BSC.

Preparation and Administration

- **VCH** – refer to Hazardous Drugs- Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	**LUPRON:** rotate injection sites daily **ELIGARD:** • Allow product to reach room temperature before using. Join the two syringes provided in the package and thoroughly mix the contents. • administer within 30 minutes of mixing; discard if not used within this time. • prepare and administer according to manufacturer's directions found on/in package and/or manufacturer monograph	Basic monitoring or according to protocol
Intramuscular	YES	**LUPRON DEPOT:** • actuate the prefilled syringe to reconstitute the drug, administer immediately according to manufacturer's directions found on/in package and/or manufacturer monograph	Basic monitoring or according to protocol
NO OTHER APPROVED ROUTES			

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leuprolide

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples of regimens for prostate cancer:
- LUPRON 1 mg **subcutaneous** daily
- LUPRON DEPOT 7.5 mg **IM** every 4 weeks (monthly)
- LUPRON DEPOT 22.5 mg **IM** every 12 weeks (3 months)
- ELIGARD 45 mg **subcutaneous** every 24 weeks (6 months)

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- injection site reaction; may include pain, erythema and irritation
- extravation risk: non-vesicant

Important Implications

Contraindications/Cautions
- contraindicated in pregnancy or undiagnosed vaginal bleeding
- caution: history of heart disease or previous heart attack or stroke, cardiovascular risk factors (i.e., hypertension, high cholesterol, smoking), or diabetes; long QT syndrome, electrolyte abnormalities, CHF, or concurrent administration with other QT prolonging drugs
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- adverse CNS effects occur in 3% or more of patients, including dizziness, pain, headache, paresthesias and mood changes
- hot flashes (40 to 77 %), testicular atrophy, decreased libido, impotence, gynecomastia, muscle weakness, weight gain
- disease flare (worsening symptoms) may occur in the first few weeks of treatment; in men this may be blocked with the use of anti-androgen drugs concurrent with the beginning of leuprolide therapy
- long-term use accelerates osteoporosis

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levETIRAcetam

Warnings	Classification	Alternate Names
	anticonvulsant	KEPPRA

Indications

- status epilepticus
- seizure prophylaxis in patients stabilized on oral levETIRAcetam, who cannot take orally or via a feeding tube
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store vials at room temperature in the original container to protect from light
- concentrations greater than 15 mg/mL must be used immediately after mixing
- must be diluted prior to use, undiluted and diluted solutions are clear, colourless and transparent

Compatibility

- compatible with D5W, NS, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	status epilepticus • dilute dose in 100 mL *immediately prior to use*: • give up to 3000 mg over 5 minutes • more than 3000 mg to 4500 mg over 10 minutes seizure prophylaxis (maintenance dosing): • doses up to 1500 mg in 100 mL • doses above 1500 mg in 250 mL • infuse over 15 minutes *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion	NO		

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levETIRAcetam

Dosage

status epilepticus:
- 40 to 60 mg/kg (maximum 4500 mg) IV once

seizure prophylaxis (maintenance dosing) :
- usual dose: 500 mg to 1500 mg IV Q12H
  IV dose and frequency is the same as the oral dose, transfer to oral dosing as soon as feasible.

Dosage adjustment required in renal impairment as follows:

Creatinine Clearance (mL/minute)	maintenance dose
80 and above	500 to 1500 mg Q12H
50 to 79	500 to 1000 mg Q12H
30 to 49	250 to 750 mg Q12H
15 to 29	250 to 500 mg Q12H
less than 15	250 to 500 mg Q24H
hemodialysis	500 to 1000 mg Q24H, post dialysis (50% is dialyzable; if given before hemodialysis, repletion with 50% of dose is recommended)
peritoneal dialysis	250 to 500 mg Q24H

Potential Hazards of Parenteral Administration

- rare: hypersensitivity reactions (i.e. anaphylaxis, angioedema, hypotension, hives, rash, dyspnea)

Important Implications

Contraindications/Cautions
- *Caution*: Delayed hypersensitivity reactions ranging from mild maculopapular rash to severe cutaneous adverse reactions [toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome (SJS), Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS)] have been reported. Usual onset within 1 to 2 weeks of treatment initiation, but may be delayed.
- *Caution*: should be withdrawn slowly to prevent withdrawal seizures

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CNS*: ataxia, weakness, fatigue dizziness, drowsiness, headache
  - *psychiatric symptoms*: anxiety, anger, emotional lability, depression, suicidal ideation
- abdominal pain
- nasopharyngitis

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LevOCARNitine

Warnings	Classification	Alternate Names
	carnitine replenisher, caloric agent	CARNITOR L-carnitine

Indications

- treatment of primary systemic carnitine deficiency
- acute and chronic treatment of secondary carnitine deficiency caused by an inborn error of metabolism
- acute valproic acid toxicity

Reconstitution and Stability

- store vials at room temperature and protect from light
- vials are single use - discard unused portion after opening

Compatibility

- compatible with D5W, D10W, NS, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted, slowly over 2 to 3 minutes	Intermediate Monitoring
IV intermittent	YES	Metabolic disorders: o 0.5 g to 1 g in NS 100 mL infuse over 10 to 15 minutes o greater than 1 g up to 2 g in NS 250 mL infuse over 30 minutes to 2 hours Valproic acid toxicity: o add dose to NS 100 mL infuse over 15 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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LevOCARNitine

Dosage

Metabolic disorders:
Usually, dose is empiric:
- 0.5 g to 2 g IV Q6H depending on the metabolic condition, **or**
- 50 mg/kg IV direct over 2 to 3 minutes or IV intermittent (over 30 minutes to 2 hours)

In severe metabolic crisis:
- Loading dose: 50 mg/kg IV direct; followed by 50 mg/kg (divided Q3H to Q6H) given over the next 24 hours
- Subsequent doses are usually in the range of 50 mg/kg/day or higher if required.
  (The highest dose administered has been 300 mg/kg/day.)

Symptomatic hyperammonemia or hepatotoxicity secondary to valproic acid toxicity:
- Loading dose: 100 mg/kg IV over 15 to 30 minutes (maximum 6 g in adult)
- Maintenance dose: 50 mg/kg IV every 8 hours over 15 to 30 minutes (maximum 3 g / dose).
- Continue levOCARNitine until ammonia levels decrease and patient improves clinically.

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- Caution in patients with a history of seizures
- Caution in patients with a history of cardiac disease or cardiac dysfunction; hypertension, peripheral edema, and ventricular arrhythmias have been reported with IV administration of levOCARNitine in dialysis patients

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- transient nausea and vomiting, anemia, drug-induced body odor (described as "fishy" odour), headache, paresthesia and weakness, increase in seizure activity

Monitoring
- includes CBC, electrolytes, BUN, serum creatinine, glucose, plasma carnitine
- *required monitoring for valproic acid toxicity:* contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911

Other
- easily removed from plasma by dialysis

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levofloxacin

Warnings	Classification quinolone antibiotic	Alternate Names LEVAQUIN

Indications

- treatment of infections of the respiratory tract, urinary tract, skin or skin structure caused by susceptible organisms, when the oral route is not feasible

Reconstitution and Stability

- available as premix bags in D5W: 250 mg/50 mL, 500 mg/100 mL and 750 mg/150 mL
- store at room temperature and protect from light

Compatibility

- compatible in D5W, NS and dextrose 5% in sodium chloride 0.9%

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	infuse 500 mg/100 mL bag over 60 minutes infuse 750 mg/150 mL bag over 90 minutes	Basic Monitoring
Continuous IV infusion	NO		

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levofloxacin

Dosage

- usual dose: 750 mg IV once daily
- dose adjustment required in renal dysfunction:

Creatinine Clearance	Dose
20 to 49 mL/minute	750 mg IV Q48H
less than 20 mL/minute, or hemodialysis, or continuous ambulatory peritoneal dialysis (CAPD)	750 mg IV initial dose, then 500 mg IV Q48H

Neither hemodialysis nor CAPD significantly remove levofloxacin

Potential Hazards of Parenteral Administration

- hypersensitivity and/or anaphylactic reactions (less than 1%)
- hypotension with rapid IV administration

Important Implications

Contraindications/Cautions

- contraindicated in patients with hypersensitivity to this drug or other quinolone antibiotics (e.g. ciprofloxacin)
- may cause QTc prolongation: avoid in patients with a history of prolonged QTc, uncorrected hypokalemia, hypomagnesemia, or concurrent administration of other medications known to prolong the QT interval
- avoid in patients with myasthenia gravis, as may exacerbate muscle weakness
- caution in patients with CNS disorder, or risk factors that predispose to seizures or lower seizure threshold
- associated with increased risk of tendonitis and tendon rupture (risk increased in patients older than 60 years or in patients taking corticosteroids, and in patients with kidney, heart or lung transplants)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- dizziness, headache, insomnia
- constipation, diarrhea and nausea
- peripheral neuropathy
- hyperglycemia or symptomatic hypoglycemia,
- rash, severe phototoxicity reactions (rare)

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levothyroxine

Warnings	Classification thyroid hormone	Alternate Names SYNTHROID L-thyroxine sodium

Indications

- reversal of myxedema coma or stupor without concomitant severe heart disease
- replacement therapy in primary hypothyroidism if oral therapy is interrupted for greater than 7 to 10 days
- hormonal resuscitation of hemodynamically unstable organ donors

Reconstitution and Stability

- vial is stable at room temperature
- 500 mcg vial: add 5 mL preservative free NS to provide 100 mcg/mL solution
- shake well to ensure complete mixing
- use solution immediately following reconstitution

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	not recommended, absorption is variable	Basic Monitoring
IV direct	YES	*preferred route* administer undiluted; maximum rate: 100 mcg / minute	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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levothyroxine

Dosage

- Myxedema coma:
  200 to 500 mcg IV direct; may give additional 100 to 300 mcg IV direct the next day if response is not optimal; repeat as indicated

  Usual maintenance dose: 50 to 200 mcg IV direct daily until condition stabilizes and drug can be given orally

- Primary hypothyroidism: (oral replacement)
  Give dose IV direct once daily (dose should be approximately one-half of the previously established oral dose) Adjust according to response.

- Hormonal resuscitation of hemodynamically unstable organ donors:
  100 mcg IV direct once, followed by 50 mcg IV Q12H

Potential Hazards of Parenteral Administration

- adrenocortical insufficiency, if present, must be corrected before administration, or acute adrenal crisis and death may result

Important Implications

Contraindications/Cautions
- contraindicated after myocardial infarction and thyrotoxicosis
- use with caution in diabetes mellitus and cardiovascular disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- chest pain, tachycardia, hypertension, muscle cramps, nervousness, perspiration

Monitoring
- thyroid function status

Other
- increases the metabolic rate; dose adjustment may be required if patient on anticoagulants, antidepressants, oral hypoglycemics, insulin, digoxin
- onset of action is slow: 5 to 8 hours (24 hours may be necessary to note full effects)

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lidocaine

Warnings	Classification	Alternate Names
	local anesthetic; antiarrhythmic	XYLOCAINE (local anesthetic); XYLOCARD (antiarrhythmic); lignocaine; lidocaine hydrochloride

Indications

- rapid acting local anesthetic for painful procedures
- treatment of ventricular arrhythmias
- pain

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, dextrose-saline combinations and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Continuous Subcutaneous infusion	YES	**initiated by anesthesiologist, pain specialist or palliative physician** **standard solution concentration:** 20 mg/mL (2 %) transfer dose to empty sterile bag (obtain from stores or pharmacy) bolus dose and SUBCUT infusion given from same bag for rates up to 3 mg/kg/hour *rate must be controlled by a subcutaneous infusion pump*	baseline ECG then Palliative Monitoring See site-specific restrictions
Intramuscular	YES	use 10 mg/mL (1 %) solution	Basic Monitoring
IV direct	YES	use 100 mg/ 5 mL prefilled syringe give undiluted; maximum rate: 50 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	YES	use 1 g/ 250 mL or 2 g/ 500 mL (0.4 %) premixed solution if dose is less than amount in bag, infuse dose, stop pump and discard remainder of bag (per site specific protocol) infuse dose over 15 minutes to 3 hours *rate must be controlled with an IV infusion pump*	baseline ECG, then Full Monitoring or as per site protocol
Continuous IV infusion	YES	**standard solution concentrations:** 4 mg/mL (0.4 %): o 1 g in D5W 250 mL premixed solution o 2 g in D5W 500 mL premixed solution neuropathic pain: rate up to and including 2 mg/kg/hour (maximum 72 hours) palliative patients: rate up to and including 3 mg/kg/hour post-operative pain: rate up to and including 1.5 mg/kg/hour (maximum 48 hours) chronic pain: SPH Post Anesthesia Care Unit (PACU) only ventricular arrhythmias *rate must be controlled by an IV infusion pump*	baseline ECG, then Advanced Monitoring post-operative pain: See site-specific restrictions Full Monitoring Full Monitoring
Local infiltration	YES	**by physician,** or by practitioner with specialized training (as per site specific protocols) use 10 mg/mL (1 %) or 20 mg/mL (2 %) solution	Basic Monitoring

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lidocaine

Dosage

Ventricular arrhythmia:
- 1 to 1.5 mg/kg IV direct; may follow with 0.5 to 0.75 mg/kg IV direct every 5 to 10 minutes as needed (up to maximum 3 mg/kg); follow with 1 to 4 mg/minute continuous IV infusion

Local anesthetic:
- by local infiltration, required dose will vary: maximum single dose 4.5 mg/kg (maximum 300 mg)

Cannulation pain:
- use 10 mg/mL (1%) or 20 mg/mL (2%) by local infiltration; refer to site specific protocols

Neuropathic pain:
- **regimens vary – follow site specific protocols and pre-printed orders (order sets), examples are:**
- 5 to 15 mg/kg (maximum 900 mg) IV intermittent over 1 to 2 hours, dose adjusted based on response
- initial dose of 1 to 2 mg/kg subcutaneous or IV *may be given*, followed by 0.5 to 3 mg/kg/hour continuous subcutaneous or IV infusion

Chronic pain: SPH PACU **– follow SPH, site specific protocol and order set:**
- Continuous IV infusion of rates up to 6.67 mg/minute (400 mg/hour) to a maximum dose of 1200 mg over 3 hours

Post-operative pain:
- regimens may vary – follow site specific protocols and pre-printed orders
- use ideal body weight to calculate dose:
  1 to 1.5 mg/kg IV direct, followed by 0.5 to 1.5 mg/kg/hour (to a maximum of 120 mg/hour) continuous IV infusion for 24 hours post-op
- maximum duration: 48 hours

dose adjustment: decrease maintenance doses for patients with severe heart failure or liver disease

Potential Hazards of Parenteral Administration

- anaphylactoid reactions
- thrombophlebitis from prolonged infusions, transient burning at injection site
- rarely, tissue necrosis and sloughing

Important Implications

Contraindications/Cautions
- uncontrolled seizures, bradycardia, second or third degree heart block, hypovolemia
- solutions containing preservatives should **not** be used for spinal or epidural block
- use caution when administering with other antiarrhythmics
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- early onset (low doses): tinnitus, metallic taste, lightheadedness, perioral numbness, headache; then, slurred speech, seizures.
- late onset: CNS depression, sedation, leading to coma
- myocardial depression, bradycardia, hypotension, hypertension, cardio-vascular collapse, cardiac automaticity, prolongation of the PR interval and widening of the QRS complex.

Monitoring
- electrolytes, renal function and liver function
- signs of toxicity
- pain, sedation

Other
- also used as a diluent to reconstitute some specific medications to decrease pain of injection
- possible cross sensitivity with other amide local anesthetics

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linezolid

Warnings	Classification antibacterial, oxazolidinone	Alternate Names ZYVOXAM

Indications

- treatment of serious and life-threatening infections caused by gram positive organisms, including vancomycin-resistant enterococcus faecium (VRE) or methicillin-resistant staphylococcus aureus (MRSA)
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- solution may be yellow, and colour may intensify over time without loss in potency

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, and Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	infuse dose over 30 to 120 minutes flush IV line with NS or D5W prior to and following each dose	Basic Monitoring
Continuous IV infusion	NO		

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linezolid

Dosage

- 600 mg IV Q12H for 7 to 28 days

Switch to oral route as soon as possible; oral dose is equivalent to IV dose

Potential Hazards of Parenteral Administration

- phlebitis/thrombophlebitis
- skin reactions; erythema, rash

Important Implications

Contraindications/Cautions

Contraindications:
- hypersensitivity to linezolid or any component of the formulation
- use with (or within 2 weeks) of MAO inhibitors
- linezolid is a weak, reversible monoamine oxidase inhibitor (MAOI- A and MAOI-B); avoid combining with adrenergic agents, serotonergic agents, meperidine, dextromethorphan, and foods with high tyramine content

Caution:
- patients who develop recurrent nausea and vomiting, unexplained acidosis, or low bicarbonate levels need immediate evaluation
- in patients with pre-existing myelosuppression or chronic infection (including previous or current antibiotic treatment)
- prolonged use may result in fungal or bacterial superinfection, including C. difficile-associated diarrhea (CDAD) and pseudomembranous colitis; CDAD has occurred more than 2 months after antibiotic treatment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- diarrhea, nausea, vomiting
- headache, dizziness, tinnitus, blurred vision, optic neuropathy, peripheral neuropathy, hypertension
- elevated liver enzymes
- leukopenia, decreased hemoglobin, thrombocytopenia,
- myelosuppression with therapy greater than 2 weeks
- persistent diarrhea and/or nausea/vomiting, potentially progressing to lactic acidosis, even as late as 2 months or more after last dose

Monitoring
- weekly CBC and platelets if anticipated use is longer than 2 weeks, particularly in patients with pre-existing bleeding, myelosuppression, thrombocytopenia, or taking medications that cause bone marrow suppression

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LORazepam

Warnings	Classification anxiolytic-sedative anticonvulsant	Alternate Names ATIVAN

Indications

- short-term relief of acute anxiety/agitation
- anticonvulsant for management of status epilepticus
- prevention of nausea and vomiting in combination with antiemetics during chemotherapy
- alleviation of symptoms of acute alcohol withdrawal

Reconstitution and Stability

- vials are stored refrigerated and protected from light
- do not use if solution is discoloured or cloudy
- unopened vials may be stored for up to 60 days at room temperature

Compatibility

- compatible with NS, D5W, sterile water for injection

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Intramuscular	YES	deeply into muscle	Intermediate Monitoring
IV direct	YES	dilute in equal volume of compatible solution; maximum rate: 2 mg /minute	Advanced Monitoring
IV intermittent	YES	dilute in 50 mL and give over 15 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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LORazepam

Dosage

Anxiety/agitation: 0.5 mg to 2 mg IM/IV/SUBCUT every 1 to 6 hours PRN (range 1 to 10 mg/day)

elderly or debilitated patients: start with 1 to 2 mg/day in 2 or 3 divided doses

Status epilepticus: 2 to 4 mg IV direct once, may repeat in 3 to 5 minutes if seizures persist

Anticipatory or breakthrough nausea and vomiting for emetogenic chemotherapy: 0.5 mg to 2 mg IV/IM every 6 hours PRN, as an adjunct to conventional antiemetics

Alcohol Withdrawal:
0.5 mg to 4 mg IM or IV Q1H to Q2H PRN (or follow site protocol eg.CIWA)

Potential Hazards of Parenteral Administration

- pain, burning and redness at the injection site
- antidote: flumazenil IV

Important Implications

Contraindications/Cautions
- use with caution in elderly patients and patients with limited pulmonary reserve due to risk of hypoventilation and hypoxic cardiac arrest
- use with caution in combination with other CNS depressant medications
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- CNS depressant, sedation, dizziness, vertigo (more pronounced in the elderly), anterograde amnesia, depression, mental confusion, and hypotension or hypertension

Monitoring
- notify physician if respiratory rate falls below 8 breaths per minute

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loxapine

Warnings	Classification antipsychotic	Alternate Names LOXAPAC loxapine HCl

Indications

- management of acute and chronic psychosis
- pharmacologic management of agitated and/or aggressive patients

Reconstitution and Stability

- store at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Intramuscular	YES		Intermediate Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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loxapine

Dosage

Psychoses:
- 12.5 to 50 mg IM/subcutaneous every 4 to 6 hours until symptoms controlled.

Rapid tranquilization in hostile and aggressive acutely schizophrenic patients:
- 12.5 to 25 mg IM every hour until the initial "severe" or "very severe" symptoms are controlled
- recommended maximum dose: 50 mg in 4 hours and 250 mg in 24 hours

Agitated and/or aggressive patients:

	Dose (IM or SUBCUT)	Maximum Dose in 24 hours
very elderly / fragile	2.5 to 5 mg every hour as needed	30 mg
elderly / medically stable	5 to 10 mg every hour as needed	75 mg
younger / medically stable	10 to 20 mg every hour as needed	160 mg

Potential Hazards of Parenteral Administration

- hypotension, tachycardia

Important Implications

Contraindications/Cautions
- contraindicated in patients with severe drug-induced depression, circulatory collapse, and comatose patients
- use with extreme caution in patients with a history of seizure disorders or cardiovascular disorders

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- most frequent: transient initial drowsiness; tolerance usually develops with continued therapy
- extrapyramidal reactions occur frequently and include tremor, rigidity, excessive salivation, masked facies, and akathisia; less often acute dystonic reaction and tardive dyskinesia may occur
- lowered seizure threshold

Other
- loxapine is NOT approved by the manufacturer to be given by the intravenous route (due to propylene glycol in formulation, which is cardiotoxic)
- if severe hypotension occurs NORepinephrine or PHENYLephrine may be used; epinephrine should NOT be used as loxapine inhibits epinephrine's pressor effect and a further lowering of blood pressure may occur

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magnesium sulfate

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	electrolyte	

Indications

- magnesium replacement
- ventricular tachycardia, fibrillation, torsades de pointes
- prevention and control of seizures in severe pre-eclampsia or eclampsia
- fetal neuroprotection for imminent or planned pre-term birth
- adjunctive agent for severe acute asthma exacerbations

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with NS, dextrose solutions, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	reserve for patients with no IV access (painful) inject deeply into upper outer quadrant of buttock in divided doses	Intermediate Monitoring
IV direct	YES	**by physician only** or in emergency/ urgent situations cardiac arrest: maximum concentration of 200 mg/mL; give over 1 to 2 minutes	Advanced Monitoring
IV intermittent	YES	magnesium replacement o dilute 2 g in 50 mL; infuse over 30 to 60 minutes o dilute 5 g in 100 mL; infuse over 3 to 4 hours anticonvulsant in pre-eclampsia/ eclampsia; fetal neuroprotection Loading dose: dilute 4 g in 50 mL; infuse over 30 minutes (or give loading dose via bolus feature from continuous infusion bag) Torsades de pointes with pulse dilute 2 g in 50 mL; infuse over 15 minutes asthma, severe acute exacerbations dilute 2 g in 50 mL; infuse over 20 minutes *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Advanced Monitoring Perinatal Monitoring Advanced Monitoring Advanced Monitoring
Continuous IV infusion	YES	Loading dose may be given via bolus feature from continuous infusion bag **standard solution concentration:** 40 mg/mL: o **if 200 mg/mL vial supplied**: remove 100 mL from 500 mL bag, then add 20 g to bag o **if 500 mg/mL vial supplied**: add 20 g to 500 mL bag o 20 g in SWFI 500 mL premixed bags *rate must be controlled with an IV infusion pump*	Advanced Monitoring Perinatal Monitoring

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magnesium sulfate

Dosage

Magnesium (Mg) Replacement for Hypomagnesemia:
- mild to moderate (serum Mg 0.5 to 0.69 mmol/L): 5 g (20 mmol Mg) IV Q24H for 1 to 3 doses
- severe non-life threatening (serum Mg less than 0.5 mmol/L): 5 g (20 mmol Mg) IV Q12H to Q24H for 3 to 4 doses
- for GFR less than 30 mL/min: 2 g (8 mmol) or 5 g (20 mmol Mg) IV once, then repeat serum Mg level
- **or**, as per specific site protocol

Prevention of seizures in pre-eclampsia or seizure control in eclampsia; fetal neuroprotection when pre-term birth is imminent or planned:
- Loading dose of 4 g IV over 30 minutes, followed by 1 g/hour continuous IV infusion
- severe pre-eclampsia or eclampsia: continue IV infusion for 24 hours after delivery
- fetal neuroprotection: continue IV infusion until delivery up to maximum duration of 24 hours

Torsades de pointes with pulse (not in cardiac arrest):
2 g IV intermittent; may follow with 0.5 to 1 g/hour continuous IV infusion, titrated to effect

For ventricular fibrillation/pulseless ventricular tachycardia due to suspected hypomagnesemia or Torsades de pointes **(cardiac arrest)**: 2 g IV direct

Asthma, severe acute exacerbations: 2 g IV over 20 minutes once

- maximum dose: 30 g/day
- renal insufficiency: maximum of 20 g/48 hours

Potential Hazards of Parenteral Administration

- hypotension, respiratory and cardiac depression especially with rapid infusion rates
- antidote for respiratory depression: calcium chloride or calcium gluconate
- high alert medication:
  - magnesium sulfate for injection at concentrations above 20% (200 mg/mL)

Important Implications

Contraindications/Cautions
- contraindication: heart block
- caution with patients receiving digitalis preparations or neuromuscular blocking agents
- caution: potentiates the effects of other CNS depressants
- safe for use in pregnant and lactating women; refer to Lexicomp or Micromedex

Side effects
- cardiac, CNS, and respiratory depression, flushing, sweating, depression of reflexes and hypotension; these effects are usually signs of excessive magnesium administration

Monitoring
- serum magnesium levels; serum creatinine
- deep tendon reflexes can be assessed to detect onset of magnesium toxicity
- for antepartum patients, refer to applicable nursing care standards for fetal surveillance

Other
- IV administration: onset immediate; duration 30 minutes
- IM administration: onset 1 hour; duration 3 to 4 hours

- magnesium sulfate 20% contains 200 mg/mL magnesium sulfate

200 mg magnesium sulfate = 0.8 mmol magnesium = 1.6 mEq magnesium

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mannitol

Warnings	Classification	Alternate Names
vesicant	osmotic diuretic	OSMITROL

Indications

- treatment of oliguria or anuria; promotion of diuresis in ascites and edema
- reduction of elevated intracranial pressure, cerebral edema or increased intraocular pressure

Reconstitution and Stability

- store at room temperature; DO NOT refrigerate
- if crystals are present, they may be re-dissolved by immersing in hot water and shaking periodically; cool to body temperature before use

Compatibility

- compatible with D5W, NS

Preparation and Administration

- *Peripheral IV: use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	**by physician only** undiluted up to 50 g, over 3 to 5 minutes	Basic Monitoring
IV intermittent*	YES	• do not use solution if crystals present; administer through a 0.2 micron in-line filter • undiluted, over several minutes to hours • if dose is less than amount in bag, infuse dose then discard remainder of bag (programmed as a primary fluid in Alaris pump)	Basic Monitoring
Continuous IV infusion	NO		

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mannitol

Dosage

- **20% solution = 200 mg/mL (1 g mannitol = 5 mL)**
- Dose is individualized according to the condition being treated and the patient's fluid requirements, urinary output and response.

Oliguria, edema, ascites:
- test dose: required for patients with impaired renal function to determine renal response to mannitol
  - 12.5 g or 0.2 g/kg IV over 3 to 5 minutes
  - response is adequate if 30 to 50 mL of urine is excreted over the next 2 to 3 hours
  - if no renal response, may give a second test dose. If still no renal response, mannitol should not be used.
- maintenance dose: 50 to 100 g/ day IV over 2 to 6 hours

Reduction of intraocular pressure:
- 1.5 to 2 g/kg IV over 30 to 60 minutes

Reduction of intracranial pressure:
- loading dose: 1 to 1.5 g/kg IV over 10 to 20 minutes
- maintenance dose: 0.25 to 0.5 g/kg IV over 20 to 60 minutes every 4 to 6 hours
- measure serum osmolality 15 minutes after administration: if more than 320 milliosmoles, do not repeat dose

Potential Hazards of Parenteral Administration

- thrombophlebitis at injection site (central line preferred)
- extravasation risk: vesicant, may produce local edema and skin necrosis
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- severe allergic reactions, anaphylaxis; antidote: epinephrine

Important Implications

Contraindications/Cautions
- contraindicated:
  - in patients with active intracranial bleeding except during craniotomy
  - in patients with congestive heart failure, severe pulmonary edema or congestion
  - in patients with severe dehydration or anuria from severe renal disease
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea, vomiting, acidosis, chills, fever, dizziness, urticaria
- circulatory overload, hypotension, hypertension, tachycardia, angina-like pain

Monitoring
- patients should be catheterized; monitor urine output, fluid and electrolyte balance (signs of electrolyte imbalance: thirst, muscle cramps, weakness)
- in cerebral edema: monitor intracranial pressure and observe clinical status of the patient
- serum osmolality

Other

Therapeutic Goal	Onset of Action	Duration of Action
diuresis	15 to 30 minutes	2 to 8 hours
ocular pressure reduction	30 to 60 minutes	4 to 6 hours
intracranial pressure reduction	15 minutes	3 to 8 hours

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measles-mumps-rubella vaccine

Warnings	Classification vaccine, active immunizing agent	Alternate Names measles-mumps-rubella vaccine (live, attenuated) M-M-R II, PRIORIX

Indications

- active immunization against infection by measles, mumps and rubella
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C), protect from light
- PRIORIX brand: Reconstitute the vial (containing pellet of lyophilized vaccine) with the supplied diluent (sterile water for injection). Shake the vial gently until pellet is dissolved. Administer immediately after reconstitution or within 8 hours (if kept refrigerated).
- M-M-R II brand: Reconstitute the vial (containing yellow plug of lyophilized vaccine) with the supplied diluent (sterile water for injection). Shake to mix thoroughly - if dissolution does not occur within 2 minutes, do not use and return to pharmacy. The reconstituted solution should be clear yellow. Administer immediately after reconstitution or within 8 hours (if kept refrigerated).

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	M-M-R II brand PRIORIX brand, preferred route	Basic Monitoring
Intramuscular	YES	PRIORIX brand **only**	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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measles-mumps-rubella vaccine

Dosage

measles-mumps-rubella (MMR) vaccine

- give entire contents of reconstituted vial (0.5 to 0.7 mL) subcutaneously
- two doses required: give one dose now and repeat in 28 days

For further information refer to MMR vaccine at BC Centre for Disease Control Immunization Manual:
Part 4: Biological Products (Vaccines & Immune Globulins)

Potential Hazards of Parenteral Administration

- anaphylaxis: epinephrine should be readily available
- tenderness, redness, swelling, induration, wheal and flare reaction, urticaria

Important Implications

Contraindications/Cautions
Contraindications:
- Must not be given to those with a history of *anaphylactic* reaction to:
  - a previous dose of any type of measles, mumps or rubella vaccine
  - components of the vaccine: (M-M-R II: neomycin, sorbitol, sucrose, sodium phosphate, human albumin, fetal bovine serum, and hydrolyzed gelatin); (PRIORIX: neomycin, lactose, amino acids, human albumin, mannitol, and sorbitol; pre-filled syringe of PRIORIX diluent contains latex). See package insert for full list.

- Pregnancy/Lactation: **contraindicated in pregnancy**
  - Additional information: BC Centre for Disease Control Immunization manual-Part 2: Immunization of Special Populations (go to Other high risk conditions ->People Who are Pregnant or Planning a Pregnancy)

Side effects
- moderate fever, rash, malaise, headache, and nausea, myalgia, and paresthesia
- thrombocytopenia
- encephalitis
- acute transient arthritis or arthralgia; 25% of post-pubertal females may experience arthralgia, and 10% may have arthritis-like signs and symptoms

Other
- MMR vaccine should be given on the same day or delayed 4 weeks after administration of another live parenteral vaccine.
- Immune globulin preparations (including postpartum RhIg) and/or blood products can interfere with the immune response of MMR containing vaccine.
  - Spacing may be required. Refer to Part 4-Biological Products (Vaccines & Immune Globulins) (go to Immune globulins (HBIg, Ig, RabIg, TIg, VarIg)->Immune Globulin Preparations or Blood: Timing Intervals for Vaccines Containing Live Measles, Mumps, Rubella or Varicella Virus)

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medroxyPROGESTERone

Warnings	Classification	Alternate Names
hazardous drug group 2	progestin	DEPO-PROVERA medroxyPROGESTERone acetate

Indications

- endometriosis in non-pregnant women
- palliation of advanced endometrial and renal cancer
- metastatic carcinoma of the breast in post-menopausal women
- contraception

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- available as 1 mL prefilled syringes or vials, providing 150 mg/mL
- suspension, shake well before use
- store at room temperature

Compatibility

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into the gluteal or deltoid muscle; rotate site	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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medroxyPROGESTERone

Dosage

- Endometriosis: 50 mg IM weekly or 100 mg IM every 2 weeks for 6 months.
- Endometrial & Renal Cancer: 400 to 1000 mg IM weekly, followed by 400 mg IM monthly once disease has stabilized.
- Breast Cancer: 500 mg IM daily for 28 days, then 500 mg IM twice weekly for as long as disease is responding to therapy
- Contraception: 150 mg IM every 3 months. It is recommended to give within 5 days of the onset of a normal menstrual period or within the first 5 days postpartum

Potential Hazards of Parenteral Administration

- a residual lump, change in colour of skin, or sterile abscess at the injection site

Important Implications

Contraindications/Cautions
- Contraindicated in thromboembolic disorders, undiagnosed vaginal and/or urinary tract bleeding, liver disease and pregnancy
- Caution: anaphylaxis, urticaria
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- thromboembolic phenomena and pulmonary embolism

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melphalan

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic, alkylating agent	ALKERAN

Indications

- used in autologous stem cell transplant (SCT) conditioning regimens
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet
- complete administration within 90 minutes of reconstitution

Compatibility

- compatible with NS only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute to 0.1 to 0.45 mg/mL concentration in NS; doses over 250 mg will be divided into two bags **central line only** infuse over 15 to 60 minutes *rate must be controlled with an IV infusion pump*	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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melphalan

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Example:
- Autologous SCT conditioning regimens: 200 mg/m^2 IV

- Dosing adjustments are required for myelosuppression or renal failure

  Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity reactions (pruritus, rash, exanthema, urticaria)
- extravation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- bone marrow depression is a major and dose-limiting toxicity - it usually occurs after 2 to 3 weeks, although in some patients it can occur within the first week.
- nausea and vomiting occur most frequently after large doses
- transient maculopapular skin rash occurs occasionally

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meningococcal C conjugate vaccine

Warnings	Classification	Alternate Names
	vaccine	NEISVAC-C

Indications

- active immunization for the prevention of meningitis and/or septicemia caused by *Neisseria meningitidis* serogroup C.
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C)
- shake well to obtain a homogenous suspension

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	into the deltoid region	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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meningococcal C conjugate vaccine

Dosage

- routine primary immunization in previously unimmunized adults: 0.5 mL IM once
- For other indications and dosing regimens refer to NEISVAC-C monograph in Part 4 – Biological Products at BC Centre for Disease Control Immunization.

Potential Hazards of Parenteral Administration

- pain at injection site, erythema, and swelling can occur; resolves within 24 to 72 hours.

Important Implications

Contraindications/Cautions

- contraindicated if hypersensitivity to tetanus toxoid or any component of this vaccine (refer to package insert)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- headache, fever, malaise, myalgia – usually mild and resolve spontaneously

Other

- may be given at same time as most other vaccines, at different sites (refer to package insert)
- NEISVAC-C contains meningococcal polysaccharide group C 10 mcg/0.5 mL and tetanus toxoid 20 mcg/0.5 mL
- immunization with this vaccine does **not** substitute for routine tetanus immunization.

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meningococcal quadrivalent conjugate vaccine

Warnings	Classification	Alternate Names
	vaccine	MENACTRA, MENVEO, NIMENRIX

Indications

- to be administered in medically high risk individuals (functional or anatomic asplenia; congenital immunodeficiency states [e.g. complement, properdin, or factor D deficiencies, primary antibody deficiencies], hematopoietic stem cell transplant, islet cell transplant, solid organ transplant)
- for immunization against *Neisseria meningitidis* serogroups A,C,Y and W-135
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- MENACTRA: refrigerate (2 to 8°C)

- MENVEO: refrigerate (2 to 8°C)
  - Reconstitute one MenA lyophilized powder vial with the entire contents from one MenCWY-135 liquid vial.
  - Gently invert or swirl until the vaccine is dissolved.
  - Use reconstituted vaccine immediately, or within 2 hours if stored at or below room temperature (25°C)

- NIMENRIX: refrigerate (2 to 8ºC)
  - Reconstitute by adding the entire contents of the pre-filled diluent syringe to the vial.
  - Use reconstituted vaccine immediately, but is stable for up to 8 hours if stored at room temperature.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	▪ deltoid muscle preferred ▪ If patient is anticoagulated, to decrease risk of hematoma formation: administer into deltoid muscle (not gluteus), use fine gauge needle (23 gauge or smaller caliber); apply firm pressure on site without rubbing for 5 minutes.	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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meningococcal quadrivalent conjugate vaccine

Dosage

Patients undergoing splenectomy:

- Pre-splenectomy: 0.5 mL IM at least 14 days prior to elective splenectomy. Re-immunize every 5 years.
- Post-splenectomy (non-elective): 0.5 mL IM 14 or more days post-splenectomy. Give prior to discharge, if discharged before 14 days. Re-immunize every 5 years.

Medically high risk individuals : 0.5 mL IM once, reinforcement doses and whether meningococcal C conjugate vaccine is required is based on age at which first dose is given.

Close contacts of a case of invasive meningococcal disease (serogroups A, Y, or W-135) that meet the public health criteria for chemoprophylaxis: 0.5 mL IM once

For additional information refer to BC Centre for Disease Control Immunization.

- Part 2 – Immunization of Special Populations
- Part 4 – Biological Products (meningococcal quadrivalent conjugate vaccines monograph)

Potential Hazards of Parenteral Administration

- local pain, redness, swelling at site of injection
- epinephrine should be readily available for immediate treatment of anaphylactoid or hypersensitivity reactions

Important Implications

Contraindications/Cautions

- History of anaphylaxis to a previous dose of any meningococcal or diphtheria containing vaccine. Also contraindicated if hypersensitivity to any component of the specific BRAND being administered. See manufacturer's monograph or package insert.
- MENACTRA: contraindicated if known history of Guillain-Barré Syndrome
  MENVEO: prior history of Guillain-Barré Syndrome is a relative precaution to MENVEO.
- should not be administered during acute febrile illness
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- systemic reactions including headache, malaise, fever, muscle soreness, nausea

Other

- MENACTRA = meningococcal (groups A, C, Y and W-135) polysaccharide diphtheria toxoid conjugate vaccine. It is covalently linked to diphtheria toxoid, but is NOT indicated for immunization against diphtheria.
- MENVEO = meningococcal (groups A, C, Y and W-135) oligosaccharide CRM197 conjugate vaccine
- NIMENRIX = purified capsular polysaccharides of Neisseria meningitides serogroups A, C,Y and W-135, each conjugated to tetanus toxoid; but is NOT indicated for immunization against tetanus.
- may be given at same time as other vaccines, at different sites

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meperidine

Warnings	Classification partial opioid agonist, analgesic	Alternate Names DEMEROL pethidine hydrochloride

Indications

- treatment of drug induced or blood induced rigors or post-operative shivering
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, ringers or lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		
Intramuscular	YES		
IV direct	YES	dilute to 10 mL with sterile water for injection or NS; maximum concentration 10 mg/mL Maximum rate: 25 mg/minute	Intermediate Monitoring
IV intermittent	YES	dilute dose in D5W 25 mL; give over 5 to 10 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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meperidine

Dosage

Drug induced or blood induced rigors or post-operative shivering

25 to 50 mg IV / subcutaneous / IM

Potential Hazards of Parenteral Administration

- respiratory depression, cardiovascular depression (increased with rapid IV injection);
- repeated subcutaneous administration may cause local tissue irritation, pain and induration

- antidote: naloxone

Important Implications

Contraindications/Cautions
- Contraindicated in patients receiving or who have received monoamine oxidase inhibitors within 14 days
- Caution: patients with renal dysfunction should not receive multiple doses as accumulation of the toxic metabolite (normeperidine) can occur, causing CNS excitation (e.g. twitching)
- Caution: in patients with cranial injuries, respiratory insufficiency, convulsive disorders, cardiac arrhythmias, or hypersensitivity

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- orthostatic hypotension, tachycardia, vasodilation, sedation, dizziness.

Monitoring
- toxicity: respiratory rate, sedation scale
- patient should be supine during injection and observed closely

Other
- Institute for Safe Medication Practices (ISMP) Canada, pain management authorities and the BC Provincial Formulary do not support the use of meperidine for analgesia.

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meropenem

Warnings	Classification Beta-lactam, carbapenem antibiotic	Alternate Names MERREM

Indications

- treatment of documented or suspected infections involving multi-drug resistant organisms
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- powder is stable at room temperature
- reconstitute with sterile water for injection (SWI) as follows:
  - 500 mg vial: add 10 mL to provide 50 mg/mL solution
  - 1 g vial: add 20 mL to provide 50 mg/mL solution
- solutions are **stable for 4 hours** at room temperature following reconstitution or dilution
- when Minibag plus system provided, administer medication immediately following activation

Compatibility

- compatible with NS (preferred) - stable for 4 hours at room temperature
- compatible with D5W - for immediate use only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	no further dilution; give slowly over 5 minutes	Basic Monitoring
IV intermittent	YES	*preferred route* dilute doses: o 500 mg in NS 50 mL o 1000 mg in NS 50 mL o 2000 mg in NS 100 mL administer over 15 to 30 minutes if requested, may be administered over 3 hours in select critically ill patients	Basic Monitoring
Continuous IV infusion	NO		

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meropenem

Dosage

- usual: 500 mg IV Q6H
- obstetrics: 1000 mg IV Q8H
- meningitis or cystic fibrosis: 2000 mg IV Q8H

- Dose adjustment necessary for renal dysfunction:

Creatinine Clearance (Adults)	Dose	
	usual	meningitis or cystic fibrosis
30 to 50 mL/minute	500 mg IV Q8H	2000 mg IV Q12H
10 to29 mL/minute	500 mg IV Q12H	1000 mg IV Q12H
Hemodialysis	500 mg IV Q24H given after dialysis on dialysis days	1000 mg IV Q24H given after dialysis on dialysis days
Continuous Ambulatory Peritoneal Dialysis	500 mg IV Q24H	1000 mg IV Q24H

Potential Hazards of Parenteral Administration

- inflammation at injection site, phlebitis/thrombophlebitis
- anaphylaxis

Important Implications

Contraindications/Cautions
- Contraindicated if allergy to other carbapenem antibiotics (eg. imipenem-cilastatin, ertapenem)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- headache, seizures
- rash, pruritus
- diarrhea, nausea/vomiting , constipation
- anemia

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mesna

Warnings	Classification	Alternate Names
	uroprotector	UROMITEXAN

Indications

- reduction and prevention of urinary tract toxicity (hemorrhagic cystitis) caused by oxazaphosphorine antineoplastics (cyclophosphamide, ifosfamide)

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS, D5W, dextrose-saline combinations, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	o dilute dose in 50 to 100 mL (to a concentration of 1 to 20 mg/mL) infuse over 15 to 30 minutes o dilute dose in up to 1000 mL (to a concentration of 1 to 20 mg/mL) infuse over 1 to 24 hours	Basic Monitoring
Continuous IV infusion	NO		

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mesna

Dosage

The mesna dose is a percentage of the oxazaphosphorine (e.g. ifosfamide or cyclophosphamide) dose given. Hour 0 is the start time of the oxazaphosphorine infusion.

Numerous dosing schedules exist. **Refer to the protocol being used**.

Hemorrhagic Cystitis Prophylaxis (examples):

- 20% of the oxazaphosphorine dose at hour 0, 5, and 9; **or**
- 12% of the ifosfamide dose at hour 0, then 50% of the ifosfamide dose (admixed with ifosfamide) and infused over 24 hours, followed by 25% of the ifosfamide dose over 12 hours; **or**
- Haploidentical stem cells transplantation:
  - 80% of cyclophosphamide dose IV, *divided* and given TID over 15 to 30 minutes
  - continue for duration of cyclophosphamide treatment plus two additional days

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- venous irritation may occur (rare)

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- diarrhea, nausea, abdominal pain, headache, pain in limbs and joints, increase in heart rate, hypersensitivity

Other

- false positive results may occur with sodium nitroprusside tests for urinary ketones (e.g. CHEMSTRIP, MULTISTIX, LABSTIX); the sulfonate group in mesna is presumed to interact with the sodium nitroprusside reagent.

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methotrexate

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic; antimetabolite	amethopterin, methotrexate sodium

Indications

- oncology: treatment of trophoblastic neoplasms, leukemia, non-Hodgkin's lymphomas, and solid tumours
  - for *all* indications see BC Cancer benefit drug list
  - restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- symptomatic control of severe psoriasis and inflammatory arthritis
- as an immunosuppressant for the prevention of graft versus host disease (GVHD)
- ectopic pregnancy
- placenta increta or percreta

Reconstitution and Stability

- will be sent to the ward with a label indicating storage conditions and the expiry date
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS, dextrose 5% in sodium chloride 0.9%

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring or according to protocol
Intramuscular	YES		
IV direct	YES	Maximum rate 10 mg / minute	
IV intermittent	YES	dilute in 50 to 1000 mL; administer over 20 minutes to 24 hours *rate must be controlled with an IV infusion pump*	
Continuous IV infusion	NO	This IV infusion, formerly known as continuous, has been reclassified as IV intermittent	
Intrathecal	YES	**by physician only**	

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methotrexate

Dosage

Oncology

Follow specific protocol; dose and schedule depend on protocol and patient response:

- Usual range 25 mg/m^2 /dose to 300 mg/m^2 /dose IV frequency and duration of treatment varies (doses of 100 mg/m^2 or more may require leucovorin rescue).
- High dose (with leucovorin rescue): 1,000 mg to 8,000 mg /m^2 (1 g to 8 g /m^2) IV given over 4 to 24 hours
- Usual intrathecal (IT) dose is 12 mg, frequency as indicated in protocol

- Refer to BC Cancer Drug Manual Monographs

Ectopic pregnancy:

- 50 mg/m^2 IM once (various IM regimens have been used)

GVHD prophylaxis:

- 5 mg/m^2 or 10 mg/m^2 or 15 mg/m^2 IV intermittent - see site specific protocols

Psoriasis / psoriatic arthritis / rheumatoid arthritis:

- usual range is10 to 25 mg subcutaneous once weekly (if oral route cannot be used); rarely 30 mg weekly

Placenta increta or percreta (only used in select circumstances, various regimens exist):

- example 50 mg or 1 mg/kg IM every other day following delivery for a total of 3 or 4 doses, respectively

Dose adjustments: *renal insufficiency*: GFR 10 to 50 mL/minute – decrease dose by 50%;
GFR less than 10 mL/minute or on dialysis – methotrexate contraindicated
hepatic insufficiency: dose should be decreased

Potential Hazards of Parenteral Administration

- Extravasation risk: non-vesicant
  VCH see: Hazardous Drugs-Administration and Handling ; **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Contraindicated in Pregnancy/Lactation, refer to Lexicomp or Micromedex
- Caution: methotrexate clearance is delayed in patient's with "third space" compartments (e.g. pleural effusions, ascites) and toxicity may be enhanced. Drainage prior to methotrexate treatment is recommended.

Side effects

- bone marrow depression - may develop rapidly (within the first week); the nadir occurs in 7 to 14 days with recovery at 14 to 21 days.
- nausea and vomiting - more common with high dose therapy (starting within the first few hours of a dose), diarrhea, GI ulceration, glossitis, pharyngitis and stomatitis (usually starting a few days to a week after the first dose)
- renal toxicity: maintain alkaline urine and high urinary output with high dose methotrexate
- with high tumour burden, tumour lysis syndrome and subsequent hyperuricemia may occur, consider prophylaxis with allopurinol and hydrate accordingly
- hepatotoxicity (most likely to occur in patients receiving prolonged daily therapy)
- rashes and photosensitivity; alopecia occasionally occurs; usually reversible within a few months
- pulmonary toxicity can occur with all doses of methotrexate, although more often with chronic low-dose
- Neurologic complications: neurotoxicities can be seen with IT injection and with high-doses:
  - IT: aseptic meningitis (includes headache, neck rigidity, back pain, nausea, vomiting, fever, and lethargy), transverse myelopathy, encephalopathy (confusion, irritability, somnolence, ataxia, seizures)
  - For high-dose methotrexate (1,000 mg/m^2 or more) acute neurotoxicity: includes confusion, and seizures within 24 hours of treatment; subacute neurotoxicity: transient neurologic deficits, confusion and leukoencephalopathy

Monitoring

- hematologic, renal and hepatic function tests; patients at high risk of hyperuricemia monitor uric acid, electrolytes, calcium phosphate and LDH

Other:

- drug interactions: salicylates, sulfonamides and phenytoin displace methotrexate from albumin binding sites; toxicity potential of methotrexate is consequently increased
- antidote for methotrexate is leucovorin, refer to the leucovorin monograph, protocol by which patient is being treated or contact the Drug and Poison Information Centre (604-682-5050)
- leucovorin rescue administered within 24 to 36 hours – refer to leucovorin monograph

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methotrimeprazine

Warnings	Classification neuroleptic anxiolytic, analgesic, antiemetic	Alternate Names NOZINAN

Indications

- sedative and analgesic prior to surgery and in the treatment of moderate to severe pain
- treatment of psychotic disorders, anxiety and tension
- control of nausea and vomiting

Reconstitution and Stability

- store at room temperature; protect from light
- discard markedly discoloured solutions

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Continuous subcutaneous infusion	YES	**standard solution concentration** 0.4 mg/mL: dilute 100 mg in D5W 250 mL	Palliative Monitoring
Intramuscular	YES	deeply into large muscle mass; rotate injection sites	Intermediate Monitoring
IV direct	NO		
IV intermittent	YES	dilute up to 50 mg in D5W 50 mL; infuse over 30 to 60 minutes dilute more than 50 mg in D5W 100 mL; infuse over 1 to 2 hours	Intermediate Monitoring
Continuous IV infusion	NO		

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methotrimeprazine

Dosage

Usual dose:
- 10 to 25 mg IM/IV/subcutaneous every 4 to 8 hours as required.

In the elderly:
- initially 5 to 10 mg IM/IV/subcutaneous; increase dose slowly

Preoperative medication
- 5 to 25 mg IM/IV/subcutaneous 45 to 60 minutes before surgery

Potential Hazards of Parenteral Administration

- hypotension : usually occurs within 10 to 20 minutes after administration and can persist for 4 to 6 hours;
  - antidote: PHENYLephrine or NORepinephrine;
  - do NOT use epinephrine as may further decrease blood pressure
- pain at injection site
- local irritation with subcutaneous administration

Important Implications

Contraindications/Cautions
- contraindicated in comatose patients and patients with significant hypotension
- use with caution in patients with severe renal or hepatic disease.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects:
- excessive sedation
- hypotension, tachycardia
- extrapyramidal side effects and/or tardive dyskinesia

Monitoring
- keep patient supine for at least half an hour after administration

Other
- tachycardia and hypotension may occur when given concomitantly with atropine or scopolamine
- potentiates the anticholinergic effects of other anticholinergic drugs
- potentiates action of other CNS depressants: reduce dose by 50% if given with barbiturates or opioids

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methylene blue

Warnings	Classification	Alternate Names
vesicant	diagnostic agent	methylthionine chloride

Indications

- to aid in the identification of parathyroid glands during surgery
- methemoglobinemia
- diagnostic dye for parenteral and/or sterile procedures

Reconstitution and Stability

- stable at room temperature; single use vial, discard unused portion

Compatibility

- compatible with D5W, use immediately after dilution

Preparation and Administration

- * Peripheral IV: use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	**by physician only** or under the supervision of a physician ▪ undiluted over 5 to 10 minutes ▪ flush line before and after administration with D5W, 15 to 30 mL	Intermediate Monitoring
IV intermittent*	YES	methemoglobinemia: dilute in D5W 50 mL; infuse over 10 to 15 minutes visualization of parathyroid glands: dilute in D5W 500 mL; infuse over 1 hour ▪ flush line before and after administration with D5W, 15 to 30 mL	Intermediate Monitoring
Continuous IV infusion	NO		

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methylene blue

Dosage

- Methemoglobinemia: 1 to 2 mg/kg IV; may repeat dose in 1 hour if required
- Visualization of parathyroid glands: 5 mg/kg IV, starting 1 hour prior to surgery

Potential Hazards of Parenteral Administration

- stains tissue and turns urine or feces blue-green
- extravasation risk: vesicant,may result in necrotic abscesses
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- risk of serotonin syndrome: methylene blue is a monoamine oxidase inhibitor (MAOI); avoid other MAOIs and serotonergic drugs (e.g. SSRI)
- caution: large IV doses may produce methemoglobin & cyanosis
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, bladder irritation, dizziness, headache, blue discoloration of skin and body fluids
- abdominal pain, anemia, precordial pain, profuse diaphoresis, mental confusion, hypertension.

Others

- may induce hemolysis in patients with glucose 6 phosphate dehydrogenase (G6PD) deficiency

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methylnaltrexone

Warnings	Classification	Alternate Names
	peripheral opioid receptor antagonist	RELISTOR methylnaltrexone bromide

Indications

- treatment of opioid-induced constipation where conventional laxative treatments have failed or are not appropriate for patient circumstances.
- restrictions apply

Reconstitution and Stability

- store at 20 to 25°C (room temperature), do not freeze, protect from light
- supplied as a clear, colourless to pale yellow solution for subcutaneous injection

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	▪ administer into upper arm, abdomen or thigh; rotate injection sites ▪ patient should be seated or lying down during administration, monitor for dizziness when patient stands ▪ ensure close proximity to toilet facilities	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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methylnaltrexone

Dosage

The following table provides dosing for subcutaneous injection to be administered every other day as needed

Patient Weight (kg)	Dose	Volume (20 mg/mL)
33 to 37.9	6 mg	0.3 mL
38 to 61.9	8 mg	0.4 mL
62 to 114	12 mg	0.6 mL
115 to 126	18 mg	0.9 mL

- Patients whose weight falls above of the range in the table should be dosed at 0.15 mg/kg
- Severe renal impairment (CrCl below 30 mL/minute) or severe hepatic impairment: administer half of the normal dose

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions

- Contraindicated if known or suspected GI obstruction or patients at increased risk of recurrent GI obstruction.
- Caution if known or suspected GI lesions or impaired structural integrity of GI wall (eg. GI malignancy, peptic ulcer disease, Crohn's, diverticular disease), as drug increases risk of GI perforation. If patients develop severe, persistent, and/or worsening abdominal symptoms, discontinue drug.
- Discontinue if patient develops severe or persistent diarrhea.
- Use beyond 4 months has not been studied. Discontinue methylnaltrexone if opioids are discontinued.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- Gastrointestinal (GI): abdominal pain, flatulence and nausea, diarrhea
- Central Nervous System (CNS): dizziness
- Dermatologic: hyperhidrosis

Other

- Methylnaltrexone blocks μ-opioid receptors peripherally; in the GI tract, this reverses opioid-induced constipation. The drug does not readily cross the blood-brain barrier and therefore does not reduce the analgesic effect of opioids or precipitate opioid withdrawal (as is observed with centrally acting opioid antagonists such as naloxone).
- Onset of action: usually within 30 to 60 minutes

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methylPREDNISolone ACETATE long acting

Warnings	Classification corticosteroid	Alternate Names DEPO-MEDROL methylPREDNISolone ACETATE

Indications

- for sustained anti-inflammatory action in allergic, dermatological, and collagen diseases
- adjunctive therapy in acute episodes of arthritic disorders, ulcerative colitis, multiple sclerosis

Reconstitution and Stability

- store vials at room temperature
- suspension - shake well before withdrawing

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into gluteal muscle	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intra–articular and periarticular	YES	**by physician only**	Basic Monitoring
Intralesional	YES	**by physician only**	Basic Monitoring

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methylPREDNISolone ACETATE long acting

Dosage

Individualized depending on condition, route of administration and patient response.

- Intra-articular (local effect) :
  - small joints (interphalangeal): 4 to 10 mg
  - medium joints (elbow, wrist): 10 to 40 mg
  - large joints (knee, ankle, shoulder): 20 to 80 mg

- Intramuscular (systemic effect): 40 to 120 mg

- Intralesional (local effect for various dermatological disorders): 20 to 60 mg

Potential Hazards of Parenteral Administration

- subcutaneous and cutaneous atrophy
- post injection flare after intra-articular use
- sterile abscess
- hyper-pigmentation and hypo-pigmentation

Important Implications

Contraindications/Cautions
- injections for local effect are contraindicated in presence of acute infections
- caution is required with steroid therapy in patients with tuberculosis, peptic ulcer, systemic fungal infections, herpes simplex keratitis

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- short term (early onset): sodium and fluid retention, hypokalemia, hyperglycemia, hypertension, increased susceptibility to and masked symptoms of infection.
- long term: osteoporosis, thrombocytopenia, Cushing's syndrome, muscle weakness, loss of muscle mass, peptic ulcers

Other
- increased dose may be required in times of stress

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methylPREDNISolone sodium succinate

Warnings	Classification corticosteroid	Alternate Names SOLU-MEDROL

Indications

- treatment of responsive conditions including adrenal insufficiency, allergic reactions, dermatologic conditions, acute systemic lupus erythematosus, inflammatory bowel disease and status asthmaticus.
- immunosuppression to prevent and treat rejection of organ transplants

Reconstitution and Stability

Vial Size	Act-o-vial system volume of diluent	Final Concentration
40 mg	as supplied	40 mg/mL
125 mg	as supplied	62.5 mg/mL
500 mg	as supplied	125 mg/mL
1000 mg	as supplied	125 mg/mL

Vial Size	TEVA brand (vial) volume of sterile water for injection to be added	Final Concentration
40 mg	1 mL	40 mg/mL
125 mg	2 mL	62.5 mg/mL
500 mg	7.8 mL	62.5 mg/mL
1000 mg	15.6 mL	62.5 mg/mL

- **Act-o-vial system**: Press down on plastic top to force diluent into lower compartment, gently agitate to prepare solution, remove plastic top to access stopper/bung.
- single use vials; discard unused portion of all brands

Compatibility

- compatible with D5W, NS, dextrose-saline solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	*only suitable for low doses (up to 125 mg)* deeply into well-developed muscle (avoid deltoid)	Basic Monitoring
IV direct	YES	o up to 40 mg over at least 1 minute o greater than 40 mg over 5 minutes *maximum IV direct dose is 250 mg*	Basic Monitoring
IV intermittent	YES	*preferred route* dilute up to 1000 mg in 50 mL administer at the following rate: o 250 mg over 15 minutes o 251 to 500 mg over 30 minutes (autoimmune pulse therapy over 60 minutes) o 501 to 1000 mg over 60 minutes *rate must be controlled with infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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methylPREDNISolone sodium succinate

Dosage

- Usual: 10 to 500 mg IV, depending on condition being treated
- Status asthmaticus: 40 to 125 mg IV every 6 hours
- Immunosuppresive regimen to treat organ transplant rejection: 500 to 1000 mg IV daily for 3 to 5 days

NOTE: IV is preferred, however doses up to 125 mg may be given IM

Potential Hazards of Parenteral Administration

- cardiovascular collapse may occur with rapid IV injection of doses greater than 500 mg
- risk of anaphylaxis with doses of 1000 mg or more
- high incidence subcutaneous atrophy if administered into deltoid muscle

Important Implications

Contraindications/Cautions

- avoid injection into a locally infected site
- caution is required in patients with active peptic ulcer; active/latent infections (i.e. tuberculosis, fungal, and viral infections)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- short term (early onset): sodium and fluid retention, hypokalemia, hypocalcemia, hyperglycemia, increased susceptibility to and masked symptoms of infection, psychosis.
- long term: osteoporosis, osteonecrosis, thrombocytopenia, Cushing's syndrome, muscle weakness, loss of muscle mass, peptic ulcers.
- high dose (1000 mg or more) side effects include short term effects listed above, plus:
  - arrhythmias, cardiac arrest, congestive heart failure, hypotension, bradycardia.
  - seizures, increased intracranial pressure, headache.
  - avascular necrosis of bone may occur 3 months to 3 years after therapy (incidence 5%, range 3 to 40%)

Other

- equivalent anti-inflammatory dose: 4 mg methylPREDNISolone IV = 5 mg predniSONE oral
- if therapy longer than a few days, dose should be decreased gradually
- increased dose may be required in times of stress

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metoclopramide

Warnings	Classification	Alternate Names
	modifier of upper gastrointestinal tract motility antiemetic	MAXERAN, REGLAN metoclopramide HCl

Indications

- management of delayed gastric emptying, gastroesophageal reflux
- adjunct to facilitate small bowel intubation, radiological examination
- prevention and treatment of nausea and vomiting

Reconstitution and Stability

- store at room temperature
- protect from light
- solution should be colourless

Compatibility

- compatible with D5W, NS, dextrose 5% in sodium chloride 0.45%, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Continuous subcutaneous infusion	YES		Palliative Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	for doses up to 10 mg: give undiluted, preferably over 2 minutes maximum rate: 10 mg/minute	Basic Monitoring
IV intermittent	YES	dilute up to 50 mg in 50 mL dilute doses over 50 mg in 100 mL infuse over 15 to 30 minutes	Basic Monitoring
Continuous IV infusion	NO		

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metoclopramide

Dosage

General use, usual dose:
0.5 mg/kg/24 hours or 10 mg IM, IV or subcutaneous; may repeat 2 to 4 times daily

Small bowel intubation:
10 mg IV 15 minutes prior to intubation, or preferably when tip of tube reaches pyloric region

Prevention of emesis due to chemotherapy (mild to moderate emetogenic agents):
10 to 60 mg IV, 15 to 30 minutes prior to chemotherapy and repeated every 4 hours as required

Hyperemesis gravidarum:
5 to 10 mg IV or IM Q8H

Reduce dose in renal impairment:

Creatinine clearance	Dose
10 to 50 mL/minute	75% of usual dose
less than 10 mL/minute	50% of usual dose

Potential Hazards of Parenteral Administration

- anxiety and agitation with rapid IV administration

Important Implications

Contraindications/Cautions
- caution: may increase seizure frequency in patients with seizure disorder
- caution in patients with pheochromocytoma or receiving MAO inhibitors; may increase release of catecholamines

- Pregnancy/Lactation: refer to Lexicomp or Micromedex (avoid in patients with recent eclamptic seizures)

Side effects:
- sedation, diarrhea
- parkinsonism and/or other extrapyramidal effects with high doses and/or in renal impairment

Other
- may accelerate the absorption of drugs from the small bowel (e.g. diazepam, levodopa, lithium)
- may decrease the absorption of drugs from the stomach (e.g. digoxin)
- may enhance sedative effects of concurrently administered sedatives, hypnotics, or tranquillizers

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metoprolol

Warnings	Classification antihypertensive; antianginal cardioselective beta blocker	Alternate Names BETALOC, LOPRESOR metoprolol tartrate

Indications

- management of acute myocardial infarction (MI) in hemodynamically stable patients
- treatment of mild to moderate hypertension and angina pectoris when oral therapy not feasible
- management of hypertensive emergency
- peri-operative or diagnostic beta blockade

Reconstitution and Stability

- stable at room temperature
- protect from light

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted; doses up to 5 mg over 1 minute	Full Monitoring See site-specific restrictions
IV intermittent	YES	dilute dose in D5W 50 mL; infuse over 15 minutes *Rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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metoprolol

Dosage

Acute myocardial infarction:
5 mg IV direct followed by two additional 5 mg doses at 2 to 5 minute intervals

Hypertensive emergency:
2.5 to 5 mg IV direct: may repeat every 2 to 5 minutes to a total of 15 mg; repeat every 6 hours if needed

Mild to moderate hypertension or angina pectoris when oral route not tolerated:
2.5 to 15 mg IV intermittent every 6 hours

Diagnostic CT-Angiogram (as per site protocol):
usual dose: 5 mg IV direct Q5 MIN PRN to achieve target heart rate less than 60 to 65 beats per minute (maximum total dose 30 mg). Hold if systolic blood pressure is less than 100 mmHg.

Potential Hazards of Parenteral Administration

- acute cardiac failure
- severe sinus bradycardia: antidote - atropine
- partial heart block: antidote – atropine; if unresponsive initiate isoproterenol or temporary pacing
- bronchospasm: antidote – salbutamol
- profound beta-blockade: antidote when other measures have failed – glucagon

Important Implications

Contraindications/Cautions
- contraindicated in patients with sinus bradycardia, overt heart failure, cardiogenic shock, second or third degree block, or right ventricular failure secondary to pulmonary hypertension
- abrupt discontinuation after prolonged therapy may cause exacerbation of angina, MI or ventricular arrhythmias in patients with angina; taper dose prior to discontinuing
- use with caution in patients with cardiac, renal, hepatic impairment or uncontrolled diabetes mellitus

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- may precipitate or potentiate heart failure

Monitoring
- if adverse cardiovascular effects are observed, stop IV therapy and monitor the patient

Other
- onset of action: immediate; maximum response: about 20 minutes; duration of action: 5 to 8 hours
- route conversion: 1 mg IV dose is approximately equal to 2.5 mg orally

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metroNIDAZOLE

Warnings	Classification antibacterial, antiprotozoal	Alternate Names FLAGYL

Indications

- treatment of infections caused by susceptible strains of microorganisms, includes:
  - treatment of serious abdominal infections due to susceptible anaerobic bacteria
  - treatment of protozoal infections e.g. amebiasis, giardiasis, trichomoniasis

Reconstitution and Stability

- premixed bag 500 mg in NS 100mL is stable at room temperature
- do not use if solution is cloudy

Compatibility

- compatible with NS, D5W, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	infuse 500 mg/100 mL bag over 20 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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metroNIDAZOLE

Dosage

- Usual: 500 mg IV every 12 hours
- Fulminant C*lostridioides difficile* infection: 500 mg IV every 8 hours
- Intracranial abscess: 7.5 mg/kg (usually 500 mg) IV every 6 to 8 hours (maximum dose: 4 g / day)
- Surgical prophylaxis: 500 mg IV 1 hour pre-op

- reduce dose in patients with severe hepatic impairment

Potential Hazards of Parenteral Administration

- local reactions
- thrombophlebitis

Important Implications

Contraindications/Cautions

- Contraindication: not for use in patients with Cockayne syndrome
- Caution: in patients with severe hepatic impairment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- metallic taste, nausea and vomiting
- peripheral neuropathy manifested as tingling of extremities; ataxia; dizziness; drowsiness; headache; seizures (rare)

Monitoring

- monitor CBC since leukopenia and neutropenia (not related to bone marrow depression) may occur; reversible on discontinuation of the drug

Other

- disulfiram-like reactions may occur with concomitant alcohol use (flushing of face, palpitations, hyperventilation, dyspnea, nausea and vomiting)
- may discolour urine dark brown
- 500 mg metroNIDAZOLE contains 14 mmol (322 mg) sodium

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micafungin

Warnings	Classification antifungal echinocandin	Alternate Names MYCAMINE micafungin sodium

Indications

- treatment of invasive candidiasis or candidemia
- restrictions apply

Reconstitution and Stability

- store vials at room temperature, protect from light during storage and administration
- reconstitute vials with NS as follows:
  - 50 mg vial: add 5 mL to provide 10 mg/mL solution
  - 100 mg vial: add 5 mL to provide 20 mg/mL solution
- **swirl gently to avoid foaming**
- diluted solutions stable at room temperature for 6 hours if exposed to light.

Compatibility

- compatible with NS or D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute dose in NS 100 mL; infuse over 1 hour o **handle solution gently to avoid foaming** o wrap bag with brown paper during infusion o flush line with NS or D5W before and after administration	Basic Monitoring
Continuous IV infusion	NO		

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micafungin

Warnings	Classification antifungal echinocandin	Alternate Names MYCAMINE micafungin sodium

Dosage

- Candidemia:100 mg IV daily; treat for at least 14 days after last positive blood culture and resolution of signs and symptoms
- Invasive Candidiasis:100 mg IV daily; until resolution of signs and symptoms of infection (duration may vary from 3 to 6 months)

Potential Hazards of Parenteral Administration

- possible histamine-mediated reactions have been reported: rash, pruritus, facial swelling, and vasodilatation; rapid infusion may result in more frequent histamine-mediated reactions
- anaphylaxis, including shock have been reported: discontinue micafungin if occurs
- injection site reactions: including phlebitis and thrombophlebitis

Important Implications

Contraindications/Cautions

- Consider discontinuing micafungin in the presence of significant and persistent elevation of ALT/AST; safety in severe liver failure has not been evaluated
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- increased AST, ALT and serum alkaline phosphatase
- nausea, constipation
- hypokalemia
- rare: acute renal failure, hemoglobinuria, hemolysis, hemolytic anemia, hepatic failure

Monitoring

- CBC and electrolytes
- liver function tests, renal function tests

Other

- Drug interactions: micafungin may increase cycloSPORINE, sirolimus and nifedipine levels - monitor

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midazolam

Warnings	Classification	Alternate Names
	anxiolytic-sedative	VERSED midazolam hydrochloride

Indications

- pre-operative sedation
- induction of anesthesia
- procedural sedation prior to diagnostic and endoscopic procedures
- palliative sedation as determined by palliative care physician
- refractory status epilepticus
- Indications and / or Prescribing restrictions apply.

Reconstitution and Stability

- stable at room temperature; protect from light

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Advanced Monitoring See site-specific restrictions
Continuous Subcutaneous Infusion	YES	**standard solution concentrations:** 1 mg/mL: o remove 10 mL from NS 50 mL bag, then add 50 mg to the bag **or** o remove 20 mL from NS 100 mL bag, then add 100 mg to the bag 5 mg/mL: (undiluted) transfer 250 mg solution into empty sterile bag (obtain bag from pharmacy) *rate must be controlled with a subcutaneous infusion pump*	Advanced Monitoring See site-specific restrictions
Intramuscular	YES	deeply into large muscle	Advanced Monitoring See site-specific restrictions
IV direct	YES	undiluted; administer slowly over 2 to 3 minutes	Advanced Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations:** 1 mg/mL: o remove 10 mL from NS 50 mL bag, then add 50 mg to the bag **or** o remove 20 mL from NS 100 mL bag, then add 100 mg to the bag 5 mg/mL: (undiluted) transfer 250 mg solution into empty sterile bag (obtain bag from pharmacy) *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions

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midazolam

Dosage

Pre-operative sedation: 0.07 to 0.1 mg/kg (usual dose 5 mg) IM 30 to 60 minutes pre-op.

Procedural sedation:
- 0.5 mg to 2.5 mg IV direct. May increase subsequent doses in small increments, every 2 minutes up to 0.1 mg/kg until desired effect *(elderly or debilitated*: 1 to 1.5 mg IV direct; maximum 0.07 mg/kg), or
- 1 to 5 mg IM or subcutaneous repeated every 2 to 4 hours as needed, or
- 2 to 2.5 mg IV direct then 2 mg/hour continuous IV infusion. May increase rate in increments of 25 to 50% of initial rate every 30 minutes.

Palliative sedation: 2.5 to 10 mg IV direct or subcutaneous, then 1.25 to 10 mg/hour continuous IV or subcutaneous infusion. May increase rate in increments of 25 to 50% of initial rate every 30 minutes. Usual dosage range is 1 to 20 mg/hour.

Palliative sedation for major hemorrhage or acute respiratory distress:
5 to 10 mg IV direct or subcutaneous every 10 to 15 minutes until patient is sedated or symptoms resolved.

Induction of anesthesia: 0.3 to 0.35 mg/kg IV direct (elderly or debilitated patient: 0.2 to 0.3 mg/kg IV direct)

Refractory status epilepticus: 10 to 15 mg IV direct, then 1 to 50 mg/hour to attain burst suppression on electroencephalography (EEG)

Dose reduction:
- reduce dose in patients with renal or hepatic dysfunction
- reduce dose by 30 to 60% if used with other CNS depressants (e.g. opioids)

Potential Hazards of Parenteral Administration

- pain on injection, local irritation, thrombophlebitis
- severe hypotension, bradycardia, respiratory depression and cardiac arrest may follow too rapid IV administration

Important Implications

Contraindications/Cautions
- contraindicated: hypersensitivity to benzodiazepines
- caution: respiratory depression, hypotension and apnea occur more frequently in patients who have been pre-medicated with opioids or other CNS depressants
- caution: when treating patients with myasthenia gravis
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- notify physician if respiratory rate falls below 8 per minute
- when discontinued, recovery from sedation may be prolonged (more than10 hours) if the infusion duration exceeds 24 hours
- anterograde amnesia may persist for up to 2 hours, although usual duration is 20 to 30 minutes

Other
- midazolam is 1.5 to 2 times more potent than diazepam
- onset of action following IV direct: 1 to 5 minutes; duration of activity: less than 2 hours (range 2 to 6 hours)

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milrinone

Warnings	Classification	Alternate Names
	inotrope, vasodilator	PRIMACOR milrinone lactate

Indications

- short term management of severe congestive heart failure refractory to conventional therapy, including low output states following cardiac surgery
- treatment of cerebral vasospasm

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS or sodium chloride 0.45%

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	loading dose (optional) and IV infusion administered from the same bag **standard solution concentrations:** 200 mcg/mL: remove 20 mL from D5W 100 mL bag, then add 20 mg to the bag 400 mcg/mL: remove 40 mL from D5W 100 mL bag, then add 40 mg to the bag *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions

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milrinone

Dosage

short term management of severe congestive heart failure:

- Loading dose (optional): 50 mcg/kg (0.05 mg/kg) IV over 10 minutes
- Maintenance dose: 0.125 to 0.75 mcg/kg/minute continuous IV infusion; titrate at 6 to 8 hour intervals to allow for new steady-state
- maximum total daily dose: 1130 mcg/kg (1.13 mg/kg)

treatment of cerebral vasospasm:

- 0.75 mcg/kg/minute (suggested range 0.125 to 1.5 mcg/kg/minute)

Potential Hazards of Parenteral Administration

- injection site pain
- extravasation risk
- hypotension; reduce or discontinue infusion if excessive

Important Implications

Contraindications/Cautions

- contraindicated during the acute phase following myocardial infarction
- contraindicated for patients with severe aortic or pulmonic valvular disease
- may enhance AV nodal conduction; may increase ventricular response rate in patients with atrial flutter/fibrillation
- hypokalemia may predispose to arrhythmias and should be corrected immediately

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- ventricular and supraventricular arrhythmias, hypotension, headache, thrombocytopenia

Monitoring

- serum potassium, serum creatinine

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mitomycin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic antibiotic	MUTAMYCIN mitomycin C

Indications

- Oncology: primarily used for the treatment of anal, bladder, colon, gastric, head and neck, primary unknown cancers and pseudomyxoma peritonei
  - for *all* indications see BC Cancer benefit drug list
  - restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- used in high risk fistulization procedures in glaucoma surgery
  - Indications and / or prescribing restrictions apply

Reconstitution and Stability

- stability and storage dependent upon concentration (follow pharmacy label)
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W (stable for 3 hours), NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	Peripheral route: ▪ via syringe using side arm method; into the tubing of a free flowing IV of D5W or NS over 5 to 10 minutes ▪ use large vein in forearm; avoid hand, wrist or antecubital fossa	Basic Monitoring or according to protocol
IV intermittent	NO		
Continuous IV infusion	NO		
Topical ophthalmic	YES	**by physician only**	Basic Monitoring
Intravesical (bladder installation)	YES	retain solution in bladder for one to two hours	Basic monitoring or according to protocol See site-specific Restrictions
Intraperitoneal	YES	**by physician only** (used at VGH only)	Basic monitoring or according to protocol

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mitomycin

Dosage

Oncology
Follow specific protocol; dose and schedule depend on protocol and patient response:

- *Intravenous* usual: 10 mg/m^2 IV as a single dose every 4 to 8 weeks.
  - Dosage reduction is recommended in renal dysfunction; if creatinine clearance is less than 10 mL/minute, give 75% of the dose.

- *Intravesical* (instillation into the bladder): example GUBMITO
  - induction: 40 mg instilled into the bladder weekly for 6 doses
  - maintenance: monthly for 1 year, starting 6 weeks after end of induction

- *Intraperitoneal*: 10 mg/m^2 once (to be used with Belmont hyperthermia pump, follow specific protocol)

Refer to BC Cancer Drug Manual Monographs

Glaucoma surgery: 0.05 mg/mL to 0.66 mg/mL applied topically to eye

Potential Hazards of Parenteral Administration

- Extremely irritating: may cause pain, induration, thrombophlebitis, and paresthesia on injection

- Extravasation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- bone marrow depression is a major toxicity, dose-limiting and cumulative. Myelosuppression occurs with a nadir at 24 to 28 days and recovery at 42 to 56 days
- nausea and vomiting 1 to 2 hours after drug administration.
- prolonged malaise (fever and anorexia)
- pulmonary toxicities (dyspnea and productive cough)
- hemolytic uremic syndrome (HUS), 15% or less
- *intravesical*: causes dysuria, cystitis, nocturia, increased micturition and hematuria. Myelosuppression is not seen.
- *topical, ophthalmic*: toxicities include endophthalmitis, macular edema, papilledema

Monitoring
- monitor hematologic status, continue for 2 months post therapy

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mitoXANTRONE

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic anthracenedione	NOVANTRONE

Indications

- primary oncological uses: leukemia, including acute non-lymphocytic, prostate cancer
  - for *all* indications see BC Cancer benefit drug list
  - restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer
- treatment of patients with secondary progressive, progressive relapsing, and worsening relapsing remitting multiple sclerosis and neuromyelitis optica (NMO or Devic's syndrome)

Reconstitution and Stability

- store at room temperature, protect from light
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 50 mL; typically given over 15 to 30 minutes some oncological indications may give over 5 minutes *rate must be controlled with an IV infusion pump*	Intermediate Monitoring or according to protocol
Continuous IV infusion	NO		

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mitoXANTRONE

Dosage

Oncology:
Follow specific protocol; dose and schedule depend on protocol and patient response.

- Examples:
  - palliative therapy for prostate cancer: 10 to 14 mg/m^2 IV every 21 days
  - acute myeloid leukemia: 8 mg/m^2 IV daily for 5 days

- Dose modification is required for: hematological toxicities , hepatic dysfunction

- Refer to BC Cancer Drug Manual Monographs

Multiple Sclerosis:

- 12 mg/m^2 (maximum dose: 20 mg) IV administered monthly or every three months, depending on urgency for rapid induction of immunosuppression
- pre-treatment: initiate intravenous infusion of D5W or NS (50 mL/hour), methylprednisolone 1000 mg IV over 1 hour, ondansetron 8 mg IV over 30 minutes

Maximum cumulative lifetime dose:

- 100 to 140 mg/m^2 depending on prior anthracycline or cyclophosphamide use or thoracic radiation and cardiac function

Potential Hazards of Parenteral Administration

- anaphylaxis (rare)
- phlebitis: manifested by a bluish discoloration along the course of the vein
- Extravasation risk: non-vesicant (irritant with vesicant-like properties)
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- bone marrow suppression; more severe in patients who have had extensive prior chemotherapy or radiotherapy, or in debilitated patients
- leukopenia can occur about 10 days after the dose with recovery in about 21 days
- thrombocytopenia and anemia may occur
- cardiac toxicities (CHF, arrhythmias, ECG changes, chronic cardiomyopathy) may occur, especially in patients who have been previously treated with anthracyclines (DAUNOrubicin, DOXOrubicin, epirubicin, idarubicin) or who have cardiac disease
- nausea and vomiting, mucositis and reversible alopecia may occur
- occasional elevation in liver function tests
- blue discolouration of urine, but not clinically significant
- abdominal pain, amenorrhea, constipation, diarrhea, dyspnea, fatigue, weakness, fever, rash, dry skin, and non-specific neurological side effects

Monitoring

- CBC with differential, liver function tests
- LV ejection fraction (MUGA scan) before initiating therapy and subsequently as per physician and/or PPO

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morphine

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	opioid analgesic	morphine sulphate

Indications

- symptomatic relief of moderate to severe pain; indications and / or prescribing restrictions apply

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, NS, dextrose-saline combinations, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Continuous subcutaneous infusion	YES	**standard solution concentrations** 1 mg/mL: 50 mg in 50 mL; 100 mg in 100 mL 10 mg/mL: o remove 10 mL from 50 mL bag, then add 500 mg to bag o remove 20 mL from 100 mL bag, then add 1000 mg to bag 50 mg/mL: transfer 2500 mg or 5000 mg into an empty sterile bag (obtain empty bag from stores or pharmacy) *must control rate with subcutaneous infusion pump*	Intermediate Monitoring
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	may dilute dose with NS and give slowly over 1 to 2 minutes; maximum rate: 2 mg / minute	Intermediate Monitoring
IV intermittent	YES	dilute dose in 50 mL; infuse over 15 to 30 minutes *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion	YES	**standard solution concentrations** 1 mg/mL: 50 mg in 50 mL; 100 mg in 100 mL; 250 mg in 250 mL 10 mg/mL: o remove 10 mL from 50 mL bag, then add 500 mg to bag o remove 20 mL from 100 mL bag, then add 1000 mg to bag 50 mg/mL: transfer 2500 mg or 5000 mg into an empty sterile bag (obtain empty bag from stores or pharmacy) *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Patient Controlled Analgesia (PCA)	YES	**syringe standard solution concentration:** 3 mg/mL in NS; *rate must be controlled with a PCA pump* **BC Women's Hospital**: 1 mg/mL in NS; *via CADD pump*	Intermediate Monitoring or per PCA site protocol
Epidural	YES	**bolus by physician only** or per epidural site protocol continuous epidural infusion – **initiated by physician** (use preservative-free solution) **standard solution concentration** bupivacaine 0.1% with morphine 50 mcg/mL (250 mL) *rate must be controlled with an epidural pump*	Intermediate Monitoring or per epidural site protocol
Intrathecal	YES	**initiated by physician** (use preservative-free solution) **standard solution concentrations:** 0.25 mg/mL: 25 mg in NS 100 mL 0.5 mg/mL: 50 mg in NS 100 mL	Intermediate Monitoring or per intrathecal site protocol

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morphine

Dosage

Dose is individualized based on patient response and tolerance.

Usual dosing for opioid naïve patient:

- **IV direct:** 0.5 to 2.5 mg every 6 to 10 minutes until analgesia achieved (usual maximum 10 mg per hour)
- **Subcutaneous or IM:** 2.5 to 5 mg every 3 to 4 hours
- **IV intermittent:** 2.5 to 5 mg every 3 to 4 hours
- **continuous IV infusion or continuous subcutaneous infusion:** 0.5 to 4 mg/hour and titrate to effect (there is no maximum dose)
- **epidural:** 1 to 5 mg; may follow with infusion of 0.05 to 0.5 mg/hour
- **intrathecal :** 0.05 to 0.3 mg single dose

Switching between parenteral and oral routes:

- subcutaneous or IM dose is one-half the oral immediate release dose given at the same interval
- continuous IV or subcutaneous infusion dose is one-half the oral dose per 24 hours

Potential Hazards of Parenteral Administration

- respiratory/circulatory depression and orthostatic hypotension may be increased with rapid IV injection
- pain at injection site
- repeated subcutaneous administration may cause local tissue irritation, pain and induration
- antidote: naloxone
- **resuscitative equipment should be readily available**
- high alert medication:
  - morphine vials or ampoules containing more than 15 mg
  - when given by these routes: epidural infusions, intrathecal, patient controlled analgesia

Important Implications

Contraindications/Cautions

- caution in patients with convulsive disorders, cranial injuries, respiratory insufficiency, cardiac arrhythmias, reduced blood volume
- older or debilitated patients, and patients with hepatic or renal dysfunction or on other CNS depressants should receive reduced doses and carefully titrated.
- morphine may enhance respiratory and circulatory depression if used in combination with other opioids, sedatives, phenothiazines or anesthetics

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- respiratory depression, circulatory depression and orthostatic hypotension
- allergic-type reactions due to direct stimulation of histamine release may occur: hypotension, skin rash, and wheal and flare over vein; true allergy is rare
- increased intracranial pressure, sedation, dizziness, nausea, vomiting, constipation, confusion, dysphoria, increased biliary pressure, urinary retention, seizures

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MOXIfloxacin

Warnings	Classification	Alternate Names
	quinolone antibiotic	AVELOX

Indications

- treatment of infections caused by susceptible strains of microorganisms

Reconstitution and Stability

- stable at room temperature
- protect from light
- solution is yellow
- available as premixed bags of 400 mg in NS 250 mL

Compatibility

- compatible with D5W, NS, D10W, Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	Give 400 mg in NS 250 mL over 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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MOXIfloxacin

Dosage

- 400 mg IV once daily

Potential Hazards of Parenteral Administration

- allergic and hypersensitivity reactions including anaphylaxis, urticaria, rash
- injection site pain, inflammation

Important Implications

Contraindications/Cautions

Contraindication:
- hypersensitivity to MOXIfloxacin or other quinolone antibiotics (e.g. ciprofloxacin, levofloxacin)
- not recommended for use in patients 18 years or younger

Caution:
- MOXIfloxacin has potential to cause prolongation of the QT interval: caution in patients with known prolongation of the QT interval, patients with hypokalemia and patients on concomitant Class 1A (e.g. quinidine, procainamide) or Class III (e.g. amiodarone, sotalol) antiarrhythmic agents or other agents known to cause QT prolongation.
- in patients with pre-existing neurological disease or any condition which may lower the seizure threshold (e.g. alcoholism)
- concomitant use of MOXIfloxacin and warfarin may lead to increased anticoagulation; INR should be closely monitored in these patients

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, diarrhea, headache, dizziness
- may cause CNS stimulation leading to tremor, restlessness, lightheadedness, confusion and rarely hallucinations or convulsive seizures

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multiple vitamin infusion

Warnings	Classification	Alternate Names
	vitamins	MULTI-12; MVI-1000

Indications

- vitamin supplement for patients unable to tolerate oral route

Reconstitution and Stability

- keep refrigerated; protect from light

Compatibility

- compatible with D5W, NS, dextrose solutions, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	Supplied by pharmacy as: ▪ MVI-1000 10 mL vial, dilute as indicated below or ▪ MULTI-12 (5 mL of vial 1 and 5 mL of vial 2 provides10 mL dose), dilute as indicated below peripheral line: dilute 10 mL in 500 mL; infuse over at least 2 hours or longer central line: dilute 10 mL in 100 mL; infuse over at least 1 hour or longer BC Women's Hospital: dilute 10 mL in 1000 mL	Basic Monitoring
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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multiple vitamin infusion

Dosage

- 10 mL multiple vitamin injectable IV once daily (must be diluted before use)

Potential Hazards of Parenteral Administration

- pain, thrombophlebitis and necrosis if infused too rapidly and in too high concentration
- patients sensitive to niacinamide may experience flushing, itching, or a burning sensation of the skin
- allergic or anaphylactoid reactions due to thiamine

Important Implications

Contraindications/Cautions

- known hypersensitivity to thiamine
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

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mycophenolate mofetil

Warnings	Classification	Alternate Names
hazardous drug group 2	immunosuppressant agent	mycophenolate mofetil hydrochloride MMF; CELLCEPT

Indications

- prevention of organ rejection in patients receiving solid organ transplants
- Indications and / or prescribing restrictions apply.

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- store vials at room temperature
- reconstitute each 500 mg vial with 14 mL D5W to produce 33 mg/mL of a slightly yellow solution; swirl vial (do not shake)

Compatibility

- compatible with D5W only

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa dilute doses o up to 1 g in D5W 100 mL o over 1 g in D5W 250 mL infuse over a minimum of 2 hours	Basic Monitoring
Continuous IV infusion	NO		

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mycophenolate mofetil

Dosage

- start on day of transplant (within 24 hours of transplantation): 1 to 1.5 g IV every 12 hours
- oral therapy should replace IV as soon as possible; conversion for IV to PO = 1 to 1

Potential Hazards of Parenteral Administration

- phlebitis and thrombosis from peripheral infusion
- Extravasation risk: irritant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- dose-dependent bone marrow depression (leukopenia, macrocytic anemia, pancytopenia and thrombocytopenia)
- nausea, vomiting, hepatotoxicity, oral lesions, and skin rash

Monitoring

- CBC and liver function tests
- observe for signs of infection or of unusual bleeding/bruising
- therapy should be interrupted or dose reduced if leukopenia develops

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nalbuphine

Warnings	Classification analgesic,opioid; opioid partial agonist	Alternate Names NUBAIN nalbuphine hydrochloride

Indications

- symptomatic relief of moderate to severe pain
- pre-operative and post-operative pain
- as a supplement to balanced anesthesia
- treatment of pruritus associated with epidural opioids (without reversing analgesia)

Reconstitution and Stability

- ampoules and vials are stored at room temperature and protected from light

Compatibility

- compatible with NS, D5W, dextrose-saline solutions, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	undiluted or dilute dose with NS to 10 mL; administer 10 mg or less over 2 to 5 minutes	Intermediate Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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nalbuphine

Dosage

Dose should be individualized based on patient response and tolerance.

Analgesia (opioid naïve): 10 to 20 mg IM, subcutaneous or IV direct Q3H to Q6H PRN

Pruritus associated with epidural opioids: 1 to 5 mg IM, subcutaneous or IV direct Q3H PRN

Maximum daily dose: 160 mg

1 mg nalbuphine is roughly equianalgesic to 1 mg morphine

Potential Hazards of Parenteral Administration

- may precipitate narcotic withdrawal symptoms if patient is physically dependent on narcotics
- pain at injection site following intravenous administration

- antidote: naloxone

Important Implications

Contraindications/Cautions
- Caution:
  - patients with history of opioid abuse or patients chronically taking narcotics may experience withdrawal symptoms
  - caution in those with cardiovascular disease (including acute MI)
  - caution in those with impaired respiration, renal function or liver function
  - use with extreme caution in patients with head injury or increased intracranial pressure
  - in patients who undergo biliary tract surgery: nalbuphine may cause spasm of the sphincter of Oddi

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- sedation, dizziness, headache, vertigo, miosis, dry mouth, nausea, vomiting, cold and clammy skin
- respiratory depression
- increased intracranial pressure, hypertension or hypotension, bradycardia or tachycardia

Monitoring
- monitoring for relief of pain and side effects of the drug as listed above

Other
- onset of action: 15 minutes for IM and subcutaneous; 2 to 3 minutes for IV direct

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naloxone

Warnings	Classification	Alternate Names
	opioid antagonist	NARCAN naloxone HC

Indications

- reversal of opioid depression including respiratory depression caused by natural and synthetic opioids
- diagnosis of suspected acute opioid overdose
- management of opioid-induced pruritus

Reconstitution and Stability

- stable at room temperature, protect ampoules from light

Compatibility

- compatible with NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	if IV route not available (doses less than 0.2 mg : see IV direct route for dilution)	Basic Monitoring
Intramuscular	YES	if IV route not available (doses less than 0.2 mg : see IV direct route for dilution)	Basic Monitoring
IV direct	YES	undiluted or diluted over 30 seconds doses less than 0.2 mg *recommend*: dilute 0.4 mg (1 mL) with 9 mL NS to make a 0.04 mg/mL concentration	Basic Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration** 16 mcg/mL: *opioid overdose* dilute 4 mg in D5W 250 mL *rate must be controlled with an infusion pump*	Advanced Monitoring See site-specific restrictions

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naloxone

Dosage

Opioid overdose:
- 0.4 to 2 mg IV direct; if no response repeat in 2 to 3 minutes; in cases of methadone, pentazocine or large opioid overdoses, higher doses may be required; if no response after 10 mg, reassess diagnosis; effective dose may be repeated every 20 to 60 minutes.
- IV infusion:
  - Usual dose: 0.2 to 0.8 mg/hour, titrate to achieve reversal of opioid effects;
  - **or,** rate of infusion is equal to two-thirds of initial IV direct dose every hour; one-half of initial dose may be repeated 15 minutes after start of infusion.
- if the opioid duration of action exceeds that of naloxone, repeat doses or naloxone IV infusion may be required

Post-operative respiratory depression:
- 0.1 to 0.2 mg IV direct at 2 to 3 minute intervals until desired response is obtained; repeat doses may be required at 1 to 2 hour intervals.

Opioid-induced respiratory depression:
- 0.04 to 0.2 mg IV direct or subcutaneous, assess response and repeat every 2 minutes PRN
- Continue to monitor respiratory rate every 15 minutes until no naloxone given for 1 hour; then Q1H for 4 hours or Q1H for 10 hours if patient was using long-acting opioid, methadone or transdermal patch
- If desired response is not observed after 0.8 mg total, consider other causes of respiratory depression

Partial reversal of opioid-associated respiratory depression in palliative patients:
- If respiratory rate is less than 6 breaths per minute, administer 0.04 to 0.2 mg IV direct or subcutaneous every 2 to 5 minutes until respiratory rate is greater than 10 breaths per minute.
- Continue to monitor respiratory rate every 15 minutes until no naloxone given for 1 hour.
- If desired response is not observed after 0.8 mg total, consider other causes of respiratory depression

Opioid-induced pruritus:
- 0.04 mg IV direct Q15MIN PRN.

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- caution in patients who have received potentially cardiotoxic drugs or have pre-existing cardiac disease; hypotension, hypertension, ventricular tachycardia or fibrillation, and pulmonary edema have been reported.
- Use with caution in patients dependent on opioid drugs; may precipitate acute withdrawal symptoms within 15 to 30 minutes after receiving naloxone.
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea and vomiting following large doses

Other
- onset of action: 1 to 2 minutes (IV) ; 2 to 5 minutes (IM or subcutaneous)
- duration of action: 45 minutes to 4 hours

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neostigmine

Warnings	Classification parasympathomimetic, anticholinesterase	Alternate Names PROSTIGMIN neostigmine methylsulphate

Indications

- symptomatic treatment of myasthenia gravis
- prophylaxis and treatment of post-operative intestinal atony and urinary retention
- reverse the effect of non-depolarizing neuromuscular blocking agents (eg. atracurium, rocuronium) after surgery

Reconstitution and Stability

- stable at room temperature

Compatibility

- Compatible with D5W, D10W, NS, dextrose-saline solutions, Ringer's and Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Advanced Monitoring
Intramuscular	YES		Advanced Monitoring
IV direct	YES	give undiluted; maximum rate: 0.5 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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neostigmine

Dosage

- Treatment of myasthenia gravis:
  0.5 to 2.5 mg subcutaneous, IM or IV direct every 1 to 3 hours as needed (maximum 10 mg per 24 hours)

- Post-operative intestinal atony or urinary retention:
  0.25 to 0.5 mg subcutaneous or IM

- Reversal of non-depolarizing neuromuscular blockade after surgery:
  0.5 to 2 mg IV direct; repeat as required. Total dose should rarely exceed 5 mg.

Large parenteral doses of neostigmine should be accompanied by atropine 0.6 to 1.2 mg IV to counteract the adverse cholinergic effects

Potential Hazards of Parenteral Administration

- respiratory arrest
- antidote: atropine

Important Implications

Contraindications/Cautions

- Caution:
  - use caution in patients with epilepsy, bronchial asthma, bradycardia, peptic ulcers
  - avoid in patients with obstruction of the intestinal or urinary tract
  - use caution in patients with recent coronary occlusion, vagotonia, hyperthyroidism, cardiac arrhythmia
  - atropine may mask early detection of neostigmine overdose which may result in cholinergic crisis

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hypotension, bradycardia

Monitoring

- overdose - nausea, vomiting, diarrhea, abdominal cramps, increased salivation and bronchial secretions, miosis, diaphoresis; muscle cramps, fasciculation, weakness

Other

- neuromuscular block may be potentiated by drugs (like aminoglycoside antibiotics) with neuromuscular blocking properties

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nicardipine

Warnings	Classification calcium channel blocker (dihydropyridine), antihypertensive	Alternate Names CARDENE, NICARDIPINE AGUETTANT, nicardipine hydrochloride

Indications

- treatment of hypertension in patients with acute ischemic stroke or intracerebral hemorrhage that is not responsive to other parenteral agents (e.g. labetalol, hydrALAZINE and enalaprilat) *and* oral therapy is not feasible
- available through Health Canada **Special Access Program**; contact pharmacy

Reconstitution and Stability

- store vials at room temperature and protect from light

Compatibility

- compatible with D5W, NS, and dextrose-saline solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	• infuse by central line, • or peripherally, use large vein in forearm, if possible avoid hand, wrist or antecubital fossa; venous irritation may be minimized by changing the infusion site every 12 hours **standard solution concentration** 0.1 mg/mL: o remove 10 mL from 100 mL bag, then add 10 mg to bag o remove 50 mL from 500 mL bag, then add 50 mg to bag *rate must be controlled with an IV infusion pump*	Full monitoring

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nicardipine

Dosage

- Rapid titration:
  - initial rate: 5 mg/hour
  - minimum rate: 2.5 mg/hour, maximum rate: 15 mg/hour
  - titrate by 2.5 mg/hour every 5 minutes (to a maximum of 15 mg/hour) until blood pressure (BP) target reached
- Gradual titration: for elderly, pregnant patients, or patients with renal or hepatic dysfunction
  - initial rate: 2.5 mg/hour
  - minimum rate: 2.5 mg/hour, maximum rate: 15 mg/hour
  - titrate by 0.5 mg/hour every 30 minutes (to a maximum of 15 mg/hour) until BP target reached
- Once target BP reached, taper rate by 1 to 2.5 mg/hour every 15 minutes to maintain target BP. Typical maintenance rate is 2 to 4 mg/hour.
- If there is a trend toward hypotension or tachycardia, discontinue infusion and once BP has stabilized, may restart at 2.5 to 5 mg/hour and adjust to maintain target BP

Potential Hazards of Parenteral Administration

- injection site pain, venous thrombosis, phlebitis, local irritation, swelling
- Extravasation risk: irritant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- *Contraindications*: hypersensitivity to nicardipine, severe aortic stenosis, compensatory hypertension, unstable angina, within 8 days after myocardial infarction
- *Caution*:
  - nicardipine is metabolized by hepatic enzyme CYP 3A4 – consult drug interaction references
  - concomitant use with beta-blockers (may enhance negative inotropic effect) in patients with heart failure

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- frequent (more than 10%): headache
- less frequent (1 to 10 %): hypotension, peripheral edema, flushing, exacerbation of angina, palpitations, tachyarrhythmia, extrasystoles, nausea, vomiting, hypokalemia, weakness, hematuria, dizziness, weakness

Monitoring

- BP, heart rate

Other

- onset of effect within one to two minutes
- 50% maximal effect achieved in 45 minutes of continuous IV infusion
- discontinuation of infusion results in 50% decrease in effect in approximately 30 minutes, with gradually decreasing effect over the subsequent 15 hours

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nitroglycerin

Warnings	Classification	Alternate Names
	vasodilator	NITROBID IV, NITROJECT, NITROSTAT IV, TRIDIL

Indications

- relief of refractory or unstable angina, control of congestive heart failure
- control of hypertension during coronary artery bypass graft surgery or post-surgical period
- management of hypertensive emergency
- premedication, diagnostic tool or treatment of angina in the cardiac catheter lab
- acute myocardial infarction
- uterine relaxant to facilitate external cephalic version, extraction of fetus at caesarean delivery, and treatment of uterine tachysystole

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**by physician only** uterine relaxation (for External Cephalic Version): by physician *or* by RN with direct supervision by physician; dilute 1 mg in NS 9.8 mL	Full monitoring See site-specific restrictions Advanced Monitoring Perinatal Monitoring (per site specific protocol)
IV intermittent	NO		
Continuous IV infusion	YES	use DEHP-free or polyethylene-lined (low sorbing) tubing **standard solution concentrations:** ▪ 200 mcg / mL: dilute 50 mg in 250 mL, use glass or non-PVC container (i.e. PVC free and DEHP free); also available as premixed solution in a glass bottle ▪ 400 mcg / mL: dilute 100 mg in 250 mL, use glass or non-PVC container (i.e. PVC free and DEHP free); also available as premixed solution in a glass bottle *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions

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nitroglycerin

Dosage

Congestive Heart Failure*:
- 5 to 10 mcg/minute; titrate as needed based on response and tolerability in increments of 5 to 10 mcg/minute every 3 to 5 minutes up to 200 mcg/minute

Management of hypertension*:
- 5 to 10 mcg/minute; increase based on BP response and tolerability in increments of 5 mcg/minute every 3 to 5 minutes up to 20 mcg/minute; if no response at a dose of 20 mcg/minute, may increase by 10 to 20 mcg/minute every 3 to 5 minutes to a maximum dose of 200 mcg/minute.

Unstable angina*:
- 5 to 10 mcg/minute with continuous cardiac monitoring; titrate as needed to relieve angina symptoms in increments of 5 mcg/minute every 5 to 10 minutes up to 20 mcg/minute; if angina persists at a dose of 20 mcg/minute, may increase by 10 to 20 mcg/minute every 3 to 5 minutes to a maximum dose of 400 mcg/minute

*Tachyphylaxis develops within 24 to 48 hours of continuous nitrate administration.

Uterine relaxation (for External Cephalic Version):
- 50 mcg IV direct every 90 seconds; repeat as required up to a maximum of 500 mcg over 15 minutes

Uterine tachysystole:
- 50 to 100 mcg IV direct, repeated every 2 minutes to a maximum dose of 400 mcg (may double dose with each subsequent administration)

Potential Hazards of Parenteral Administration

- headache, severe hypotension, reflex tachycardia

Important Implications

Contraindications/Cautions
- Contraindications: hypotension, uncorrected hypovolemia, increased intracranial pressure, constrictive pericarditis and pericardial tamponade
- Caution: additive preload reduction
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side Effects
- nausea, dizziness
- methemoglobinemia (rare)

Monitoring
- follow pulmonary capillary wedge and systemic pressures, cardiac output for congestive heart failure

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nitroprusside

Warnings	Classification	Alternate Names
	antihypertensive	NIPRIDE, NITROPRESS nitroprusside sodium sodium nitroprusside

Indications

- treatment of acute hypertension refractory to standard therapeutic measures
- acute decompensated heart failure
- induction of hypotension to minimize bleeding during surgery

Reconstitution and Stability

- store at room temperature; protect from light
- solutions coloured other than light brown should not be used

Compatibility

- D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion ONLY	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa protect solution from light during administration (not necessary to wrap tubing) **standard solution concentrations** 200 mcg/mL: dilute 50 mg in D5W 250 mL 800 mcg/mL: dilute 200 mg in D5W 250 mL *rate must be controlled with an IV infusion pump*	Intensive Monitoring (Full Monitoring may be used short term when treatment is initiated) See site-specific restrictions

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nitroprusside

Dosage

Acute hypertension:
- initial dose: 0.5 mcg/kg/minute continuous IV infusion;
- adjust dose by 0.2 mcg/kg/minute every 5 minutes until desired reduction in blood pressure (BP) is obtained
  - usual dose range: 1.5 to 3 mcg/kg/minute; maximum dose: 10 mcg/kg/minute; if inadequate reduction at 10 mcg/kg/minute for 10 minutes, discontinue drug.

Acute Decompensated Heart Failure:
- initial dose: 0.1 to 0.2 mcg/kg/minute continuous IV infusion;
- adjust dose by 0.25 to 0.5 mcg/kg/minute every 5 to 15 minutes
- usual dose range: 0.5 to 5 mcg/kg/minute

Lower doses may be required in the elderly and in renal impairment

Potential Hazards of Parenteral Administration

- irritation at injection site
- Extravasation risk: irritant
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- caution in patients with hypothyroidism, severe renal or hepatic impairment or low vitamin B12 plasma levels

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- nausea, vomiting, diaphoresis, headache and chest pain (these effects disappear on slowing or temporarily discontinuing the infusion)
- toxicity may result from accumulation of metabolic byproducts *cyanide* and *thiocyanate;* risk increases with high doses (greater than 3 mcg/kg/minute), prolonged infusions and oliguria
  - *cyanide toxicity* (rare): more likely to occur in patients with hepatic dysfunction;
    - metabolic acidosis, confusion, dyspnea, rapid or weak pulse, loss of consciousness and convulsions;
    - stop the infusion; Cyanide Antidote Kit should be used if toxicity does not reverse.
  - *thiocyanate toxicity*: more likely to occur if prolonged therapy, higher doses or if impaired renal function
    - neurotoxicity: tinnitus, toxic psychosis, hyperreflexia, confusion, weakness, seizures and coma
    - stop the infusion; thiocyanate is readily removed by hemodialysis.
- hypothyroidism from prolonged administration

Monitoring:
- CBC, SCr, arterial blood gases, urine output
- signs of cyanide toxicity and acid-base balance
- signs of thiocyanate toxicity; monitor serum thiocyanate concentrations in patients on prolonged therapy, high doses or if renal dysfunction (toxicity symptoms may appear at levels of 50 to 100 mcg/mL)

Other
- onset of action 0.5 to 2 minutes; duration: as long as infusion is running

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NORepinephrine

Warnings	Classification	Alternate Names
vesicant	sympathomimetic	LEVOPHED noradrenaline bitartrate, levarterenol bitartrate, NORepinephrine bitartrate

Indications

- maintenance of blood pressure in acute hypotensive states or shock.
- maintenance of cerebral perfusion in patients with cerebral vasospasm

Reconstitution and Stability

- protect ampoule from light
- stable at room temperature
- do not use if solution is brown in colour

Compatibility

- compatible with D5W, dextrose 5% in sodium chloride 0.9%, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations**: 16 mcg/mL: dilute 4 mg in 250 mL 32 mcg/mL: dilute 8 mg in 250 mL 64 mcg/mL: dilute 16 mg in 250 mL **infuse by central line** for urgent/emergency situation pending insertion of central line: may use peripheral line in large vein in forearm; if possible avoid hand, wrist or antecubital fossa *rate must be controlled with an infusion pump*	Intensive Monitoring See site-specific restrictions (Full monitoring may be used short term when treatment is initiated and transfer for hemodynamic monitoring is imminent)

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NORepinephrine

Dosage

- dosing refers to NORepinephrine base:
  2 mg NORepinephrine bitartrate is equivalent to 1 mg NORepinephrine base

- Initially, 2 to 4 mcg/minute continuous IV infusion; titrate every 10 to 15 minutes to achieve desired blood pressure

Potential Hazards of Parenteral Administration

- rapid IV: tachycardia, premature ventricular contractions, chest pain
- extravasation risk (vesicant); may cause sloughing and necrosis
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
  - treat with phentolamine (administer within 12 hours), refer to phentolamine monograph
- hypersensitivity reactions
- discontinue gradually to avoid a sudden drop in blood pressure

Important Implications

Contraindications/Cautions

- high doses over prolonged periods and low doses in patients with occlusive vascular disease have resulted in gangrene of extremities due to vasoconstriction.
- contraindicated in patients with pheochomocytoma

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- headache, anxiety, restlessness, tremor, hypertension, arrhythmias

Monitoring
- monitor urine output, perfusion of extremities,
- monitor peripheral infusion site Q1H and PRN for signs of extravasation

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oBINutuzumab

Warnings	Classification	Alternate Names
high alert medication	antineoplastic, monoclonal antibody	GAZYVA

Indications

- as part of combination therapy for treatment of chronic lymphocytic leukemia (CLL)
- non-Hodgkin's lymphoma
- in combination or alone for treatment of follicular lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- all doses are prepared by pharmacy, store in fridge

Compatibility

- compatible with NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above).
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**Cycle 1**(split dosing) *day 1*: 100 mg in NS 100 mL; infuse over 4 hours *day 2*: 900 mg in NS 250 mL; start at 50 mg / hour, increase at 50 mg / hour every 30 minutes if tolerated to a maximum of 400 mg/hour **Cycle 1** (full dose) *day 1*: 1000 mg in NS 250 mL; start at 50 mg/hour increase at 50 mg / hour every 30 minutes if tolerated to a maximum of 400 mg/hour **Cycle 1** *days 8 and 15* & **all other cycles**: 1000 mg in NS 250 mL; start at 100 mg / hour and increase at 100 mg / hour every 30 minutes if tolerated to a maximum of 400 mg/hour *rate must be controlled with an IV infusion pump*	Advanced Monitoring vital signs prior to start of infusion, at every incremental increase of infusion rate, and as clinically indicated during and after infusion or as per protocol
Continuous IV infusion	NO		

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oBINutuzumab

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Examples:

- Previously untreated chronic lymphocytic leukemia or small lymphocytic lymphoma (LYVENOB-combination of IV oBINutuzumab and oral ventoclax) :
  - Cycle 1 (split dose): 100 mg on *day 1*, followed by 900 mg on *day 2*, followed by 1000 mg weekly for 2 doses (*days 8 and 15*)
  - Cycle 2 (starts 21 days after cycle 1): 1000 mg on *day 8*
  - Cycles 3* to 6: 1000 mg on *day 1* every 4 weeks

    *cycle 3 starts 5 weeks after *day 1* of cycle 2 to allow for oral ventoclax dose ramp up

- Refractory follicular lymphoma (LYOBBEND - combination of IV oBINutuzumab with bendamustine)
  - Cycle 1: 1000 mg on *days 1, 8 and 15*
  - Cycle 2 to 6: 1000 mg on *day 1* every 4 weeks
  - Cycle 7 to 18: 1000 mg on *day 1* every 2 months

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Infusion related (hypersensitivity) reactions [e.g. nausea, chills, hypotension, pyrexia, vomiting, dyspnea, flushing, hypertension, headache and tachycardia] can occur within 24 hours; occurring more frequently with first infusion and decreasing with each subsequent infusion.
  - May require pre-treatment with acetaminophen, diphenhydrAMINE and a glucocorticoid (dexamethasone or methylPREDNISolone).
  - Hypotension may occur during infusion, consider holding antihypertensive medications for 12 hours prior to, during and 1 hour after OBINutuzumab administration.
  - Mild (Grade 1): Reduce infusion rate or interrupt infusion and manage symptoms as appropriate. Upon symptom resolution, continue or resume infusion. If no further infusion reaction symptoms occur, may resume infusion rate escalation as appropriate for treatment cycle dose
  - Moderate to severe (Grade 2 or 3): Interrupt therapy; manage symptoms as appropriate. Upon symptom resolution, may reinitiate infusion at no more than 50% of rate at which reaction occurred. If no further infusion reaction symptoms occur, may resume infusion rate escalation as appropriate for treatment cycle dose
  - Life-threatening (Grade 4): Discontinue infusion immediately; permanently discontinue therapy
- Extravasation risk: non-vesicant

Important Implications

Cautions

- hepatitis B reactivation, follow prophylactic treatment in protocol as required
- hyperuricemia and tumour lysis syndrome (TLS) can occur with obinutuzumab; patients with high tumour burden, high lymphocyte count (greater than 25 x 10^9/L), and/or renal impairment (creatinine clearance less than 70 mL/min) are most at risk.
  - follow protocol, includes antihyperuricemic prophylaxis and adequate patient hydration
- pre-existing cardiac disease: may develop worsening of cardiovascular disease, monitor closely
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- neutropenia may have a late onset (more than 28 days after therapy completion) and/or be prolonged (duration longer than 28 days)
- thrombocytopenia; has occurred acutely (within 24 hours); platelet transfusions may be necessary. Fatal hemorrhagic events during first cycle of therapy have been reported

Monitoring

- CBC and diff, potassium, calcium, magnesium, phosphate, uric acid, creatinine, bilirubin, ALT, AST, LDH, albumin per protocol

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octreotide

Warnings	Classification	Alternate Names
	synthetic somatostatin analog	SANDOSTATIN octreotide acetate

Indications

- inhibits secretion of peptide hormones from the gastroenteropancreatic endocrine system and growth hormone
- used to control symptoms in patients with carcinoid and vasoactive intestinal peptide-secreting tumors (VIPomas), acromegaly, Zollinger-Ellison syndrome, GI-endocrine tumors, secretory diarrhea and fistulas
- decrease pancreatic secretions after pancreatic surgery
- treatment of esophageal variceal bleed
- palliation of intractable vomiting due to malignant bowel obstruction

Reconstitution and Stability

- octreotide acetate is a clear colourless solution
- store in fridge and protect from light in the original carton
- ampoules and multi-dose vials can be stored at room temperature for up to 2 weeks if protected from light

Compatibility

- compatible in NS (preferred), D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	rotate injection sites	Basic Monitoring
Subcutaneous infusion	YES	**standard solution concentration**: 20 mcg/mL: dilute 1000 mcg in NS 50 mL *rate must be controlled with subcutaneous infusion pump*	Palliative Monitoring
Intramuscular	NO		
IV direct	YES	administer undiluted over 15 seconds to 3 minutes	Basic Monitoring
IV intermittent	YES	dilute dose in normal saline 50 mL; infuse over 15 to 30 minutes *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	YES	**standard solution concentration**: 5 mcg/mL: o dilute 500 mcg in NS 100 mL, or o dilute 1250 mcg in NS 250 mL *rate must be controlled with an IV infusion pump*	Basic Monitoring

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octreotide

Dosage

Doses vary depending on the indication and are titrated to patient response and/or laboratory values.

- Acromegaly:
  Initial dose: 50 mcg subcutaneous TID. Increase dose gradually, based on growth hormone levels, symptoms and tolerability. The most common effective dose is 100 mcg subcutaneous TID.
  Maximum dose: 1500 mcg/day.

- Bleeding esophageal varices:
  50 to 100 mcg IV direct, followed by 25 to 50 mcg/hour continuous IV infusion for up to 5 days.

- Carcinoid crisis:
  50 to 500 mcg IV direct; may also use 50 to 200 mcg/hour continuous IV infusion

- Carcinoid tumours: for treatment of symptoms (diarrhea and cutaneous flushing) from carcinoid tumours
  100 to 600 mcg/day subcutaneous, in 2 to 4 divided doses
  Usual therapeutic range is 50 to 750 mcg/day. Or follow BC Cancer protocol.

- Intractable vomiting due to malignant bowel obstruction:
  100 to 600 mcg/day continuous subcutaneous infusion **or** subcutaneously in 2 to 3 divided doses (median dose 300 mcg/day)

- Refractory HIV/AIDS diarrhea:
  50 mcg subcutaneous TID; may increase to 500 mcg subcutaneous TID.

- VIPomas:
  200 to 300 mcg/day subcutaneous, in 2 to 4 divided doses. Doses are titrated to therapeutic response but usually no greater than 450 mcg/day. Or follow BC Cancer protocol.

Potential Hazards of Parenteral Administration

- pain & stinging at injection site, with redness and swelling (may be reduced by allowing solution to reach room temperature prior to administration)
- repeated injections at same site in short periods of time should be avoided

Important Implications

Contraindications/Cautions

- Caution: Bradycardia, arrhythmias, and conduction abnormalities (including QT prolongation) have been observed in acromegalic and carcinoid syndrome patients taking octreotide

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- has been associated with cholelithiasis, hyperglycemia or hypoglycemia
- nausea, diarrhea, vomiting, anorexia, transient dizziness

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octreotide long acting

Warnings	Classification	Alternate Names
	synthetic somatostatin analog	SANDOSTATIN LAR octreotide acetate long acting release

Indications

- to control symptoms in patients with carcinoid and vasoactive intestinal peptide-secreting tumors (VIPomas)
- restrictions apply

Reconstitution and Stability

- **SANDOSTATIN LAR is a long acting suspension of microspheres for depot IM injection and is NOT interchangeable with other octreotide injectable solutions**
- Store in fridge.
- Available as a kit containing 10 mg, 20 mg or 30 mg vials of powder for suspension, prefilled syringe with diluent, a reconstitution needle "c" and a safety needle

- **Refer to enclosed leaflet for full reconstitution and administration instructions**.
- Allow drug and diluent to come to room temperature (takes 30 to 60 minutes).
- Suspend powder with 2 mL of provided diluent immediately before injection.
- Gently add diluent to the vial by running liquid down the inside wall of the vial to wet all the powder. Do not disturb, shake or invert vial while allowing complete wetting of the powder (about 2 to 5 minutes).
- Then **swirl vial gently** to achieve a uniform milky suspension.
- Slowly withdraw the vial contents into the syringe, residual suspension (overfill) may remain in vial.
- Change to safety needle. Gently invert the syringe as needed to maintain a uniform suspension.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into gluteal muscle rotate injection sites (alternate between the left and right gluteal muscle)	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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octreotide long acting

Dosage

Doses vary depending on the indication and are titrated to patient response and/or laboratory values.

Patients stabilized on subcutaneous octreotide for 2 weeks (*see separate octreotide monograph*) may be started on octreotide long acting, **but** patients should continue to receive subcutaneous octreotide for at least two weeks after switch over. Follow BCCA protocol(s) for SANDOSTATIN LAR

- Carcinoid tumours: (treatment of symptoms, specifically, diarrhea and cutaneous flushing)
  Starting dose: 20 mg IM every 4 weeks.

- VIPomas:
  Starting dose: 20 mg IM every 4 weeks.

Potential Hazards of Parenteral Administration

- pain and stinging at injection site, with redness and swelling (may be reduced by allowing solution to reach room temperature prior to administration)

Important Implications

Contraindications/Cautions

- Caution: bradycardia, arrhythmias, and conduction abnormalities (including QT prolongation) have been observed in acromegalic and carcinoid syndrome patients taking octreotide

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- has been associated with cholelithiasis, hyperglycemia or hypoglycemia
- nausea, diarrhea, vomiting, anorexia, transient dizziness

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OLANZapine

Warnings	Classification	Alternate Names
	antipsychotic	ZYPREXA, OLANZapine tartrate

Indications

- rapid control of agitation in patients with schizophrenia and related psychotic disorders, and bipolar mania

Reconstitution and Stability

- store vials at room temperature (15 to 30 ºC)
- reconstitute 10 mg vial with 2.1 mL sterile water for injection for a final concentration of 5 mg/mL, (stable for 60 minutes at room temperature); solution is clear yellow

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	Inject slowly, deep into muscle mass	Advanced monitoring Monitor postural BP, HR, respiratory rate and level of sedation before administration; then at 30 minutes, 1, 2 and 4 hours after injection
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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OLANZapine

Dosage

- 2.5 mg to 10 mg I.M.
  Repeat doses of 2.5 to 10 mg IM may be given at 2 hours after the first dose and a third and final dose 4 hours after the second dose if required.
- Maximum daily dose is 20 mg, with no more than 3 injections in a 24 hour period.
- If ongoing therapy is required, switch to oral as soon as possible.

Potential Hazards of Parenteral Administration

- Local: pain at injection site

Important Implications

Contraindications/Cautions

- concomitant use of parenteral benzodiazepines and other CNS depressants is not recommended; *if parenteral benzodiazepine is needed*:
  - do not give parenteral benzodiazepine or parenteral OLANZapine within two hours of each other
- caution in the elderly (65 years or older) with dementia
- caution with cardiovascular disease, cerebrovascular disease, and conditions which would predispose patients to hypotension

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *CVS:* hypotension and/or syncope associated with bradycardia (infrequent)
- *CNS*: headache, somnolence, dizziness, extrapyramidal reactions (e.g. acute dystonia); neuroleptic malignant syndrome (rare) : hyperpyrexia, muscle rigidity; altered mental status, autonomic instability

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onabotulinumtoxinA

Warnings	Classification	Alternate Names
	neuromuscular paralytic agent	BOTOX clostridium botulinum toxin type A botulinum toxin type A

Indications

- botulinum products are NOT interchangeable; this monograph applies to onabotulinumtoxinA (BOTOX) only
- treatment of focal limb spasticity associated with stroke, traumatic brain injury, spinal cord injury, multiple sclerosis, and cerebral palsy
- treatment of patients with achalasia who are not surgical candidates
- idiopathic neurogenic bladder (detrusor) spasticity or overactivity
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator
- each vial contains 100 units of vacuum-dried Clostridium botulinum toxin type A
- reconstitute vial with normal saline as follows:

reconstitution volume	resulting concentration
1 mL	10 units/ 0.1 mL
2 mL	5 units/ 0.1 mL
4 mL	2.5 units/ 0.1 mL
8 mL	1.25 units/ 0.1 mL
10 mL	1 unit/ 0.1 mL

- inject diluent into the vial along the vial wall. **Gently mix** by rotating the vial (botulinum toxin is denatured by bubbling or violent agitation).
- reconstituted solution is stable for 4 hours, return to fridge if not used immediately
- reconstituted solution should be clear, colourless and free of particulate matter

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	**by physician only** intradetruser (bladder): physician must be present	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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onabotulinumtoxinA

Dosage

Spasticity:
- 10 to 50 units IM into 1 to 4 sites depending upon the type of muscle being injected. For larger muscles increase dilution and inject into 6 to 8 sites.

Idiopathic neurogenic bladder (detrusor) spasticity or overactivity:
- 100 to 200 units IM (intradetrusor) administered in 0.5 to 2 mL aliquots as directed

Do not exceed 6 units/kg (400 to 600 units) in a 3 month interval

Potential Hazards of Parenteral Administration

- localized pain or tenderness at injection site
- rare: skin rash, pruritus, allergic reaction

Important Implications

Contraindications/Cautions
- Contraindicated in the presence of infection at the proposed injection site
- Caution:
  - use of one vial for more than one patient is not recommended as the product and diluent do not contain a preservative
  - in patients with myopathy associated with neuromuscular disease (e.g. amyotrophic lateral sclerosis, myasthenia gravis)
  - the effect of botulinum toxin may be potentiated by aminoglycosides, neuromuscular blockers or other drugs that interfere with neuromuscular transmission

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- altered balance, leg pain and local weakness for patients treated for spasticity

Other
- onset of action (muscle relaxation): 7 to 10 days after injection and increases in intensity over first two weeks
- maximum effect: 6 to 8 weeks depending on condition being treated
- duration of effect: generally lasts 3 to 4 months; longer if muscles are stretched properly

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ondansetron

Warnings	Classification	Alternate Names
	antiemetic	ZOFRAN

Indications

- prophylaxis and treatment of nausea and vomiting

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS, D5W, dextrose-saline combinations, Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Palliative Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	for doses up to 4 mg: give undiluted, over 2 to 5 minutes	Basic Monitoring
IV intermittent	YES	dilute dose in D5W 50 mL; infuse over 15 minutes	Basic Monitoring
Continuous IV infusion	YES	for hyperemesis gravidarum: dilute dose in 250 mL IV fluid; infuse at a rate of 1 mg/hour	Basic Monitoring

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ondansetron

Dosage

Nausea and vomiting associated with chemotherapy:
- 8 mg IV 30 minutes prior to chemotherapy, may repeat 8 mg IV or PO every 8 to 12 hours if needed for 24 hours after chemotherapy

Post-operative nausea and vomiting:
- prophylaxis: 4 mg IV/IM
- treatment: 1 to 4 mg IV every 8 hours as needed for 24 hours then reassess

Nausea and vomiting from other causes:
- 4 mg IV every 8 hours as needed
- refractory nausea and vomiting in palliative care: 4 to 8 mg IV/subcutaneous 1 to 3 times daily Occasionally Q6H dosing is necessary.

Hyperemesis Gravidarum (unresponsive to other antiemetics):
- 4 to 8 mg IV every 8 to 12 hours as needed **or**
- 1 mg/hour continuous IV infusion for up to 24 hours

In patients with severely impaired hepatic function, the maximum daily dose is 8 mg.

Potential Hazards of Parenteral Administration

- hypersensitivity reactions (rare) - rash, bronchospasm, urticaria, angioedema
- pain & erythema at site of injection

Important Implications

Contraindications/Cautions
- avoid in patients with congenital long QT syndrome
- ondansetron prolongs the QT interval in a dose-dependent manner:
  - caution in patients with hypokalemia, hypomagnesemia, congestive heart failure, bradyarrhythmias and concomitant use of other QT prolonging medications
  - single doses greater than 16 mg IV are no longer recommended

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- headache, sedation, constipation and diarrhea
- transient increase in liver enzymes (rare)
- transient ECG changes including QT interval prolongation and torsades de pointes (rare)

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oxaliplatin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, alkylating agent	ELOXATIN

Indications

- primarily used for colorectal cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 250 to 500 mL D5W (final concentration 0.2 to 2 mg/mL) infuse over 2 to 6 hours • do not use aluminum containing IV needles, syringes or sets to administer • flush IV line with D5W before and after administration of oxaliplatin • administer before fluorouracil if both drugs used as part of a protocol *rate must be controlled with an IV infusion pump*	Advanced Monitoring for 1st dose, then Intermediate Monitoring or according to protocol
Continuous IV infusion	NO		
Intraperitoneal	YES	**by physician** at VGH only	Basic monitoring or according to protocol

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oxaliplatin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples:
- 35 mg/m^2 **IV** on day 1; repeat weekly
- 85 mg/m^2 (range 80 to 100 mg/m^2) **IV** for one dose on day 1; repeat every 2 weeks

- 460 mg/m^2 **intraperitoneally** once (refer to oxaliplatin for hyperthermic intraperitoneal chemotherapy (HIPEC) orders, to be used with Belmont hyperthermia pump)

- Dosage adjustments required in patients who have/develop renal failure, sensory neuropathies, severe diarrhea or severe neutropenia or thrombocytopenia.

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity (wheezing, tachycardia, hypotension) and anaphylactic reactions have been reported and may occur within minutes of administration
- during administration, resuscitation equipment and emergency drugs should be readily available
- extravasation risk: even though classified as a non-vesicant (irritant), *follow guidelines below and treat like a vesicant*
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- *contraindications*:
    - history of hypersensitivity reaction to oxaliplatin or other platinum agents (eg, CISplatin, CARBOplatin)
    - peripheral sensory neuropathy interfering with function or severe renal dysfunction (CrCl less than 30 mL/min)
- *caution*: Elderly patients over 65 may be at higher risk of severe diarrhea. Women may be at higher risk of severe neutropenia.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- anemia, neutropenia and thrombocytopenia
- nausea and vomiting, diarrhea
- sensory neuropathy
- Reversible posterior leukoencephalopathy syndrome (RPLS; also known as PRES) has been associated with oxaliplatin. Although usually reversible, permanent disability and fatalities have been reported.

Monitoring
- CBC, electrolytes, serum creatinine

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oxytocin

Warnings	Classification	Alternate Names
hazardous drug group 2	oxytocic	SYNTOCINON, PITOCIN

Indications

- used in induction of labour to stimulate uterine contractions and increase uterine tone
- prevention and treatment of postpartum hemorrhage

Reconstitution and Stability

- see safe work procedures to prepare doses, unless dose provided by pharmacy
- store vials at room temperature

Compatibility

- compatible with D5W, NS, dextrose-saline combinations, ringers and lactated ringers

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Advanced monitoring
IV direct	YES	**under supervision of physician** give undiluted; over 1 to 2 minutes	Advanced monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations:** o induction/augmentation: 60 milliunits/mL: dilute 30 units in 500 mL o *initial* postpartum care: 60 milliunits/mL: dilute 30 units in 500 mL o postpartum care: 20 milliunits/mL: dilute 20 units in 1 L 40 milliunits/mL: dilute 40 units in 1 L o postpartum after induction for termination or fetal demise: 100 milliunits/mL: dilute 10 units in 100 mL dilute 50 units in 500 mL *rate must be controlled with an infusion pump*	Advanced monitoring Perinatal monitoring

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oxytocin

Dosage

Labour induction /augmentation:
- start at 1 to 2 milliunits/minute continuous IV infusion; increase by 1 to 4 milliunits/minute every 30 minutes until regular uterine activity is established.
- usual dose to achieve labour: 8 to 12 milliunits/minute
- Maximum rate prior to reassessment: 20 milliunits/minute

Postpartum hemorrhage:
- Prevention:
  - 10 units IM on delivery of anterior shoulder **or** 5 units IV direct
  - postpartum after induction for termination or fetal demise:
    83 milliunits/minute continuous IV infusion until 2 hours after delivery of the placenta

- Treatment (after delivery of placenta):
  50 to 150 milliunits/minute continuous IV infusion; titrate to control bleeding as per site specific protocol

Potential Hazards of Parenteral Administration

- hypersensitivity reactions including anaphylaxis
- cardiovascular collapse may occur with large doses; hazardous to patients with valve heart disease and those receiving spinal and epidural anesthetics

Important Implications

Contraindications/Cautions
- caution in patients with previous caesarean section or uterine surgery
- caution in any fetal malpresentation

Side effects
- hypertension, tachycardia, ECG changes (dose related)
- flushing, headache, nausea, vomiting
- uterine hypertonicity, spasm, tetanic contraction, uterine rupture

Monitoring
- may produce antidiuretic effects - monitor fluid intake and output
- monitor the duration and intensity of contractions
- ECG monitoring (dose related)

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PACLitaxel

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, taxane, antimicrotubule agent	TAXOL, ONXOL

Indications

- primary uses: breast, lung, or ovarian cancers and Kaposi's sarcoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store at room temperature
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS (preferred), D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling for all routes of administration.

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in polyolefin bag or other non-PVC container (i.e. PVC free and DEHP free); final concentration should be 0.3 to 1.2 mg/mL administer using DEHP-free or polyethylene-lined tubing (low sorbing tubing) with in-line 0.2 micron filter ; infuse over 1 to 3 hours *rate must be controlled with an infusion pump*	Advanced Monitoring for 1st dose, then Intermediate Monitoring or according to protocol
Continuous IV infusion	NO		
Intraperitoneal	YES	**by physician** at VGH only	Basic monitoring or according to protocol

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PACLitaxel

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Some examples:

- 80 to 110 mg/m^2 IV may be repeated weekly as part of a 3 or 4 week cycle. Total dose per cycle is 240 to 330 mg/m^2
- Higher doses of 135 to 200 mg/m^2 IV for one dose on day one and then may be repeated as part of a 3 week cycle. Total dose per cycle 135 to 200 mg/m^2

- 20 mg/m^2 intraperitoneally once daily for up to 5 days

- Dose modification for myelosuppression, hepatic failure: see protocol by which patient is being treated or refer to BC Cancer link below.
- A dose reduction of 20% is recommended for all subsequent cycles of PACLItaxel for patients who experience severe peripheral neuropathy

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity reactions: typically occur within the first 10 minutes of the first two cycles. Frequent, minor hypersensitivity reactions include: flushing and rash. Severe hypersensitivity reactions requiring treatment can occur; monitor patient closely and institute appropriate therapy in the event of an anaphylactic reaction
- during administration, resuscitation equipment and emergency drugs should be readily available
- injection site reactions
- extravasation risk: even though classified as a non-vesicant (irritant), *follow guidelines below and treat like a vesicant*
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- *Contraindications*: severe hypersensitivity to PACLItaxel or Cremophor EL (polyethoxyethylated castor oil) or other drugs formulated in polyethoxyethylated castor oil (eg. cycloSPORINE and teniposide); baseline neutropenia of less than 1.5 x 10^9/L or in patients with AIDS-related Kaposi's sarcoma who have a neutrophil count of less than 1 x 10^9/L.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *CNS*: peripheral neuropathy, arthralgia/myalgia
- *CVS*: anemia, febrile neutropenia, leukopenia, bradycardia, hypotension, ECG abnormalities
- *GI*: intestinal obstruction, nausea and vomiting
- *musculoskeletal*: arthralgia/myalgia
- *skin*: alopecia: usually complete, generally occurs 14 to 21 days after administration (onset sudden, often occurring in a single day)

Monitoring

- refer to specific hematology/oncology protocols for monitoring requirements

Other

- metabolized by cytochrome P450 isoenzymes CYP 2C8 (primarily) and CYP3A4; interacts with many drugs – consult interaction texts

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paliperidone long-acting

Warnings	Classification antipsychotic	Alternate Names INVEGA SUSTENNA paliperidone palmitate

Indications

- management of schizophrenia and related psychotic disorders
- restrictions apply

Reconstitution and Stability

- available as a kit containing a prefilled syringe of sustained release suspension and 2 safety needles
- store at room temperature
- prior to injection, shake syringe for *at least 10 seconds* to ensure a homogenous suspension
- after use, activate the needle protection system. It is fully activated when a "click" is heard.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	initial dose: give day 1 and day 8 injections into the **deltoid** muscle, using alternate arms o for patient weight less than 90 kg: use the 1 inch 23 gauge needle (blue coloured hub) o for patient weight 90 kg or more: use the 1.5 inch 22 gauge needle (gray coloured hub) monthly maintenance dose: o give in the **deltoid**, use needles as indicated above, **or** o give in the upper outer quadrant of the **gluteal** muscle, using the 1.5 inch 22 gauge needle (gray coloured hub) give monthly injections in alternate deltoid or gluteal muscles	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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paliperidone long-acting

Dosage

Prior to initiating therapy, establish tolerability with oral paliperidone or risperidone (paliperidone is the primary active metabolite of risperidone).

Initial dose:
- 150 mg IM on treatment day 1 followed by 100 mg IM on day 8, both doses administered into **deltoid** muscle
- the second dose may be given within 4 days before or after day 8

Maintenance dose:
- 75 mg IM monthly into **deltoid** or **gluteal** muscle
- dose may be adjusted based on response and tolerability (range: 25 to 150 mg)
- the monthly maintenance dose may be given within 7 days before or after the monthly time point

Conversion from oral paliperidone to paliperidone long-acting IM: give initial dose IM as described above, then the maintenance dose may be approximated as follows:

daily oral dose	monthly maintenance IM dose
3 mg	25 to 50 mg
6 mg	75 mg
12 mg	150 mg

Switching from risperidone long-acting IM to paliperidone long-acting IM: start monthly paliperidone long-acting in place of next scheduled risperidone long-acting dose:

risperidone long-acting	paliperidone long-acting
25 mg IM every 2 weeks	50 mg IM monthly
37.5 mg IM every 2 weeks	75 mg IM monthly
50 mg IM every 2 weeks	100 mg IM monthly

Dose adjustment required in renal impairment:
- CrCl 50 to 79 mL/minute: Initial dose: 100 mg IM on treatment day 1, followed by 75 mg IM on day 8
  Maintenance dose: 50 mg IM monthly
- CrCl less than 50 mL/minute: not recommended

Potential Hazards of Parenteral Administration

- hypotension and circulatory collapse: treat with sympathomimetic agents (AVOID epinephrine and DOPamine since beta stimulation may worsen hypotension in the setting of risperidone-induced alpha blockade)
- pain at injection site

Important Implications

Contraindications/Cautions
- avoid in elderly patients with dementia-related psychosis (increased risk of cerebrovascular, cardiovascular and infectious adverse events)
- caution:
  - in patients with cardiovascular disease – may alter cardiac conduction and prolong QT interval
  - may lower seizure threshold
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- extrapyramidal symptoms: tremor, rigidity, akathisia, dystonia; treat with anticholinergics (e.g. benztropine)
- orthostatic hypotension, tachycardia, vomiting
- hyperprolactinemia: symptoms may include non-puerperal lactation, amenorrhea, gynecomastia

Monitoring:
- potential for metabolic syndrome: baseline and periodic BMI, waist circumference, fasting plasma glucose and fasting lipid profile

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pamidronate

Warnings	Classification	Alternate Names
hazardous drug group 2	bone metabolism regulator	AREDIA pamidronate disodium, APD

Indications

- oncology : multiple myeloma, breast cancer
- hypercalcemia of malignancy
- potent inhibitor of osteoclastic bone resorption:
  - used for osteolytic bone metastases or osteolytic bone lesions of multiple myeloma to prevent or delay skeletal related events (eg. hypercalcemia, pathologic fractures, spinal cord compression and bone pain)
  - used for Paget's disease

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- vials stable at room temperature

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in NS 250 mL (or may dilute to a final concentration of 0.06 to 0.36 mg /mL) Maximum rate: o Paget's disease: 15 mg / hour o all other indications: 90 mg / hour	Basic Monitoring or according to protocol
Continuous IV infusion	NO		

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pamidronate

Dosage

- Oncological indications:
  - Bone metastases and acute bone pain secondary to breast cancer: 90 mg IV once monthly
  - Multiple myeloma: 30 mg (may give up to 90 mg) IV every 4 to 6 weeks for 1 to 2 years

- Hypercalcemia of malignancy: 60 to 90 mg IV once as follows:

Total serum calcium corrected*	Dose
below 3.5 mmol/L (with symptoms of hypercalcemia)	60 to 90 mg
3.5 mmol/L or above	90 mg
***Corrected calcium** = Measured total calcium (mmol/L) + ([40 - serum albumin (g/L)] x 0.027)	

Allow at least 7 days to elapse before retreatment in those who show an initial partial or complete response. However, if calcium does not decrease within 2 days, a repeat dose may be given 48 hours after the first dose.

- Paget's Disease: 180 to 210 mg per treatment course:
  - divided into weekly doses of 30 mg for 6 doses,
  - or biweekly doses of 60 mg for 3 doses,
  - start with a 30 mg dose, as influenza-like reactions are common only with the first infusion.

Potential Hazards of Parenteral Administration

- redness, swelling at IV site

Important Implications

Contraindications/Cautions:
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- increase in temperature greater than 1º C lasting up to 48 hours
- transient leukopenia may occur 1 to 7 days after IV infusion (nadir 48 to 72 hours)
- *CNS*: fatigue, headache; *Endocrine & metabolic*: hypocalcemia, hypophosphatemia, hypokalemia, hypomagnesemia; *Gastrointestinal* :nausea and vomiting; *Genitourinary*: urinary tract infection; *Neuromuscular & skeletal*: weakness, myalgia, osteonecrosis of the jaw

Monitoring
- monitor ionized serum calcium - decreases in serum calcium generally occur within 24 to 48 hours with maximum lowering capacity in 3 to 7 days
- monitor renal function: BUN, creatinine; if during therapy there is a deterioration in renal function, stop infusion
- patients should be adequately hydrated throughout therapy

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pantoprazole

Warnings	Classification proton pump inhibitor	Alternate Names PANTOLOC

Indications

- treatment of conditions which require a rapid reduction of gastric acid such as reflux esophagitis and peptic ulcer disease in those patients who cannot take oral medication (oral or NG route)
- management of acute upper gastrointestinal peptic ulcer bleed

Reconstitution and Stability

- store at room temperature; protect from light
- reconstitute 40 mg vial with 10 mL NS to provide 4 mg/mL solution

Compatibility

- compatible with D5W, NS, Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted, over 2 to 5 minutes	Basic Monitoring
IV intermittent	YES	dilute dose in NS 100 mL; administer: o 40 mg over 15 minutes o 80 mg over 30 minutes	Basic Monitoring
Continuous IV infusion	YES	**standard solution concentration** 0.4 mg/mL: dilute 40 mg in NS 100 mL, infuse at 8 mg/hour *rate must be controlled with an infusion pump*	Basic Monitoring

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pantoprazole

Dosage

Active GI bleed:
- 80 mg IV loading dose, followed by 8 mg/hour continuous IV infusion for 72 hours

Unable to take oral/NG therapy:
- usual dose: 40 mg IV once to twice daily

Zollinger-Ellison syndrome:
- initial dose: 80 mg IV Q12H
- may increase dose to 80 mg IV Q8H for a limited time (7 days)
- step down to oral therapy when feasible

Potential Hazards of Parenteral Administration

- thrombophlebitis
- serious hypersensitivity reactions, including anaphylaxis, erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis have been reported

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- headache
- diarrhea, nausea, flatulence
- elevated liver enzymes
- pruritus

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papaverine

Warnings	Classification vasodilator, smooth muscle relaxant	Alternate Names papaverine HCl

Indications

- treatment of cerebral and peripheral ischemia with arterial spasm
- myocardial ischemia complicated by arrhythmias

Reconstitution and Stability

- protect from light
- store at room temperature
- faint yellow colouring does not affect potency

Compatibility

- compatible with NS, D5W, Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Advanced Monitoring
Intramuscular	YES		Advanced Monitoring
IV direct	YES	**by physician only** give undiluted or diluted with equal volume of sterile water for injection maximum rate: 15 mg/minute	Full Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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papaverine

Dosage

- Arterial spasm: 30 to 120 mg IM, IV direct or subcutaneous every 3 hours as necessary
- Cardiac extrasystoles: 30 mg IV direct; may be repeated in 10 minutes if necessary

Potential Hazards of Parenteral Administration

- thrombosis at injection site
- too rapid IV administration may result in apnea and arrhythmias

Important Implications

Contraindications/Cautions

- caution in patients with glaucoma and impaired liver function
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- facial flushing and sweating, vertigo, dizziness, headache
- abdominal distress, nausea, anorexia

Other

- effects of papaverine may be potentiated by CNS depressants
- synergism may occur in combination with morphine

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pegaspargase (ONCASPAR)

Warnings	Classification	Alternate Names
high alert medication	antineoplastic	ONCASPAR PEG-L-asparaginase, (asparaginase (*E.Coli*) – polyethylene glycol)

Indications

- acute lymphoblastic leukemia
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- syringes stable for 4 hours at room temperature
- all doses are prepared by pharmacy

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above).
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	▪ maximum volume of 3 mL per site ▪ if volume greater than 3 mL, use more than one site	Advanced monitoring or per protocol observe for 1 hour after administration
IV direct	NO		
IV intermittent	YES	in 100 mL NS over 1 to 2 hours *rate must be controlled with an IV infusion pump*	Advanced monitoring or per protocol BP and vitals during administration; observe for 1 h after end of administration
Continuous IV infusion	NO		

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pegaspargase (ONCASPAR)

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response

Example: 2000 to 2,500 units/m^2 IV intermittent or IM every 2 to 4 weeks

Refer to BC Cancer Manual Monographs

Potential Hazards of Parenteral Administration

- hypersensitivity reactions, include rash, urticaria, edema, hypotension, respiratory distress, chills, fever and anaphylaxis (1 to 5 %)
- during administration, resuscitation equipment and emergency drugs should be readily available

Important Implications

Contraindications/Cautions

- contraindicated if a history of allergy to pegaspargase (ONCASPAR), or past or present pancreatitis, or in those who have experienced significant hemorrhagic or thrombotic side effects with other formulations of asparaginase

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- pegaspargase toxicities have a later onset than comparable toxicities of asparaginase e.coli (KIDROLASE).
- *CVS:* coagulation abnormalities (1 to 5%); fibrinogen decreased (1 to 5 %); thrombosis (4%)
- *GI*: hepatotoxicity (1 to 5 %); pancreatitis acute (2 % or more)
- *metabolic/laboratory*: bilirubin, transient increase (1 to 5%); transaminase, transient increase (1 to 5%)
- *CNS*: neurotoxicity (1 to 5 %), generally reversible

Other:

- Pegaspargase (ONCASPAR) is the least immunogenic, of asparaginase products and may be used in patients who have had an allergic reaction to asparaginase e.coli (KIDROLASE) or asparaginase erwinia (ERWINASE)

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pembrolizumab

Warnings	Classification	Alternate Names
high alert medication	antineoplastic, monoclonal antibody	KEYTRUDA

Indications

- treatment of advanced non-small cell lung cancer
- treatment of unresectable or metastatic melanoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge and protect from light, do NOT shake
- single use vials :100 mg/4 mL (25 mg/mL)
- allow vials and diluted solution to come to room temperature prior to use
- complete administration within 6 hours at room temperature

Compatibility

- compatible with D5W, NS

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above).
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	mix by gentle inversions • dilute in 50 mL NS, • (keep final concentration at 1 to 10 mg/mL), • infuse over 30 minutes, • use tubing with 0.2 micron, low protein binding in-line filter	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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pembrolizumab

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples:
- 2 mg/kg IV every 3 weeks (max 200 mg per dose)
- 4 mg/kg IV every 6 weeks (max 400 mg per dose)

- dose adjustments may be required in myelosuppression

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions
- avoid systemic corticosteroids or immunosuppressants *prior* to starting pembrolizumab (however may be used *during* treatment with pembrolizumab to manage immune-mediated adverse reactions)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- Immune mediated endocrinopathies: hyperthyroidism, hypothyroidism, hypophysitis, type 1 diabetes mellitus. May also present as non-specific symptoms i.e. headache, fatigue
- Immune mediated colitis, hepatitis, nephritis, pneumonitis.
- Other less common side effects: arthralgia, myalgia, pruritus

Monitoring
- blood glucose
- thyroid function at baseline and throughout therapy
- liver function
- renal function

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penicillin G benzathine

Warnings	Classification	Alternate Names
for IM use only	penicillin antibiotic, Beta-lactam antibiotic	BICILLIN LA; benzylpenicillin benzathine; benzathine penicillin G;

Indications

- treatment of infections caused by penicillin G sensitive microorganisms that are susceptible to the low and prolonged serum levels produced by this intramuscular formulation.

Reconstitution and Stability

- stable in fridge at 2 to 8 °C
- supplied as prefilled syringes

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into the ventrogluteal muscle (preferred) or dorsogluteal muscle at a slow and steady rate	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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penicillin G benzathine

Dosage

Primary, secondary, and early latent syphilis: 2.4 million units IM, given as 1.2 million units into each buttock.

Syphilis late latent:

- treatment is complex, consult **BC Centre for Disease Control STI Clinic at 604-660-6161**
- often, treatment is 2.4 million units IM (given as 1.2 million units into each buttock) weekly for 3 doses for a total of 7.2 million units.

- Tertiary syphilis (cardiovascular syphilis, neurosyphilis, benign late syphilis): these forms of syphilis are uncommon, complex to manage, consult **BC Centre for Disease Control STI Clinic at 604-660-6161**

Potential Hazards of Parenteral Administration

- anaphylaxis - ensure equipment and treatment readily available
- **IM injection only** - other administration routes are associated with cardiopulmonary arrest and death
- hypersensitivity reactions: urticaria, rash, chills, fever

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to penicillin antibiotics; refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult pharmacist if patient has an allergy to a cephalosporin
- Caution:
  - in patients with impaired renal function
  - in patients with pre-existing seizure disorders

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- 70% of patients treated for early syphilis will have a febrile (non-allergic) reaction starting a few hours after treatment and lasting a few hours (Jarisch-Herxheimer reaction). Sometimes lesions or rash will become more evident.

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penicillin G sodium

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antibiotic	CRYSTAPEN benzylpenicillin, penicillin G

Indications

- treatment of infections caused by susceptible strains of microorganisms
- Group B Streptococcus, maternal prophylaxis for prevention of neonatal disease

Reconstitution and Stability

- powder is stable at room temperature

- for IV administration reconstitute with sterile water for injection as follows:
  1 million unit vial: add 1.8 mL to provide 500,000 units/mL solution
  5 million unit vial: add 8.2 mL to provide 500,000 units/mL solution
  10 million unit vial: add 16.2 mL to provide 500,000 units/mL solution

- for **IM administration** reconstitute with sterile water for injection as follows:
  1 million unit vial: add 0.8 mL to provide 1 million units/mL solution
  5 million unit vial: add 3.2 mL to provide 1 million units/mL solution
  10 million unit vial: add 6.2 mL to provide 1 million units/mL solution

Compatibility

compatible with D5W, NS, dextrose-saline solutions, and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	inject deeply into upper outer quadrant of the buttock	Basic Monitoring
IV direct	NO		
IV intermittent	YES	*preferred route* dilute doses: o up to 5 million units in 50 mL; infuse over 15 to 30 minutes o over 5 million units in 100 mL; infuse over 30 minutes use large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Basic Monitoring
Continuous IV infusion	NO		

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penicillin G sodium

Dosage

- Usual dose: 0.5 to 4 million units IV every 4 to 6 hours
- dose adjustment required in renal impairment:

Creatinine Clearance	Dose
10 to 50 mL/minute	Administer 75% of normal dose
less than 10 mL/minute	Administer 20% to 50% of normal dose
Hemodialysis	Administer normal dose followed by either: ▪ 25% to 50% of normal dose every 4 to 6 hours, or ▪ 50% to 100% of normal dose every 8 to 12 hours (after dialysis on dialysis days)

Group B Streptococcus, maternal prophylaxis for prevention of neonatal disease: 5 million units IV as a single dose at onset of labour or prelabour rupture of membranes; then 2.5 million units every 4 hours until delivery

Potential Hazards of Parenteral Administration

- phlebitis and thrombophlebitis
- hypersensitivity reactions: urticaria, rash, chills, fever, anaphylaxis
- convulsions with very high doses, particularly in renal insufficiency
- hemolytic anemia may occur after large IV doses
- Extravasation risk: irritant (reports of vesicant effects)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to penicillin antibiotics; refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult pharmacist if patient has an allergy to a cephalosporin
- Caution:
    - impaired renal function
    - pre-existing seizure disorders
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- monitor electrolytes frequently when administering high doses

Other

- 1 million units penicillin G sodium contains 2 mmol (48 mg) sodium

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pentamidine

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	antiprotozoal	PENTAM-300, PENTACARINAT pentamidine isethionate

Indications

- treatment and prophylaxis of pneumonia caused by susceptible *Pneumocystis jiroveci*, (formerly called *Pneumocystis carinii* pneumonia – PCP)
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- powder stable at room temperature
- protect vials from light
- reconstitute 300 mg vial with 3 mL sterile water for injection to provide a 100 mg/mL solution

Compatibility

- compatible with D5W and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	only when IV route not possible; use a relatively large muscle mass	Basic Monitoring
IV direct	NO		
IV intermittent	YES	*preferred route* dilute doses: o up to 150 mg in 50 mL o 151 to 300 mg in 100 mL o more than 300 mg in 250 mL use large vein in forearm; if possible avoid hand, wrist or antecubital fossa administer over at least 60 minutes; preferably give over 2 to 3 hours to minimize risk of hypotension	Basic Monitoring
Continuous IV infusion	NO		
Inhalation	YES	Reconstitute 300 mg vial with 6 mL sterile water for injection administer via Respirigard nebulizer at a rate of 5 to 7 L/ minute	Basic Monitoring

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pentamidine

Dosage

- *Pneumocystis jiroveci* (or PCP) treatment:
  - 4 mg/kg/day IV given Q24H for 14 to 21 days
  - Dose adjustment required in renal impairment:

Creatinine Clearance	Dosage Interval
less than 10 mL/minute	24 to 36 hours

- *Pneumocystis jiroveci* (or PCP) prophylaxis:
  - 300 mg via **inhalation** every 4 weeks
  - dose for leukemia/bone marrow transplant patients: 300 mg IV every 2 to 4 weeks

Potential Hazards of Parenteral Administration

- sterile abscess may form at IM injection site
- phlebitis, rash at IV infusion site
- hypotension after IM or rapid IV infusion; tachycardia, flushing less common
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hypoglycemia - may have a delayed onset (5 to 7 days)
- transient increases in liver function tests may occur
- dose-related reversible azotemia has been reported
- nephrotoxicity may be potentiated by other nephrotoxic drugs
- leukopenia, neutropenia, anemia, thrombocytopenia may occasionally occur
- *inhalation route:* may include hypotension, anemia, nausea, vomiting, anorexia, metallic taste, dizziness, fatigue, cough, bronchospasm

Monitoring

- risk of sudden hypotension; if possible patient should be supine during IM/IV administration
- monitor heart rate, blood pressure, blood glucose, serum creatinine, BUN, CBC and differential, and liver function tests

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phenobarbital

Warnings	Classification	Alternate Names
	anticonvulsant, barbiturate-sedative	LUMINAL SODIUM phenobarbital sodium

Indications

- status epilepticus
- anticonvulsant for treatment of epilepsy
- treatment of severe/complex alcohol withdrawal

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS, D5W, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Intramuscular	YES	deeply into muscle	Intermediate Monitoring
IV direct	YES	in emergency/urgent situations if given peripherally, use large vein in forearm dilute with 10 mL sterile water for injection and give at a rate of 25 to 50 mg/minute maximum rate: 60 mg/minute	Advanced Monitoring BP and respiratory rate Q15 MIN x 2 after each dose
IV intermittent	YES	if given peripherally, use large vein in forearm dilute dose as follows: o up to 500 mg in 50 mL o 501 mg to 1000 mg in 100 mL infuse over 20 to 30 minutes	Intermediate Monitoring
Continuous IV infusion	NO		

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phenobarbital

Dosage

Status epilepticus:

- Loading dose: 15 to 18 mg/kg IV
  - If no mechanical ventilation:10 mg/kg IV, followed by 5 mg/kg IV after 30 to 60 minutes
  - an additional 5 mg/kg IV may be given every 15 to 30 minutes for refractory seizures
  - maximum total loading dose 30 mg/kg

- Maintenance dose: 1 to 3 mg/kg/day IV, IM, subcutaneous, given in 1 to 2 divided doses.

Alcohol withdrawal (if not using oral dosing):

- dose based on Clinical Institute Withdrawal Assessment Alcohol Scale Revised (*CIWA-Ar*) score:
  - a score of 10 to 19: 120 mg IV Q1H PRN
  - a score of 20 or greater: 240 mg IV Q1H PRN;
    - if score is 20 or greater *AND history of severe/complicated alcohol withdrawal,* consider loading dose: 5 mg/kg IV over 30 minutes, wait 30 minutes before administering subsequent doses
- maximum total dose (all routes): 1000 mg / 24 hours

Dose adjustments:

- reduce dose in elderly and patients with renal or hepatic dysfunction
- supplemental doses are required following hemodialysis and peritoneal dialysis

Potential Hazards of Parenteral Administration

- hypotension, shock, respiratory depression, apnea, bronchospasm (especially with rapid IV administration)
- thrombophlebitis, pain at injection site
- extravasation risk: can cause tissue necrosis

Important Implications

Contraindications/Cautions

- use with caution in patients with impaired cardiac or pulmonary function, porphyria, hypotension, hypertension
- abrupt withdrawal after prolonged use may precipitate seizures

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- sedation, agitation, confusion, dizziness, nausea, vomiting, headache
- bradycardia, hypotension, respiratory depression

Monitoring

- therapeutic (anticonvulsant) serum levels: 60 to 160 micromol/L

Other

- **NOT the drug of first choice in status epilepticus** due to slow onset of action (15 to 30 minutes following IV injection)

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phentolamine

Warnings	Classification alpha-adrenergic blocking agent antihypertensive	Alternate Names ROGITINE phentolamine mesylate

Indications

- hypertensive episodes in patients with pheochromocytoma
- differential diagnosis of pheochromocytoma
- prevention and treatment of dermal necrosis due to extravasation during IV administration of vasopressors (DOPamine, epinephrine, NORepinephrine, PHENYLephrine, vasopressin)

Reconstitution and Stability

- refrigerate
- protect vials from heat and light

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES		Advanced Monitoring
IV direct	YES	dilute each 5 mg with NS 4 mL maximum rate: 5 mg/ minute	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration** 0.04 mg/mL: add 20 mg to NS 500 mL *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions
Local infiltration	YES	**by physician or practitioner with specialized education** 1 mg/ mL: dilute 10 mg in NS 8 mL ○ inject 5 mg into extravasated catheter, then ○ inject 0.5 to 1 mg aliquots clockwise around leading edge of extravasation site. ○ may repeat procedure	Basic Monitoring See site-specific restrictions

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phentolamine

Dosage

Test dose for pheochromocytoma:
- 5 mg IM

Control of blood pressure during surgical removal of pheochromocytoma:
- preoperatively: 2 to 5 mg IV direct 1 to 2 hours prior to surgery
- during operation: 2 to 5 mg IV direct; may be repeated as indicated

Hypertensive crisis (from catecholamine excess e.g. pheochromocytoma):
- 1 to 5 mg IV direct. May follow with 1 mg/hour continuous IV infusion, titrated to blood pressure response; maximum infusion rate: 40 mg/hour

Extravasation of vasopressors:
- infiltrate area with 5 to 10 mg within 12 hours of extravasation

Potential Hazards of Parenteral Administration

- myocardial infarction, cerebral vascular spasm and occlusion
- tachycardia, cardiac arrhythmias, angina, and prolonged hypotension

Important Implications

Contraindications/Cautions
- caution: solution contains sulfites which can cause hypersensitivity reactions (acute asthma attack, shock, clouding of consciousness)
- caution: in patients with coronary artery disease; may precipitate an angina

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- may exacerbate pulmonary hypertension
- orthostatic hypotension

Other
- to reverse phentolamine-induced hypotension, use NORepinephrine

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PHENYLephrine

Warnings	Classification	Alternate Names
vesicant	sympathomimetic	NEOSYNEPHRINE PHENYLephrine HCl

Indications

- maintenance of blood pressure during spinal and inhalation anesthesia
- maintenance of blood pressure in acute hypotensive states or shock

Reconstitution and Stability

- stable at room temperature
- protect vials from light
- do not use darkened solutions

Compatibility

- compatible with, NS, ringers and lactated ringers
- compatible with D5W, but only stable for 4 hours

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	use 10 mg/mL vial; dilute 10 mg in NS 100 mL to provide 100 mcg/mL concentration administer calculated dose over 20 to 30 seconds use large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Full Monitoring Perinatal Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentrations**: 100 mcg/mL: dilute 10 mg in 100 mL 400 mcg/mL: dilute 40 mg in 100 mL **infuse by central line** for urgent/emergency situation pending insertion of central line: may use peripheral line in large vein in forearm; if possible avoid hand, wrist or antecubital fossa *rate must be controlled with an infusion pump*	Intensive Monitoring (Full monitoring may be used short term when treatment is initiated and transfer for hemodynamic monitoring is imminent) See site-specific restrictions

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PHENYLephrine

Dosage

Mild to moderate hypotension:

- 50 to 200 mcg IV direct; if necessary, repeat every 10 to 15 minutes in increments up to 200 mcg, **or**
- to raise blood pressure rapidly, give 100 to 180 mcg/minute continuous IV infusion; when blood pressure is stabilized, maintain rate of 40 to 60 mcg/minute

Potential Hazards of Parenteral Administration

- rapid IV injection of high doses may result in ventricular extra systoles, ventricular tachycardia, and hypertension
- tingling in extremities
- increased effect when given in conjunction with oxytocics
- extravasation risk (vesicant); may cause sloughing and necrosis
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
    - treat with phentolamine (administer within 12 hours), refer to phentolamine monograph

Important Implications

Contraindications/Cautions
- product contains sodium metabisulfite; contraindicated in patients with sulfite allergy
- avoid in pheochromocytoma
- use with caution in patients with hyperthyroidism, bradycardia, partial heart block, or cardiac disease
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- may cause severe peripheral and visceral vasoconstriction, reduced blood flow to vital organs, decreased renal perfusion and possibly reduced renal output and metabolic acidosis; these effects are more likely to occur in hypovolemic patients
- reflex bradycardia is common
- nausea vomiting, headache, nervousness

Monitoring
- signs of peripheral vasoconstriction (colour and temperature of extremities)
- urine output, fluid balance
- if administered peripherally, check injection site hourly and PRN for signs of extravasation

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phenytoin

Warnings	Classification	Alternate Names
hazardous drug group 2 **vesicant**	anticonvulsant	phenytoin sodium DILANTIN; diphenylhydantoin

Indications

- treatment of status epilepticus and control/prevention of seizures

Reconstitution and Stability

- see safe work procedures to prepare doses, unless dose provided by pharmacy
- vial is stable at room temperature; a faint yellow colour has no effect on potency
- administer the infusion **immediately** following preparation and monitor for precipitation

Compatibility

- compatible with NS or sodium chloride 0.45%

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted; in large vein in forearm; if possible avoid hand, wrist or antecubital fossa maximum rate: 50 mg/minute 25 mg/minute (if cardiac disease or older adult)	Full Monitoring
IV intermittent	YES	• phenytoin will precipitate in the tubing of a clamped IV line if it is not flushed or if it is left to stand o flush IV tubing with a minimum of 25 mL NS after administration to avoid precipitation • use tubing with 0.2 micron in-line filter • give peripherally through a large vein in forearm; if possible avoid hand, wrist or antecubital fossa • **phenytoin can precipitate and block PICC, IVAD (eg. Port-a-Cath) or tunneled CVC (eg. Hickman)** o consult infusion programme or IV nurse educator prior to using in the lines above • may use a short term non-tunneled catheter standard dilutions: • doses up to 500 mg in NS 50 mL • 501 to 1000 mg in NS 100 mL • doses over 1000 mg in NS 250 mL infuse doses over 30 to 60 minutes maximum rate: 50 mg/minute 25 mg/minute (if cardiac disease or older adult) *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	NO		

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phenytoin

Dosage

Status epilepticus

- Loading dose: 15 to 20 mg/kg IV; may give 5 mg/kg IV 30 minutes later if required
- Maintenance: 5 to 7 mg/kg IV daily; divided doses are recommended

Potential Hazards of Parenteral Administration

- phenytoin **precipitation will block centrally inserted IV access lines** including PICC, IVAD (Port-a-Cath) or tunneled CVC (Hickman).
- cardiovascular collapse, CNS and respiratory depression, severe hypotension may occur with too rapid IV administration
- depression of cardiac conduction, ventricular fibrillation, heart block have been reported
- extravasation risk: vesicant; thrombophlebitis, pain, skin necrosis
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- dose should not be increased at greater than 50 to 100 mg increments
- discontinue if skin rash occurs

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side Effects
- signs of toxicity include drowsiness, nystagmus, ataxia, vertigo

Monitoring
- monitor solution for precipitate
- serum levels recommended: 2 to 4 hours after IV loading dose; steady state trough levels (time to reach steady state varies from 8 to 60 days)
- therapeutic total phenytoin levels: 40 to 80 micromol/L
    - pregnant patient: obtain total and free phenytoin level (free therapeutic range is 4 to 8 micromol/L)
- liver enzymes

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piperacillin-tazobactam

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	penicillin antibiotic, extended-spectrum penicillin Beta-lactam antibiotic & beta-lactamase inhibitor	piperacillin sodium **&** tazobactam sodium

Indications

- for the treatment of moderate to severe infections caused by susceptible strains of bacteria

Reconstitution and Stability

- powder stable at room temperature
- available as:
  - 2.25 g vial contains piperacillin 2 g and tazobactam 0.25 g
  - 3.375 g vial contains piperacillin 3 g and tazobactam 0.375 g
  - 4.5 g vial contains piperacillin 4 g and tazobactam 0.5 g
- reconstitute each vial with sterile water for injection as follows:
  - 2.25 g vial: add 8.4 mL
  - 3.375 g vial: add 12.6 mL
  - 4.5 g vial: add 16.9 mL

  solution concentration: 225 mg/mL (piperacillin 200 mg/mL and tazobactam 25 mg/mL)

- also available as Minibag Plus, for immediate use only

Compatibility

- compatible in D5W, NS, dextrose-saline solutions
  - compatibility with lactated ringers varies with brand used; SteriMax, Sandoz and Alveda/Teligent formulations are compatible with lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	use large vein in forearm; if possible avoid hand, wrist or antecubital fossa dilute all doses in 50 mL; administer over 30 minutes if requested, may be administered over 3 hours in select critically ill patients	Basic Monitoring
Continuous IV infusion	NO		

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piperacillin-tazobactam

Dosage

Note: dose includes pipericllin and tazobactam components combined

- usual dose: 3.375 g IV every 6 hours
- severe infections: 4.5 g IV every 6 to 8 hours
- cystic fibrosis: 4.5 g IV every 4 hours
- Dose adjustment required for renal impairment:

Creatinine Clearance	Dose and Interval
30 to 50 mL/minute	2.25 to 3.375 g IV Q6H
less than 30 mL/minute	2.25 g IV Q6H to Q8H
Hemodialysis	2.25 g IV Q8H to Q12H (give dose after dialysis)
Continuous Ambulatory Peritoneal Dialysis	2.25 g IV Q8H to Q12H

Potential Hazards of Parenteral Administration

- anaphylaxis, rash, pruritus
- thrombophlebitis
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Contraindicated if allergy to penicillin antibiotics; refer to Beta-Lactam Antibiotic Cross-Allergy Chart or consult pharmacist if patient has an allergy to a cephalosporin
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, vomiting, diarrhea, headache, insomnia
- may cause increase in hepatic enzymes and serum creatinine
- hematological abnormalities include leukopenia, eosinophilia, thrombocytopenia, anemia and prolongation of bleeding time, particularly in patients with renal failure
- may cause hypokalemia

Other

- 1 gram piperacillin contains 2.35 mmol (54 mg) sodium
- when administered concomitantly with an aminoglycoside, space the doses at least one hour apart

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plerixafor

Warnings	Classification	Alternate Names
hazardous drug group 2	hematopoietic agent	MOZOBIL

Indications

- used in combination with filgrastim (G-CSF) to mobilize hematopoietic stem cells to the peripheral blood for collection and subsequent autologous transplantation
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- store vials at room temperature
- supplied as a clear, preservative-free colourless to pale yellow solution
- single use vial, any remaining drug must be discarded

Compatibility

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	into the abdomen	Advanced Monitoring vital signs at baseline and 15 and 30 minutes after each dose
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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plerixafor

Dosage

- begin plerixafor after patient has received filgrastim (G-CSF) daily for 4 days
- give approximately 6 to15 hours (ideally 10 to 11 hours) prior to initiation of each apheresis
- use actual weight to calculate dose; however, if the actual weight is greater than 175% of ideal body weight (IBW) use 175% IBW to calculate dose

Weight	Creatinine clearance mL/minute	daily dose for up to 3 doses*
83 kg or less	greater than 50 mL/minute	20 mg fixed-dose or 0.24 mg/kg subcutaneously daily
greater than 83 kg		0.24 mg/kg subcutaneously, not to exceed 24 mg/day
all weights	50 mL/minute or less (limited data for less than 20 mL/minute or those on dialysis)	0.16 mg/kg subcutaneously, not to exceed 24 mg/day

*manufacturer states higher maximums; but in practice a maximum of 24 mg/day for up to 3 doses provides good collection rates

Potential Hazards of Parenteral Administration

- injection site reaction including erythema, swelling, pruritus
- allergic reactions and anaphylaxis rarely, resuscitation equipment and emergency drugs should be readily available

Important Implications

Contraindications/Cautions
- use caution with drugs that reduce renal function or compete for active tubular secretion
- women of childbearing potential should use contraception during treatment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *GI*: nausea, diarrhea

Monitoring
- CBC, electrolytes,

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pneumococcal conjugate vaccine (13-valent)

Warnings	Classification	Alternate Names
	vaccine	PREVNAR 13

Indications

- inactive vaccine used for immunization against pneumococcal infections in patients at high risk of pneumococcal disease due to HIV infection, receipt of hematopoietic stem cell transplant (HSCT) and asplenia
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	shake well to form a homogeneous white suspension administer into deltoid muscle	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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pneumococcal conjugate vaccine (13-valent)

Dosage

Vaccination in patients with HIV infection:
- 0.5 mL IM
- give early in the course of HIV infection and prior to initiation of immunosuppressive therapy

Vaccination in recipients of hematopoietic stem cell transplant (HSCT):
- 0.5 mL IM monthly for 3 doses (minimum of 4 weeks between each dose), starting 6 to 12 months after HSCT

Asplenia:
- elective splenectomy: 0.5 mL IM at least 14 days prior to splenectomy
- non-elective splenectomy: 0.5 mL IM 14 days post-op or at discharge

Potential Hazards of Parenteral Administration

- injection site pain, erythema and swelling

Important Implications

Contraindications/Cautions
- hypersensitivity to pneumococcal vaccine or any component of the formulation, including diphtheria toxoid
- vaccine should not be administered to people with acute febrile illness
- thrombocytopenia or any coagulation disorder that would contraindicate IM injections (unless the benefit outweighs the risks)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- chills, fever, drowsiness, fatigue, insomnia, headache
- arthralgia, myalgia, skin rash

Other
- PREVNAR 13 can be given, at a different injection site, with any of the following vaccines: diphtheria, tetanus, acellular pertussis, H. influenzae type b, inactivated poliomyelitis, hepatitis B, meningococcal serogroup C, measles, mumps, rubella and varicella. **Different vaccines should be given at separate injection-sites**.
- If PREVNAR 13 given, then must wait 8 weeks to give PNEUMOVAX 23 [see separate monograph - pneumococcal polysaccharide vaccine (23-valent)]
- If PNEUMOVAX 23 given, them must wait 1 year to give PREVNAR 13
- PREVNAR 13 is composed of the purified polysaccharides of the capsular antigens from 13 S. *pneumoniae* serotypes conjugated to CRM_{197} (cross-reacting material 197), a purified non-toxic variant of the diphtheria toxin protein.

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pneumococcal polysaccharide vaccine (23-valent)

Warnings	Classification	Alternate Names
	vaccine	PNEUMOVAX 23; PNEUMO 23; pneumococcal vaccine polyvalent

Indications

- to promote active immunity to pneumococcal infections in individuals who are at increased risk of morbidity or mortality from these infections (e.g. splenectomy, sickle cell anemia, chronic illnesses such as cardiovascular, chronic obstructive pulmonary disease or diabetes mellitus, those over 65 years who are otherwise healthy)
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C)

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		
Intramuscular	YES	deltoid muscle or lateral mid-thigh preferred	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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pneumococcal polysaccharide vaccine (23-valent)

Dosage

- 0.5 mL IM or subcutaneous

Potential Hazards of Parenteral Administration

- local erythema and soreness at site of injection (occurs after 2 to 3 days, resolves within 48 hours)

Important Implications

Contraindications/Cautions
Contraindications:
- vaccine should not be administered to people with acute febrile illness
- intradermal administration may cause severe local reactions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- low grade fever (rarely greater than 39°C), weakness, myalgia, headache, photophobia, chills and nausea

Other
- routine revaccination is not recommended
- may be given at same time as other vaccines at **separate sites**, with no evidence of increased adverse effects or decreased antibody response; except:
    - if PNEUMOVAX 23 given, them must wait 1 year to give PREVNAR 13 [see separate monograph - pneumococcal conjugate vaccine (13-valent)]
    - if PREVNAR 13 given, then must wait 8 weeks to give PNEUMOVAX 23

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polatuzumab vedotin

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic	POLIVY

Indications

- primary use: non-Hodgkin's Lymphoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in refrigerator
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs– Administration and Handling.
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ dilute in 50 to 250 mL (final concentration of 0.7 to 2.7 mg/mL) ▪ gently invert bag to mix (do NOT shake) ▪ administer with 0.2 micron in-line filter ▪ infuse initial dose over 90 minutes (if well tolerated, subsequent infusions over 30 minutes) ▪ central vein preferred; or peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa *rate must be controlled with an IV infusion pump*	Advanced monitoring or according to protocol *Cycle 1*: o Monitor for infusion-related reactions (vitals before the infusion, Q30MIN during the infusion and for 90 minutes after the end of the infusion) *All other cycles*: o If prior infusion was well tolerated; monitor vitals before the infusion, at the end of the infusion, and at least once 30 minutes after the end of the infusion.
Continuous IV infusion	NO		

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polatuzumab vedotin

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response:

Example of a dosing schedule:

Treatment of relapsed or refractory diffuse large B-Cell lymphoma and not eligible for transplant (LYPOLABR):

- *Cycle 1*: 1.8 mg/kg IV on day 2
- *Cycles 2 to 6*: 1.8 mg/kg IV on Day 1

Cycle length: 21 days (may extend to 28 days if required for better tolerance)

Dosage adjustment required in patients who develop peripheral neuropathy.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- Infusion-related reactions, including fever, chills, flushing, dyspnea, hypotension, and urticaria occur in one-third of patients. Most reactions are mild to moderate, but severe reactions have been reported. Reactions may also be delayed, occurring as late as 24 hours after administration. Premedication with antihistamine and antipyretic is recommended prior to each infusion. If a reaction occurs during the infusion, interrupt the infusion.
- During administration, resuscitation equipment and emergency drugs should be readily available.
- Extravasation risk: non-vesicant (irritant)
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions

- *Caution*:
    - patients with rapidly proliferating tumour and high tumour burden are at risk of tumour lysis syndrome
    - potential for drug interactions, concomitant use with a strong CYP 3 A inhibitor may increase toxicity from polatuzumab vedotin, consult interaction texts

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *blood/lymphatic system:* anemia, neutropenia, thrombocytopenia
- *Nervous system*: peripheral neuropathy, progressive multifocal leukoencephalopathy (rare)
- *GI*: diarrhea, nausea, hepatic toxicity

Monitoring

- CBC, platelets, bilirubin, AST, ALT

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poliomyelitis vaccine

Warnings	Classification	Alternate Names
	vaccine, active immunizing agent	polio vaccine, inactivated (vero cell origin) IMOVAX POLIO

Indications

- indicated for active immunization against poliomyelitis caused by poliovirus types 1, 2 and 3
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator (2 to 8°C)
- shake the pre-filled syringe well before administration
- solution is clear and colourless; if it is cloudy, do not use and return to pharmacy

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	in the deltoid or triceps area	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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poliomyelitis vaccine

Dosage

- 0.5 mL subcutaneous
- For additional information refer to polio vaccine (inactivated) (IMOVAX POLIO) monograph in Part 4 – Biological Products at BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- anaphylaxis (epinephrine and diphenhydrAMINE should be readily available)
- pain and redness at injection site

Important Implications

Contraindications/Cautions

- History of an anaphylactic reaction to a previous dose of any polio-containing vaccine or to any component of this vaccine (includes 2-phenoxyethanol, formaldehyde, residual calf serum protein, neomycin, streptomycin, polymyxin B, Medium199 Hanks)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- fever

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potassium acetate

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	electrolyte	

Indications

- correction of low serum potassium levels with concurrent low sodium bicarbonate levels

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with most commonly used IV solutions

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent*	YES	*For urgent potassium replacement:* **peripheral:** maximum concentration: 20 mmol/250 mL maximum rate: 20 mmol/hour **central:** maximum concentration: 20 mmol/50 mL rate: up to 20 mmol/hour rate: 21 to 40 mmol/hour maximum rate: 40 mmol/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Intermediate Monitoring Full Monitoring See site specific restrictions
Continuous IV infusion*	YES	**peripheral:** maximum concentration: 80 mmol/L maximum rate: 20 mmol/hour **central:** maximum concentration: 100 mmol/L maximum rate: 20 mmol/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Intermediate Monitoring

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potassium acetate

Dosage

Electrolyte Replacement:
- 1 to 3 mmol potassium/kg/24 hours given as IV intermittent or continuous IV infusion

Serum potassium and bicarbonate should be monitored as a guide to dosage

Potential Hazards of Parenteral Administration

- hyperkalemia, alkalosis, cardiac arrest (especially in renal impairment or if administered too rapidly)
- may cause pain and thrombophlebitis if administered in high concentration into small veins
- Extravasation risk: irritant (concentration of greater than 0.1 mmol/mL)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- high alert medication: potassium (all salts) for injection at concentrations of 2 mmol/mL or more

Important Implications

Contraindications/Cautions
- use with caution in renal insufficiency

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- monitor serum potassium and bicarbonate levels and acid-base balance especially in patients with cardiac disease, renal impairment or acidosis

Other
- 1 mmol potassium acetate = 1 mEq potassium acetate
- 1 mmol potassium acetate provides 1 mmol potassium and 1 mmol acetate

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potassium chloride

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	electrolyte	

Indications

- prevention or treatment of hypokalemia

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with dextrose, saline, dextrose-saline combinations, ringers and lactated ringers

Preparation and Administration

- *Peripheral IV : use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Continuous subcutaneous infusion	YES	palliative care patients only ▪ maximum concentration: 30 mmol/L (with 300 to 750 units of hyaluronidase/L); ▪ infuse at a rate of 20 to 80 mL/hour; ▪ without hyaluronidase: use lower infusion rate due to slower absorption	Palliative Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent*	YES	**peripheral line:** maximum concentration: 10 mmol/100 mL maximum rate: 20 mmol/hour **central line:** maximum concentration: 20 mmol/50 mL rate: up to 20 mmol/hour rate: 21 to 40 mmol/hour maximum rate: 40 mmol/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Intermediate Monitoring Full Monitoring See site-specific restrictions
Continuous IV infusion*	YES	**peripheral line:** usual concentration: 20 to 40 mmol/L maximum concentration: 80 mmol/L **central line:** usual concentration: 20 to 40 mmol/L maximum concentration: 100 mmol/L maximum rate: 20 mmol/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Intraperitoneal	YES	add dose to dialysate solution	Intermediate Monitoring

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potassium chloride

Dosage

Potassium replacement for prevention or treatment of hypokalemia:
- usual dose: 40 to 200 mmol potassium per day
- higher doses may be required as indicated by serum potassium levels

Potential Hazards of Parenteral Administration

- may cause pain and thrombophlebitis if administered in high concentration into small veins
- cardiac arrest (especially in renal impairment or if administered too rapidly)
- Extravasation risk: irritant (concentration of greater than 0.1 mmol/mL)
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

- hyperkalemia: suggested treatment guidelines (dependent on patient and clinical circumstances)
    - discontinue potassium chloride
    - If ECG changes: give calcium gluconate 1 g in D5W 50 mL IV intermittent over 15 minutes **or** 1 g IV direct over 2 to 5 minutes
    - If acidosis present: give sodium bicarbonate 150 mmol in 1 L D5W at 100 mL/hour IV infusion (preferred) **or** 50 mmol IV direct over 1 to 3 minutes
    - 25 to 50 g dextrose (e.g. 50 to 100 mL dextrose 50%) IV direct over 5 minutes, followed by 5 to 10 units insulin regular IV direct. Monitor blood glucose 30 minutes and 60 minutes post dose and PRN for 6 hours
    - sodium polystyrene sulfonate (KAYEXALATE) 15 to 30 g orally or 30 to 60 g rectally; repeat serum potassium 2 hours after dose
    - hemodialysis in life-threatening situations
- high alert medication: potassium (all salts) for injection at concentrations of 2 mmol/mL or more

Important Implications

Contraindications/Cautions
- caution in patients with cardiac disease and renal impairment
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- serum potassium levels
- serum creatinine
- in patients with cardiac disease, renal impairment, or acidosis: monitoring of acid-base balance, potassium levels, and ECG is recommended

Other
- 1 mmol potassium chloride = 1 mEq potassium chloride

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POTASSIUM phosphate

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	electrolyte	potassium acid phosphate monobasic-dibasic

Indications

- treatment of hypophosphatemia

Reconstitution and Stability

- stable at room temperature
- discard unused portion

Compatibility

- compatible with dextrose and saline solutions *except* dextrose 10% in sodium chloride 0.9%

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	all solutions are prepared by pharmacy dilution for **peripheral line**: o up to 15 mmol phosphate in D5W 250 mL; infuse over 2 to 4 hours o 30 mmol phosphate in D5W 500 mL; infuse over 4 to 8 hours o 45 mmol phosphate in D5W 1000 mL; infuse over 6 to 12 hours dilution for **central line**: o up to 15 mmol phosphate in D5W 50 mL; infuse over 2 to 4 hours o 30 mmol phosphate in D5W 100 mL; infuse over 4 to 8 hours o 45 mmol phosphate in D5W 250 mL; infuse over 6 to 12 hours **central line** only: o maximum rate: 15 mmol phosphate/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Full Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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POTASSIUM phosphate

Dosage

- Treatment of hypophosphatemia: dose based on serum phosphate level and renal function; refer to dosing table below:

Serum phosphate level	POTASSIUM phosphate dose in **mmol phosphate**			Repeat serum phosphate level
	CrCl (or eGFR) less than 25 mL/min	CrCl (or eGFR) 25 to 50 mL/min	CrCl (or eGFR) greater than 50 mL/min	
0.6 to 0.79 (mmol/L)	Nil	15 mmol	30 mmol	Next morning
0.4 to 0.59 (mmol/L)	15 mmol	30 mmol	45 mmol	Next morning (or at least 4 hours after end of infusion)
less than 0.4 (mmol/L)	30 mmol	45 mmol	45 mmol	Next morning (or at least 4 hours after end of infusion)

Potential Hazards of Parenteral Administration

- rapid infusion MUST be avoided to prevent:
  - hypocalcemia (which may lead to tetany, convulsions, cardiac arrhythmias and hypotension)
  - the formation of insoluble calcium phosphate (precipitation in soft tissues, renal failure)
- extravasation risk (pain on extravasation, tissue necrosis)
- high alert medication: potassium (all salts) for injection at concentrations of 2 mmol/mL or more

Important Implications

Contraindications/Cautions
- caution should be used in patients with renal insufficiency, dehydration
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- hydration must be maintained
- serum phosphate, potassium and calcium levels

Other
- **each mL POTASSIUM phosphate contains 3 mmol phosphate and 4.4 mmol potassium**

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pralidoxime

Warnings	Classification antidote, anticholinesterase antagonist, cholinesterase reactivator	Alternate Names PROTOPAM pralidoxime chloride

Indications

- antidote for organophosphate or carbamate insecticide poisoning
- available through Health Canada **Special Access Program**; contact pharmacy
- Contact **Drug and Poison Information Centre (DPIC):604-682-5050 or 1-800-567-8911** for complete treatment guidance related to specific insecticides

Reconstitution and Stability

- stable at room temperature
- reconstitute each 1 g vial with 20 mL sterile water for injection to provide 50 mg/mL solution

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	first dose only; if IV route is unavailable	Advanced Monitoring See site-specific restrictions
IV direct	YES	**by physician only** give undiluted by slow injection; maximum rate: 200 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	YES	further dilute: ○ 1 g in NS 100 mL ○ 2 g in NS 250 mL infuse over 30 minutes	Full Monitoring See site-specific restrictions
Continuous IV infusion	YES	*preferred route* **standard solution concentration:** 10 mg/mL: remove 20 mL from NS 100 mL bag; then add 1 g to the bag	Full Monitoring See site-specific restrictions

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pralidoxime

Dosage

Organophosphate or carbamate insecticide poisoning:

- Initial dose: 1 to 2 g IV infused over 30 minutes. In cases of severe poisoning, may be given IV direct **slowly** at rate of 200 mg/minute. May repeat dose in 1 hour if no response.

- Maintenance dose: 8 to 10 mg/kg/hour continuous IV infusion. Lower rates may be adequate, titrate to response.

- Therapeutic endpoint: control of nicotinic symptoms (muscle fasciculation, paralysis, respiratory failure). Treatment for 24 to 48 hours is usually adequate.

Use pralidoxime in conjunction with atropine

Potential Hazards of Parenteral Administration

- risk of serious adverse reactions (laryngospasm, hypertension) increases with rapid IV infusion
- respiratory arrest (rare, but has been fatal)
- rapid administration may result in transient muscle rigidity, or neuromuscular blockade
- mild pain at IM injection site

Important Implications

Contraindications/Cautions
- use with caution in patients with impaired renal function; may require dosing adjustment
- use caution in patients with myasthenia gravis

- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects
- hypertension, transient tachycardia
- dizziness, headache
- blurred vision, diplopia

Other
- treatment is most effective if given within 24 to 36 hours of acute exposure, but has proven beneficial even when administered several days after exposure.

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procainamide

Warnings	Classification	Alternate Names
	antiarrhythmic	PRONESTYL procainamide hydrochloride

Indications

- treatment of ventricular and atrial arrhythmias

Reconstitution and Stability

- stable at room temperature
- solutions may develop a slightly yellow colour which does not alter efficacy; solutions darker than light amber must NOT be used

Compatibility

- compatible with NS, Lactated Ringers solution
- stable in D5W for 8 hours only

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	loading dose (alternative dosing): dilute each 100 mg with 10 to 20 mL NS; administer each 100 mg over 2 minutes maximum rate: 50 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	YES	loading dose: dilute dose in NS 100 mL; maximum concentration: 20 mg/mL maximum rate: 50 mg/minute *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions
Continuous IV infusion	YES	**standard solution concentrations**: 4 mg/mL: dilute 1000 mg in NS 250 mL 8 mg/mL: dilute 2000 mg in NS 250 mL *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions

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procainamide

Dosage

Loading dose:
- 15 to 17 mg/kg or 1000 mg IV intermittent given as follows:
  - doses up to 1000 mg: infuse over 30 to 60 minutes; followed by maintenance infusion
  - doses greater than 1000 mg: infuse at 20 to 30 mg/minute until arrhythmia is suppressed, hypotension occurs, or the QRS complex widens; followed by maintenance infusion
- **alternative** dosing: 100 mg IV direct over 2 minutes, repeated every 5 minutes until arrhythmia is controlled or until a maximum of 1000 mg is reached; followed by maintenance infusion

Maintenance infusion: 1 to 4 mg/minute continuous IV infusion

Dose adjustment required in renal dysfunction

Potential Hazards of Parenteral Administration

- severe hypotension with rapid IV administration or high doses
- cardiac arrhythmias (e.g. ventricular asystole, fibrillation)

Important Implications

Contraindications/Cautions
- caution in patients with marked disturbances in atrioventricular conduction: may further depress conduction
- caution: avoid concurrent use with other drugs that prolong QT interval
- use with extreme caution in myasthenia gravis due to enhanced neuromuscular blockade and antagonism of cholinergic agents

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- blood dyscrasias, peripheral neuropathy, systemic lupus erythematosus

Monitoring
- with prolonged use: electrolytes, CBC and differential, serum creatinine

Other
- therapeutic range: 20 to 40 micromol/L
- concomitant administration of proPRANolol may significantly reduce renal clearance of procainamide

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proPOFol

Warnings	Classification	Alternate Names
irritant (reports of vesicant effects)	anesthetic-general	DIPRIVAN, FRESENIUS PROPOVEN

Indications

- induction and maintenance of general anesthesia for surgical procedures
- procedural sedation for surgical and diagnostic procedures
- sedation of mechanically ventilated patients
- sedation in palliative care patients
- ipsilateral hemisphere anesthesia to test for speech and memory (Wada test)
- management of status epilepticus
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature, protect from light
- prior to use, visually inspect emulsion for particulate matter, discoloration or emulsion separation
- shake well before use
- after vial puncture, complete administration within 12 hours; discard unused portion of vial
- change IV tubing and administration sets every 12 hours

Compatibility

- compatible with D5W, dextrose 5% in sodium chloride 0.45%, dextrose 5% in lactated ringers or lactated ringers

Preparation and Administration

- *Peripheral IV: use large vein in forearm; if possible avoid hand, wrist or antecubital fossa

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct*	YES	give undiluted administer slowly at approximately 20 to 40 mg every 10 seconds maximum rate: 10 mg /second	Intensive Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion*	YES	**standard solution concentration** 10 mg/mL: 1000 mg/100 mL commercially available premixed emulsion infusion rate: varies with indication and clinical status of patient *rate must be controlled with an infusion pump*	Intensive Monitoring Palliative Monitoring See site-specific restrictions

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proPOFol

Dosage

Induction of anesthesia:
2 to 2.5 mg/kg (given as 40 mg every 10 seconds) IV direct until onset

Maintenance of anesthesia (titrated to meet individual requirements):
- 20 to 50 mg IV direct when anesthesia lightening; or
- 100 to 200 mcg/kg/minute continuous IV infusion starting immediately after the induction dose; 30 to 60 minutes later, decrease infusion rate to 50 to 100 mcg/kg/minute (to optimize recovery time).

Elderly or debilitated patients may require up to 50% lower induction and maintenance doses.

Sedation of mechanically ventilated patient:
- 5 mcg/kg/minute continuous IV infusion initially; increase by 5 to 10 mcg/kg/minute every 5 minutes until desired sedation level is achieved (usual range 5 to 80 mcg/kg/minute).
- Daily assessment of minimum effective dose to maintain goal level of sedation is required.

Procedural sedation:
0.25 to 0.5 mg/kg IV direct over 1 minute, then 10 to 20 mg slow IV direct every 1 to 2 minutes as needed until the patient is sedated

Status epilepticus:
1 to 2 mg/kg IV loading dose, then 20 to 200 mcg/kg/minute continuous IV infusion, titrated to achieve seizure cessation or burst suppression on electroencephalography (EEG)

Palliative care sedation:
5 to 15 mcg/kg/minute, continuous IV infusion, increase by 5 to 10 mcg/kg/minute every 30 to 60 minutes until desired response (usual range 15 to 50 mcg/kg/minute; rarely up to 100 mcg/kg/minute)

Potential Hazards of Parenteral Administration

- anaphylaxis (rare), pain during injection, phlebitis
- facilities for assisting respiration and circulation are necessary
- Extravasation risk: irritant (reports of vesicant effects)
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions
- Contraindicated in those with hypersensitivity to soybean or peanut protein and eggs
- Caution in patients with hypovolemia, severe cardiac or respiratory disease or a history of seizures
- Caution: prolonged use (more than 48 hours) of high doses (more than 83 mcg/kg/minute) has been associated with an increased risk of proPOFol infusion syndrome which can lead to cardiac arrest in adults
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- hypotension, apnea, bradycardia; nausea and vomiting (infrequent)
- while proPOFol appears to possess anticonvulsant activity, excitatory phenomena, such as myoclonus, spontaneous movement, tremor and twitching have been observed
- rarely epileptiform movement, urticaria, abnormal ECG, increased plasma glucose
- pancreatitis has been reported following anesthesia with proPOFol, although a causal relationship has not been established; elevation of pancreatic enzymes may occur during prolonged infusions

Monitoring
- lactate, triglycerides, CK levels, liver function tests for infusion duration beyond 48 hours

Other
- IV direct onset of anesthesia: 30 seconds; duration of anesthesia: approximately 3 to 10 minutes
- proPOFol is suspended in a 10% lipid emulsion which is a source of calories

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proPRANolol

Warnings	Classification beta-blocker, antihypertensive, antiarrhythmic, antianginal	Alternate Names INDERAL

Indications

- treatment of cardiac arrhythmias, supraventricular tachycardia, ventricular premature beats
- cardiac disturbances associated with thyrotoxicosis
- idiopathic hypertrophic subaortic stenosis
- treatment of angina pectoris and hypertension when the oral route is not feasible

Reconstitution and Stability

- stable at room temperature, protect from light

Compatibility

- compatible with D5W, NS, dextrose-saline combinations, Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted; maximum rate: 1 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	YES	dilute in D5W 50 mL infuse over 10 to 30 minutes (recommended rate: 1 mg/10 minutes) *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions
Continuous IV infusion	YES	**standard solution concentration**: 0.1 mg/mL: dilute 10 mg in D5W 100 mL; *rate must be controlled with an IV infusion pump*	Full Monitoring See site-specific restrictions

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proPRANolol

Dosage

Dose is titrated to response.

- Acute Arrhythmias / Thyroid Storm:
  1 mg IV direct every 2 to 5 minutes to a maximum of 0.1 mg/kg

- Hypertension:
  - 1 to 3 mg IV every 4 to 6 hours; **or**
  - 2 to 3 mg/hour continuous IV infusion

- lower doses may be required in hypothyroidism, liver disease and the elderly
- higher doses may be required in patients with thyrotoxicosis

Potential Hazards of Parenteral Administration

- severe sinus bradycardia; antidote: atropine
- partial heart block; antidote: atropine; if unresponsive, use isoproterenol or temporary pacing
- hypotension; antidote: vasopressors (epinephrine, NORepinephrine, DOPamine)
- bronchospasm; antidote: salbutamol
- profound beta-blockade; antidote when other measures have failed: glucagon

Important Implications

Contraindications/Cautions:
- contraindicated in patients with sinus bradycardia, overt heart failure, cardiogenic shock, bronchial asthma, bronchospastic disease, second and third degree heart block
- caution in cardiac, renal or hepatic impairment, uncontrolled diabetes mellitus, or hemorrhagic shock
- in patients with angina, abrupt discontinuation after prolonged use may lead to exacerbation of angina, myocardial infarction, or ventricular arrhythmias
- prior administration of other antiarrhythmic cardiac depressant drugs (eg.procainamide, quiNIDine, disopyramide, or verapamil) may potentiate the cardiac depressant effect

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects:
- also see “Potential Hazards of Parenteral Administration” above
- may precipitate or potentiate heart failure

Monitoring
- notify physician if systolic blood pressure is less than 90 mm Hg or heart rate less than 50 beats per minute, or as per prescriber’s orders

Other
- onset of action within 2 to 5 minutes; peak response within 15 minutes, with duration of 3 to 6 hours
- change over to oral therapy should be made as soon as possible
- dose conversion: oral to IV = 15:1

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protamine

Warnings	Classification heparin antagonist; partial antidote - low molecular weight heparin	Alternate Names protamine sulphate

Indications

- treatment of severe heparin overdose or heparin reversal
- treatment of hemorrhage from low molecular weight heparin (LMWH)

Reconstitution and Stability

- store at room temperature, do not freeze

Compatibility

- compatible with D5W, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	administer undiluted slowly, maximum rate: 5 mg/minute	Intermediate Monitoring
IV intermittent	YES	dilute dose in D5W 50 mL; o infuse over 10 to 30 minutes maximum rate: 5 mg/minute o **or** infuse over 8 to 16 hours	Intermediate Monitoring
Continuous IV infusion	YES	*after cardiopulmonary bypass surgery:* **standard solution concentrations:** 1.5 mg / mL: o remove 15 mL from 100 mL bag, then add 150 mg to bag *rate must be controlled with an IV infusion pump*	Intermediate Monitoring

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protamine

Dosage

- Neutralizing heparin given IV direct: may give protamine IV direct or IV intermittent
  - if less than 30 minutes have elapsed; give protamine 1 to 1.5 mg every 100 units of heparin given in last dose
  - if 30 to 60 minutes have elapsed; give protamine 0.5 to 0.75 mg for every 100 units of heparin
  - if 2 or more hours have elapsed; give 0.25 to 0.375 mg of protamine for every 100 units of heparin
  - **maximum dose**: 50 mg

- Neutralizing heparin given continuous IV infusion: give protamine 25 to 50 mg IV direct or IV intermittent

- Neutralizing heparin after cardiac surgery [cardiopulmonary bypass (CPB)], *several options exist including*:
  - 50 mg IV PRN based on activated clotting time (ACT), followed by 25 mg/hour for 6 hours after the end of cardiopulmonary bypass
  - 50 mg IV per 500 mL of pump blood
  - Total dose: Recommended to limit protamine to less than 2.6 mg protamine per 100 units heparin

- Neutralizing subcutaneous heparin: give protamine 1 to 1.5 mg IV direct or IV intermittent for every 100 units of heparin given in last dose. Administer as follows:
  - protamine loading dose: 25 to 50 mg IV direct or IV intermittent, then
  - give remainder of calculated dose by IV intermittent infusion over 8 to 16 hours

- Neutralizing subcutaneous dalteparin (LMWH):
  - give protamine 1 mg IV direct or IV intermittent for every 100 units dalteparin.
  - if bleeding continues or PTT remains prolonged 2 to 4 hours after first protamine dose, give a second dose as follows: protamine 0.5 mg IV direct or IV intermittent for every 100 units dalteparin
  - **maximum dose**: 50 mg

- Neutralizing subcutaneous enoxaparin (LMWH):
  - if less than 8 hours since last dose enoxaparin, give protamine 1 mg IV direct or IV intermittent for every 1 mg of enoxaparin;
  - if 8 to 12 hours since last dose enoxaparin, give 0.5 mg protamine per 1 mg enoxaparin;
  - if bleeding continues or PTT remains prolonged 2 to 4 hours after first protamine dose, give a second dose as follows: protamine 0.5 mg IV direct or IV intermittent for every 1 mg enoxaparin.
  - **maximum dose**: 50 mg

Potential Hazards of Parenteral Administration

- too rapid IV injection: hypotension, anaphylactoid reactions, bradycardia, dyspnea, flushing, feeling of warmth
- hypersensitivity reaction: anaphylaxis,urticarial, angioedema, acute pulmonary hypertension

Important Implications

Contraindications/Cautions
- use with caution in patients allergic to fish
- previous exposure to protamine may predispose to hypersensitivity
- due to anticoagulant effect of protamine, doses greater than 50 mg over a short duration may cause bleeding
- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Other
- protamine sulphate is a weak anticoagulant: overdose can result in hemorrhage
- heparin rebound may occur after several hours (requiring additional protamine sulphate)
- protamine only neutralizes approximately 60% of LMWH anti-factor Xa activity

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pyriDOXine

Warnings	Classification	Alternate Names
	vitamin	pyriDOXine HCl, vitamin B6

Indications

- treatment of vitamin B6 deficiency, isoniazid poisoning, pyriDOXine dependent convulsions, hyperemesis gravidarum
- prevention and reversal of isoniazid induced peripheral neuropathy
- treatment of certain metabolic disorders (eg. primary homocystinuria, hyperoxaluria, xanthinuric aciduria)

Reconstitution and Stability

- stable at room temperature
- protect from light

Compatibility

- compatible with dextrose, saline, and dextrose-saline combination solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Basic Monitoring
Intramuscular	YES		Basic Monitoring
IV direct	YES	undiluted maximum rate: 50 mg/minute Isoniazid poisoning: maximum rate is 500 mg to 1 g/minute	Basic Monitoring
IV intermittent	YES	dilute in D5W 50 mL infuse over 30 minutes maximum rate: 50 mg/minute Isoniazid poisoning: rate varies as indicated under dosage maximum rate is 500 mg to 1 g/minute	Basic Monitoring
Continuous IV infusion	NO		

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pyriDOXine

Dosage

- Vitamin B6 deficiency: 10 to 30 mg daily
- Metabolic disorders: 100 to 500 mg daily
- Isoniazid induced peripheral neuropathy:
  - prophylaxis: 10 to 50 mg daily
  - reversal: 100 to 200 mg daily
- Hyperemesis gravidarum: 20 to 100 mg daily
- Isoniazid poisoning:
  - *Known amount*: give an equal amount of pyridoxine to the amount of isoniazid ingested
    - *seizing :* administer IV direct at a rate of 500 mg to 1 g / minute. If seizures stop prior to the administration of the entire dose, dilute remainder in D5W 50 mL and infuse over 4 to 6 hours.
    - *not seizing*: dilute in D5W 50 mL and infuse over 30 to 60 minutes (maximum rate: 500 mg to 1 g / minute).
  - *Unknown amount*: 5 g IV direct over 5 to 10 minutes if seizing. Dilute in D5W 50 mL and infuse over 30 to 60 minutes if not seizing. Dose may be repeated if necessary to control seizures, or may be repeated later if coma persists.
  - Contact Drug and Poison Information Centre (DPIC) for most current recommendations: 604-682-5050

Potential Hazards of Parenteral Administration

- stinging or burning sensation and pain at injection site
- seizures have occurred following large IV doses
- some slight flushing or feeling of warmth may occur
- allergic reactions

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side Effects:

- with larger doses: low folic acid levels, paresthesia, somnolence

Others:

- pyriDOXine reduces effects of levodopa

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rabies immune globulin

Warnings	Classification	Alternate Names
	passive immunizing agent	KAMRAB, IMOGAM, HYPERRAB,RIG

Indications

- passive immunization against rabies as part of a post-exposure prophylaxis regimen in individuals exposed to the disease or virus who previously have not been vaccinated with rabies vaccine
- indications and / or prescribing restrictions apply
- **restricted to use approved by the Medical Health Officer**
  Monday to Friday, 0830 -1700 call 604-675-3900; or after-hours and on weekends call 604-527-4893

Reconstitution and Stability

- store in refrigerator (2 to 8°C)
- discard unused solution

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	▪ ventrogluteal area is the preferred site, alternatively the vastus lateralis ▪ administer at an anatomical site distant from the rabies vaccine	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Wound infiltration	YES	preferred method ▪ administer at an anatomical site distant from rabies vaccine ▪ infiltrate as much as possible into and around the wound(s) and exposed area and then inject the remaining amount IM ▪ if volume is inadequate to infiltrate wound(s) and exposed area: o *for IMOGAM*: dilute 2 to 3 fold in NS only o *for HYPERRAB*: dilute with an equal volume of D5W only	Basic Monitoring

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rabies immune globulin

Dosage

Post-exposure prophylaxis in patients who have not been previously vaccinated:

- usual dose (= maximum dose) is 20 units (IU)/kg once; preferably administered at the same time as the first dose of rabies vaccine, at a separate anatomical site
- the full dose should be infiltrated into and around the wound(s) and exposed area; any remaining volume should be administered IM at an anatomical site distant from rabies vaccine administration
- because rabies immune globulin can suppress the active immune response to rabies vaccine, do not exceed the recommended dose

For all other information refer to immune globulins (rabies immune globulin monographs) within Part 4 - Biological Products at BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- soreness, tenderness, pain or stiffness at the injection site; may persist for several hours after injection
- low grade fever may occur
- hypersensitivity reactions including anaphylaxis occur rarely; resuscitation equipment and emergency drugs should be readily available

Important Implications

Contraindications/Cautions:

- avoid immunization with **live** vaccines, e.g. measles, mumps, rubella or varicella
  - live vaccines should *not* be given within **4** months following rabies immune globulin

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Others:

- rabies immune globulin should be administered at the time of the first dose of rabies vaccine; since vaccine-induced antibodies begin to appear within 1 week, there is no value in administering rabies immune globulin more than 7 days after initiating a vaccine course
- repeated doses of rabies immune globulin should not be administered once vaccine treatment has been initiated as this could prevent the full expression of active immunity expected from the rabies vaccine

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rabies vaccine, inactivated

Warnings	Classification	Alternate Names
	vaccine – active immunizing agent	IMOVAX RABIES, RABAVERT

Indications

- active immunization against rabies for both:
  - pre-exposure prophylaxis (primary series and periodic reinforcement)
  - post-exposure prophylaxis
- indications and / or prescribing restrictions apply
- **restricted to use approved by the Medical Health Officer**
  Monday to Friday, 0830 -1700 call 604-675-3900; or after-hours and on weekends call 604-527-4893.

Reconstitution and Stability

- store in refrigerator (2 to 8°C)
- reconstitute vaccine with 1 mL of provided diluent (sterile water for injection). Gently swirl the contents until completely dissolved.
- Administer immediately after reconstitution. However, when one vial is being used for multiple intradermal injections, the reconstituted solution may be used for up to 6 hours, when stored in refrigerator.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	give into the deltoid muscle administer at an anatomical site distant from rabies immune globulin	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intradermal (ID)	YES	may be used for immunocompetent people only **preferred**: into the deltoid area; alternatively the anterolateral area of the thighs and suprascapular areas may be used 2 injections required for total dose, use different sites/limbs for each injection. administer at an anatomical site distant from rabies immune globulin	Basic Monitoring

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rabies vaccine, inactivated

Dosage

refer to rabies vaccine monographs within Part 4-Biological Products at
BC Centre for Disease Control Immunization for most current and complete information

Pre-exposure prophylaxis (immunocompetent people, use either intradermal (ID) or IM route):
- two doses of 0.2 mL ID (administer at 2 separate sites, 0.1 mL/site) on day zero and day 7 **or**
- three dose series of 1 mL IM (2.5 units): on day zero, on day 7, and a 3rd dose during days 21 to 28
- for recommended serological testing and booster doses refer to BC CDC link above

immunocompromised individuals, and those on chloroquine or hydroxychloroquine, or planning to start chloroquine or hydroxychloroquine within a month of series completion, **must be** immunized using the IM regimen.

Post-exposure prophylaxis (no previous immunization against rabies):

patient	day zero	day 3	day 7	day 14	Day 28
immunocompetent, 3 doses intradermal (ID) **or** 4 doses IM	0.2 mL ID (0.1 mL at 2 sites)	0.2 mL ID (0.1 mL at 2 sites)	0.2 mL ID (0.1 mL at 2 sites)		
	1 mL IM	1 mL IM	1 mL IM	1 mL IM	
immunocompromised, and people on chloroquine or hydroxychloroquine; 5 doses IM	1 mL IM	1 mL IM	1 mL IM	1 mL IM	1 mL IM

- day zero = as soon as possible after exposure; **also one dose of rabies immune globulin should be given on day zero** (refer to rabies immune globulin monograph)
- for recommended serological testing and booster doses refer to BC CDC link above

Post-exposure prophylaxis (*previously immunized with a full course of pre or post-exposure vaccine* using a WHO approved vaccine & schedule, or those with prior documented anti-rabies antibody level of 0.5 unit/mL or higher)
- 1 mL IM on day zero (administer as soon as possible after exposure), and again on day 3, for a total of 2 doses

Potential Hazards of Parenteral Administration
- hypersensitivity reactions including anaphylaxis in patients allergic to neomycin or other components of the vaccine ; resuscitation equipment and emergency drugs should be readily available
- local pain, redness, swelling or itching at site of injection

Important Implications

Contraindications/Cautions
- history of anaphylaxis to previous rabies vaccine or any component of the vaccine (see product monograph).
- those with severe hypersensitivity to eggs should be immunized with IMOVAX RABIES.
- pre-exposure vaccination should be deferred in persons with acute illness or fever
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- transient headache, nausea, abdominal pain, muscle aches and dizziness may occur
- once initiated, rabies vaccination should not be interrupted or discontinued because of local or mild systemic adverse reactions; such reactions can be successfully managed with anti-inflammatory and antipyretic agents (e.g. aspirin)

Other: persons taking chloroquine, hydroxychloroquine, corticosteroids, or immunosupressants may not develop an adequate antibody response to the vaccine. A rabies antibody titre should be done 7 to 14 days after series completion

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raltitrexed

Warnings	Classification	Alternate Names
hazardous drug group high alert medication	antineoplastic, antimetabolite	TOMUDEX

Indications

- treatment of colorectal cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling.
- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 100 mL NS, and infuse over 15 minutes	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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raltitrexed

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Example:
- 3 mg/m^2 IV every 3 weeks

- Dosage adjustments: reduce dose for myelosuppression, gastrointestinal toxicity (diarrhea, stomatitis), renal failure, hepatic failure

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- contraindicated in patients with severe renal or hepatic impairment
- contraindicated in patients with clinically significant cardiac arrhythmias

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *GI*: nausea (54%), vomiting (32%), anorexia (24%), diarrhea (34%). Nausea and vomiting usually occurs 2 to 3 days after the dose.
- *Hematologic*: leukocytopenia (23%). Nadir usually within 7 to 14 days.
- *Other*: rash (13%), fever (20%), weakness (42%), transiently elevated LFTs, cardiac rhythm abnormalities (3%)

Monitoring
- renal and liver function tests

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rasburicase

Warnings	Classification uricolytic agent, enzyme	Alternate Names FASTURTEC

Indications

- Management of hyperuricemia in tumour lysis syndrome
- restrictions apply

Reconstitution and Stability

- Store vials in fridge in original package to protect from light.
- Reconstitute 1.5 mg vial with 1 mL of supplied diluent (1.5 mg/mL)
- Reconstitute 7.5 mg vial with 5 mL of supplied diluent (1.5 mg/mL)
- **Swirl gently**.
- Diluted solutions should be used immediately.

Compatibility

- Compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 50 mL NS infuse over 30 minutes infuse through a separate line or flush IV line with NS prior to and after infusion	Advanced Monitoring
Continuous IV infusion	NO		

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rasburicase

Dosage

- Recommended dose is 3 mg once, which may be repeated in 24 hours if necessary
- Higher doses as recommended by the manufacturer: 0.2 mg/kg daily for 5 to 7 days may not be necessary.
- Chemotherapy may be initiated as soon as 4 hours after the first dose

Potential Hazards of Parenteral Administration

Rarely, severe hypersensitivity reactions (eg. anaphylaxis including bronchospasm, dyspnea, hypotension, shock) may occur during treatment, even with the first dose

Important Implications

Contraindications/Cautions

- Contraindications:
  - G-6-PD deficiency
  - hemolytic reactions, methemoglobinemia, hypersensitivity to rasburicase or any ingredient in the formulation
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- most common: fever, headache, diarrhea, nausea, vomiting, and rash
- rare: hemolysis, methemoglobinemia

Monitoring

- uric acid levels, electrolytes and renal function at baseline and then during therapy
- observe closely for signs of anaphylactoid reaction (ie. dyspnea, hypotension, bronchospasm, wheezing)

Other

- hydrate according to standard medical practice for the management of plasma uric acid in patients at risk for tumour lysis syndrome.
- will cause enzymatic degradation of uric acid within blood samples left at room temperature resulting in falsely low uric acid levels. Follow lab procedures/guidelines for collection and storage of blood collected from rasburicase treated patients.

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remdesivir

Warnings	Classification antiviral; nucleoside RNA polymerase inhibitor, nucleotide prodrug	Alternate Names VEKLURY

Indications

- antiviral therapy for treatment of COVID-19 as recommended by the British Columbia COVID-19 Therapeutics Committee (CTC) and COVID-19 Therapeutics Review and Advisory Working Group (CTRAWG) Clinical Practice Guidelines
- Refer to BC Centre for Disease Control-Treatment for most current guidance and information

NON-FORMULARY

Reconstitution and Stability

- store vials of powder for reconstitution at room temperature
  - reconstitute 100 mg vial with 19 mL sterile water for injection to provide 5 mg/mL clear solution
  - shake vial for 30 seconds and allow contents to settle for 2 to 3 minutes; repeat until completely dissolved

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ dilute dose in 250 mL NS *fluid restriction only*: dilute dose in 100 mL NS ▪ gently invert bag twenty times to mix; do NOT shake ▪ infuse over 30 to 120 minutes; flush line with at least 30 mL NS after administration *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion	NO		

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remdesivir

Dosage

- mild to moderately ill patients with COVID-19 (not on supplemental oxygen) deemed at high risk for progression to severe disease:
  - *dose adjustment required in renal dysfunction*:

	Dose and interval
eGFR of 30 mL/minute or greater	200 mg IV once, then 100 mg IV daily for 2 additional days
eGFR of less than 30 mL/minute	200 mg IV once, then 100 mg IV 48 hours later for one dose
hemodialysis	200 mg IV once, then 100 mg IV 48 to 72 hours later for one dose (give during dialysis)
peritoneal dialysis	200 mg IV once, then 100 mg IV 48 hours later for one dose

- severely ill hospitalized patients with COVID-19 (requiring low flow supplemental oxygen):
  200 mg IV once, then 100 mg IV daily for 4 additional days (note: **no** dose modification for renal dysfunction);
  - may use in patients who do *not* have COVID-19 related inflammation/cytokine storm
  - may use in patients who are *not* receiving baricitinib for COVID-19-related inflammation/cytokine storm (i.e. those with contraindications to baricitinib use)
  - or may be added to baricitinib in patients who are deteriorating (but not requiring organ support), or not improving despite baricitinib as the combination has been shown to reduce recovery time and improve clinical status for patients with severe COVID-19

Potential Hazards of Parenteral Administration

- rarely (less than 1%) hypersensitivity reactions (including anaphylaxis) and infusion-related reactions have been reported:
  - hypotension, hypertension, tachycardia, bradycardia, hypoxia, fever, dyspnea, wheezing, angioedema, nausea, vomiting, diaphoresis, and shivering
  - mild reactions may be alleviated by slowing infusion rate (maximum infusion duration 120 minutes)

Important Implications

Contraindications/Cautions
- use with caution in patients with hepatic impairment; if ALT is 10 times the upper limit of normal (ULN) consider discontinuing remdesivir
- caution: should be administered within 7 days of symptom onset
- Pregnancy: refer to BC Centre for Disease Control-Treatment for clinical guidance
  Pregnancy / Lactation refer to Lexicomp or Micromedex

Side effects
- 10% or more: increased liver enzymes
- 1 to less than 10%: headache, nausea, rash, increased prothrombin time
- rare (less than 1 %): bradycardia including severe and sinus bradycardia, cardiac failure

Monitoring
- hepatic and renal function

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REMifentanil

Warnings	Classification opioid analgesic	Alternate Names ULTIVA

Indications

- analgesic adjunct in the induction and maintenance of anesthesia
- analgesic adjunct for procedures requiring conscious analgesia
- patient controlled analgesia (PCA) for relief of severe pain in labour

Reconstitution and Stability

- store vials at room temperature

- 1 mg vial: add 1 mL sterile water for injection and shake well to provide 1 mg/mL reconstituted solution
- 2 mg vial: add 2 mL sterile water for injection and shake well to provide 1 mg/mL reconstituted solution

Compatibility

- compatible in D5W, D5NS, normal saline, 0.45% SODIUM chloride (1/2 NS)
- stable for 4 hours at room temperature in Lactated Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**by anesthesiologist only** dilute to concentration between 20 to 250 mcg/mL; give over 30 to 60 seconds	Full monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**by anesthesiologist only** **standard solution concentrations**: 25 mcg/mL: dilute 2.5 mg in 100 mL 50 mcg/mL: dilute 5 mg in 100 mL 200 mcg/mL: dilute 20 mg in 100 mL *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions
Patient Controlled Analgesia (PCA)	YES	**anesthesiologist must be present at initiation & dose change** **BC Women's Hospital (BCW) only**: 25 mcg/mL in NS; *via CADD pump*	Advanced Monitoring and per BCW PCA protocol

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REMifentanil

Dosage

- Induction of anesthesia (with hypnotic or volatile agent):
  0.5 to 1 mcg/kg/minute until after intubation; may give initial dose of 1 mcg/kg if intubation to occur less than 8 minutes after start of the infusion

- Maintenance of anesthesia:
  0.25 to 0.5 mcg/kg/minute (range 0.05 to 2 mcg/kg/minute); may bolus with 0.5 to 1 mcg/kg every 2 to 5 minutes in response to light anesthesia or transient episodes of intense surgical stress

- Conscious analgesia: 1 mcg/kg bolus, followed by 0.05 to 0.2 mcg/kg/minute

- To facilitate mechanical ventilation in the immediate post-op period:
  0.0125 to 1.5 mcg/kg/minute. Adjust by increments of 0.0125 to 0.025 mcg/kg/minute Q5MIN, until desired level of sedation achieved

- Sedation during hypothermia: 0.05 to 0.2 mcg/kg/minute

- PCA for relief of severe pain in labour **(BC Women's Hospital only)**:
  20 to 50 mcg IV Q2MIN PRN; refer to site specific protocol

Dose modification: dosage should be determined using ideal body weight in obese patients.

Potential Hazards of Parenteral Administration

- antidote: naloxone
- resuscitation equipment must be readily available

Important Implications

Contraindications/Cautions
- contraindicated in patients allergic to fentanyl and its derivatives

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- skeletal and thoracic muscle rigidity, especially with higher doses
- respiratory depression; bradycardia or tachycardia, hypotension

Other
- Onset of action: IV: 1 to 3 minutes; Peak effect: 3 to 5 minutes; Duration of action: 3 to 10 minutes
- REMifentanil is not eliminated by the liver or kidney

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rifAMPin

Warnings	**Classification** antibiotic antituberculosis agent	**Alternate Names** RIFADIN rifampin sodium, rifampicin

Indications

- used in combination with other agents in the treatment of systemic infections caused by *M. tuberculosis* and associated mycobacterial infections when the oral route is not feasible
- available through Health Canada's **Special Access Program**, contact pharmacy

Reconstitution and Stability

- powder stable at room temperature, protect from light and excessive heat
- reconstitute 600 mg vial with 10 mL sterile water for injection to produce 60 mg/mL solution
- swirl vial gently to dissolve
- follow specific manufacturer guidelines if instructions differ from above information
- for RIFADIN (Sanofi BRAND):
    - reconstituted solution diluted in D5W is stable for up to 8 hours at room temperature
    - reconstituted solution diluted in NS is stable for up to 6 hours at room temperature

Compatibility

- compatible in NS, D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute up to 1500 mg in D5W 250 mL (**preferred**); infuse over 1.5 hours *flush line with D5W or NS before and after administration*	Basic Monitoring
Continuous IV infusion	NO		

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rifAMPin

Dosage

Refer to infectious disease references for specific treatment guidelines and regimens

- active tuberculosis and certain nontuberculous mycobacterium (e.g. *M.kansasii*):
  10 mg/kg/day, used in combination with other antibiotics

- synergy for *Staphylococcus aureus* infections:
  300 to 600 mg once to twice daily with other antibiotics

- reduced dose required in impaired hepatic function

Switch to oral route as soon as possible; oral dose equivalent to IV dose

Potential Hazards of Parenteral Administration

- extravasation risk
- may cause local irritation and inflammation.

Important Implications

Contraindications/Cautions

- Contraindicated:
  - hypersensitivity to rifAMPin or other rifamycins
  - presence of active *Neisseria meningitidis* infection
- Caution:
  - liver dysfunction (higher risk for complications)
  - **many significant drug interactions (some are potentially life threatening):** consult drug interaction reference or contact pharmacy
  - may cause vitamin K – dependent coagulation disorders / bleeding

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- common: heartburn, loss of appetite, nausea, flu-like symptoms (fever, chills)
- serious: thrombocytopenia (high dose therapy) and hepatotoxicity
- frequency not defined: ataxia, behavioural changes, impaired concentration, headache
- may cause a reddish discolouration of urine, sweat, sputum and tears. Remove soft contact lenses during therapy, since lenses may be permanently stained.

Monitoring

- when treating tuberculosis: chest X-ray, sputum, symptomatic improvement
- periodic (baseline and every 2 to 4 weeks during therapy) liver function (AST, ALT, bilirubin), serum creatinine, CBC, and platelet count, mental status
- coagulation tests during rifAMPin treatment (INR and other coagulation tests) in patients at risk of vitamin K deficiency

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risperidone long-acting

Warnings	Classification	Alternate Names
	antipsychotic	RISPERDAL CONSTA injectable kit

Indications

- management of schizophrenia and related psychotic disorders where non-compliance is present
- restrictions apply

Reconstitution and Stability

- available as a kit containing a vial of risperidone extended-release microspheres, a pre-filled syringe containing 2 mL diluent, one SMARTSITE needle-free reconstitution device and two safety needles
- store kit in refrigerator; kit stable for 7 days at room temperature
- prior to reconstitution, allow the kit to come to room temperature; reconstitute vial using 2 mL supplied diluent; shake vial vigorously for 10 seconds to ensure a homogeneous suspension
- use suspension immediately; re-suspend syringe by shaking vigorously if not used within 2 minutes of reconstitution; suspension must be injected within 6 hours of reconstitution

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deep gluteal or deltoid injection gluteal administration: use the 2-inch 20 gauge needle (yellow hub); alternate buttock with each injection deltoid administration: use the 1-inch 21 gauge needle (green hub); alternate arm with each injection	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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risperidone long-acting

Dosage

Patients should be able to tolerate oral risperidone prior to initiating depot therapy

- usual initial dose: 25 mg IM every 2 weeks.
- maximum dose: 50 mg IM every 2 weeks
- consider lower initial dose of 12.5 mg in patients with renal or hepatic impairment, or in those who have poorly tolerated other psychotropic medications
- initiation of therapy requires at least 3 weeks of overlap with oral risperidone to allow time for risperidone long acting depot to achieve therapeutic levels

Potential Hazards of Parenteral Administration

- hypotension and circulatory collapse: treat with sympathomimetic agents (AVOID epinephrine and DOPamine since beta stimulation may worsen hypotension in the setting of risperidone-induced alpha blockade)
- pain at injection site

Important Implications

Contraindications/Cautions

- avoid in elderly patients with dementia-related psychosis (increased risk of cerebrovascular, cardiovascular and infectious adverse events)
- caution:
  - in patients with cardiovascular disease – may alter cardiac conduction and prolong QT interval
  - may lower seizure threshold
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- extrapyramidal symptoms: tremor, rigidity, akathisia, dystonia; treat with anticholinergics (e.g. benztropine)
- sedation, insomnia, headache, anxiety, dizziness
- orthostatic hypotension
- nausea, constipation, weight gain, xerostomia,
- hyperprolactinemia: symptoms may include nonpuerperal lactation, amenorrhea, gynecomastia, abnormal sexual function, impotence

Monitoring

- potential for metabolic syndrome: baseline and periodic BMI, waist circumference, fasting plasma glucose and fasting lipid profile

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riTUXimab (IV)

Warnings	Classification	Alternate Names
high alert medication	monoclonal antibody, immunosuppressant antineoplastic	RITUXAN RUXIENCE (biosimilar) RIXMYO (biosimilar)

Indications

- **This monograph is specific for intravenous riTUXimab (RITUXAN, RUXIENCE, RIXMYO)**
- riTUXimab (IV) and riTUXimab (subcutaneous) (*see separate monograph*) are **NOT** interchangeable.
- oncology: non-Hodgkin's and Hodgkin's lymphoma and chronic lymphocytic leukemia (CLL)
- adjunct therapy in kidney or heart transplantation for refractory biopsy-proven antibody-mediated rejection
- glomerulonephritis
- indications and/or prescribing restrictions apply

Reconstitution and Stability

- refrigerate; protect from direct sunlight
- discard partial vials
- diluted solution stable for 24 hours in the fridge, followed by 12 hours at room temperature

Compatibility

- compatible with NS and D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute to a final concentration of 1 to 4 mg/mL: o doses up to 1 g in NS 250 mL o doses more than 1 g in NS 500 mL o mix by inverting bag gently; do NOT shake initial dose (all indications): start infusion at 50 mg/hour for 1 hour; then increase rate by 50 mg/hour every 30 minutes until rate is 400 mg / hour subsequent doses (for oncological monotherapy, or kidney or heart transplant rejection, or glomerulonephritis): start infusion at 100 mg/hour for 1 hour; then increase rate by 100 mg/hour every 30 minutes until rate is 400 mg/hour subsequent doses (for oncological uses with combined chemotherapy or maintenance regimens): may administer over a total of 90 minutes (20% of the dose in the first 30 minutes and remaining 80% over 60 minutes) *rate must be controlled with an IV infusion pump*	Advanced Monitoring monitor blood pressure, pulse, respiratory rate and temperature Q15MIN x 2, then Q30MIN until a stable infusion rate is reached; then hourly until 30 minutes after infusion is completed or as per site-specific protocol
Continuous IV infusion	NO		

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riTUXimab (IV)

Dosage

Oncological indications:
Follow specific protocol; dose and schedule depend on protocol and patient response. Examples:

- Follicular Lymphoma: 375 mg/m^2 IV weekly for 4 weeks is an example of a single agent dosing regimen.
- Hodgkins and Non-Hodgkins Lymphoma: 375 mg/m^2 IV every 3 to 4 weeks
- CLL: 375 mg/m^2 IV, followed by 500 mg/m^2 IV for subsequent cycles every 3 to 4 weeks

- Refer to BC Cancer Drug Monographs

Kidney or Heart transplant antibody-mediated rejection:
- 375 mg/m^2 IV once

Glomerulonephritis:
- 1000 mg IV every 2 weeks for 2 doses; **or** 375 mg/m^2 IV weekly for 4 doses
- maintenance dose (ANCA Vasculitis): 500 mg IV on days 0 and 14, then 500 mg IV at months 6, 12, and 18

Potential Hazards of Parenteral Administration

- hypersensitivity reactions may occur:
  - severe hypotension (BP lower than 80/50), rapid pulse (heart rate over 120), flushing, dyspnea, rash, pruritus, cough, fever or faintness, vomiting or chest pain
  - stop the infusion and notify physician;
  - may require acetaminophen and diphenhydrAMINE pre-treatment and 4 hours into infusion
- transient hypotension - consider withholding antihypertensive medications 12 hours prior to riTUXimab infusion; hold infusion until resolution, then may re-start
- incidence of infusion-related events decreases dramatically with subsequent doses
- fatal cytokine release syndrome (stop infusion immediately and contact physician):
  - usually occurs within 1 to 2 hours of initiating the first infusion;
  - severe dyspnea (often with bronchospasm and hypoxia), fever, chills, rigors, urticaria and angioedema
  - pulmonary interstitial infiltrates or edema visible on chest X-ray may accompany acute respiratory failure

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation : refer to Lexicomp or Micromedex;

Side effects
- severe mucocutaneous skin reactions may occur (including Stevens-Johnson Syndrome, toxic epidermal necrolysis) with onset from days to several months following exposure to riTUXimab
- fatigue, headache, rhinitis, nausea, vomiting, diarrhea, arthralgia, back pain, peripheral edema, mild transient elevations in liver function tests
- neutropenia, thrombocytopenia, anemia may occur; caution in patients with neutrophils less than 1.5 x 10^9/L and/or platelets less than 75 x 10^9/L

Monitoring
- signs of infusion reactions

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riTUXimab (subcutaneous)

Warnings	Classification	Alternate Names
high alert medication	monoclonal antibody immunosuppressant antineoplastic	RITUXAN SC

Indications

- **This monograph is specific for subcutaneous riTUXimab (RITUXAN SC)**
- riTUXimab (subcutaneous) and riTUXimab (IV) *(see separate monograph*) are **NOT** interchangeable.
- oncology: Non-Hodgkin's and Hodgkin's lymphoma, chronic lymphocytic leukemia (CLL)
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- single dose, colorless to yellowish, clear solution, preservative free vials that also contains hyaluronidase
- refrigerate and protect from light
- discard unused portion (1400 mg vial contains overfill of 0.55 mL per vial and 1600 mg vial contains overfill of 0.8 mL per vial) **or** if supplied by pharmacy in a syringe, then stable for 48 hours in a fridge plus 8 hours at room temperature
- RITUXAN SC 1400 mg and 1600 mg vials are **NOT** interchangeable. Although given by the same route, the formulations differ in dose and are intended for different indications

Compatibility

Preparation and Administration

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	▪ undivided into a single injection site in the abdomen ▪ 1400 mg (11.7 mL) over aprox. 5 minutes ▪ 1600 mg (13.4 mL) over aprox. 7 minutes	Basic monitoring or according to protocol
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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riTUXimab (subcutaneous)

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Examples:

Tolerance to riTUXimab must be established by giving the first dose using the IV formulation, riTUXimab (IV) (see separate monograph). If tolerance is established, subsequent doses may be given as follows:

- Follicular Lymphoma: RITUXAN SC 1400 mg subcutaneously weekly for the next three 3 doses.
- Hodgkins and Non-Hodgkins Lymphoma: RITUXAN SC 1400 mg subcutaneously every 3 to 4 weeks
- CLL: RITUXAN SC 1600 mg subcutaneously every 3 to 4 weeks

Potential Hazards of Parenteral Administration

- injection site reactions and local cutaneous reactions are common, including pain, swelling, induration, hemorrhage, erythema, pruritus; most common during the first cycle

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- neutropenia, nausea, chills, fever, hypersensitivity, hepatitis B reactivation, infection, tumour lysis syndrome, progressive multifocal leukoencephalopathy, reversible posterior leukoencephalopathy syndrome, rash, mucocutaneous reactions.

Other

- hyaluronidase is an enzyme used to increase the dispersion and absorption of other drugs administered subcutaneously (eg. riTUXimab), allowing for a larger injected volume, with limited swelling or pain; SUBCUT tissue returns to normal within 24 to 48 hours after injection
- Administer other subcutaneous drugs into alternative sites wherever possible

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rocuronium

Warnings	Classification	Alternate Names
high alert medication	neuromuscular blocking agent	ZEMURON rocuronium bromide

Indications

- an adjunct to general anesthesia to facilitate both rapid sequence intubation and routine endotracheal intubation
- to provide skeletal muscle relaxation during surgery or mechanical ventilation

Reconstitution and Stability

- refrigerate

Compatibility

- compatible with NS, D5W, Lactated Ringers Solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted; over 2 to 10 seconds	Intensive Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration**: 2 mg/mL o remove 20 mL from a D5W 100 mL bag; then add 200 mg rocuronium to the bag o remove 50 mL from a D5W 250 mL bag; then add 500 mg rocuronium to the bag *rate must be controlled with an infusion pump*	Intensive Monitoring See site-specific restrictions

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rocuronium

Dosage

Endotracheal intubation:
0.6 to 1.2 mg/kg IV direct; may follow with maintenance doses of 0.1 to 0.2 mg/kg whenever twitch height returns.

Neuromuscular Blockade for Management of Induced Hypothermia:
- Load: 1 mg/kg IV direct
- Maintenance: 0.6 to 1 mg/kg IV Q1H PRN to prevent shivering

Neuromuscular Blockade during Mechanical Ventilation:
- IV direct: 0.6 to 1 mg/kg (approximately 50 mg) IV Q1H PRN
- Continuous IV infusion: Initial (bolus) dose of 0.45 to 0.6 mg/kg IV, followed by 0.4 to 0.6 mg/kg/hour (range 0.2 to 0.9 mg/kg/hour) started within 10 minutes of the initial dose and adjusted to maintain a single twitch on the Train-of-Four using a peripheral nerve stimulator

Dosage reduction: may be required in the elderly and patients with hepatic disease

Potential Hazards of Parenteral Administration

- extension of the pharmacological action of the drug beyond the time period needed for surgery and anesthesia; varying from skeletal muscle weakness to prolonged paralysis and apnea
- slight elevation of heart rate and blood pressure with bolus doses greater than 1.2 mg/kg
- oxygen and resuscitation equipment must be readily available
- anticholinesterase agents should be readily available
- antidote: sugammadex

Important Implications

Contraindications/Cautions
- Caution:
  - in debilitated patients and those with myasthenia gravis
  - neuromuscular blocking effects are enhanced in the presence of inhalation anesthetics
  - concomitant use of aminoglycosides, vancomycin, tetracyclines, polymyxin B and clindamycin can result in prolonged neuromuscular blockade
  - phenytoin and carbamazepine may cause diminished effect or shortened duration
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- respiratory acidosis, hypomagnesemia, hypokalemia, or hypocalcemia may enhance effect of rocuronium
- reposition patient and provide skin, mouth and eye care every 2 to 3 hours while paralyzed

Other
- complete neuromuscular blockade occurs within 1 to 1.5 minutes
- duration of action: 20 to 30 minutes after a single dose

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ROPivacaine

Warnings	Classification	Alternate Names
high alert medication **(see Potential Hazards section)**	local anesthetic	ropivacaine hydrochloride, NAROPIN; ropivacaine HCl

Indications

- peripheral nerve block, intra-articular infiltration, sympathetic blockade, caudal, epidural, pudendal block, field block
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- store at room temperature
- solutions that are cloudy, discoloured or contain particulate matter should be discarded
- solutions are for single use only

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Local injection	YES	**by physician only**	Intermediate monitoring
Epidural Intermittent injection	YES	**by physician only** use preservative free solutions	Intermediate monitoring as per specific site epidural protocols
Continuous epidural infusion	YES	**infusion initiated by physician only** use preservative free solutions **standard solution concentrations** 2 mg/mL: 200 mg in NS 100 mL premixed bag 3 mg/mL: combine 750 mg with NS 175 mL to provide 250 mL total volume *rate must be controlled with an epidural infusion pump*	Intermediate monitoring as per specific site epidural protocols
Continuous Peripheral Nerve Block	YES	infusion initiated **by physician only** use preservative free solutions *rate must be controlled with a peripheral nerve block infusion pump*	Intermediate monitoring as per specific site protocols
Intra-articular infiltration	YES	infusion initiated **by physician only** use preservative free solutions *infusion rate must be controlled with closed elastomeric device (eg. Pain Buster)*	Intermediate monitoring as per specific site protocols

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ROPivacaine

Dosage

acute pain management
- epidural intermittent injection (bolus) : 20 to 40 mg/dose
- epidural continuous infusion: 12 to 28 mg/hour
- field block: 2 to 200 mg

surgical anaesthesia
- epidural injection: 75 to 200 mg
- major nerve block: 175 to 250 mg
  field block: 5 to 200 mg

dosage for local injection and infiltration is individualized varying with procedure, the degree of anesthesia required and patient response.

dosage adjustment may be considered for patients with severe liver disease

Potential Hazards of Parenteral Administration

- epidural administration may result in hypotension and bradycardia
- inadvertent intravascular injection may cause serious CNS effects such as excitation, tremors, convulsions, drowsiness, coma and respiratory arrest, and cardiovascular effects such as myocardial depression, hypotension, and ventricular arrhythmias
- Confirm resuscitative equipment and drugs for treatment of adverse effects are readily available
- antidote for ROPivacaine toxicity: fat emulsion (INTRALIPID 20%)
- high alert medication when given by these routes: epidural infusions, continuous peripheral nerve block (perineural infusion)

Important Implications

Contraindications/Cautions
- contraindicated if known allergy to local anesthetics of the amide type

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- most common adverse effects include hypotension, nausea/vomiting, transient paresthesia, bradycardia, back pain, urinary retention and fever

Monitoring
- pain level, motor function, heart rate, temperature.

Other
- ROPivacaine may offer a greater degree of differential block (preferential sensory over motor) compared to bupivacaine, especially at the lower dosage range

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salbutamol

Warnings	Classification	Alternate Names
	bronchodilator	VENTOLIN albuterol

Indications

- treatment of bronchospasm associated with chronic bronchitis and asthma
- treatment of status asthmaticus
- in patients refractory to salbutamol respiratory solution

Reconstitution and Stability

- protect ampoule from light
- store at room temperature

Compatibility

- compatible with D5W, NS, and dextrose-saline combinations

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration:** 10 mcg/mL: dilute 5 mg in D5W 500 mL *rate must be controlled with an IV infusion pump*	Full Monitoring (Advanced monitoring may be used short term when treatment is initiated and transfer for ECG monitoring is imminent) See site-specific restrictions

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salbutamol

Dosage

- 5 mcg/minute continuous IV infusion; may increase to 10 mcg/minute, then 20 mcg/minute at 15 to 30 minute intervals PRN

Potential Hazards of Parenteral Administration

- fine muscle tremor is common
- hypokalemia, hyperglycemia
- dose dependent increase in heart rate, palpitations

Important Implications

Contraindications/Cautions

- caution in patients with hyperthyroidism, diabetes mellitus, cardiovascular disorders including coronary insufficiency or hypertension

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- serum potassium and glucose

Other

- beta blockers may antagonize the action of salbutamol

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scopolamine HYDRObromide

Warnings	Classification anticholinergic	Alternate Names hyoscine HYDRObromide

Indications

- pre-anesthetic medication to reduce secretions of the respiratory tract
- antiemetic
- to reduce upper airway secretions in palliative care patients

Reconstitution and Stability

- stable at room temperature

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Intermediate Monitoring
Intramuscular	YES		Intermediate Monitoring
IV direct	YES	for emergency use only give undiluted; or dilute in 10 mL sterile water for injection give over at least one minute	Advanced Monitoring
IV intermittent	NO		
Continuous IV infusion	NO		

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scopolamine HYDRObromide

Dosage

Pre-anesthetic medication to reduce respiratory tract secretions:
0.3 to 0.6 mg IM, IV or subcutaneous

Nausea:
0.6 to 1 mg subcutaneous repeated 3 or 4 times daily

To reduce upper airway secretions in palliative care patients:
0.8 mg subcutaneous initially, then 0.4 to 0.6 mg subcutaneous every 1 to 4 hours as needed

Potential Hazards of Parenteral Administration

- bradycardia
- tachycardia, especially with higher doses, followed by bradycardia

Important Implications

Contraindications/Cautions
- contraindicated in acute glaucoma, asthma, obstructive uropathy, obstructive diseases of the GI tract, myasthenia gravis and unstable cardiovascular status
- use with caution in patients with hypertension, cardiac arrhythmias and prostatic hypertrophy

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- urinary retention, dry mouth
- increased ocular pressure, mydriasis, blurred vision
- disorientation, delirium, drowsiness

Other
- when combined with morphine, may produce hypotension
- this product is **NOT** interchangeable with or equivalent to hyoscine BUTYLbromide (BUSCOPAN).

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siltuximab

Warnings	Classification	Alternate Names
high alert medication	antineoplastic monoclonal antibody, interleukin-6 receptor antagonist	SYLVANT

Indications

- treatment of Multicentric Castleman's Disease (MCD)
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store vials in fridge and protect from light
- allow vial to come to room temperature prior to use
- reconstitute with sterile water for injection; do not shake, swirl gently to dissolve:
  100 mg vial: add 5.2 mL to provide 20 mg/mL solution
  400 mg vial: add 20 mL to provide 20 mg/mL solution
- reconstituted solution diluted in minibag, complete administration within 6 hours at room temperature

Compatibility

- compatible with D5W only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above).
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute dose to 250 mL D5W final volume; (remove volume equal to dose, prior to adding drug) infuse over 60 minutes; use tubing with 0.2 micron in-line filter	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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siltuximab

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

- MCD: 11 mg/kg IV every 3 weeks
- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- anaphylaxis rarely (1 to 2%)
- infusion-related reactions including back pain, chest pain, nausea, vomiting, flushing, erythema, or palpitations; consider pre-medication with antihistamines, acetaminophen and/or steroids

Important Implications

Contraindications/Cautions

- *Caution*:
  - serious active infection, including localized infection, should be treated and resolved prior to therapy
  - live, attenuated vaccines should not be given concurrently or within 4 weeks prior to the first treatment of siltuximab
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hemoglobin increase, hypertriglyceridemia, hypertension, peripheral edema
- pruritus, skin rash
- gastrointestinal perforation (less than 1 %), abdominal pain, constipation
- upper respiratory tract infection
- may mask signs and symptoms of infection (example fever, elevated c-reactive protein)

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sincalide

Warnings	Classification	Alternate Names
	diagnostic agent	KINEVAC

Indications

- diagnostic aid (gallbladder function, pancreatic function)

Reconstitution and Stability

- store at room temperature
- reconstitute 5 mcg vial with 5 mL sterile water for injection to provide a 1 mcg/mL solution

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**by physician only** give over a minimum of 30 to 60 seconds; or preferably given over 3 to 5 minutes to prevent biliary spasm and gastrointestinal adverse events	Basic Monitoring
IV intermittent	YES	**by physician only** dilute dose in NS 50 mL; infuse over 30 minutes	Basic Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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sincalide

Dosage

- For prompt contraction of gallbladder during cholecystography:
  0.02 mcg/kg IV direct; if satisfactory contraction does not occur in 15 minutes, a second dose of 0.04 mcg/kg may be administered

- Calculation of gallbladder ejection fraction:
  0.02 mcg/kg IV intermittent

Potential Hazards of Parenteral Administration

- administration may be accompanied by dizziness, flushing, nausea, mild abdominal pain, cramps and the urge to defecate; these effects are transient and last no longer than 2 to 5 minutes
- rapid IV administration may result in biliary spasm; giving via intermittent infusion reduces the incidence of gastrointestinal adverse events

Important Implications

Contraindications/Cautions
- should not be used in patients sensitive to sincalide
- should not be used in acute pancreatitis, acute cholecystitis, cystic duct obstruction, obstruction of the common bile duct, infection or empyema of the gallbladder, appendicitis, peritonitis, pyloric stenosis, penetrating, perforating or bleeding peptic ulcer or mechanical obstruction of the gastrointestinal tract

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other
- a synthetic C-terminal octapeptide of the hormone cholecystokinin
- stimulates contraction of the gallbladder with maximum effect within 5 to15 minutes; the gallbladder returns to basal size in approximately one hour
- also inhibits gastric emptying and stimulates intestinal motility and pancreatic secretions

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sodium acetate

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	electrolyte	

Indications

- added to parenteral nutrition (PN) solutions for correction of low serum bicarbonate levels due to metabolic acidosis
- used in high dose methotrexate protocols to alkalinize the urine, **only if sodium bicarbonate is unavailable**

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with most commonly used IV solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	• supplied in parenteral nutrition solutions • *only if sodium bicarbonate is unavailable*: o dilute 100 mmol in D5W or pre-hydration fluid 1L per BC Cancer protocols o central vein preferred; or peripherally use large vein in forearm o Usual rates: 125 to 200 mL/hour Infuse at rates not exceeding 50 mmol/hour (based on sodium content). *rate must be controlled with an IV infusion pump*	Intermediate Monitoring

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sodium acetate

Dosage

Parenteral Nutrition (PN):
- usually acid-base balance is generally maintained by keeping the chloride to acetate ratio approximately 1:1 in PN formulations
- used to replace some or all sodium chloride in a PN formulation for patients with hyperchloremic metabolic acidosis
- sodium is added at 1 to 2 mmol/kg/24 hours
- serum sodium and bicarbonate should be monitored as a guide to dosage

Part of urine alkinization regimens for high dose methotrexate (*only if sodium bicarbonate is unavailable*):
Follow directions within the BC Cancer protocols (or site protocols), if urine pH is less than 7 before starting methotrexate, add sodium acetate 100 mmol/L to pre-hydration fluid

Potential Hazards of Parenteral Administration

- hypernatremia, fluid overload, electrolyte disturbances and alkalosis
- extravasation risk; avoid perivascular infiltration
- high alert medication:
  - sodium acetate for injection at concentrations of 4 mmol/mL or more of sodium

Important Implications

Contraindications/Cautions
- use with caution in patients with congestive heart failure, renal insufficiency, edematous states and those receiving corticosteroids

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- monitor serum sodium and bicarbonate levels and acid-base and fluid balance

Other
- 1 mmol sodium acetate = 1 mEq sodium acetate
- 1 mmol sodium acetate provides 1 mmol sodium and 1 mmol acetate
- each mmol of acetate is metabolized to 1 mmol of bicarbonate

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sodium bicarbonate

Warnings	Classification	Alternate Names
vesicant	electrolyte, alkalinizing agent	$NaHCO_3$

Indications

- treatment of metabolic acidosis
- as alkalinizing agent in cardiopulmonary resuscitation and in the treatment of certain drug intoxicants

Reconstitution and Stability

- stable at room temperatures

Compatibility

- compatible with dextrose solutions (preferred diluent)

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	in emergency/ urgent situations: give undiluted over 1 to 3 minutes into a large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Advanced Monitoring See site-specific restrictions
IV intermittent	YES	dilute 150 mmol in D5W 1 L (total volume =1150 mL); **or** for hypervolemic patients may give undiluted*: o via central line (preferred); or o peripheral line into a large vein in forearm; if possible avoid hand, wrist or antecubital fossa maximum rate: 50 mmol/hour **central line only**: 51 to 100 mmol/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Full Monitoring See site-specific restrictions
Continuous IV infusion	YES	dilute 150 mmol in D5W 1 L (total volume =1150 mL); **or** for hypervolemic patients may give undiluted*: o via central line (preferred); or o peripheral line into a large vein in forearm; if possible avoid hand, wrist or antecubital fossa maximum rate: 50 mmol/hour **central line only**: 51 to 100 mmol/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Full Monitoring See site-specific restrictions

*1 mmol/mL (undiluted); transfer 150 mmol to empty sterile bag [obtain bag from stores or pharmacy]

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sodium bicarbonate

Dosage

- Cardiac Arrest:
  1 mmol/kg IV direct, then 0.5 mmol/kg every 10 minutes until an acceptable plasma pH is obtained or spontaneous cardiac function is restored

- Metabolic Acidosis:
  Dose individualized according to plasma pH and fluid limitations
  - 2 to 5 mmol/kg IV intermittent over 4 to 8 hours or by continuous IV infusion
  - if rapid administration is required, it is recommended that initial dose not be more than 33 to 50% of the calculated bicarbonate requirement (consult acid-base references for specific guidelines)

- Metabolic Acidosis in Hyperkalemia:
  - give continuous IV infusion (preferred): dilute 150 mmol in 1 L D5W and infuse at 100 mL/hour; or
  - 50 mmol IV direct
  - refer to specific site pre-printed orders for management of hyperkalemia

Potential Hazards of Parenteral Administration

- alkalosis, hyper-excitability, irritability, restlessness, tetany
- extravasation risk: vesicant with undiluted solution; may cause chemical cellulitis resulting in necrosis, ulceration, and sloughing at the site of injection
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
- too rapid injection may produce hypernatremia, a decrease in cerebrospinal fluid pressure, and possible intracranial hemorrhage

Important Implications

Contraindications/Cautions
- sodium retention may occur in cardiac, liver or renal disease
- full correction of bicarbonate deficit should not be attempted during the first 24 hours as metabolic alkalosis may occur

- safe for use in pregnant and lactating women (refer to Lexicomp or Micromedex for additional information)

Side effects
- hypokalemia may occur with high doses

Other
- 8.4% injection provides 1 mmol/mL sodium bicarbonate
- 1 mmol sodium bicarbonate = 1 mEq sodium bicarbonate
- 1 g of sodium bicarbonate contains 12 mmol of sodium

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sodium chloride 3% or 5%

Warnings	Classification	Alternate Names
high alert medication vesicant	electrolyte	hypertonic saline 3% or 5 %; NaCl 3% or 5 %

Indications

sodium chloride 3%
- management of severe sodium chloride depletion when rapid electrolyte restoration is essential
- management of severe symptoms of hyponatremia including seizures, coma, and focal neurologic signs
- management of elevated intracranial pressure (ICP)

sodium chloride 5%
- management of elevated intracranial pressure in neuro-critically ill patients in the ICU only

Reconstitution and Stability

- sodium chloride 3%, stable at room temperature:
  supplied as a premixed bag that contains 128.3 mmol /250 mL each of sodium and chloride
  (manufacturer's label reads 513 mmol/L each of sodium and chloride)
- sodium chloride 5%: pharmacy compounded bags, store in fridge

Compatibility

- dextrose and saline solutions, dextrose-saline combinations, ringers and lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**sodium chloride 3%** hyponatremia with severe symptoms or elevated intracranial pressure: ▪ central vein preferred; or peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa ▪ 100 mL over 10 minutes (rate: 600 mL/hour **for 10 minutes**) or 150 mL over 20 minutes (rate: 450 mL/hour **for 20 minutes**) ▪ programmed as continuous infusion in Alaris pump **sodium chloride 5%** elevated intracranial pressure: ▪ may only be used in VGH ICU by central line ▪ 100 mL (85.6 mmol) over 10 minutes *rate must be controlled with an IV infusion pump*	Intermediate Monitoring
Continuous IV infusion	YES	**sodium chloride 3% only** ▪ central vein preferred; or peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa usual rate: 25 to 50 mL/hour maximum rate: 100 mL/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring

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sodium chloride 3% or 5%

Dosage

Hyponatremia: sodium chloride 3%

- A serum sodium concentration increase of 4 to 6 mmol/L within a 24 hour period is sufficient to improve most symptoms of hyponatremia. Rapid correction of hyponatremia can result in osmotic demyelination syndrome.
- Usual: 25 to 50 mL/hour. Dosage is individualized. Dose is dependent on patient's age, weight, clinical condition, fluid, electrolyte, and acid-base balance. Maximum Rate: 100 mL/hour.

Hyponatremia with severe symptoms (e.g. seizures): sodium chloride 3%

- 100 mL IV over 10 minutes or 150 mL IV over 20 minutes; may repeat every 20 to 30 minutes x 2 until an increase in serum sodium of 5 mmol/L is achieved

Elevated Intracranial Pressure:

- sodium chloride 3%: 100 mL IV over 10 minutes or 150 mL IV over 20 minutes; physician to assess need for repeat dosing based on clinical symptoms, intracranial pressure, and/or radiographic findings
- Alternatively, only at VGH ICU, sodium chloride 5% may be used: 100 mL (85.6 mmol) IV over 10 minutes; physician to assess need for repeat dosing based on clinical symptoms, intracranial pressure, and/or radiographic findings

Potential Hazards of Parenteral Administration

- thrombophlebitis
- extravasation risk: vesicant
    - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- caution in congestive heart failure, liver cirrhosis, severe renal failure, urinary tract obstruction, or in patients receiving drugs that can cause sodium retention, such as corticosteroids

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- electrolyte, volume and acid-base balance disturbances
- congestive heart failure and pulmonary edema

Monitoring

- fluid balance, serum electrolytes (sodium, potassium, bicarbonate, chloride, magnesium), and acid-base balance should be monitored closely
- ICP, neurovitals (if using for elevated ICP)

Other

- sodium chloride 3% contains 513 mmol /L each of sodium and chloride; osmolarity of 1026 mOsm/L
- sodium chloride 5% contains 856 mmol /L each of sodium and chloride; osmolarity of 1711 mOsm/L

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sodium nitrite

Warnings	Classification antidote	Alternate Names

Indications

- treatment of acute cyanide poisoning **if hydroxycobalamin is unavailable**

Contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911

Reconstitution and Stability

- store at room temperature and protect from light

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted 300 mg over 2 to 4 minutes Maximum rate: 150 mg/minute (slow rate if hypotension occurs)	Full Monitoring continuous blood pressure monitoring during administration; with blood pressure and pulse rate following administration Q 5 MIN x 3
IV intermittent	NO		
Continuous IV infusion	NO		

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sodium nitrite

Dosage

- 300 mg IV for one dose
  - if insufficient response after 30 minutes, give 150 mg IV
- administer sodium nitrite first, followed immediately by the administration of sodium thiosulfate (see separate drug monograph)

Potential Hazards of Parenteral Administration

- rapid infusion can cause hypotension

Important Implications

Contraindications/Cautions

- *contraindicated in patients*:
  - who are asymptomatic, or mildly symptomatic with suspected cyanide poisoning
  - with life-threatening smoke inhalation if the carboxyhemoglobin level is elevated or unknown
- *caution in patients*:
  - with pre-existing diminished oxygen or cardiovascular reserve (eg. smoke inhalation victims, anemia)
  - with renal impairment and the elderly - increased risk for adverse effects
  - with glucose-6-phosphate dehydrogenase (G6PD) deficiency- increased risk for hemolytic crisis
- *caution*: all cyanide-poisoned patients must receive 100% oxygen and supportive care in addition to antidote
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hypotension
- severe methemoglobinemia (dose related)
- headache
- nausea and vomiting

Monitoring

- hemoglobin, hematocrit, methemoglobin, and oxyhemoglobin
- observe for blue-grey skin discolouration
- lactate, renal function, venous and arterial blood gases
- cyanide levels, if available, (prior to treatment and only to confirm diagnosis) – do NOT delay sodium nitrite therapy while awaiting lab results

Other

- after sodium nitrite administration, peak methemoglobin levels occur within 30 to 60 minutes
- high methemoglobin levels are not considered essential for antidote efficacy
  - titrate to clinical response, but do not exceed 25% methemoglobin.

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SODIUM phosphate

Warnings	Classification	Alternate Names
high alert medication (see Potential Hazards section)	electrolyte	sodium acid phosphate monobasic-dibasic

Indications

- treatment of hypophosphatemia

Reconstitution and Stability

- store single use vials at room temperature

Compatibility

- compatible with dextrose and saline solutions *except d*extrose 10% in sodium chloride 0.9%

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilution for **peripheral line**: o up to 15 mmol phosphate in 100 mL; pharmacy may supply 15 mmol in 100 mL or 125 mL; infuse over 2 to 4 hours o 30 mmol phosphate in 250 mL; infuse over 4 to 8 hours o 45 mmol phosphate in 500 mL; infuse over 6 to 12 hours dilution for **central line**: o up to 15 mmol phosphate in 100 mL; pharmacy may supply 15 mmol in 100 mL or 125 mL; infuse over 2 to 4 hours o 30 mmol phosphate in 100 mL; infuse over 4 to 8 hours o 45 mmol phosphate in 250 mL infuse over 6 to 12 hours **central line** only: o maximum rate: 15 mmol phosphate/hour *rate must be controlled with an IV infusion pump*	Intermediate Monitoring Full Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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SODIUM phosphate

Dosage

- Treatment of hypophosphatemia: dose based on serum phosphate level and renal function; refer to dosing table below:

Serum phosphate level	SODIUM phosphate dose in **mmol phosphate**			Repeat serum phosphate level
	CrCl (or eGFR) less than 25 mL/min	CrCl (or eGFR) 25 to 50 mL/min	CrCl (or eGFR) greater than 50 mL/min	
0.6 to 0.79 (mmol/L)	Nil	15 mmol	30 mmol	Next morning
0.4 to 0.59 (mmol/L)	15 mmol	30 mmol	45 mmol	Next morning (or at least 4 hours after end of infusion)
less than 0.4 (mmol/L)	30 mmol	45 mmol	45 mmol	Next morning (or at least 4 hours after end of infusion)

Potential Hazards of Parenteral Administration

- rapid infusion MUST be avoided to prevent:
  - hypocalcemia (which may lead to tetany, convulsions, cardiac arrhythmias and hypotension)
  - the formation of insoluble calcium phosphate (precipitation in soft tissues, renal failure)
- high alert medication:
  - sodium phosphate for injection at concentrations of 4 mmol/mL or more of sodium

Important Implications

Contraindications/Cautions

- caution should be used in patients with renal insufficiency, dehydration
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- hydration must be maintained
- serum phosphate and calcium levels

Other

- **each mL SODIUM phosphate contains 3 mmol phosphate and 4 mmol sodium**

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sodium tetradecyl sulfate

Warnings	Classification sclerosing agent	Alternate Names TROMBOJECT, TROMBOVAR

Indications

- sclerosing agent for esophageal varices, varicose veins and testicular varicocele

Reconstitution and Stability

- stable at room temperature
- discard if precipitate or discolouration present

Compatibility

- compatible with dextrose solutions

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intravariceal/ into varicose vein	YES	**by physician only** *17Jul2018* : may contain visible and insoluble particles, withdraw from vial using a 0.2 (or 0.22) micron filter	Basic Monitoring

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sodium tetradecyl sulfate

Dosage

- Esophageal varices:
  0.5 to 2 mL of 1.5% or 3% solution injected into each varix site, up to a total volume of 10 to 20 mL to control bleeding.

- Varicose veins / testicular varicocele:
  - allergic reactions have been reported. May give 0.5 mL test dose (1% solution) into a varicosity and observe patient for a few hours before giving treatment doses.
  - dose varies with size and degree of varicosity or varicocele
  - *dose range:* 0.5 to 2 mL of 1% or 3% solution into a single varicosity
  - *maximum dose*: 10 mL (3% solution) per treatment
  - may repeat treatment in 5 to 7 days

Potential Hazards of Parenteral Administration

- allergic reactions have been reported: anaphylactoid reactions, urticaria
- extravasation can cause tissue necrosis and/or sloughing
- local pain or ulceration may occur at the site of injection
- thrombosis into deep veins

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *sclerotherapy of esophageal varices*: retrosternal pain and burning which subsides within 24 to72 hours; residual pain in the esophagus, fever, esophageal ulceration or stricture, mediastinitis and pneumonitis

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sodium thiosulfate

Warnings	Classification	Alternate Names
	antidote; chelating agent	sodium hyposulphite

Indications

- treatment of calciphylaxis
  - Indications and / or prescribing restrictions apply
- treatment of acute cyanide poisoning **if hydroxycobalamin is unavailable**
  - **Contact BC Drug and Poison Information Centre (DPIC): 604-682-5050 or 1-800-567-8911**

Reconstitution and Stability

- store at room temperature
- protect vials from light

Compatibility

- compatible with D5W, NS, D5-1/2NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	Calciphylaxis: give undiluted: o 12.5 g / 50 mL, give over 30 minutes o 25 g / 100 mL, give over 60 minutes **or** further dilute: o 12.5 g in D5W 100 mL, give over 30 minutes o 25 g in D5W 250 mL: remove 100 mL from D5W 250 mL bag, then add 25 g to bag; give over 60 minutes administer doses post-dialysis Cyanide poisoning: give undiluted; 12.5 g / 50 mL over 10 minutes (may slow infusion rate if hypotension occurs)	Basic Monitoring Advanced Monitoring
Continuous IV infusion	NO		

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sodium thiosulfate

Dosage

Calciphylaxis:
12.5 to 25 g IV intermittent 3 times weekly until lesions disappear. Duration varies, but is typically 2 to 3 months.

Cyanide poisoning:
- given alone or in combination with sodium nitrite (sodium thiosulfate is given immediately after sodium nitrite - see separate drug monograph)
- 12.5 g IV for one dose
- repeat doses may be indicated for persistent or recurrent symptoms of acute poisoning; some sources suggest reducing subsequent doses to 6.25 g

Potential Hazards of Parenteral Administration

- infusion site irritation
- rapid infusion can cause hypotension

Important Implications

Contraindications/Cautions
- caution:
  - edematous sodium retaining conditions, such as cirrhosis of the liver, congestive heart failure, and hypernatremia may occur with large doses (sodium salt of thiosulfate)
  - cyanide poisoning: toxic effects of thiocyanate (product of cyanide detoxification): weakness, muscle spasm, nausea, hyperreflexia, hypotension, CNS effects (disorientation, psychosis, stupor)
  - all *cyanide-poisoned* patients must receive 100% oxygen and supportive care in addition to antidote

- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects
- hypotension
- nausea and vomiting
- prolonged bleeding time
- headache, disorientation
- salty taste in mouth, warm sensation over body

Monitoring
- Monitor for anion gap metabolic acidosis during long term administration (because of unmeasured anion-thiosulfuric acid).
- electrolytes, calcium, and phosphate.
- *cyanide poisoning*: renal function, hemoglobin, hematocrit, methemoglobin, oxyhemoglobin, lactate, venous and arterial blood gases, and cyanide levels

Other
- sodium thiosulfate and the resulting calcium complex are eliminated in the urine and removed by hemodialysis

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somatropin

Warnings	Classification growth stimulant, growth hormone	Alternate Names HUMATROPE

Indications

- For people 20 years or younger, when prescribed by an endocrinologist at the British Columbia Children's Hospital for true growth hormone deficiency or chronic renal insufficiency
- restrictions apply

Reconstitution and Stability

- protect from light, do not freeze
- vials:
  - Reconstitute each 5 mg vial with 1.5 to 5 mL of diluent provided. If sensitivity to the diluent (contains metacresol and glycerin) should occur, reconstitute with sterile water for Injection.
  - **Swirl vial gently** until the contents are completely dissolved and solution is clear. Do not shake.
  - Use immediately.
- cartridges (for use with HUMATROPEN):
  - **For complete guidance refer to manufacturer's instructions for reconstituting cartridge or pen**
  - Reconstitute each cartridge by attaching it to the diluent syringe and injecting the entire contents slowly. If sensitivity to the accompanying diluent occurs, use 3.15 mL sterile water for injection to reconstitute each cartridge. (Do not use vial diluent for reconstituting cartridges).
  - Aim the diluent against the wall of the cartridge.
  - **Gently invert 10 times** until a clear solution results. Do NOT shake.
  - Attach cartridge to HUMATROPEN.
  - Use immediately.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	rotate sites to minimize risk of lipoatrophy	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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somatropin

Dosage

- **NOTE**: Many different BRANDS of somatropin are available. All information in this monograph applies to HUMATROPE only. If a different BRAND is used, consult manufacturer's information.

- Growth hormone deficiency in adults:

  Initiate at not more than 0.006 mg/kg/day. Should be titrated based on adverse effects and to maintain a level of insulin-like growth factor *(IGF -1)* of less than the upper limit of normal for age and sex

  Increasing age or excessive body weight may require dose reduction

  Maximum: 0.0125 mg/kg/day

Potential Hazards of Parenteral Administration

- injection site reaction
- hypersensitivity to diluent

Important Implications

Contraindications/Cautions
- Contraindication for growth promotion in patients with closed epiphyses
- Contraindicated with active malignancy
- Caution in diabetes mellitus, somatropin may decrease insulin sensitivity. Adjustment of antidiabetic medications may be necessary

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- fluid retention (transient and dose dependent), hypothyroidism, hyperglycemia, arthralgia, carpal tunnel syndrome, paresthesias

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sotrovimab

Warnings	Classification	Alternate Names
	anti-SARS-CoV-2 spike protein monoclonal antibody	

Indications

- immunomodulatory therapy for treatment of COVID-19 as recommended by the British Columbia COVID-19 Therapeutics Committee (CTC) and COVID-19 Therapeutics Review and Advisory Working Group (CTRAWG) Clinical Practice Guidelines
- Refer to BC Centre for Disease Control-Treatment for most current guidance and information

- **NON-FORMULARY**

Reconstitution and Stability

- store 500 mg / 8 mL single use vials (containing a colourless or yellow to brown solution) in refrigerator and protect from light
- before preparation, remove vial from refrigerator, allow to sit at room temperature for at least 15 minutes to bring to room temperature (protect from light)
- gently swirl vial several times before use without creating air bubbles, **do not shake**
- dilute prior to infusion, see preparation and administration table below
- diluted solution stable for 6 hours at room temperature

Compatibility

- compatible in NS or D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ dilute 500 mg in 100 mL; ▪ gently rock bag approximately 3 to 5 times to mix (do not invert) and infuse immediately ▪ if diluted solution is refrigerated (e.g. supplied by pharmacy), bring to room temperature for approximately 15 minutes prior to administration ▪ use a 0.2 micron in-line filter ▪ administer over at least 60 minutes *rate must be controlled with an IV infusion pump*	Advanced Monitoring Baseline vital signs then once infusion initiated, vital signs Q15 MIN x 2 then Q30 MIN until 1 hour after infusion
Continuous IV infusion	NO		

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sotrovimab

Dosage

- 40 kg or more: 500 mg IV once

Potential Hazards of Parenteral Administration

- infusion related reactions: fever, chills, dyspnea, reduced oxygen saturation, bronchospasm, arrhythmia, hypotension, hypertension, throat irritation, rash, pruritus, angioedema
- severe hypersensitivity/anaphylaxis is rare
    - assess for hypersensitivity/ infusion reactions during infusion and slow infusion as needed
    - stop infusion if severe hypersensitivity or anaphylactic reaction occurs and notify physician

Important Implications

Contraindications/Cautions

- *contraindication*: hypersensitivity to sotrovimab or any component of the formulations (see product monograph)
- *caution*:
    - should be administered within 7 days of symptom onset

- Pregnancy refer to BC Centre for Disease Control-Treatment for clinical guidance in pregnancy
  Lactation refer to Lexicomp or Micromedex

Side effects

- *Gastrointestinal:* nausea, diarrhea; *CNS*: headache, dizziness

Other

- defer COVID-19 vaccination for at least 90 days after administration of sotrovimab

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streptomycin

Warnings	Classification antibiotic, aminoglycoside	Alternate Names streptomycin sulfate

Indications

- treatment of tuberculosis, tularemia, plague, brucellosis, and enterococcal synergy
- restrictions apply

Reconstitution and Stability

- powder stable at room temperature; protect from light
- add 1.8 mL sterile water for injection to 1 g vial to provide a concentration of 400 mg/mL
- solutions range in colour from colourless to yellow
- exposure to light may cause solution to darken; this does not affect potency

Compatibility

- compatible with D5W and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	give deeply into muscle, rotate sites	Basic Monitoring
IV direct	NO		
IV intermittent	YES	dilute dose in D5W 100 mL and infuse over 30 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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streptomycin

Dosage

- Tuberculosis (concomitant therapy with other antitubercular drugs):
  - 15 mg/kg IM (maximum 1 g) daily or 25 to 30 mg/kg IM twice weekly
  - 12 to 15 mg/kg IV daily

- Enterococcal synergy: 7.5 mg/kg (IV or IM) Q12H *or* 500mg (IV or IM) Q12H.

- Adjust dosage in renal impairment

Potential Hazards of Parenteral Administration

- local tissue irritation, pain, sterile abscess
- subcutaneous atrophy, fat necrosis
- thrombophlebitis
- if tingling or dizziness occurs during infusion, extend infusion time to 60 minutes

Important Implications

Contraindications/Cautions

- Contraindication: concomitant use with neurotoxic drugs or muscle relaxants can result in respiratory arrest

- Pregnancy/Lactation:
  - avoid use in pregnancy
  - refer to Lexicomp or Micromedex

Side effects
- ototoxicity, neurotoxicity and nephrotoxicity
- tinnitus or vertigo may be indications of vestibular injury and impending bilateral irreversible damage

Monitoring
- monitor renal and auditory function with prolonged use

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succinylcholine

Warnings	Classification	Alternate Names
high alert medication	neuromuscular blocking agent	ANECTINE, QUELICIN succinylcholine chloride

Indications

- an adjunct to general anesthesia to facilitate both rapid sequence intubation and routine endotracheal intubation
- to provide skeletal muscle relaxation during surgery or mechanical ventilation
- to reduce intensity of muscle contractions of pharmacologically or electrically induced convulsions

Reconstitution and Stability

- keep refrigerated

Compatibility

- compatible with D5W, NS, D10W, dextrose-saline combinations, lactated ringers and ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	*when IV route not feasible* high into deltoid muscle	Intensive Monitoring See site-specific restrictions
IV direct	YES	give undiluted; over 10 to 30 seconds	Intensive Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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succinylcholine

Dosage

Short surgical procedures/intubation:

- 0.6 mg/kg (range 0.3 to 1.1 mg/kg) IV direct, or
- Usual IM dose: up to 2.5 to 4 mg/kg; total dose should not exceed 150 mg

Potential Hazards of Parenteral Administration

- respiratory depression, hypoxia, apnea
- transient muscle fasciculation with too rapid administration
- transient cardiac arrhythmias, especially bradycardia (antidote: atropine sulphate)
- malignant hyperthermia
- increased intraocular pressure
- increased intra-cranial pressure
- hyperkalemia
- cardiac arrest

- facilities for intubation, artificial respiration, and oxygen must be readily available

Important Implications

Contraindications/Cautions

- patients with decreased levels of plasma pseudocholinesterases and those with atypical pseudocholinesterase may experience prolonged respiratory depression and apnea
- caution in patients recovering from severe trauma and severe burns, patients with hyperkalemia, receiving quinidine or cardiac glycosides; cardiac arrhythmia or arrest may occur
- effect of succinylcholine is enhanced by procainamide, quinine, quiniDINE

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- onset of action IV: less than 1 minute,
- maximum effect lasts 4 to 6 minutes after injection

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SUFentanil

Warnings	Classification	Alternate Names
	opioid analgesic	SUFENTA; SUFentanil citrate

Indication

- analgesic adjunct in the induction and maintenance of balanced general anesthesia for major surgical procedures
- primary anesthetic agent for the induction and maintenance of anesthesia in patients undergoing major surgical procedures
- may be given sublingually for the management of incident pain

Reconstitution and Stability

- stable at room temperature; protect from light

Compatibility

- compatible with D5W and NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES		Palliative Monitoring See site-specific restrictions
Continuous subcutaneous infusion	YES	**standard solution concentration:** 50 mcg/mL transfer 2500 mcg to an empty sterile bag (*obtain empty bag from stores or pharmacy)* *must control rate with a subcutaneous infusion pump*	Palliative Monitoring See site-specific restrictions
Intramuscular	NO		
IV direct	YES	**by anesthesiologist only** dilute dose in NS 10 mL; give slowly over at least 2 minutes o rate of 100 to 150 mcg/minute for less hypotension o maximum rate: 300 mcg/minute	Full monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**by anesthesiologist only** **standard solution concentrations:** 25 mcg/mL: dilute 1250 mcg with D5W 25 mL in an empty sterile bag 50 mcg/mL: o transter 5000 mcg to an empty sterile bag (*obtain empty bag from stores or pharmacy)* Maximum infusion rate: 1 mcg/kg/hour *rate must be controlled with an infusion pump*	Full monitoring
Sublingual	YES	give injectable solution sublingually	Intermediate monitoring (sedation scale and respiratory rate every 5 to 10 minutes for 25 minutes after each dose)

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SUFentanil

Dosage

- Analgesic adjunct to major surgery:
  Total dose: 1 to 2 mcg/kg
  Induction: 75% or more of the total dose may be administered by slow IV direct or IV infusion prior to intubation.
  Maintenance: increments of 10 to 25 mcg IV direct PRN or 0.3 to 0.9 mcg/kg/hour continuous IV infusion

- Analgesic adjunct to more complicated major surgery:
  Total dose: 2 to 8 mcg/kg
  Induction: up to 75% of the total dose may be administered by slow IV direct or IV infusion prior to intubation.
  Maintenance: increments of 25 to 50 mcg IV direct PRN or 0.3 to 0.9 mcg/kg/hour continuous IV infusion

- Primary anesthetic agent:
  Total dose: 8 to 30 mcg/kg
  Induction: 8 to 30 mcg/kg by slow IV direct and/or continuous IV infusion
  Maintenance: increments of 25 to 50 mcg IV direct PRN or continuous IV infusion, such that the total dose for the procedure does not exceed 30 mcg/kg

- Analgesia for palliative care patients:
  12.5 to 50 mcg subcutaneously Q1H PRN and/or 1 to 200 mcg/hour by subcutaneous infusion

Dose modification: Initial dose should be reduced for elderly or debilitated patients. In obese patients (more than 20% above ideal total body weight) dosage should be determined using lean body weight

- Incident pain:
  - 5 to 25 mcg **sublingual** pre-procedure; maximum dose 50 mcg per episode. Instruct patients not to swallow for 2 minutes. Wait 3 to 5 minutes before attempting the procedure. Wait at least 30 minutes before giving SUFentanil for the next procedure.
  - **sublingual** administration: analgesic onset is 3 to 5 minutes; duration of action of 10 to 25 minutes

Potential Hazards of Parenteral Administration

- IV direct rate less than 1 minute is associated with increased incidence of hypotension.
- resuscitation equipment must be readily available
- antidote: naloxone

Important Implications

Contraindications/Cautions
- contraindicated in patients allergic to fentanyl or its derivatives
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- respiratory, circulatory depression, bradycardia or tachycardia
- skeletal muscle rigidity, particularly of the truncal muscles

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sugammadex

Warnings	Classification	Alternate Names
	selective relaxant binding agent	BRIDION

Indications

- emergency reversal of deep neuromuscular blockade induced by rocuronium or vecuronium
- restrictions apply

Reconstitution and Stability

- store at room temperature and protect from light

Compatibility

- Compatible with NS, D5W, dextrose 2.5% in sodium chloride 0.45%, dextrose 5% in sodium chloride 0.9% , Ringers solution and Ringers lactate solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	▪ **by physician only** ▪ give over 10 seconds ▪ flush line with NS, before and after administration	Intensive Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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sugammadex

Dosage

Reversal of deep block (at least 1 to 2 post-tetanic counts but prior to appearance of T_2):
4 mg/kg IV direct

Immediate reversal of blockade: 16 mg/kg IV direct

Potential Hazards of Parenteral Administration

- uncommonly may cause hypersensitivity reactions (rash, flushing, urticaria), including anaphylaxis or anaphylactoid reactions (greatest risk with 16 mg/kg dose).
- Local: pain at injection site

Important Implications

Contraindications/Cautions
- not recommended with severe renal impairment (Creatinine Clearance less than 30 mL/min)

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- *CVS*: hypotension (5% to 13%), marked bradycardia, other dysrhythmias; *CNS*: Headache (10%); *GI*: nausea (26%), vomiting (11% to 15%)

Monitoring
- neuromuscular stimulation
- hemostatic and coagulation parameters
- respiratory function during recovery (ventilatory support is mandatory for patients until adequate spontaneous respiration is restored)

Other
- Onset of reversal: less than 3 minutes

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SUMAtriptan

Warnings	Classification Migraine Therapy; 5-HT1 Receptor Agonist	Alternate Names IMITREX

Indications

- treatment of migraine attacks with or without aura

Reconstitution and Stability

- store at room temperature
- protect from light
- single use vial

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	into lateral thigh or upper arm	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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SUMAtriptan

Dosage

Migraine treatment
- 6 mg subcutaneous at first sign of migraine
- may repeat in 1 hour if migraine returns or there is only a partial response to the initial dose
- maximum dose is 12 mg per 24 hour period

Potential Hazards of Parenteral Administration

- minor injection site reactions

Important Implications

Contraindications/Cautions
- contraindicated in patients:
  - with history of or signs and symptoms of cardiovascular disease including ischemic heart disease, cardiac arrhythmias, cerebrovascular disease and peripheral vascular disease
  - with severe or uncontrolled hypertension
  - if currently taking linezolid or monoamine oxidase inhibitors (MAOI) or within last 2 weeks
  - if less than 24 hours since use of an ergotamine-containing drug (e.g. dihydroergotamine, methysergide) due to potential to cause prolonged vasospastic reactions
- do not administer to patients with severe hepatic dysfunction
- do not use SUMAtriptan for management of hemiplegic, basilar, or ophthalmoplegic migraine
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- increased blood pressure
- angina-like symptoms (chest pressure, tightness and pain), coronary vasospasm, unstable angina, myocardial infarction and cardiac arrhythmias may occur within a few hours of drug administration especially in patients with a history of cardiovascular disease
- nausea/vomiting, taste disturbances, malaise/fatigue and dizziness/vertigo

Other
- onset of action: 10 to 30 minutes; significant relief usually occurs 10 to 15 minutes following subcutaneous injection

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TACrolimus

Warnings	Classification	Alternate Names
hazardous drug group 2	immunosuppressant	PROGRAF FK506

Indications

- prevention and treatment of rejection in transplant recipients
- prevention and treatment of graft versus host disease (GVHD) in stem cell transplant recipients
- Indications and / or prescribing restrictions apply.

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- store at room temperature

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	administer using DEHP-free or polyethylene-lined tubing (low sorbing tubing); dilute in polyolefin bag, glass or other non-PVC container (i.e. PVC free and DEHP free); final concentration should be 0.004 to 0.02 mg/mL **standard dilutions**: ▪ 0.2 mg to 0.49 mg in D5W 50 mL; remove 50 mL from D5W 100 mL bag, then add drug to bag ▪ 0.5 mg to 2 mg in D5W 100 mL ▪ doses greater than 2 mg, up to 5 mg in D5W 250 mL Prevention of rejection of heart /kidney /liver /lung transplant: infuse over 4 to 6 hours GVHD in hematopoietic stem cell transplantation: infuse over 24 hours *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	NO	*This IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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TACrolimus

Dosage

- Prevention and treatment of rejection in heart/kidney/liver/lung transplant:
  0.03 to 0.04 mg/kg/day IV; titrate to target trough concentration

- Prevention and treatment of GVHD in hematopoietic stem cell transplantation:
  0.03 mg/kg IV infused over 24 hours daily

- convert to oral therapy as soon as possible: **oral dose = 4 x IV dose**; give the first oral dose 8 to 12 hours after the IV has been discontinued
- for patients with hepatic or renal insufficiency: use doses at the lower end of the dosing range

Potential Hazards of Parenteral Administration

- potential for higher risk of nephrotoxicity and CNS symptoms with infusion durations less than 24 hours (related to high peak concentrations)
- blurred vision and photophobia have been reported with IV therapy
- hypersensitivity reactions: including anaphylaxis (rare); epinephrine must be readily available

Important Implications

Contraindications/Cautions
- do not administer with cycloSPORINE (increased risk of nephrotoxicity); cycloSPORINE must be discontinued 24 to 48 hours before starting TACrolimus (and vice versa)
- do not use in patients who are allergic to castor oil

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- CNS (most common) - headache, tremor, insomnia, paresthesia, hyperesthesia, numbness, nightmares (greater with IV therapy than oral)
- anemia, leukocytosis and thrombocytopenia have been reported
- hyperglycemia, hyperkalemia, hyperuricemia, GI complaints

Monitoring
- trough levels 2 to 3 times during the first week of therapy at the same time each day
- target levels are 4 to 12 ng/mL (using Tandem Mass Spectrometry); the level should never exceed 18 ng/mL; target levels are based on type of transplanted organ and time from transplantation
- if serum creatinine doubles from baseline, hold dose or decrease TACrolimus dose by half and repeat levels

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Td ADSORBED

Warnings	Classification	Alternate Names
	vaccine, active immunizing agent	tetanus-diphtheria toxoids adsorbed vaccine

Indications

- active immunization against tetanus and diphtheria
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator (2 to 8°C)
- discard unused portion of ampoule
- shake before using, do not use if solution contains clumps after shaking

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	into deltoid muscle must be given at a separate anatomic site from tetanus immune globulin	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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Td ADSORBED

Dosage

Primary series for unimmunized or incompletely immunized adults,18 years or older:
- 1st dose : 0.5 mL IM Tdap (ADACEL, see separate monograph)
- 2nd dose : 0.5 mL IM Td ADSORBED 4 to 8 weeks after 1st dose
- 3rd dose : 0.5 mL IM Td ADSORBED 6 to 12 months after 2nd dose

Reinforcing (booster) doses:
0.5 mL IM every 10 years

After injury:
- *For clean, minor wounds*:
  if immunization history is uncertain or primary series was incomplete **or** if more than 10 years have elapsed since the last dose, give 0.5 mL IM

- *All other wounds:*
  - if more than 5 years has elapsed since the last dose, give 0.5 mL IM
  - if immunization history is uncertain or primary series was incomplete, give 0.5 mL IM
    (in addition give 250 units of tetanus immune globulin; see tetanus immune globulin monograph).
    Td ADSORBED and tetanus immune globulin must be given at separate anatomic sites.

Potential Hazards of Parenteral Administration

- anaphylaxis (epinephrine and diphenhydrAMINE should be readily available)
- slight soreness and redness at site of injection

Important Implications

Contraindications/Cautions
- immunization should be deferred in the presence of acute febrile illness

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- fever, malaise, headache, starting a few hours after injection and lasting 1 to 2 days

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tenecteplase

Warnings	Classification fibrinolytic agent	Alternate Names TNKase

Indications

- fibrinolysis of coronary artery thrombosis associated with ST elevation myocardial infarction (STEMI)
- thrombolysis in acute ischemic stroke (within 4.5 hours of symptom onset)

Reconstitution and Stability

- available as a kit; store at room temperature
- reconstitute vial with 10 mL sterile water for injection (supplied); final solution concentration: 5 mg/mL
  - use the syringe and dual cannula device provided
  - to avoid foaming, swirl the vial gently to dissolve; DO NOT SHAKE
  - slight foaming may occur; allow vial to stand for several minutes to dissipate large bubbles
- reconstituted solution stable for 8 hours if refrigerated

Compatibility

- compatible with NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	dextrose containing lines should be flushed with NS prior to and following administration of tenecteplase undiluted, over 5 seconds	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	NO		

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tenecteplase

Dosage

ST elevation myocardial infarction (STEMI) - fibrinolysis of coronary artery thrombosis:

Patient Weight	Tenecteplase Dose	Tenecteplase Volume (5 mg/mL)
less than 60 kg	30 mg	6 mL
60 to 69 kg	35 mg	7 mL
70 to 79 kg	40 mg	8 mL
80 to 89 kg	45 mg	9 mL
90 kg or more	50 mg	10 mL

Acute ischemic stroke - thrombolysis within 4.5 hours of symptom onset:

Patient Weight	Tenecteplase Dose	Tenecteplase Volume (5 mg/mL)
less than 40 kg	per neurologist (usual dose 0.25 mg/kg)	
40 to 49.9 kg	12.5 mg	2.5 mL
50 to 59.9 kg	15 mg	3 mL
60 to 69.9 kg	17.5 mg	3.5 mL
70 to 79.9 kg	20 mg	4 mL
80 to 89.9 kg	22.5 mg	4.5 mL
90 kg or more	25 mg	5 mL

Potential Hazards of Parenteral Administration

- hemorrhage
- hypersensitivity reactions (e.g. anaphylaxis, urticaria, angioedema) have been reported
- reperfusion arrhythmias

Important Implications

Contraindications/Cautions

- *Absolute* contraindications:
  - intracranial hemorrhage
  - ischemic stroke within 3 months (EXCEPT treatment of acute ischemic stroke within 4.5 hours of symptom onset)
  - known structural cerebral vascular lesion (e.g. arteriovenous malformation, aneurysm)
  - known malignant intracranial neoplasm (primary or metastatic)
  - suspected aortic dissection
  - active bleeding or bleeding diathesis (excluding menses)
  - significant closed-head or facial trauma within 3 months
  - intracranial or intraspinal surgery within 2 months
  - severe uncontrolled hypertension unresponsive to emergency therapy
- *Relative* contraindications:
  - history of chronic, severe, poorly controlled hypertension
  - severe, uncontrolled hypertension on presentation (SBP above 180 or DBP above 110)
  - history of prior ischemic stroke greater than 3 months, dementia, or known intracranial pathology not covered in contraindications
  - traumatic or prolonged (greater than 10 minutes) CPR or recent major surgery (within 3 weeks)
  - recent internal bleeding (within 2 to 4 weeks)
  - non-compressible vascular punctures
  - active peptic ulcer
  - current use of anticoagulants (bleeding risk increases with increased INR)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring

- cardiac arrhythmias
- bleeding

Other

- avoid IM injections

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testosterone enanthate long acting

Warnings	Classification	Alternate Names
hazardous drug group 2	androgen, hormonal agent	DELATESTRYL, testosterone enanthate

Indications

- breast cancer, (for all oncological indications see BC Cancer benefit drug list)
- male hypogonadism and hormone therapy for transgender males
- **This monograph is specific for** testosterone **enanthate (DELATESTRYL)** only

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- store at room temperature

Compatibility

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	*hormone therapy for transgender males*: maximum of 100 mg rotate injection sites	Basic monitoring
Intramuscular	YES	deeply into the gluteal muscle	Basic monitoring or according to protocol
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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testosterone enanthate long acting

Dosage

- oncological indications: **follow specific protocol**; dose and schedule depend on protocol and patient response.
  - Metastatic breast cancer: 400 mg IM for one dose on day 1 every 4 weeks
  - Refer to BC Cancer Drug Manual Monographs

- male hypogonadism = 50 mg to 100 mg IM once weekly or 100 mg to 200 mg IM every 2 weeks

- hormone therapy for transgender males: 100 mg to 200 mg IM every 2 weeks or 50 mg to 100 mg IM/subcutaneous every week
  - may adjust dose after 3 months based on clinical response and serum testosterone levels

Potential Hazards of Parenteral Administration

- injection site pain, urticaria, injection reactions (including induration and furunculosis)

Important Implications

Contraindications/Cautions

- should not be administered to those with known hypersensitivity to any component. Each mL contains: testosterone (synthesized from soy) enanthate 200 mg formulated in sesame oil with 0.5% chlorobutanol as preservative
- in diabetic patients, the metabolic effects of androgens may decrease blood glucose. Therefore, insulin or oral hypoglycemic requirements may change
- May potentiate the effects of oral anticoagulants

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- virilization in women (e.g., voice changes, clitoromegaly)
- worsening of hypercalcemia
- worsening of tumour growth during initial therapy

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tetanus immune globulin (human)

Warnings	Classification	Alternate Names
	passive immunizing agent	HYPERTET

Indications

- passive immunization against tetanus
- treatment of active tetanus infection

Reconstitution and Stability

- store in refrigerator (2 to 8°C)

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	ventrogluteal is the preferred site alternate sites: deltoid and vastus lateralis must be given at a separate anatomic site from any tetanus toxoid-containing vaccine	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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tetanus immune globulin (human)

Dosage

Prophylaxis:

Refer to Td ADSORBED monograph in conjunction with this monograph

Major or unclean wounds (eg. contaminated with dirt, feces, soil and saliva; puncture wounds; tearing away of body parts or structures; crushing; burns and frostbite):

- *if immunization history is incomplete or uncertain:* give 250 units tetanus immune globulin IM
  Also administer 0.5 mL Td ADSORBED IM. Tetanus immune globulin and Td ADSORBED must be given at separate anatomic sites.
- *in those who have a significant immune deficiency state (e.g. HIV) regardless of their immunization history:* give 250 units tetanus immune globulin IM

Treatment:

Dosage not well established: 3000 to 6000 units (doses up to 10,000 units have been used)

For further information refer to Tetanus Immune Globulin (TIg) monograph in Part 4 – Biological Products at BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- rarely allergy or anaphylaxis (epinephrine and diphenhydrAMINE should be readily available)
- mild soreness at injection site

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- localized tenderness, erythema, or low grade fever

Other

- sensitivity tests are not recommended due to high incidence of false positive reactions

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tetanus-diphtheria-acellular pertussis vaccine

Warnings	Classification	Alternate Names
	active immunizing agent	ADACEL, BOOSTRIX, Tdap

Indications

- active immunization against tetanus, diphtheria, and pertussis (whooping cough)
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator (2 to 8°C)
- ADACEL: single dose vial
- BOOSTRIX: prefilled syringe, protect from light
- shake well until a uniform, cloudy white suspension results prior to administration

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	preferred site: into deltoid muscle	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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tetanus-diphtheria-acellular pertussis vaccine

Dosage

tetanus-diphtheria-acellular pertussis vaccine = Tdap

Adults 18 years of age and older (unimmunized or incompletely immunized), complete series as follows:

- 1st Dose: 0.5 mL IM **Tdap**
- 2nd Dose: 0.5 mL IM Td Adsorbed (see Td Adsorbed monograph) 4 to 8 weeks after **Tdap** dose
- 3rd Dose: 0.5 mL IM Td Adsorbed (see Td Adsorbed monograph) 6 to 12 months after Td Adsorbed dose

Reinforcing booster dose: 0.5 mL IM every 10 years or as recommended by BC Centre for Disease control

After injury:

- *For clean*, *minor wounds*:
  if information regarding previous tetanus immunization is lacking **or** if 10 or more years have elapsed since the last tetanus toxoid containing vaccine, give Tdap* booster.

- *All other wounds*:
  - if more than 5 years has elapsed since the last tetanus toxoid containing vaccine , give Tdap* booster
  - if information regarding previous tetanus immunization is lacking, give Tdap* booster (in addition to 250 units of tetanus immune globulin; see tetanus immune globulin monograph).
    Tdap* and tetanus immune globulin must be given at separate anatomic sites.
- * or an alternate tetanus toxoid containing vaccine may be administered

During pregnancy (for prevention of pertussis in the newborn):

- 0.5 mL IM, preferably between 27 and 32 weeks** gestation, during every pregnancy, irrespective of immunization history
  ** *may be given from 13 weeks up to the time of delivery*

For additional information: refer to Part 4 - Biological Products BC Centre for Disease Control Immunization

Potential Hazards of Parenteral Administration

- anaphylaxis (epinephrine should be readily available)
- redness, tenderness, swelling, induration, pain at injection site

Important Implications

Contraindications/Cautions

- History of an anaphylactic reaction to a previous dose of any tetanus, diphtheria, or pertussis-containing vaccine or to any components of ADACEL or BOOSTRIX vaccines (consult manufacturer's product monograph)
- History of Guillain-Barré syndrome (GBS) occurring within 8 weeks after receiving a tetanus-containing vaccine

- Pregnancy/Lactation: refer to Lexicomp or Micromedex.
  also refer to BC Centre for Disease Control Immunization manual-Part 2: Immunization of Special Populations
  (go to Other high risk conditions ->People Who are Pregnant or Planning a Pregnancy)

Side effects

- headache, decreased energy, fever, nausea, diarrhea, generalized body-ache, sore or swollen joints

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thiamine

Warnings	Classification	Alternate Names
	vitamin	BETAXIN thiamine hydrochloride, vitamin B_1

Indications

- prophylaxis and treatment of thiamine deficiency

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with D5W, NS, and dextrose-saline combinations, Lactated Ringer's and Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	into large muscle mass	Basic Monitoring
IV direct	YES	may give undiluted; maximum rate: 20 mg/minute	Basic Monitoring
IV intermittent	YES	preferred IV route dilute in D5W 50 mL central line, fluid restricted: dilute in D5W 25 mL infuse over 30 minutes	Basic Monitoring
Continuous IV infusion	NO	*this IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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thiamine

Dosage

- Usual dose: 25 to 200 mg IV or IM daily
- Thiamine deficiency (beriberi): 5 to 100 mg IV or IM TID
  reduce dose depending on response, followed by oral therapy for 1 month
- Wernicke's encephalopathy: 500 mg IV TID for 2 to 3 days
  if response, continue with 200 mg IV or IM daily for an additional 3 to 5 days or until clinical improvement

Potential Hazards of Parenteral Administration

- hypersensitivity reactions including anaphylaxis have occurred mainly following IV administration
- an intradermal test dose is recommended in patients suspected of being sensitive
- induration and/or tenderness at IM injection site

Important Implications

Contraindications/Cautions

- Caution: if IV glucose is to be administered, give thiamine prior to or with the glucose solution (thiamine is a cofactor in normal carbohydrate metabolism; a concentrated glucose load may rapidly deplete thiamine stores and precipitate or worsen encephalopathy in patients with underlying thiamine deficiency)
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hypotension

Other

- thiamine requirements may be increased with alcoholism, burns, fever, chronic, renal or hepatic disease, hyperthyroidism, intestinal disease, or prolonged infection

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thiotepa

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, alkylating agent	TEPADINA

Indications

- Bone marrow transplant (BMT)
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	over 1 to 2 minutes	Basic monitoring or according to protocol
IV intermittent	YES	dilute doses: • 500 mg or less in 500 mL NS • greater than 500 mg in 1000 mL NS use tubing with 0.2 micron in-line filter infuse over 2 to 4 hours	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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thiotepa

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Some examples:
- BMT autograft for CNS lymphoma: range 250 to 300 mg/m^2 IV intermittent daily for 2 to 3 doses

- Haploidentical stem cells transplantation: 5 mg/kg IV intermittent daily for 2 doses

Dose adjustments
- Dosage may be reduced, delayed, or discontinued in patients with bone marrow depression due to cytotoxic/radiation therapy or in patients with other toxicities
- *renal or hepatic failure*: caution, dose reduction may be required

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- injection site pain
- extravasation risk: non-vesicant
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- avoid skin contact; skin reactions including depigmentation and dermatitis have occurred after accidental exposure; if skin contact occurs with thiotepa, immediately wash thoroughly with soap and water

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- myelosuppression (cumulative and dose-related) may occur up to 30 days after treatment
- fatigue

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thyrotropin alfa

Warnings	Classification	Alternate Names
	hormonal agent, diagnostic agent	THYROGEN human thyroid stimulating hormone, recombinant TSH

Indications

- thyroid cancer - adjunctive agent
- Indications and / or prescribing restrictions apply.

Reconstitution and Stability

- store vials in refrigerator (2 to 8 ºC), protect from light.
- reconstitute 1.1 mg vial with 1.2 mL sterile water for injection to provide 0.9 mg/mL solution.
- swirl the vial gently until contents dissolved; do not shake. Solution is clear and colourless.
- use within three hours of preparation. Discard unused solution.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	into the gluteal muscle	Basic Monitoring See site-specific restrictions
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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thyrotropin alfa

Dosage

- refer to the protocol being used for the patient.
- BC Cancer usual dose: 0.9 mg IM Q24H for 2 doses
- refer to Cancer Drug Manual - BC Cancer. This is not a cytotoxic agent.

Potential Hazards of Parenteral Administration

- hypersensitivity reactions (less than 1%, but increased risk with repeated administration): urticaria, pruritis, flushing, and respiratory difficulties.

Important Implications

Contraindications/Cautions

- Contraindicated:
  - patients with a known hypersensitivity to natural or recombinant TSH or any components of the formulation (see manufacturer's monograph)
  - patients with recent myocardial infarction or patients with hypopituitarism.
- Caution: patients with cardiac disease - thyrotropin alfa-induced hyperthyroidism may exacerbate existing cardiac conditions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- nausea, transient increase in TSH levels

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tigecycline

Warnings	Classification antibiotic, glycylcycline	Alternate Names TYGACIL

Indications

- treatment of complicated skin and skin structure infections and complicated intra-abdominal infections
- antimicrobial spectrum of activity:
  - a variety of aerobic gram-positive and negative pathogens and some anaerobes; (includes: methicillin-resistant staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE), extended spectrum Beta-Lactamase (ESBL) organisms: E.coli and K. pneumoniae)

- indications and / or prescribing restrictions apply

Reconstitution and Stability

- reconstitute 50 mg vial with 5.3 mL of NS to obtain 10 mg/mL (vial contains overfill)
- reconstituted solution should be yellow to orange in colour; if not, discard

Compatibility

- compatible with NS or D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute doses: o 25 to 50 mg in 50 mL o 100 mg in 100 mL o 200 mg in 250 mL infuse over 30 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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tigecycline

Warnings	Classification antibiotic, glycylcycline	Alternate Names TYGACIL

Dosage

Intra-abdominal or complicated skin and skin structure infections:
- initial dose 100 mg IV, followed by 50 mg IV Q12H
- recommended duration of therapy: 5 to 14 days

Multidrug resistant organisms with high minimum inhibitory concentrations (MICs):
- initial dose 200 mg IV, followed by 100 mg IV Q12H

Potential Hazards of Parenteral Administration

Important Implications

Contraindications/Cautions

- Caution: in patients with prior hypersensitivity and/or severe adverse reactions to tetracyclines.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- most frequent: nausea and vomiting (dose related, transient), followed by diarrhea
- theoretical risk of similar adverse effects as tetracyclines including pancreatitis, hepatitis, hearing loss, vertigo, hyperpigmentation, lupus like syndrome, pruritus, urticaria and rashes

Other

- *drug interactions:* may increase serum concentration of warfarin; monitor INR closely during initiation or discontinuation

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tirofiban

Warnings	Classification platelet aggregation inhibitor, glycoprotein (GP) IIb/IIIa inhibitor	Alternate Names AGGRASTAT, tirofiban hydrochloride

Indications

- adjunctive treatment in non-ST elevation acute coronary syndromes or ST elevation myocardial infarction for high risk patients undergoing percutaneous coronary intervention (PCI)

NON-FORMULARY (*for use during eptifibatide shortage*)

Reconstitution and Stability

- pre-mixed bags are stored at room temperature in foil overwrap to protect from light

Compatibility

- compatible with NS, D5W and dextrose 5%-sodium chloride 0.45%

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	PCI bolus dose: withdraw calculated dose from infusion bag and administer undiluted over 3 minutes	Advanced Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	may administer bolus dose (using Alaris bolus feature) and IV infusion from the same bag **standard solution concentration:** 50 mcg/mL: 12.5 mg in NS 250 mL premixed bag *rate must be controlled with an IV infusion pump*	Advanced Monitoring See site-specific restrictions

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tirofiban

Dosage

percutaneous coronary intervention (PCI):

- 25 mcg/kg IV bolus (over 3 minutes), followed by 0.15 mcg/kg/minute continuous IV infusion for 12 to 24 hours

- dose adjustment in renal impairment (creatinine clearance of 30 mL/minute or less):
  12.5 mcg/kg IV bolus (over 3 minutes), followed by 0.075 mcg/kg/minute continuous IV infusion for 12 to 24 hours

Potential Hazards of Parenteral Administration

- hemorrhage - severe bleeding may occur
- rare: anaphylaxis

Important Implications

Contraindications/Cautions

Contraindicated in patients with:

- history of bleeding diathesis or evidence of active abnormal bleeding within the previous 30 days
- severe hypertension (SBP over 180 mmHg or DBP over 110 mmHg) not adequately controlled on antihypertensive therapy
- major surgical procedure or major trauma within the preceding 6 weeks
- history of stroke within 30 days or any history of hemorrhagic stroke
- history of thrombocytopenia or other platelet disorder
- acute pericarditis
- history of intracranial hemorrhage, neoplasm, arteriovenous malformation or aneurysm; history, symptoms or findings suggestive of aortic dissection; clinically significant liver disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- hemorrhage, thrombocytopenia

Monitoring

- CBC at baseline, 4 hours after the bolus dose, then daily during treatment; repeat CBC at 24 hours after discontinuation of infusion or prior to discharge, whichever is first
- inform physician if platelet count drops below 100 x 10^9/L. Platelet transfusion may be required if platelet count drops below 50 x 10^9/L
- baseline PTT, INR, renal function
- maintain bleeding precautions (i.e. avoid unnecessary arterial and venous punctures, avoid IM injections, avoid frequent cycling of automatic blood pressure cuffs)

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tixagevimab-cilgavimab

Warnings	Classification	Alternate Names
	anti-SARS-CoV-2 spike protein monoclonal antibody	EVUSHELD

Indications

- the British Columbia COVID-19 Therapeutics Committee (CTC) recommends the case-by-case use of EVUSHELD for pre-exposure prophylaxis of COVID-19 in patients who:
  - are expected to have a reduced response to vaccination or who cannot receive a COVID-19 vaccine AND
  - are severely immunocompromised (categorized as Clinically Extremely Vulnerable Group 1) AND
  - have no known cardiovascular disease AND
  - have additional risk factors or exceptional circumstances that correlate with an extremely high risk of poor outcomes from COVID-19
- refer to BC Centre for Disease Control-Treatment Clinical Practice Guide on tixagevimab/cilgavimab (EVUSHELD)

- **NON-FORMULARY**

Reconstitution and Stability

- store vials in fridge at 2°C to 8°C in the original carton to protect from light
- supplied as 150 mg (1.5 mL) single-dose vials of tixagevimab or cilgavimab that contain opalescent, colourless to slightly yellow solutions
- prepared syringes should be administered as soon as possible; if immediate administration is not possible, store syringes for up to 4 hours refrigerated or at room temperature (up to 25°C).

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	▪ administer tixagevimab and cilgavimab as two separate consecutive IM injections ▪ administer at different injection sites, each drug in separate gluteal muscles	Basic Monitoring (observe for at least 15 minutes after injection in case of hypersensitivity reaction)
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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tixagevimab-cilgavimab

Dosage

- 40 kg or more:150 mg of tixagevimab and 150 mg of cilgavimab (equivalent to 300 mg EVUSHELD) IM every 6 months

Potential Hazards of Parenteral Administration

- pain at injection site
- monoclonal antibodies have been shown to be associated with hypersensitivity reactions including anaphylaxis at rates similar to COVID-19 vaccines (i.e. rarely)

Important Implications

Contraindications/Cautions

- *contraindications*:
  - hypersensitivity to tixagevimab or cilgavimab or any component of the formulation (see product monograph)
  - known coronary artery disease, history of myocardial infarction, unstable angina, heart failure or arrhythmias
- *caution*:
  - In PROVENT study, a higher proportion of subjects who received EVUSHELD versus placebo reported serious cardiovascular or thromboembolic events

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- CNS: dizziness (1%), fatigue (4%), headache (6%), insomnia (1%), cough (3%)

Other

- takes approximately 29 days to reach the maximum serum concentration of antibodies after a dose tixagevimab and cilgavimab
- patients should wait at least 14 days after receiving their last COVID vaccine/boosters; all vaccine doses/boosters, should be given prior to administering tixagevimab and cilgavimab and not be delayed

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tobramycin

Warnings	Classification	Alternate Names
	antibiotic ,aminoglycoside	NEBCIN; tobramycin sulfate

Indications

- treatment of serious pseudomonas infections
- Indications and /or prescribing restrictions apply

Reconstitution and Stability

- stable at room temperature
- administration of tobramycin and beta-lactams (penicillins) must be separated with complete flushing of IV line between doses

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, lactated ringers and ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deeply into a large muscle; rotate sites	Basic Monitoring
IV direct	NO		
IV intermittent	YES	dilute all doses in 100 mL; except in dialysis patients: dilute all doses in 50 mL; administer over 30 minutes	Basic Monitoring
Continuous IV infusion	NO		
Intraperitoneal	YES	*preferred route for peritonitis in continuous ambulatory peritoneal dialysis (CAPD) patients:* add to dialysate bag; dwell for at least 6 hours	Basic Monitoring

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tobramycin

Dosage

- Dose based on ideal body weight (IBW), not total body weight (TBW).
- If TBW more than 125% IBW, dosing weight is IBW + 0.4 (TBW - IBW).
- If actual body weight is *less than* IBW, use actual body weight for dosing.
- If pregnant use TBW. If TBW more than 125% IBW, dosing weight is IBW + 0.4 (TBW - IBW).

Contact pharmacy for dosing guidelines.

Once Daily IV Dosing: pre-dose serum level recommended (should be less than 1 mg/L)

Creatinine Clearance	Dose
60 mL/minute or greater	Usual 6 mg/kg (range 5 to 7 mg/kg) Q24H
40 to 59 mL/minute	Usual 6 mg/kg (range 5 to 7 mg/kg) Q36H
less than 40 mL/minute	*aminoglycosides not recommended*; contact pharmacy for dosing recommendations and/or Infectious Diseases for alternate antibiotic therapy

Exclusions to once daily dosing*:* burns greater than 20%, dialysis, septic shock

- *Cystic fibrosis:* (CrCl 60 mL/minute or greater): 10 mg/kg IV Q24H, maximum of 660 mg/day unless previous use indicates otherwise. Monitor drug levels to adjust dose (target peak concentration: 20 to 30 mg/L; target trough concentration is less than 1 mg/L)

Conventional Multiple Daily IV Dosing:
Normal renal function (CrCl 60 mL/minute or greater): loading dose of 2 mg/kg, followed by maintenance dose of 1 to 2 mg/kg every 8 hours

- **Dosing adjustments are necessary in renal impairment - contact pharmacy for guidelines**.
- serum levels recommended around the third dose following initial therapy or with any change in dose:
  - Pre-dose level: 0 to 30 minutes before next dose (should be less than 2 mg/L)
  - Post-dose level: 30 minutes after completion of an IV infusion (should be less than 10 mg/L)

Hemodialysis (HD): serum levels suggested prior to second maintenance dose

- Loading Dose: 2 mg/kg IV
- Maintenance Dose: 1.5 mg/kg IV (target pre-HD level: less than 3.5 mg/L)
- Synergy Dosing: 1 mg/kg IV (target pre-HD level: less than 2 mg/L)
- Give after HD or over last 15 minutes of dialysis

Peritoneal dialysis-related peritonitis, Intraperitoneal (IP) instillation (preferred route); *options include*:

- 1.5 mg/kg IP to a maximum of 160 mg loading dose, then 0.5 mg/kg IP with one exchange once daily
- 1.7 mg/kg IP to a max. of 175 mg loading dose, further dosing to be decided by nephrologist based on cultures

Potential Hazards of Parenteral Administration

- erythema, irritation, pain, thrombophlebitis, hematoma at injection site
- hypersensitivity reactions

Important Implications

Contraindications/Cautions

- Contraindicated: patients with known hypersensitivity to tobramycin or other aminoglycosides
- Caution:
  - apnea/respiratory paralysis may result if combined with anesthetics or other neuromuscular blockers
  - in patients with myasthenia gravis or in patients on skeletal muscle relaxants – can cause neuromuscular blockade & muscular paralysis
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- ototoxicity: ataxia, dizziness, permanent hearing loss.Tinnitus or vertigo may be indications of vestibular injury and impending bilateral irreversible damage; **discontinue** treatment if symptoms of ototoxicity develop
- nephrotoxicity and neurotoxicity, potentiated by other ototoxic, nephrotoxic or neurotoxic drugs

Monitoring

- monitor serum creatinine twice weekly and renal function; serum drug levels (see DOSAGE section)
- monitor auditory function; if treatment duration greater than 14 days, consider baseline and weekly audiometry and dynamic illegible E-test (DIE)

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tocilizumab

Warnings	Classification monoclonal antibody, interleukin-6 receptor antagonist	Alternate Names ACTEMRA

Indications

- immunomodulatory therapy for treatment of COVID-19 as recommended by the British Columbia COVID-19 Therapeutics Committee (CTC) and COVID-19 Therapeutics Review and Advisory Working Group (CTRAWG) Clinical Practice Guidelines
    - Refer to BC Centre for Disease Control-Treatment for most current guidance and information
- rheumatoid arthritis (prior approval via the B.C. Pharmacare Special Authority program required)

NON-FORMULARY (Note, this monograph is specific to IV vials)

Reconstitution and Stability

- store single use vials in refrigerator and protect from light
- solution is colourless to pale yellow

Compatibility

- NS or sodium chloride 0.45%; (If diluted in sodium chloride 0.45%, stable for 4 hours at room temperature)

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	▪ remove volume equal to the dose from NS 100 mL bag; add dose slowly to bag, gently invert bag; do NOT shake (total volume = 100 mL) ▪ allow solution to come to room temperature prior to administration ▪ infuse over 1 hour *rate must be controlled with an IV infusion pump*	Advanced Monitoring ▪ with vital signs prior to infusion, then every 30 minutes during the infusion and for one hour post infusion. ▪ or monitor per indication specific PowerPlan(s) / pre-printed orders
Continuous IV infusion	NO		

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tocilizumab

Dosage

- immunomodulatory therapy for treatment of COVID-19: 400 mg IV once or 8 mg/kg (maximum of 800 mg) IV once; *per current CTC recommendations*

- rheumatoid arthritis (B.C. Pharmacare Special Authority approved): 4 to 8 mg/kg (maximum of 800 mg) IV once every 4 weeks

Potential Hazards of Parenteral Administration

- infusion-related and hypersensitivity reactions including anaphylaxis, erythema, rash, urticaria
- hypertension during infusion

Important Implications

Contraindications/Cautions

- *Contraindicated* in patients with the following:
  - known condition or treatment resulting in ongoing immune suppression, including neutropenia
  - active serious infection, other than COVID-19
  - ANC less than 1 x 10^9/L
  - platelets less than 50 x 10^9/L
  - ALT or AST greater than 5 times the upper limit of normal
- *Cautions*:
  - before starting treatment, all patients should be evaluated/screened for both active and latent tuberculosis, viral hepatitis
  - serious infections including sepsis, tuberculosis, invasive fungal and other opportunistic infections have been observed, mostly in patients on concomitant immunosuppressant therapy
  - use with caution in patients:
    - at increased risk for gastrointestinal perforation
    - with active hepatic disease or hepatic impairment

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- *Hepatic*: increased ALT, AST, bilirubin
- *CVS*: hypertension, peripheral edema
- *Respiratory*: upper respiratory tract infection, nasopharyngitis, bronchitis, cough, dyspnea
- *GI*: nausea, diarrhea, abdominal pain, dyspepsia, gastrointestinal perforations
- *Hematology*: neutropenia, reduction in platelet counts

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topotecan

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication**	antineoplastic, topoisomerase I inhibitor	HYCAMTIN, topotecan hydrochloride

Indications

- treatment of various cancers, primarily ovarian
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute dose in 50 to 100 mL D5W or NS, and infuse over 30 minutes	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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topotecan

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

A typical regimen:
- 3 week cycle : 0.5 to 1.5 mg/m^2 IV once daily for 5 consecutive days

Dose adjustment:
Dosage may be reduced, delayed or discontinued in patients with bone marrow depression due to cytotoxic/radiation therapy or in patients with other toxicities or in patients with renal failure.

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- extravasation risk: non-vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- myelosuppresion including anemia, leukopenia, neutropenia and thrombocytopenia, fever, fatigue, skin rash, nausea, vomiting, diarrhea, headache, dyspnea

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trace element solution

Warnings	Classification	Alternate Names
	trace metals	multiple trace metal additive, trace minerals MICRO+6 concentrate

Indications

- added to parenteral nutrition (PN) solutions to prevent depletion of trace elements

Reconstitution and Stability

- stable at room temperature

Compatibility

- compatible with D5W, dextrose 20% in water, dextrose 50% in water, NS

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	supplied in parenteral nutrition solutions	Intermediate Monitoring

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trace element solution

Dosage

- 0.5 to 1 mL daily of concentrate (must be diluted before use)

- each mL of MICRO + 6 concentrate contains:
  10 mcg chromium
  300 mcg copper
  75 mcg iodide
  55 mcg manganese
  60 mcg selenium
  5 mg zinc

Potential Hazards of Parenteral Administration

- thrombophlebitis with undiluted solution

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

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tranexamic acid

Warnings	Classification fibrinolytic inhibitor	Alternate Names CYKLOKAPRON

Indications

- treatment of excessive bleeding resulting from systemic or local hyperfibrinolysis
- prophylaxis in patients with coagulopathy undergoing surgical procedures
- treatment of trauma-associated hemorrhage
- treatment of post-partum hemorrhage

Reconstitution and Stability

- store at room temperature

Compatibility

- compatible with NS, D5W, dextrose-saline solutions and Ringers solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	**by physician only** dilute dose in NS 10 mL; administer at maximum rate of 100 mg/minute	Basic Monitoring
IV intermittent	YES	dilute dose in NS 100 mL; infuse over 10 to 30 minutes maximum rate: 100 mg/minute trauma-associated hemorrhage follow with 1000 mg in NS 100 mL infuse over 8 hours *rate must be controlled with an IV infusion pump*	Basic Monitoring
Continuous IV infusion	NO	*this IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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tranexamic acid

Dosage

Usual dose:
- 10 mg/kg (usual 500 to 1000 mg) IV intermittent 2 to 4 times daily

- dose must be reduced in patients with impaired renal function as follows:

Creatinine Clearance	Dose Adjustment
50 to 80 mL/minute	10 mg/kg IV twice daily or 50% of normal dose
10 to 50 mL/minute	10 mg/kg IV once daily or 25% of normal dose
less than 10 mL/minute	10 mg/kg IV every 48 hours or 10% of normal dose

Postpartum hemorrhage (within 3 hours of birth):
- 1000 mg IV intermittent over 10 minutes; if bleeding continues after 30 minutes or stops and restarts within 24 hours of the first dose, give 1000 mg IV intermittent over 10 minutes

Trauma-associated hemorrhage (if within 3 hours of injury):
- 1000 to 2000 mg IV intermittent over 10 to 20 minutes, followed by 1000 mg IV intermittent over 8 hours

,

Potential Hazards of Parenteral Administration

- thrombosis
- hypotension with rapid IV administration

Important Implications

Contraindications/Cautions
- contraindicated in patients with disseminated intravascular coagulation without concomitant heparin therapy
- avoid in patients with acquired disturbances in colour vision; ophthalmic exam is recommended before and during therapy if patient is treated beyond several days
- prolonged use carries a risk of thrombosis in patients who have an underlying prothrombotic state
- use with caution in patients with renal insufficiency, cardiovascular or cerebrovascular disease

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other
- tranexamic acid has a similar mechanism of action to aminocaproic acid, but is approximately 10 times more potent in vitro
- not indicated in hematuria caused by diseases of the renal parenchyma

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trastuzumab

Warnings	Classification	Alternate Names
high alert medication	antineoplastic, monoclonal antibody	HERCEPTIN, biosimilars = HERZUMA,ONTRUZANT rhuMAb HER2, HER2 monoclonal antibody

Indications

- indicated in the treatment of certain patient groups with breast cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy

Compatibility

- compatible with NS only

Preparation and Administration

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above).

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 250 mL NS infuse: *3-weekly dosing*: ▪ loading dose over 90 minutes; ▪ 1st maintenance dose over 60 minutes; ▪ subsequent doses over 30 minutes, if no adverse reactions *weekly dosing*: ▪ loading dose over 60 minutes; ▪ all subsequent doses over 30 minutes, if no adverse reactions	Intermediate monitoring or according to protocol Observe patient: *during infusion* and for 60 minutes after loading dose, & 30 minutes after subsequent doses If infusion related reactions are mild or moderate, decrease rate. Interrupt infusion in patients experiencing dyspnea or hypotension.
Continuous IV infusion	NO		

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trastuzumab

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Some typical regimens:
- weekly regimen: 4 mg/kg IV loading dose on day 1 of first cycle, then 2 mg/kg IV for one dose on day 1 of each subsequent cycle
- every 3 week regimen: 8 mg/kg IV loading dose on day 1 of first cycle, then 6 mg/kg IV for one dose on day 1 for each subsequent cycle

- For both regimens: if a dose is more than 1 week late, the clinical significance of giving another loading dose is unclear due to the slow clearance of trastuzumab.

Dosage adjustments:
Dosage may be reduced, delayed or discontinued in patients with bone marrow depression due to cytotoxic/radiation therapy or in patients with other toxicities.

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- infusion related reactions: during administration, resuscitation equipment and emergency drugs should be readily available
- extravasation risk: non-vesicant

Important Implications

Contraindications/Cautions
- contraindicated in patients with hypersensitivity reaction to chinese hamster ovary cell proteins
- use with caution in patients:
  - with pre-existing cardiac dysfunction or a left ventricular ejection fraction (LVEF) of 55% or less
  - with pre-existing pulmonary disease or extensive pulmonary tumour involvement; or those who experience dyspnea at rest due to comorbidities or advanced malignancy may be at increased risk of a fatal infusion reaction

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- infusion related reactions: *mild to moderate*: chills, fever, rash, nausea, vomiting, headache, pain, cough, dyspnea; *severe reactions*: hypotension, hypertension, wheezing, bronchospasm, tachycardia, reduced oxygen saturation and respiratory distress
- cardiac dysfunction and severe heart failure in patients with previous cardiac disease or concurrent cardiotoxic therapy (i.e. anthracyclines, cyclophosphamide), radiation, or advanced age

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triamcinolone acetonide

Warnings	Classification corticosteroid, anti-inflammatory	Alternate Names KENALOG-10, KENALOG-40

Indications

- **this monograph is specific to triamcinolone acetonide** (i.e. the acetonide salt)
- intralesional or sublesional local therapy of various skin diseases
- intramuscular treatment of allergic conditions, generalized rheumatoid arthritis, and other connective tissue disorders
- intrasynovial and intra-articular treatment of rheumatoid arthritis and osteoarthritis
- epidural and nerve root injection for treatment of low back pain

Reconstitution and Stability

- store at room temperature
- supplied as a suspension; **shake thoroughly**, withdraw and administer immediately

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deep into the gluteal muscle; alternate sites	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intrasynovial	YES	**by physician**	Basic Monitoring
Intra-articular	YES	**by physician**	Basic Monitoring
Intralesional	YES	**by physician**	Basic Monitoring
Soft tissue injection	YES	**by physician**	Basic Monitoring
Epidural	YES	**by physician**	Basic Monitoring

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triamcinolone acetonide

Dosage

- IM: 60 mg (range 40 to 80 mg); may be repeated when signs and symptoms recur
- Intrasynovial, intra-articular, soft tissue injection: 2.5 to 40 mg; depending on the size of joint; may be repeated when signs and symptoms recur
- Intralesional: 1 mg per injection site; multiple sites may be injected if they are 1 cm or more apart, but the total dose should not exceed 30 mg
- Epidural: 40 to 80 mg; may repeat in 4 to 6 weeks if necessary

Potential Hazards of Parenteral Administration

- post injection flare
- local pain and irritation at injection site
- sterile abscesses

Important Implications

Contraindications/Cautions

- Contraindicated: injection for local effect in presence of an acute infection
- Caution is required with steroid therapy in patients with tuberculosis, peptic ulcer, systemic fungal infections, herpes simplex keratitis
- Caution: reports of drug interaction between ritonavir and intra-articular or epidural triamcinolone acetonide injection leading to symptoms of corticosteroid excess (Cushingoid features) and adrenal suppression. If possible, avoid triamcinolone injection in ritonavir treated patients
- Caution (*epidural route*): product contains benzyl alcohol which in repeated and high doses is potentially neurotoxic; preservative-free preparation is not available
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- short term (early onset): sodium and fluid retention, hypokalemia, hyperglycemia, hypertension, increased susceptibility to and masked symptoms of infection, psychosis.
- long term: osteoporosis, thrombocytopenia, Cushing's syndrome, muscle weakness, loss of muscle mass, peptic ulcers

Other

- increased dose may be required in times of stress

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triamcinolone hexacetonide

Warnings	Classification	Alternate Names
	corticosteroid, anti-inflammatory	ARISTOSPAN

Indications

- **this monograph is specific to triamcinolone hexacetonide** (i.e. the hexacetonide salt)
- treatment of subacute and chronic inflammatory joint diseases including:
  - rheumatoid arthritis
  - osteoarthritis and post-traumatic arthritis
  - synovitis, tendinitis, bursitis, and epicondylitis

Reconstitution and Stability

- store at room temperature
- supplied as a suspension; **shake thoroughly**, withdraw and administer immediately

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		
Intrasynovial	YES	**by physician**	Basic Monitoring
Intra-articular	YES	**by physician**	Basic Monitoring
Periarticular	YES	**by physician**	Basic Monitoring

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triamcinolone hexacetonide

Dosage

- Average dose is 2 to 20 mg.
- dose depends on the size of the joint to be injected, the degree of inflammation and the amount of articular fluid present

joint size	dose
large joints (e.g. knee, hip, shoulder)	10 to 20 mg
medium-sized joints	5 to 10 mg
small joints (e.g. interphalangeal, metacarpophlangeal)	2 to 6 mg

  - frequency of injection into a single joint is every three to four weeks as clinically indicated (to avoid possible joint destruction use as infrequently as possible)

Potential Hazards of Parenteral Administration

- local reactions include sterile abscesses, post-injection erythema, pain, swelling and necrosis at the injection site

Important Implications

Contraindications/Cautions

- *contraindicated*: patients with acute psychoses, active tuberculosis, herpes simplex keratitis, systemic mycoses and parasitoses
- *cautions relating to potential systemic glucocorticoid effects (unusual)*:
  - GI: ulcerative colitis, gastric ulcers; renal /hepatic: cirrhosis, renal insufficiency; CVS: hypertension, congestive heart failure, coronary artery disease, thrombophlebitis; bone: osteoporosis; other: Cushing's syndrome, diabetes, hypothyroidism and myasthenia gravis.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- short term (early onset): sodium and fluid retention, hypokalemia, hyperglycemia, hypertension, increased susceptibility to and masked symptoms of infection, psychosis.
- long term: osteoporosis, thrombocytopenia, Cushing's syndrome, muscle weakness, loss of muscle mass, peptic ulcers

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trichophyton skin test

Warnings	Classification	Alternate Names
	diagnostic agent	DERMATOPHYTIN

Indications

- this test is used to establish the absence of cell-mediated immunity (anergy)

Reconstitution and Stability

- refrigerate (2 to 8°C)
- stable for 20 minutes only once drawn up in syringe – administer immediately

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intradermal ONLY	YES	**physician only** or practitioner with advanced skills in how to administer and interpret the test preferred site is anterior surface of the upper and lower arm if giving trichophyton, candida and tuberculin at the same time: trichophyton and candida sites must be well marked (i.e. circled and lettered and separated by at least 20 cm on one arm, and tuberculin test given on the other forearm)	Basic Monitoring After intradermal dose administered: *Interpretation*: ○ read test site in 48 to 72 hours ○ a response of more than 5 mm induration is considered an intact cutaneous delayed-type hypersensitivity response and the patient should be considered non-anergic

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trichophyton skin test

Dosage

- 100 units (0.1 mL) intradermal

Potential Hazards of Parenteral Administration

- vesiculation, ulceration or necrosis may appear at the test site in highly sensitive individuals; application of ice packs may provide symptomatic relief
- hypersensitivity reactions (urticaria, shortness of breath, anaphylaxis); all precautions should be taken for handling anaphylaxis, including having epinephrine and antihistamines available

Important Implications

Contraindications/Cautions

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- anergy testing utilizes those antigens to which an individual has likely been exposed in the past and to which a positive reaction would be expected
- there may be decreased reactivity in elderly patients, those with suppressed immune systems due to illness (e.g. HIV) or medications (e.g. corticosteroids, chemotherapy), or recent administration of viral vaccines
- topical steroids should be discontinued at the skin test site for at least 2 to 3 weeks before skin testing
- topical local anesthetics may suppress the flare response and should be avoided in skin test sites

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tuberculin skin test

Warnings	Classification diagnostic antigen	Alternate Names TUBERSOL tuberculin Purified Protein Derivative (PPD) test; Mantoux; TB skin test

Indications

- to aid in identification of **asymptomatic individuals** who have been infected with *Mycobacterium tuberculosis (M.tuberculosis)*, either past or present, who are at high risk for developing the disease and may benefit from preventive therapy
- to aid in identification of individuals **actively infected** with *M.tuberculosis* who have clinical tuberculosis and require treatment
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- refrigerate (2 to 8°C); protect from freezing
- protect from light
- stable for 20 minutes only once drawn up in syringe – administer immediately

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Intradermal ONLY	YES	physician or practitioner with required competencies to administer the test, as established by BC Centre for Disease Control preferred site is anterior surface of forearm, 2 to 4 inches below the elbow	Basic Monitoring After intradermal dose administered: *Interpretation*: o read test site in 48 to 72 hours o induration with redness measuring 10 mm or more is considered a positive reaction (redness without induration is of no significance)

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tuberculin skin test

Dosage

- usual test dose: 5 tuberculin units (0.1 mL) intradermal
- 1 tuberculin unit is reserved for patients who are suspected to be highly sensitive to the skin test

Potential Hazards of Parenteral Administration

- vesiculation, ulceration or necrosis may appear at the test site in highly sensitive individuals; application of ice packs may provide symptomatic relief
- hypersensitivity reactions (less than 3%): wheal and flare, nausea, wheezing, syncope; more likely to occur in atopic individuals
- epinephrine should be available in case of anaphylaxis

Important Implications

Contraindications/Cautions

- contraindicated in patients who have previously tested positive to tuberculin skin test due to potential for severe reaction
- contraindicated in patients with rash, allergic dermatitis or scabies
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- the tuberculin skin test activates T cells previously sensitized by *M.tuberculosis* and causes a delayed hypersensitivity reaction at the site of injection. Sensitivity to tuberculin begins 2 to 10 weeks following *M. tuberculosis* infection, and persists for years to decades.
- there may be decreased reactivity in elderly patients or those with suppressed immune systems due to illness (e.g. HIV) or medications (e.g. corticosteroids, chemotherapy).
- a raised blanched wheal will appear at the injection site which will subside within 10 to 15 minutes.
- cross-sensitivity to tuberculin may occur following infection caused by other mycobacteria (other than *M. tuberculosis*) or by BCG vaccination.

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valproic acid

Warnings	Classification	Alternate Names
hazardous drug group 2	anticonvulsant	valproate sodium DEPACON

Indications

- treatment of seizure disorders when other IV anticonvulsants cannot be used or oral therapy is not feasible
- available through Health Canada **Special Access Program**; contact pharmacy

Reconstitution and Stability

- store at room temperature
- see safe work procedures to prepare doses, unless dose provided by pharmacy

Compatibility

- compatible with NS, D5W and lactated ringers

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	status epilepticus: dilute in 50 mL; infuse over 5 to 10 minutes (maximum rate: 10 mg/kg/minute) maintenance therapy: dilute in 50 mL; infuse over at least 60 minutes (maximum rate 20 mg/minute) *rate must be controlled with an IV infusion pump*	Intermediate monitoring
Continuous IV infusion	NO		

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valproic acid

Dosage

Refractory status epilepticus
- 20 to 40 mg/kg IV (maximum dose 3000 mg)

Maintenance therapy for epilepsy, when valproic acid cannot be given by oral or enteral route:
- treatment naïve – initially 10 to 15 mg/kg IV daily [daily dose to be divided and given Q6H]
    - increase dose by 5 to 10 mg/kg/day at weekly intervals to therapeutic response, maximum of 60 mg/kg/day [daily dose to be divided and given Q6H]
- replacement for oral therapy – total daily IV dose should equal the total daily oral valproate dose (expressed as valproic acid) [daily dose to be divided and given Q6H]

Potential Hazards of Parenteral Administration

- localized pain, inflammation, and tenderness at the IV injection site

Important Implications

Contraindications/Cautions
- *Contraindications*:
    - hypersensitivity to valproic acid, divalproex sodium, valproate sodium or excipients in the injectable
    - hepatic disease or severe hepatic dysfunction
    - urea cycle disorders
    - mitochondrial disorders caused by mutations in mitochondrial DNA polymerase gamma (POLG; e.g. Alpers-Huttenlocher syndrome).
- *Caution*:
    - valproic acid has many drug interactions, consult drug interaction references
    - Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) has been reported, discontinue medication
- pregnancy/lactation: valproic acid is a known teratogen, use in pregnancy is not recommended; refer to Lexicomp or Micromedex

Side effects
- somnolence, dizziness, hypotension, nausea, rash
- hepatotoxicity, pancreatitis, hematopoietic disorders

Monitoring
- assess liver function tests prior to therapy and at frequent intervals thereafter
- platelet counts and coagulation tests at initiation and at periodic intervals
- serum ammonia and CBC with differential
- monitor serum trough levels, therapeutic range: 350 to 690 micromole/L.

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vancomycin

Warning	Classification	Alternate Names
irritant (reports of vesicant effects)	antibiotic	VANCOCIN vancomycin hydrochloride

Indications

- treatment of infections caused by susceptible strains of gram-positive organisms which are either resistant to other agents, or in patients who are intolerant of or have failed to respond to other sensitive antibiotics

Reconstitution and Stability

- powder is stable at room temperature
- reconstitute with sterile water for injection:
  - 500 mg vial: add 5 mL to provide 100 mg/mL solution
  - 1000 mg vial: add 10 mL to provide 100 mg/mL solution

Compatibility

- compatible with D5W, NS, dextrose-saline solutions, lactated ringers

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	**dilute dose and administer as follows:** peripheral line use large vein in forearm; if possible avoid hand, wrist or antecubital fossa: o *preferred maximum concentration of 5 mg/mL* o 500 mg in 100 mL; infuse over 60 minutes o 750 to 1250 mg in 250 mL; infuse over 60 minutes o 1251 to 2500 mg in 500 mL; infuse over 90 to 120 minutes o greater than 2500 mg in 500 mL; (maximum concentration 10 mg/mL); infuse over at least 120 minutes central line**:** dilute all doses in 50 mL; infuse dose at rates described above. hemodialysis**:** dilute all doses in 50 mL o 500 mg: infuse over last 30 minutes of dialysis o 750 to 1500 mg: infuse over last 60 minutes of dialysis o greater than 1500 mg: infuse over last 90 minutes of dialysis slow infusion by 30 minutes if patient exhibits signs or symptoms of vancomycin infusion reaction (vancomycin flushing syndrome) *rate must be controlled with an infusion pump*	Basic Monitoring
Continuous IV infusion	NO		
Intraperitoneal	YES	*preferred route for peritonitis in CAPD patients:* add to dialysate bag; dwell for at least 6 hours	Basic Monitoring
Intrathecal/ Intraventricular	YES	**by physician only** o dilute with preservative-free normal saline; o use 2.5 mg/mL for doses less than 10 mg o use 5 mg/mL for doses of 10 mg or more	Basic Monitoring

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vancomycin

Dosage

- Usual dose:
  - 20 mg/kg IV loading dose for critically ill only (maximum 3000 mg); higher loading doses may be used, consult pharmacist
  - 15 mg/kg IV maintenance every 8 to 12 hours (suggested maximum of 4500 mg per day)
  - refer to pharmacy vancomycin empiric dosing guidelines for complete dosing and drug level monitoring recommendations
- During pregnancy, usual dose:
  - 20 to 25 mg/kg IV loading dose, then 15 to 20 mg/kg IV every 8 to 12 hours

Dose adjustment required in renal impairment. **Contact pharmacy for guidance**.

- for perioperative prophylactic use:
  vancomycin infusion should be completed PRIOR to skin incision (usually given 60 to 120 minutes prior to procedure)

- Intrathecal / Intraventricular : 5 to 20 mg per 24 hours

- Hemodialysis (to maintain pre-dialysis vancomycin trough levels 10 to 20 mg/L):
  - 25 mg/kg loading dose, then 500 mg IV (or 750 mg IV, if weight is 70 kg or more) every dialysis
  - monitor serum vancomycin level pre-second maintenance dose

- Continuous Ambulatory Peritoneal Dialysis: (to maintain trough serum vancomycin levels of 10 to 20 mg/L):
  - Intraperitoneal (IP) instillation (preferred route for peritonitis): 30 mg/kg (to a maximum of 3000 mg) IP every 3 to 5 days
  - Intravenous: 20 mg/kg IV every 4 to 7 days
  - Monitor serum vancomycin level 3 to 4 days after first dose

Serum drug level monitoring:

- *Trough levels*: desired trough serum level: 10 to 15 mg/L; blood for pre-dose levels should be drawn 0 to 30 minutes before the next dose **or**
- *Area under the curve (AUC):* desired 24 hour ratio of AUC to MIC: 400 to 600 mg.h/L; calculated by pharmacist using two vancomycin levels; blood for pre-dose levels should be drawn 0 to 30 minutes before the next dose; blood for post-dose levels should be drawn 1 to 2 hours after the end of the infusion

Potential Hazards of Parenteral Administration

- pain and thrombophlebitis with repeated or prolonged therapy
- vancomycin infusion reaction (vancomycin flushing syndrome) with too rapid infusion characterized by: chills, fever, flushing, feeling of warmth, erythematous rash over face, neck and upper body, generalized tingling, hypotension
- Extravasation risk: irritant (reports of vesicant effects), causes pain and necrosis
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults

Important Implications

Contraindications/Cautions

- Caution: neuromuscular blocking drugs, other nephrotoxic drugs (especially aminoglycosides) may potentiate vancomycin toxicity
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- chills, fever, rash, hypersensitivity reactions (including anaphylaxis), renal and ototoxicity

Monitoring

- monitor renal and auditory function
- serum drug levels

Other

- high flux membrane hemodialysis removes about 30 to 40% vancomycin per 3 to 4 hour dialysis session

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varicella virus vaccine

Warnings	Classification	Alternate Names
	vaccine, active immunizing agent	varicella virus vaccine, live, attenuated (*Oka-strain*); VARILRIX; VARIVAX III

Indications

- is indicated for vaccination against varicella (chicken pox) in susceptible individuals, refer to BC Centre for Disease Control Immunization manual link in dosage section
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- store in refrigerator (2 to 8°C)
- *VARILRIX*: Reconstitute the vial (containing slightly cream or pinkish powder) with the supplied diluent (sterile water for injection). Shake well until completely dissolved; produces a clear peach/pink solution. Administer within 90 minutes (if kept at room temperature) or within 8 hours (if refrigerated).
- *VARIVAX III*: Reconstitute the vial of powder with 0.7 mL of the supplied diluent (sterile water for injection). Shake gently until dissolved; produces a clear, colourless or pale yellow solution. Administer the entire contents (about 0.5 mL) immediately. Discard if not used within 90 minutes.

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	outer aspect of the upper arm (deltoid region) is the preferred site	Basic Monitoring
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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varicella virus vaccine

Dosage

- 0.5 mL subcutaneous; repeat with a second dose in 6 weeks.

- For further information refer to Varicella vaccines at BC Centre for Disease Control Immunization Manual: Part 4: Biological Products (Vaccines & Immune Globulins)

Potential Hazards of Parenteral Administration

- anaphylaxis (epinephrine should be readily available)
- pain and redness at injection site

Important Implications

Contraindications/Cautions

- Refer to BC Centre for Disease Control Immunization manual link in dosage section above for list of individuals who should not be given this vaccine and other special considerations
- potential teratogenicity and dissemination of infection in immunocompromised patients

- Pregnancy/Lactation: **contraindicated in pregnancy**
    - Additional information: BC Centre for Disease Control Immunization manual-Part 2: Immunization of Special Populations (go to Other high risk conditions ->People Who are Pregnant or Planning a Pregnancy)

Side effects

- rash and low-grade fever

Other

- There is no data on the interchangeability of VARIVAX III and VARILRIX. However, BCCDC states a different BRAND may be used for the 2nd dose.
- Varicella vaccine should be given on the same day or delayed 4 weeks after administration of another live parenteral vaccine.
- Immune globulin preparations (including postpartum RhIg) and/or blood products can interfere with the immune response of a varicella-containing vaccine.
    - Spacing may be required. Refer to Part 4-Biological Products (Vaccines & Immune Globulins) (go to Immune globulins (HBIg, Ig, RabIg, TIg, VarIg)->Immune Globulin Preparations or Blood: Timing Intervals for Vaccines Containing Live Measles, Mumps, Rubella or Varicella Virus)

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vasopressin

Warnings	Classification	Alternate Names
vesicant	antidiuretic hormone analog; hormone, posterior pituitary	PITRESSIN, PRESSYN ADH

Indications

- organ donor management
- management of vasodilatory septic shock
- adjunctive therapy during cardiac arrest to improve return of spontaneous circulation (ROSC)

Reconstitution and Stability

- stable at room temperature
- solution is clear and colourless

Compatibility

- compatible with NS, D5W

Preparation and Administration

- Note: the vasopressin IM/SUBCUT product may be given IV

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	undiluted over a few seconds central line preferred; or if given peripherally use large vein in forearm; if possible avoid hand, wrist or antecubital fossa	Full Monitoring
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration:** 0.2 unit/mL: dilute 20 units in 100 mL **infuse by central line** for urgent/emergency situation pending insertion of central line: may use peripheral line in large vein in forearm; if possible avoid hand, wrist or antecubital fossa *rate must be controlled with an IV infusion pump*	Intensive Monitoring See site-specific restrictions

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vasopressin

Dosage

- Organ Donor Management: 0.04 unit/minute
- Septic shock: 0.01 to 0.04 units/minute
- Cardiac arrest (in those who have received at least one dose of epinephrine):
  vasopressin 20 units IV direct every 3 to 5 minutes PRN to a maximum of 4 doses AND
  methylPREDNISolone sodium succinate 40 mg IV direct once (see separate monograph)

Potential Hazards of Parenteral Administration

- thrombophlebitis;
- extravasation risk: vesicant, possibility of necrosis and gangrene if extravasation occurs
  - **refer to** : Extravasation Management (Non-Antineoplastic Vesicant/ Irritant Medications) – Adults
  - treat with phentolamine (administer within 12 hours), refer to phentolamine monograph
- IV infusion may result in reduced cardiac output, angina, arrhythmias and cardiac arrest

Important Implications

Contraindications/Cautions
- Caution: anaphylaxis
- Caution in patients with asthma, epilepsy, migraine, heart failure, and other conditions which may be aggravated by water intoxication
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- generalized vasoconstriction : cramping, bowel necrosis, lower limb ischemia, myocardial infarction
- local arterial bleeding, hepatic, gastric, and intestinal infarcts have been reported
- hyponatremia with water retention; water intoxication

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verapamil

Warnings	Classification antiarrhythmic	Alternate Names ISOPTIN, verapamil HCl verapamil hydrochloride

Indications

- paroxysmal supraventricular tachycardia
- atrial fibrillation or flutter of recent onset with rapid ventricular response

Reconstitution and Stability

- store at room temperature; protect from light

Compatibility

- D5W, NS, dextrose-saline combinations, Ringer's and Lactated Ringer's solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	YES	give undiluted; maximum rate: 5 mg/minute over 60 years of age: 2 mg/minute	Full Monitoring See site-specific restrictions
IV intermittent	NO		
Continuous IV infusion	YES	**standard solution concentration**: 0.2 mg/mL: dilute 50 mg in D5W 250 mL *rate must be controlled with an infusion pump*	Full Monitoring See site-specific restrictions

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verapamil

Dosage

Treatment of supraventricular tachycardia and atrial fibrillation or flutter:

- 0.075 to 0.15 mg/kg (usual dose 5 mg) IV direct; if response is inadequate after 15 to 30 minutes, give 0.15 mg/kg (5 to 10 mg) IV direct
- 0.075 to 0.15 mg/kg IV loading dose, followed by 0.375 mg/minute continuous IV infusion for 30 minutes, then decrease infusion to 0.125 mg/minute for maintenance

- dose reduction is required for patients with liver disease

Potential Hazards of Parenteral Administration

- hypotension, arrhythmias, AV block
- heart failure with concomitant beta-blockers; reduce verapamil dose for patients with myocardial dysfunction or taking digoxin or beta-blockers

Important Implications

Contraindications/Cautions

- contraindicated in severe heart failure without arrhythmia, acute myocardial infarction, cardiogenic shock, marked AV conduction disturbances, sick sinus syndrome, severe hypotension, marked bradycardia

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Other

- IV direct - onset of action:1 to 5 minutes; peak effect:10 minutes; duration of action: 30 minutes to 6 hours

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verteporfin

Warnings	Classification	Alternate Names
	photosensitizing agent	VISUDYNE

Indications

- for the treatment of predominantly classic subfoveal choroidal neovascularization
- Indications and /or prescribing restrictions apply.

Reconstitution and Stability

- store at room temperature
- reconstitute 15 mg vial with 7 mL sterile water for injection to provide 2 mg/mL solution
- reconstituted solution is opaque dark green
- solutions are stable for 4 hours at room temperature
- protect solutions from light

Compatibility

- compatible with D5W

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	Wear rubber gloves and eye protection during preparation and administration Flush IV tubing with D5W before and after administration Use large arm vein, preferably antecubital Dilute and infuse verteporfin with 60 watt incandescent lighting in room: ○ dilute dose with D5W to obtain a total volume of 30 mL ○ infuse over 10 minutes using 1.2 micron in-line filter	Basic Monitoring See site-specific restrictions
Continuous IV infusion	NO		

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verteporfin

Dosage

- 3 to 6 mg/m^2 IV, followed by the application of a non-thermal diode laser light to activate the drug

Potential Hazards of Parenteral Administration

- local reactions: pain, edema, inflammation, rash

Important Implications

Contraindications/Cautions
- contraindications: porphyria, severe hepatic failure
- caution: to prevent sunburn, avoid exposure to direct sunshine, bright indoor light or prolonged light-emitting medical devices for 2 days following treatment (e.g. tanning salons, bright halogen lighting, high powered lighting used in dental offices and surgical suites)

- Pregnancy and Lactation: refer to Lexicomp or Micromedex

Side effects
- hypersensitivity reactions: urticaria, pruritus, dyspnea
- blurred vision, flashes of light, visual field defects
- chest pain, vasovagal reactions
- skin photosensitivity

Other
- Patients should expose their skin to ambient indoor light to help inactivate the drug
- If patient goes outdoors within the first two days, cover the whole body with protective clothing, a wide brimmed (non-woven) hat and dark sunglasses. Sunscreen is ineffective.

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vinBLAStine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic antimitotic agent, vinca alkaloid	VELBE, vincaleukoblastine vinBLAStine sulfate

Indications

- treatment of a variety of cancers including: Hodgkin's and non-Hodgkin's lymphomas, testicular carcinoma, choriocarcinoma, breast cancer and Kaposi's sarcoma
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS

Preparation and Administration

- **intrathecal injection absolutely contraindicated; fatal if given intrathecally**

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 50 mL infuse over 5 to 15 minutes **central line (preferred):** *rate must be controlled with an IV infusion pump* **peripheral line:** infuse by gravity use large vein in forearm; AVOID hand, wrist or antecubital fossa	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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vinBLAStine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

usual: 3 to 6 mg/m^2 IV once every 1 to 4 weeks

Dose adjustments:
- hepatic impairment: serum bilirubin of 25 to 50 micromol/L give 50% of dose and if serum bilirubin is above 50 micromol/L give 25% of dose.
- myelosuppression: modify according to protocol being used

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- extravation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- **intrathecal injection absolutely contraindicated; fatal if given intrathecally**
- Avoid eye contamination (severe irritation and corneal ulceration may occur); in case of eye contamination with vinBLAStine, immediately wash thoroughly with water.

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- bone marrow depression: usually occurs within 4 to 7 days
- anorexia, nausea and vomiting: frequent on the first day of therapy; can be alleviated with antiemetics
- neurotoxicity, especially with high doses or prolonged therapy; paresthesia, footdrop, constipation, motor weakness and jaw pain; may occur weeks after therapy
- immediate or delayed pain at the tumour site

Monitoring
- monitor hematologic status

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vinCRIStine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic antimitotic agent, vinca alkaloid	ONCOVIN, vinCRIStine sulfate

Indications

- select indications: treatment of leukemia, Hodgkin's and non-Hodgkin's lymphoma, small cell lung cancer, breast cancer, neuroblastoma, miscellaneous sarcomas
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge, protect bag from light
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with D5W, NS

Preparation and Administration

- **intrathecal injection absolutely contraindicated; fatal if given intrathecally**

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** –Refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 50 mL infuse over 5 to 15 minutes ▪ **central line (preferred)** *rate must be controlled with an IV infusion pump* ▪ **peripheral line:** infuse by gravity use large vein in forearm; AVOID hand, wrist or antecubital fossa	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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vinCRIStine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Some typical regimens:
- 1 to 1.4 mg/m^2 (maximum 2 to 3 mg) IV weekly
- 1 to 2 mg IV once every 2 weeks
- Some regimens may limit the total single dose to 2 mg, especially on the weekly schedule. Refer to protocol being used.

- Dosing adjustments are required for symptoms of neuropathy, and for liver dysfunction

- Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- extravation risk: vesicant
    - **VCH** see: Hazardous Drugs-Administration and Handling
    - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- **intrathecal injection absolutely contraindicated; fatal if given intrathecally**
- avoid eye contamination (severe irritation and corneal ulceration may occur); in case of eye contamination with vinCRIStine, immediately wash thoroughly with water

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- neurotoxicity: major and dose limiting side effect
- mixed sensory - motor peripheral neuropathy occurs in nearly every patient; depression of the Achilles reflex, loss of other deep tendon reflexes, paresthesias (numbness, pain and tingling)
- prolonged high dose therapy often leads to wrist and foot drop, cranial nerve palsy, atrophy, cramps, ataxia, and difficulty in walking
- jaw pain: occurs within 24 hours of the 1st and/or 2nd dose and rarely recurs
- severe constipation and abdominal cramping (common in patients over 60 years of age)
- constipation may be treated with high enemas and laxatives - a routine prophylactic bowel regimen is usually recommended
- urinary retention (especially in the elderly)
- alopecia is common but reversible
- bone marrow depression is minimal
- nausea, vomiting, diarrhea, abdominal distention, stomatitis and oral ulceration occur occasionally

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vinorelbine

Warnings	Classification	Alternate Names
hazardous drug group 1 **high alert medication** **vesicant**	antineoplastic vinca alkaloid	NAVELBINE

Indications

- Primary uses: breast cancer, non-small cell lung cancer
- for *all* indications see BC Cancer benefit drug list
- restricted to indications outlined in the BC Cancer benefit drug list and patients who are registered with BC Cancer

Reconstitution and Stability

- store in fridge
- all doses are prepared by pharmacy in a biological safety cabinet

Compatibility

- compatible with NS, D5W, dextrose-saline combinations

Preparation and Administration

intrathecal injection absolutely contraindicated; fatal if given intrathecally

- **VCH** – Additional training required for administration of all intravenous (IV) antineoplastics (see Classification above). Refer to Hazardous Drugs- Administration and Handling

- **PHC** – refer to Site Specific Restrictions for required competencies to administer this drug and where the drug can be administered. Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute in 50 mL NS, and infuse over 6 to 10 minutes; flush with at least 75 to 125 mL NS ▪ **central line (preferred)** *rate must be controlled with an IV infusion pump* ▪ **peripheral line:** infuse by gravity use large vein in forearm; AVOID hand, wrist or antecubital fossa	Basic monitoring or according to protocol
Continuous IV infusion	NO		

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vinorelbine

Dosage

Follow specific protocol; dose and schedule depend on protocol and patient response.

Most common regimen:
- 30 mg/m^2 (range 25 to 30 mg/m^2) IV for one dose on days 1 and 8. Repeat every 3 weeks.

Dose adjustments:
- no adjustment for renal failure
- hepatic impairment: serum bilirubin 36 to 50 micromol/L give 50% of dose and if serum bilirubin is above 50 micromol/L give 25% of dose.
- myelosuppression: modify according to protocol being used

Refer to BC Cancer Drug Manual Monographs

Potential Hazards of Parenteral Administration

- injection site reactions: pain, phlebitis
- extravasation risk: vesicant
  - **VCH** see: Hazardous Drugs-Administration and Handling
  - **PHC** see: Extravasation management

Important Implications

Contraindications/Cautions
- **intrathecal injection absolutely contraindicated; fatal if given intrathecally**

- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- haematological: anemia; neutropenia, nadir 7 to 10 days.
- neurological: mild to moderate peripheral neuropathy characterised by paresthesia and hypesthesia.
- GI: nausea and vomiting, constipation, diarrhea, stomatitis
- Pain in tumour containing tissue, may occur within 30 minutes of first dose.

Monitoring
- monitor hematologic status
- monitor patient closely for signs of extravasation

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vitamin B12

Warnings	Classification	Alternate Names
	vitamin, hematopoietic	cyanocobalamin; cyanocobalamine

Indications

- pernicious anemia, treatment of vitamin B12 deficiency states
- Schilling test to assess vitamin B12 absorption

Reconstitution and Stability

- storage conditions depend on brand, check packaging for storage instructions

Compatibility

- compatible with D5W, D10W, NS, dextrose 5% in sodium chloride 0.9%, Ringers Solution

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	deeply	Basic Monitoring
Intramuscular	YES	preferred route	Basic Monitoring See site-specific restrictions
IV direct	YES	undiluted; up to 1000 mcg over one minute	Basic Monitoring
IV intermittent	YES	dilute in D5W 50 mL; infuse over 30 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO	*this IV infusion, formerly known as continuous, has been reclassified as IV intermittent*	

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vitamin B12

Dosage

- Vitamin B12 deficiency:
  - 30 to 100 mcg IM/subcutaneous daily for 5 to 10 days, then 100 to 200 mcg IM/subcutaneous monthly
  - if neurological complications: 1000 mcg IM daily for 1 week, then 1000 mcg IM weekly for 1 month, then 1000 mcg IM monthly

- Schilling test: 1000 mcg IM, in conjunction with oral administration of isotopically labelled vitamin B12

Potential Hazards of Parenteral Administration

- flushing, urticaria, feeling of swelling of the entire body
- anaphylaxis

Important Implications

Contraindications/Cautions
- caution in patients with heart disease since vitamin B12 may cause increased blood volume
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- may precipitate gout in susceptible individuals

Monitoring
- vitamin B12 levels, hemoglobin
- serum potassium during early vitamin B12 therapy (due to increased erythrocyte potassium requirements)

Other
- the drug is excreted more rapidly after IV injection, therefore give IV only when IM or subcutaneous routes are not feasible or are contraindicated

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Vitamin K

Warnings	Classification vitamin	Alternate Names AQUAMEPHYTON phytonadione, phytomenadione, phylloquinone, vitamin K1

Indications

- management of coagulation disorders when caused by vitamin K deficiency or interference with vitamin K activity

Reconstitution and Stability

- storage conditions depend on brand; check packaging for storage instructions

Compatibility

- compatible with D5W, NS, dextrose 5% in sodium chloride 0.9%, Ringers Solution, Lactated Ringers Solution, Dextran 6%, NORMOSOL - R

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	YES	delayed and unpredictable response	Basic Monitoring
Intramuscular	YES	contraindicated in hypoprothrombinemic states	Basic Monitoring
IV Direct	NO		
IV intermittent	YES	preferred route dilute in D5W 50 mL; infuse over 30 to 60 minutes	Basic Monitoring
Continuous IV infusion	NO		

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Vitamin K

Dosage

- Hypoprothrombinemia from warfarin:

INR	Recommendation
above therapeutic, but less than 5 and no bleeding	No vitamin K. Lower or omit warfarin dose; resume at lower dose when INR in therapeutic range
5 to 8.9 and no bleeding	Hold warfarin for 1 to 2 doses; resume at lower dose when INR in range. May give vitamin K 1 to 2.5 mg PO or IV intermittent; review INR within 24 hours. If more rapid reversal required, give vitamin K up to 5 mg PO or IV intermittent. May repeat vitamin K 1 to 2 mg in 24 hours if necessary
9 or greater and no bleeding	Hold warfarin. Give vitamin K 2.5 to 5 mg orally or IV intermittent; review INR in 12 hours
serious bleed or requires emergency surgery	Hold warfarin. Give vitamin K 10 mg IV intermittent, supplemented with frozen plasma. Review INR in 12 hours and repeat vitamin K if necessary Prothrombin Complex Concentrate (Octaplex®, Beriplex®) may be preferred over plasma. Call Transfusion Medicine Service for availability, approval for use, and dosing recommendations; it must be used in conjunction with vitamin K.

- Hypoprothrombinemia from other causes: 2.5 to 10 mg IV intermittent; may repeat dose as clinically indicated
- Prevention of Hypoprothrombinemia: 2 to 10 mg IV intermittent or orally once to twice weekly

Potential Hazards of Parenteral Administration

- shock, cardiac and respiratory arrest may occur after IV direct administration
- hypersensitivity and anaphylactoid reactions including flushing and sweating may occur with IV administration
- pain, swelling, tenderness at injection site

Important Implications

Contraindications/Cautions
- IM route contraindicated in hypoprothrombinemic states because of the possibility of inducing hemorrhage or hematoma at injection site
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Monitoring
- INR

Other
- expect a reduction in INR in 24 hours after administration of vitamin K
- when used to reverse elevated INR, keep vitamin K dose as low as possible (1 to 5 mg) and give for the shortest duration to prevent temporary resistance to subsequent warfarin therapy
- oral route is preferred if INR is less than 9, no active bleeding or imminent surgery; give injection orally

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voriconazole

Warnings	Classification	Alternate Names
hazardous drug group 2	antifungal	VFEND

Indications

- prophylaxis or treatment of serious fungal infections
- indications and / or prescribing restrictions apply

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- powder stable at room temperature
- reconstitute 200 mg vial with 19 mL sterile water for injection to provide a concentration of 10 mg/mL

Compatibility

- compatible with NS, D5W and lactated ringers

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal.

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute doses: o up to 200 mg in D5W 50 mL o 201 to 400 mg in D5W 100 mL o greater than 400 mg in D5W 250 mL and infuse at rate: o 3 mg/ kg over 1 hour o 4 mg/kg over 1.5 hours o 6 mg/kg over 2 hours	Intermediate Monitoring
Continuous IV infusion	NO		

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voriconazole

Dosage

- Loading Dose: 6 mg/kg IV Q12H for 2 doses
- Maintenance Dose:
  - 4 mg/kg IV Q12H
  - or 3 mg/kg IV Q12H if higher dose not tolerated
- No dosage adjustment required with reduced renal function.
  Oral route preferred if eGFR is less than 50 mL/minute, as IV formulation contains cyclodextrin vehicle associated with kidney injury in animals. If IV therapy is used, monitor serum creatinine frequently.
- In patients with mild-moderate hepatic insufficiency (Child-Pugh Classes A and B), give standard loading dose and half the maintenance dose

Potential Hazards of Parenteral Administration

- anaphylactoid-type reactions have rarely occurred, including flushing, fever, sweating, tachycardia, chest tightness, dyspnea, faintness, nausea, pruritus and rash
- infusion-related hypotension
- prolongation of QT interval; administer with caution in patients with potentially proarrhythmic conditions such as hypokalemia, clinically significant bradycardia, congestive heart failure or in patients taking other drugs that may prolong the QT interval such as antipsychotics, tricyclic antidepressants, erythromycin, Class IA (e.g. procainamide) or Class III (e.g. amiodarone, sotalol) antiarrhythmic agents

Important Implications

Contraindications/Cautions: drug interactions as follows:

- Contraindicated:
  - with pimozide, quiNIDine, rifaMPin, carBAMazepine, SIrolimus, rifaBUTin, ritonavir, efavirenz, ergot alkaloids and phenobarbital
- Caution:
  - voriconazole is metabolized in the liver via several enzymes (CYP450, CYP2C19, CYP2C9, CYP3A4); voriconazole dose or the dose of other concomitant medications may require adjustment
  - **contact pharmacy for dosing guidance**
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- visual disturbances, rash, photosensitivity, photophobia, headache, and dizziness
- reversible changes in liver function tests and renal function have occurred

Other

- fungicidal against Aspergillus species; fungistatic against Candida species

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zidovudine

Warnings	Classification	Alternate Names
hazardous drug group 2	antiretroviral agent	RETROVIR

Indications

- prevention of maternal-fetal HIV transmission
- Indications and / or prescribing restrictions apply

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- vials stable at room temperature, protect from light

Compatibility

- compatible with D5W and NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	YES	loading dose and IV infusion administered from the same bag **standard solution concentration:** 2 mg/mL: remove 100 mL from a 500 mL bag; then add 1000 mg zidovudine to the bag o Loading dose: infuse over 60 minutes o Continuous infusion rate: 1 mg/kg/hour *rate must be controlled with an IV infusion pump*	Basic Monitoring Perinatal Monitoring

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zidovudine

Warnings	Classification	Alternate Names
hazardous drug group 2	antiretroviral agent	RETROVIR

Dosage

Prevention of perinatal HIV transmission:

- **IV Loading dose:** 2 mg/kg with onset of labour, rupture of membranes, and/ or 2 hours prior to caesarean section, or as soon as possible if caesarean section is to be conducted in less than 2 hours; then
- **Continuous IV Infusion:** 1 mg/kg/hour continuous IV infusion until umbilical cord clamped

Potential Hazards of Parenteral Administration

- injection site pain has been reported and phlebitis has been reported rarely

Important Implications

Contraindications/Cautions

- Caution: bone marrow depression, impaired renal or hepatic function
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- anemia, granulocytopenia
- headache, nausea, insomnia, myalgia

Other

- *drug interactions*: drugs metabolized by glucuronidation (e.g. acetaminophen, DOXOrubicin, flucytosine, vinCRIStine) - toxicity of both drugs may be increased

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zoledronic acid

Warnings	Classification	Alternate Names
hazardous drug group 2	bone metabolism regulator bisphosphonate derivative	ZOMETA, zoledronate

Indications

- oncology: multiple myeloma, breast cancer
- hypercalcemia of malignancy
- osteogenesis imperfecta (OI)
- adjunctive therapy for Duchenne Muscular Dystrophy (DMD)
- treatment of acute bone pain secondary to breast cancer metastases
- indications and/or prescribing restrictions apply

Reconstitution and Stability

- Prepared by pharmacy in a biological safety cabinet (BSC). See approved safe work procedures for preparation outside of a BSC.
- store vials at room temperature
- 4 mg/5 mL vial (ZOMETA), must be diluted prior to use, refrigerate diluted product if not used immediately after preparation; bring to room temperature prior to administration

Compatibility

- compatible with D5W, NS

Preparation and Administration

- **VCH** – Refer to Hazardous Drugs- Administration and Handling
- **PHC** – Refer to Hazardous Drugs for handling and waste disposal

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	NO		
IV direct	NO		
IV intermittent	YES	dilute ZOMETA ▪ 3 to 4 mg in 100 mL ▪ 2 mg in 50 mL ▪ infuse over at least 15 minutes ▪ for OI or DMD, infuse over 30 minutes flush IV line with at least 10 mL NS following infusion	Basic Monitoring
Continuous IV infusion	NO		

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zoledronic acid

Dosage

- Oncological indications:
  Follow specific protocol; dose and schedule depend on protocol and patient response.
  - bone metastases and acute bone pain secondary to breast cancer: 4 mg IV every 12 weeks
  - multiple myeoloma: 4 mg IV every 4 weeks **or** every 12 weeks are examples of dosing regimens
  - Refer to BC Cancer Drug Monographs

- Hypercalcemia of malignancy (albumin-corrected serum calcium of 3 mmol/L or greater):

  4 mg IV once; wait at least 7 days before considering re-treatment

  dose adjustment for renal dysfunction as follows:

baseline creatinine clearance (mL/minute)	zoledronic acid dose
greater than 60	4 mg
50 to 60	3.5 mg
40 to 49	3.3 mg
30 to 39	3 mg

- Osteogenesis imperfecta or Duchenne Muscular Dystrophy:
  full dose: less than 80 kg = 0.05 mg/kg, 80 kg or heavier = 4 mg, repeat every 6 months
  reduced dose (based on spinal BMD Z-score*): 0.025 mg/kg (maximum 2 mg), repeat every 6 to 12 months

  *Z-score for bone mineral density

Potential Hazards of Parenteral Administration

- redness, itching at infusion site
- hypersensitivity (rare): bronchoconstriction, urticaria, angioedema, anaphylaxis

Important Implications

Contraindications/Cautions
- Contraindication: creatinine clearance less than 30 mL/minute
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- flu-like symptoms (e.g. fever, chills, arthralgia, myalgia, bone pain) - normally subsides within 24 to 72 hours
- fatigue, headache
- hypocalcemia, hypophosphatemia, hypokalemia, hypomagnesemia;
- nausea and vomiting;
- renal dysfunction, acute renal failure (risk factors include: concomitant use of diuretics or nephrotoxic drugs, dehydration, abnormal baseline creatinine)
- osteonecrosis of the jaw

Monitoring
- Patients must be appropriately hydrated prior to and maintained during treatment.
- serum electrolytes (including calcium) and creatinine.

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zuclopenthixol acetate

Warnings	Classification	Alternate Names
	antipsychotic	CLOPIXOL-ACUPHASE

Indications

- **this monograph is specific to zuclopenthixol acetate** (i.e. the acetate salt)
- management of acute psychosis

Reconstitution and Stability

- store at room temperature
- protect from light

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deep injection into gluteal region	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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zuclopenthixol acetate

Dosage

- 50 to 150 mg IM, repeated every 1 to 3 days if necessary
- per treatment episode: maximum cumulative dose is 400 mg; maximum number of injections is 4
- lower doses are recommended in geriatric patients or those with hepatic dysfunction

Potential Hazards of Parenteral Administration

- hypotension (antidote: NORepinephrine or PHENYLephrine; do **NOT** use epinephrine as may further lower blood pressure)
- extrapyramidal symptoms: tremor, akathisia, dystonia; treat with an anticholinergic drug (e.g. benztropine)

Important Implications

Contraindications/Cautions

- contraindicated:
  - in elderly patients with dementia-related psychosis
  - in patients with severe cardiovascular disease/circulatory collapse – may alter cardiac conduction and prolong QT interval
- caution:
  - may enhance sedative effects of other central nervous system depressants
  - may lower seizure threshold
  - in patients with Parkinson disease and narrow angle glaucoma
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects

- sedation, dizziness, dry mouth, increased salivation, visual disturbances
- hypertonia, tremor, akathisia, hypokinesia, dystonia,
- tachycardia, orthostatic hypotension

Monitoring

- due to the delay in time to peak serum levels as well as the prolonged duration of action, close supervision is needed in order to minimize the risk of over-medication or insufficient suppression of psychotic symptoms

Other

- can be co-administered with zuclopenthixol decanoate in one syringe and administered as a single injection
- onset of action: 2 to 4 hours (15 to 30 minutes for sedation)
- time to peak pharmacological effect: 24 to 36 hours (8 hours for sedation)
- duration of effect: 2 to 3 days

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zuclopenthixol decanoate

Warnings	Classification antipsychotic	Alternate Names CLOPIXOL DEPOT

Indications

- **this monograph is specific to zuclopenthixol decanoate** (i.e. the decanoate salt)
- maintenance treatment of chronic schizophrenia

Reconstitution and Stability

- store at room temperature
- protect from light

Compatibility

Preparation and Administration

Administration Route	Approved	Preparation and Administration Instructions	Required Monitoring
Subcutaneous	NO		
Intramuscular	YES	deep injection into gluteal region	Basic Monitoring
IV direct	NO		
IV intermittent	NO		
Continuous IV infusion	NO		

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zuclopenthixol decanoate

Dosage

Usual maintenance dose:
- 150 to 300 mg IM every 2 to 4 weeks
- lower doses are recommended in geriatric patients or those with hepatic dysfunction

- to transfer patients from zuclopenthixol acetate to zuclopenthixol decanoate:

zuclopenthixol acetate (CLOPIXOL-ACUPHASE)	zuclopenthixol decanoate (CLOPIXOL DEPOT)
50 mg every 2 to 3 days	100 mg every 2 weeks
100 mg every 2 to 3 days	200 mg every 2 weeks
150 mg every 2 to 3 days	300 mg every 2 weeks

Potential Hazards of Parenteral Administration

- hypotension (antidote: NORepinephrine or PHENYLephrine; do **NOT** use epinephrine as may further lower blood pressure)

Important Implications

Contraindications/Cautions
- contraindicated:
  - in elderly patients with dementia-related psychosis
  - in patients with severe cardiovascular disease/circulatory collapse – may alter cardiac conduction and prolong QT interval
- caution:
  - may enhance sedative effects of other central nervous system depressants
  - may lower seizure threshold
  - in patients with Parkinson disease and narrow angle glaucoma
- Pregnancy/Lactation: refer to Lexicomp or Micromedex

Side effects
- sedation, dizziness, dry mouth, increased salivation, visual disturbances
- extrapyramidal symptoms: tremor, akathisia, dystonia; treat with an anticholinergic drug (e.g. benztropine)
- tachycardia, orthostatic hypotension

Other
- can be co-administered with zuclopenthixol acetate in one syringe and administered as a single injection
- maximum serum concentrations are reached 3 to 7 days following IM injection

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Client Monitoring Levels

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Parenteral Drug Therapy
Client Monitoring Levels (Adult)

NOTE:
Health care providers must have necessary competencies to perform and interpret monitoring parameters (e.g. ECG monitoring requires dysrhythmia interpretation)
and
resources, including equipment are available to perform required monitoring parameters

INCREASING INTENSITY

Monitoring Level	Monitoring Parameters blood pressure frequency as specified; duration and frequency of all other vital signs as determined by patient status, specific care protocol and effect of medication
BASIC MONITORING Effect of drug	▪ intended and unintended drug effects
INTERMEDIATE MONITORING Basic monitoring + vital signs	▪ pulse rate, pulse oximetry, respiratory rate, level of sedation ▪ blood pressure no more frequently than hourly
ADVANCED MONITORING Intermediate monitoring + increased vital signs	▪ pulse rate, pulse oximetry, respiratory rate, level of sedation ▪ blood pressure frequency between every 5 to every 60 minutes
FULL MONITORING Advanced monitoring + advanced ECG (Rhythm interpretation and management of dysrhythmias)	▪ continuous ECG ▪ pulse rate, pulse oximetry, respiratory rate, level of sedation ▪ blood pressure frequency between every 5 to every 60 minutes
INTENSIVE MONITORING Full monitoring + invasive hemodynamic and advanced respiratory support and monitoring (Mechanical ventilation or management of sudden deterioration in respiratory / ventilation requiring immediate tracheal intubation and mechanical ventilation)	▪ non-invasive blood pressure and/or continuous arterial line ▪ continuous ECG ▪ pulse rate, pulse oximetry, respiratory rate, level of sedation ▪ other hemodynamic monitoring PRN ▪ additional respiratory / ventilator monitoring

PERINATAL MONITORING In pregnancy Any of the above monitoring levels + fetal monitoring	▪ fetal monitoring ▪ blood pressure, pulse rate, pulse oximetry, respiratory rate, sedation
PALLIATIVE MONITORING	▪ To be determined by clinical need

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ADULT Parenteral Drug Therapy Manual

IV Compatibility

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BC WOMEN'S HOSPITAL+ HEALTH CENTRE

Providence HEALTH CARE — How you want to be treated.

Vancouver CoastalHealth

Y-SITE INJECTION DRUG COMPATIBILITY CHART for GENERAL wards

KEY TO SYMBOLS:

I = **Incompatible; DO NOT MIX**

C = **Compatible;** may be mixed via Y-site. Compatibility depends upon many factors including temperature, pH, IV fluid, concentration, order of mixing and brand of drug. ***Check tubing below Y-site carefully for discoloration, cloudiness or precipitation***

☐ = (Blank) **DO NOT MIX;** conflicting or no compatibility information available

∗ = **Call Pharmacy**; compatibility depends on concentration

	acyclovir	ampicillin	calcium gluconate	ceFAZolin	cefoTAXime	cefTAZIDime	ceftriAXONE	ceFURoxime	ciprofloxacin	clindamycin	cloxacillin	co-trimoxazole	cycloSPORINE	dimenhyDRINATE	diphenhydrAMINE	DOPamine	erythromycin	famotidine	fluCONazole	furosemide	gentamicin	heparin	hydrocortisone sodium succinate	HYDROmorphone	insulin regular human	lorazepam	magnesium sulfate	meropenem	methylPREDNISolone sodium succinate	metoclopramide	metronidazole	morphine	multivitamins	oxytocin	penicillin G Sodium	piperacillin-tazobactam	PLASMA-LYTE A	potassium chloride	POTASSIUM phosphate	sodium bicarbonate	SODIUM phosphate	tobramycin	vancomycin	vitamin K
acyclovir																																												
ampicillin	C																																											
calcium gluconate	C																																											
ceFAZolin	C		C																																									
cefoTAXime	C		C	I																																								
cefTAZIDime	C		C	C	I																																							
ceftriAXONE	C		I	C	C	C																																						
ceFURoxime	C		C	C	C	C	C																																					
ciprofloxacin		I	C			C																																						
clindamycin	C	C	C	C	C	C	I	C	I																																			
cloxacillin	C		C		C	C	C	C	I	C																																		
co-trimoxazole	C	I	I	I	I	I	I	I		I	I																																	
cycloSPORINE		C	C	C	C	C	C	C		C	C																																	
dimenhyDRINATE	C		C	C	C	C		C	C	C	C	C	C																															
diphenhydrAMINE		I	C	I	I	I	I	I	C	C	I	I	C	C																														
DOPamine	I	I	C	I	C	C	C	C	C	C	C	I	C		C																													
erythromycin	C		C	I	C	I	C	C		I			C		C	C																												
famotidine	C	C	C	∗	C	C	∗	C		C		I	C	I	C	C	C																											
fluCONazole	C	I	I	C	I	I	I	I			C	I	C	C	C	C	I	C																											
furosemide	C	C	C	C	C	C	C	C	I	C	C	I	C	I	I		I	C	I																										
gentamicin		I	C	I	I	I	I	I	C	C	I	I	C	C	C	C	C	C	C																										
heparin	C	C	C	C	C	C	C	C	I	C	C	I	C	C		C	I	I	C	C	I																								
hydrocortisone sod succ	C			C	C	C	C	C	I	C	C	I	C		C	C	C	C	C	C		C																							
HYDROmorphone	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C		C	C	C	C																							
insulin regular human	C	C	C	C	C	C	C	C		C	C	I			I		C		C	C	C	C	C	C																					
lorazepam	C	I	C	C	C	C	C	C	C	C	I	C	C	C	C	C	C	C	C	C	C	C	C	C	C																				
magnesium sulfate	C	C	C	C	C	C	I	I	I	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C																			
meropenem	I								I		C		C		C				C	C	C	C			C																				
methylPREDNISolone sod succ	C		I	C	I	C	C	C	I	C	C	I	C		I	C	C		C	C	C	C		C		C	I																		
metoclopramide	C		C	C	C	C	C	C	C	C	C	I	C	C	C	C	C	C	C	I	C	C	C	C	C	C	C	C	C																
metronidazole	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	I	C	C															
morphine		C	C	C	C	C	C	C		C		C	C	C	C	C	C		C		C	C	C	C	C	C	C	C	C	C	C														
multivitamins	C	C	C	C	C	C	C	C		C		I	C	C	C	C	C	C	C	C	C	C	C		C		C	I	C	C	C	C													
oxytocin			C	C	C	C	C	C		C	C	I	C	I	C	C	C	C	C	C	C	C	C				C		C	C	C	C	C												
penicillin G sodium	C		C	C	C	C	C	C		C	C	I	C	C	C	C		C	C	C	I	C	C	C	C		C		C	C	C	C	C	C											
piperacillin-tazobactam	I		C						I	C	C	C	C	C	C	C	C	I	C	C	I	C	C	C	I	C	C		C	C	C	C	C												
PLASMA-LYTE A	C			C		C	C		C	C	C		I			C			C	C	C	C	∗	∗			C	C		C	C	∗		C		C								
potassium chloride	C	C	C	C	C	C	C	C	C	C	C	I	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C							
POTASSIUM phosphate	I		I	C					I	C	I			C	C		C			C		C	C	C	C	I	C			C	C		C		C	C		C						
sodium bicarbonate	C		I	C	I	C	C	I	I	C	C	I	C	I	I	I	C	C	C	C	C	C	C	I	C	C	C		C	C	C	C			C	C		C						
SODIUM phosphate	I		I	C					I	C							C			C		C		C	C	C	I			C	C					C								
tobramycin	C	I	C	I	I	I	I	I	C	C	I	I	C	C	C	C	C	C	C	C		I		C	C	C	C		C	C	C	C	C	C	I	I		C	C	C	C			
vancomycin	C	C	C	I	I	I	I		C	C		I	C	I	C	C	C	∗	C	I	C	I		C	C	C	C	C		C	C	C	C	C	C	I	C	C	C	C	C	C		
vitamin K		C	C	C	C	C	C	C		C		I	C	C	C	C	C	C	C	C	C	C	C		C		I			C		C	C	C	C			C	C	C		C	C	

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BC WOMEN'S HOSPITAL+ HEALTH CENTRE

Providence HEALTH CARE — How you want to be treated.

Vancouver CoastalHealth

Y-SITE INJECTION DRUG COMPATIBILITY CHART for CRITICAL CARE wards

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	amiodarone	ampicillin	calcium chloride	calcium gluconate	ceFAZolin	cefTAZIDime	ceftriAXONE	ceFURoxime	ciprofloxacin	clindamycin	cycloSPORINE	dexmedeTOMidine 4 mcg/mL	DOBUTamine	DOPamine	EPInephrine	famotidine	fentanyl	fluCONazole	furosemide	gentamicin	heparin	hydralazine	hydrocortisone sodium succinate	HYDROmorphone	insulin regular human	ketamine	labetalol	lidocaine	magnesium sulfate	meropenem	metronidazole	midazolam	milrinone	morphine	nitroglycerin	nitroprusside	NORepinephrine	penicillin G Sodium	piperacillin-tazobactam	PLASMA-LYTE A	potassium chloride	POTASSIUM phosphate	procainamide	proPOFol	REMIfentanil	ROcuronium	sodium bicarbonate	tobramycin	vancomycin	vasopressin
amiodarone																																																			
ampicillin	I																																																		
calcium chloride	C	I																																																	
calcium gluconate	I		C																																																
ceFAZolin	I		I	C																																															
cefTAZIDime	I		I	C	C																																														
ceftriAXONE	I		I	I	C	C																																													
ceFURoxime	I		I	C	C	C	C																																												
ciprofloxacin	C	I		C		C																																													
clindamycin	C	C	C	C	C	C	I	C	I																																										
cycloSPORINE		C	C	C	C	C	C	C		C																																									
dexmedeTOMidine 4 mcg/mL	C	C	C	C		C		C			C																																								
DOBUTamine	C	I	I	I	I		I	I	C	C	C	C																																							
DOPamine	C	I	C	C	I	C	C	C	C	C	C	C	C																																						
EPInephrine	C	I	C	C	C	C	C	C		C	C	C	C	C																																					
famotidine	C	C	C	C	∗	C	∗	C		C	C	C	C	C	C																																				
fentanyl	∗	C	C	C	C	C	C	C		C	C	C	C	C	C	C																																			
fluCONazole	C	I	C	I	C	I	I	I			C	C	C	C	C	C	C																																		
furosemide	I	C	C	C	C	C	C	C	I	C	C	∗	I		C	C	C	I																																	
gentamicin	C	I	C	C	I	I	I	I	C	C	C	C	C	C	C	C	C	C																																	
heparin	I	C	C	C	C	C	C	C	I	C	C	C	I	C	C	I	C	C	C	I																															
hydralazine					I	I	I	I					I			I																																			
hydrocortisone sod succ	I				C	C	C	C	I	C	C		I	C	C	C	C	C	C		C																														
HYDROmorphone		C		C	C	C	C	C	C	C	C		C	C	C		C	C	C	C	C		C																												
insulin regular human	C	C	C	C	C	C	C	C		C		C	∗				C	C	C	C	C		C	C																											
ketamine	C	I			C	C		C		C			C	C	C				I	C	I		C	C	I																										
labetalol	C		C	C		C	I	I		C		∗	C	C	C	∗	C	C		C	∗		I	C	I																										
lidocaine	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	∗	C		C																								
magnesium sulfate		C	I	C	C	C	I	I	I	C	C	C	C	C	C	C	C	C		C	C		C	C	C	C	C	C																								
meropenem	I								I		C	C						C	C		C				C	I																									
metronidazole	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I																					
midazolam	C	I	C	C	C	I	C	I	C		C		C	C	C	∗	C	C	I	C	C		I	C	C	C	C	C	C		C																				
milrinone	C	C	C	C	C	C	C	C	C	C	C	∗	C	C	C	∗	C	C	I	C	C	C		C	C	C	C	I	C	C	C	C																			
morphine	C	C	C	C	C	C	C	C		C	C	∗	C	C	C		C	C		C	C		C	C	C	C	C	C	C	C	C	C	C																		
nitroglycerin	C		C	C	C	C	C	C		C	C	C	C	C	C	C	C	C		C	C	I	C	C	C		C	C	C		C	C	C	C																	
nitroprusside		I	C	C	C	I	C	C		C	C	C	C	C	C	C	C	C	C	C	C	I	C	C	C		C	C	C		C	C	C	C	C																
NORepinephrine	C		C	C	C	C	C	C		C		C	C	C	C	C	C	C	C		C		C	C	I		C	C	C	C	C	C	C	C	C	C														
penicillin G sodium			C	C	C	C	C	C		C	C		I	C	C	C	C	C	C	I	C		C	C	C	C	I	C	C		C	C		C	C	C	C													
piperacillin-tazobactam	I		C	C					I	C	C		I	C	C	I	C	C	C	I	C	I	C	C	I	C	I	C	C		C	I	C	C	C	C	C													
PLASMA-LYTE A	I				C	C	C		C	C	I		C	C	C		C	C	C	C	C	∗	∗	∗			C	∗	C	C	C	∗	C	∗	C	C	C		C											
potassium chloride	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C											
POTASSIUM phosphate	I		I	I	C				I	C		C	I						C		C		C		C	I	C		C		C	C	C			C		C	C		C								
procainamide	C	C	C	C	C	C	C	C		C	C	∗	C	C	C	C	C	C	C	C	C		C	C	C		C	C	C		I	C	I	C	C	C		C	C	C									
proPOFol		C	I	C		C		C	I	C	C		∗	C	C		C	C	C	I	C		C	C	C	C	C				I	C	C			C	C	C			I	C							
REMIfentanil	C	C		C	C	C	C	C		C		C	C	C	C		C	C		C	C		C	C	C			C	C		C	C	C	C	C		C				C	C	C						
ROcuronium		C	C			C	C	C	C			C				I		C	I				I		I						C	C	C	C					I	C		I							
sodium bicarbonate	I		I	I	C	C	C	I	I	C	C	C	I	I	I	C	C	C	C	C	C		C	I	C	I	I	I	C		C	I	C	C	C		I	C	C		C		C	C	C					
tobramycin	C	I	C	C	I	I	I	I	C	C	C	C	C	C	C	C	C	C	C		I			C	C	C	C	C	C		C	C	C	C	C	C	C	I	I		C	C	C	I	C		C			
vancomycin	C	C	C	C	I	I	I	I	C	C	C		C	C	C	∗	C	C	I	C	I			C	C		C	C	C	C	C	C		C	C	C	C	C	I	C	C	C	C		C		C	C		
vasopressin	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C		C	C	∗		C	C	C		C	C	C	C	C	C	C	C	C		C	C	C		C	C	C	C	C		

(Rev.05Jun2023)

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Y-SITE INJECTION DRUG COMPATIBILITY CHART with Parenteral Nutrition Solutions (TPN)

For this chart, lipids (fat emulsion) = INTRALIPID ONLY

- Locate the drug name in the first column. If different concentrations are indicated, determine which concentration applies.
- Under "TPN Admixture Type", check the compatibility of the drug with the type of TPN admixture the patient is receiving (3-in-1 versus 2-in-1). Note: 2-in-1 contains dextrose, amino acids (TRAVASOL), and may also contain electrolytes, vitamins and trace elements only in one bag. 3-in-1 also called Total Nutrient Admixture (TNA) contains lipids (fat emulsion) in addition to items listed under 2-in-1 in one bag.
- For 2-in-1 TPN, when column reads C[1], if there is a piggy-back lipid (fat emulsion), it must be interrupted while drug is infused.
- Check if the TPN admixture the patient is receiving contains insulin. If so, check the last two columns to determine whether this changes the compatibility.

Drug	TPN Type		insulin in TPN
	3-in-1	2-in-1	
acyclovir	I	I	I
amikacin 5 mg/mL or less	C	C	
amikacin more than 5 mg/mL	I	C[1]	
aminophylline 2.5 mg/mL	C	C	I
aminophylline more than 2.5 mg/mL	I	I	I
amiodarone			
amphotericin B	I	I	I
ampicillin 20 mg/mL or less	C	C	C
azithromycin			
calcium chloride	I	I	I
calcium gluconate 40 mg/mL or less (0.09 mmol/mL or less)	C	C	C
ceFAZolin	C	C	C
cefoTAXime	C	C	
cefTAZidime	C	C	
cefTRIAXone	I	I	I
cefuroxime	C	C	
chloramphenicol		C[1]	
ciprofloxacin	I	I	
clindamycin	C	C	
cloxacillin 10 mg/mL or less		C	
cotrimoxazole	C	C	
cyclophosphamide	C	C	
cycloSPORINE 5 mg/mL or more	I	I	I
cytarabine	C	I	I
dimenhyDRINATE			
diphenhydrAMINE	C	C	
DOBUTamine	C	C	C
DOPamine	I	C[1]	I
erythromycin lactobionate	I	C[1]	

[1] The piggy-back infusion of lipid emulsion (if any) should be interrupted during co-infusion of the 2-in-1 TPN with this medication

3-in1 = TRAVASOL + dextrose + lipid emulsion + additives all in one bag
2-in-1 = TRAVASOL + dextrose + additives in one bag ± lipid bag administered separately via piggy-back
C = **Compatible**; may be mixed via a Y-site. Compatibility depends upon many factors including temperature, pH, IV fluid, concentration, order of mixing and brand of drug.
Check tubing below Y-site carefully for discoloration, cloudiness or precipitation
I = **Incompatible DO NOT MIX**
blank = **DO NOT MIX**; conflicting or no compatibility information available

Drug	TPN Type		insulin in TPN
	3-in-1	2-in-1	
fentanyl citrate	C	C	
fluconazole	C	C	
foscarnet	I	I	I
furosemide 3 mg/mL or less	C		
ganciclovir	I	I	I
gentamicin	C	C	C
heparin 25 units/mL or less	C	C	C
heparin 100 units/mL	I	C	C
hydrocortisone sodium succinate	C	C	I
HYDROmorphone	I	I	I
imipenem-cilastatin	C	C	C
insulin, regular	C	C	C
lidocaine	C		C
magnesium sulfate 0.4 mmol/mL or less	C	C	C
magnesium sulfate more than 0.4 mmol/mL	I	C[1]	C
mannitol	C	C	
meperidine	C	C	C
meropenem	C		C
metoclopramide	C	I	C
metroNIDAZOLE	C	C	
midazolam	I	I	I
milrinone		C	C
morphine 1 mg/mL or less	C	C	C
morphine 15 mg/mL or more	I	I	I
MOXIfloxacin			
nitroglycerin	C	C	C
NORepinephrine	C	C	I
octreotide	C	C	
ondansetron	I	C[1]	
pantoprazole			
penicillin G sodium		C[1]	C
phenytoin	I	I	I
piperacillin-tazobactam	C	C	
potassium chloride	C	C	C
POTASSIUM phosphate	I	I	I
procainamide			
proPOFol		C	I
sodium bicarbonate	I	I	I
tobramycin	C	C	C
vancomycin	C	C	C
vitamin K	C	C	C

[1] The piggy-back infusion of lipid emulsion (if any) should be interrupted during co-infusion of the 2-in-1 TPN with this medication

3-in1 = TRAVASOL + dextrose + lipid emulsion + additives all in one bag
2-in-1 = TRAVASOL + dextrose + additives in one bag ± lipid bag administered separately via piggy-back
C = **Compatible**; may be mixed via a Y-site. Compatibility depends upon many factors including temperature, pH, IV fluid, concentration, order of mixing and brand of drug.
Check tubing below Y-site carefully for discoloration, cloudiness or precipitation
I = **Incompatible DO NOT MIX**
blank = **DO NOT MIX**; conflicting or no compatibility information available

Site Specific Administration Restrictions

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Site Specific Administration Restrictions

BC Women's Hospital + Health Centre

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Site Applicability

BC Women's Hospital + Health Centre

Purpose

A companion to the Vancouver Coasta, Providence, PHSA (VPP) Adult Parenteral Drug Therapy Manual (PDTM). Document is in alignment with Cerner.

Site Specific Restrictions

Drug	Administration
adenosine	**IV direct:** • HAU/OR/PACU
amiodarone	**IV direct** • HAU/OR/PACU **IV intermittent**: • HAU/OR/PACU **Continuous IV infusion**: • HAU/OR/PACU
atropine	**IV direct:** • HAU/OR/PACU • Other areas, physician only and physician must be present for 15 minutes after the dose • if ECG unavailable; ADVANCED MONITORING with blood pressure and heart rate following administration and Q15MIN x 3 **Continuous IV infusion:** • HAU/OR/PACU
calcium chloride	**IV direct:** • HAU/OR/PACU • Other areas, physician only
calcium gluconate	**IV direct:** • HAU/OR/PACU • Other areas, physician only
carboprost	No restrictions for BCWH
dantrolene	**IV direct** • HAU/OR/PACU **IV intermittent** • HAU/OR/PACU **Continuous IV infusion** • HAU/OR/PACU
dexmedeTOMidine	**Continuous IV infusion:** • HAU/OR/PACU

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Drug	Administration
dilTIAZem	**IV direct:** • HAU/OR/PACU **Continuous IV infusion** • HAU/OR/PACU
DOBUTamine	**Continuous IV Infusion:** • HAU/OR/PACU
DOPamine	**Continuous IV infusion:** • HAU/OR/PACU
enalaprilat	**IV direct:** • HAU/OR/PACU
ePHEDrine	**IV direct:** • HAU/OR/PACU
EPInephrine	**IV direct:** • HAU/OR/PACU • Other Nursing Units, physician only • FULL MONITORING required for administration **Continuous IV infusion:** • HAU/OR/PACU
esmolol	**IV direct:** • By physician only in HAU/OR/PACU **Continuous IV Infusion:** • HAU/OR/PACU
fat emulsion	**IV direct:** • HAU/OR/PACU by physician (or under their supervision)
furosemide	**IV direct:** • No restrictions for BCW
haloperidol	**IV direct:** • HAU/OR/PACU • Other Nursing Units, physician only • FULL MONITORING required for administration
hydralazine	**IV direct:** • HAU/OR/PACU • Other areas: by physician only and physician must be present for 15 minutes after the dose. If ECG unavailable: Advanced monitoring wIth blood pressure and pulse rate following administration and Q15MIN x 3 **Continuous IV Infusion:** • HAU/OR/PACU

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Drug	Administration
isoproterenol	**Continuous IV infusion:** • HAU/OR/PACU
ketamine	**Subcutaneous Injection** • Not used at BCW (palliative care only sites) **IM** • HAU/OR/PACU if physician is present **IV direct:** • HAU/OR/PACU if physician is present **IV intermittent:** • HAU/OR/PACU **Continuous IV Infusion:** • HAU/OR/PACU
labetalol	**IV direct** • HAU/OR/PACU • Other Nursing Units, physician only • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored 5, 10 and 15 minutes after each dose. **Continuous IV infusion:** • HAU/OR/PACU
lidocaine	**Subcutaneous Continuous Infusion:** • Not used at BCW (palliative care only sites) **IV direct:** • HAU/OR/PACU
metoprolol	**IV direct:** • HAU/OR/PACU • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. The nurse may administer subsequent doses. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at the completion of the dose and again after 15 and 30 minutes. **IV intermittent:** • HAU/OR/PACU • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. The nurse may administer subsequent doses. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of dose and again after 15 and 30 minutes.

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Drug	Administration
midazolam	**SC:** • Not used at BCW (palliative care only sites) **Continuous Subcutaneous Infusion:** • Not used at BCW (palliative care only sites) **IM:** • HAU/LDR/OR/PACU **IV direct:** • HAU//OR/PACU **Continuous IV Infusion:** • HAU/OR/PACU
milrinone	**Continuous IV Infusion:** • HAU/OR/PACU
naloxone	**Continuous IV infusion:** • HAU/LDR/OR/PACU
neostigmine	**IV direct:** • HAU/OR/PACU
nitroglycerin	**IV direct:** • Uterine relaxation: under direct supervision of physician • Other indications: physician only **Continuous IV Infusion:** • HAU/OR/PACU
nitroprusside	**Continuous IV Infusion:** • HAU/OR/PACU
NORepinephrine	**Continuous IV Infusion:** • HAU//OR/PACU
phentolamine	**IV direct:** • HAU/OR/PACU **Continuous IV Infusion:** • HAU/OR/PACU **Local Infiltration:** • By physician only
PHENYLephrine	**IV direct:** • HAU/OR/PACU • Other Nursing Units, physician only **Continuous IV Infusion:** • HAU/OR/PACU

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Drug	Administration
potassium acetate	**IV intermittent:** • HAU/OR/PACU for rates 21 to 40 mmol/hour via central line
POTASSIUM chloride	**IV intermittent:** • HAU/OR/PACU for rates 21 to 40 mmol/hour via central line
POTASSIUM phosphate	**IV intermittent:** • HAU/OR/PACU for rates above 15 mmol over 2 hours via central line
procainamide	**IV direct:** • HAU/OR/PACU **IV intermittent:** • HAU/OR/PACU **Continuous IV Infusion:** • HAU/OR/PACU
proPOfol	**IV direct:** • HAU/OR/PACU with physician present **Continuous IV Infusion:** • HAU/OR/PACU
proPRANolol	**IV direct:** • HAU/OR/PACU • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of the dose and again after 15 and 30 minutes. **IV intermittent:** • HAU/OR/PACU • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of the dose and again after 15 and 30 minutes. **Continuous IV Infusion:** • HAU/OR/PACU
REMIfentanil	**IV direct:** • By anesthesiologist only **Continuous IV Infusion:** • By anesthesiologist only **IV PCA (BCW ONLY):** • An anesthesiologist must be present on initiation and for the first 15 minutes of remifentanil use, and for at least 10 minutes after any dose change
ROcuronium	**IV direct:** • HAU/OR/PACU **Continuous IV Infusion:** • HAU/OR/PACU

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Drug	Administration
salbutamol	**Continuous IV Infusion:** • HAU/OR/PACU
sodium bicarbonate	**IV direct:** • HAU/OR/PACU • Other areas - physician only **IV intermittent:** • HAU/OR/PACU for rates above 50 mmol/hour **Continuous IV infusion:** • HAU/OR/PACU for rates above 50 mmol/hour
SODIUM phosphate	Contact pharmacy for administration
succinylchonline	**IM:** • By physician only **IV direct:** • By physician only
vasopressin	**Continuous IV Infusion:** • HAU/OR/PACU

Developed By

BCW Maternal Newborn Program - Clinical Pharmacy Specialist, Maternal Fetal Medicine

Version History

DATE	DOCUMENT NUMBER and TITLE	ACTION TAKEN
26-Jul-2021	C-06-14-62535 BC Women's Hospital Parenteral Drug Therapy Manual: Site Specific Administration Restrictions	Approved at: Pharmacy, Therapeutics and Nutrition Committee

Disclaimer

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Site Specific Administration Restrictions

Coastal Community of Care - LGH

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Coastal Community of Care – LGH

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Legend:

HAU -	High Acuity Unit	PACU -	Post Anesthesia Care Unit
ICU -	Intensive Care Unit	PCU -	Palliative Care Unit
NCCU -	Neurology Critical Care Unit		

Drug	Location Restrictions for Drug Administration (LGH)
adenosine	**IV direct:** • Emergency, ICU, Operating Room, PACU, in presence of physician • Other areas - physician only with Full Monitoring **IV intermittent:** • Physician only
alteplase (rtPA)	**IV direct:** • Emergency, ICU, Operating Room, Radiology • NCCU by physician only **IV intermittent:** • Emergency, ICU, Operating Room • NCCU by physician only **Intra-arterial or Continuous IV infusion:** • ICU • Radiology (must be transferred to ICU)
aminophylline	**IV direct:** • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician. • Other areas: by physician only
amiodarone	**IV direct:** • Emergency, ICU, Operating Room, PACU • Other areas – physician only with Full Monitoring **IV intermittent:** • Emergency, HAU, ICU, Operating Room, PACU **Continuous IV infusion:** • Emergency, HAU, ICU, Operating Room, PACU

Drug	Location Restrictions for Drug Administration (LGH)
atropine	**IV direct:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU • Other areas: by physician only, and physician must be present for 15 minutes after the dose. If ECG unavailable, Advanced monitoring with blood pressure and pulse rate following administration and Q15MIN x 3 **Continuous IV infusion:** • Emergency, ICU, Operating Room
bivalirudin	**Continuous IV infusion:** • Heparin Induced Thrombocytopenia (HIT) – may be used in any area • Percutaneous Coronary Intervention (PCI) - VGH, SPH only
bleomycin	**Intra-arterial and intralesional:** • Only given in VGH Radiology
calcium chloride	**IV direct:** • Emergency, ICU, Operating Room, PACU • Other areas – in emergency situations, in presence of physician
calcium gluconate	**IV direct:** • Emergency, ICU, Operating Room, PACU • Other areas – in emergency situations, in presence of physician
carboprost	**IM:** • In Labour/Delivery/Post-partum, following consultation with obstetrician or obstetric GP
cisatracurium	**IV direct** • ICU, Operating Room, PACU **Continuous IV Infusion:** • ICU, Operating Room
dantrolene	**IV direct** • ICU, PACU, Operating Room • Other areas - physician only **IV intermittent**: • ICU, PACU, Operating Room **Continuous IV Infusion:** • ICU, PACU, Operating Room

Drug	Location Restrictions for Drug Administration (LGH)
dexmedeTOMidine	**Continuous Subcutaneous infusion** • Not currently approved at Coastal Sites **IV intermittent** • For post ECT postictal agitation: by Anesthesiologist only **Continuous IV infusion** • HAU, ICU, PACU, Operating Room
diacetylmorphine	**Not currently approved at LGH**, no formalized iOAT program in place
dilTIAZem	**IV direct:** • Emergency, HAU, ICU, NCCU, Operating Room, PACU, Radiology • Other areas: by physician only, and physician must be present for 15 minutes after the dose. If ECG unavailable. Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **Continuous IV Infusion:** • Emergency, HAU, ICU, NCCU, Operating Room, PACU, Radiology
dipyridamole	**IV Intermittent:** • Nuclear Medicine and Radiology: Nuclear medicine technologists may administer under supervision of a physician
DOBUTamine	**Continuous IV Infusion:** • Emergency, HAU (maximum rate of 10 mcg/min), ICU, Operating Room, PACU • Nuclear medicine: Nuclear medicine technologists may administer under supervision of a physician
DOPamine	**Continuous IV Infusion:** • Emergency, HAU (maximum rate of 20 mcg/kg/min), ICU, Operating Room, PACU
enalaprilat	**IV direct:** • Emergency, ICU, Operating Room, PACU, NCCU • Other areas – physician only with Full Monitoring
ePHEDrine	**IV direct:** • Emergency, ICU, Operating Room, PACU
epinephrine	**IV direct:** • Emergency, ICU, Operating Room, PACU • Other areas - physician only with Full Monitoring **Continuous IV infusion:** • Emergency, HAU (maximum rate of 10 mcg/min), ICU, Operating Room, PACU

Drug	Location Restrictions for Drug Administration (LGH)
eptifibatide	**IV direct:** • Emergency, ICU **Continuous IV Infusion:** • Emergency, ICU, Operating Room **Intra-arterial:** • Physician only
esmolol	**IV direct:** • Emergency, ICU, Operating Room **Continuous IV Infusion:** • Emergency, ICU, Operating Room
etomidate	**IV direct:** • Emergency, ICU, Operating Room
famotidine	**IV intermittent:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician
fat emulsion	**IV direct:** • Anesthesiologist or Emergency physician (or under their supervision) for cardiac arrest/ cardiovascular collapse
fentanyl	**Continuous Subcutaneous Infusion:** • Palliative Care Unit **IV direct: (high-dose for opioid withdrawal indication)** • Not approved for use at Coastal yet for this indication
fluorescein	**IV direct:** • Only at VGH Eye Care Centre
furosemide	**IV direct:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: nuclear medicine technologists may administer under supervision of a physician
gemcitabine	**Intravesical (bladder instillation):** • Operating Room by Urologist only
haloperidol	**IV direct:** • Emergency, HAU, ICU, Operating Room • Other areas - physician only with Full Monitoring

Drug	Location Restrictions for Drug Administration (LGH)
hydralazine	**IV direct:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU • Other areas: by physician only and physician must be present for 15 minutes after the dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q15MIN x 3 **Continuous IV Infusion:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU
hyoscine BUTYLbromide	**IV direct:** • Medical Imaging: Medical imaging technologists may administer under the supervision of a physician
insulin	**Continuous IV infusion:** • ***high-dose antidote:*** Emergency, ICU
isoproterenol	**Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU
ketamine	**Subcutaneous:** • Palliative Care Unit **Continuous Subcutaneous Infusion:** • Palliative Care Unit **IM** • Emergency, ICU; if physician is present **IV direct:** • Emergency, ICU; if physician is present **IV intermittent:** • For analgesia: Emergency, PACU • For refractory depression (in presence of physician): Emergency, PACU, Ambulatory Clinic **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU • HAU, NCCU and Surgical units (for peri-operative pain as per protocol/powerplan) • SPH PACU/ High Acuity Unit ONLY for chronic neuropathic pain (250 mg/250 mL D5W)
labetalol	**IV direct** • Emergency, HAU, ICU, Operating Room, PACU, NCCU • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **Continuous IV infusion:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU

Drug	Location Restrictions for Drug Administration (LGH)
lidocaine	**ECG Requirements:** • Patients in Palliative Care Unit require a baseline ECG prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 3 mg/kg/hour, or for IV intermittent neuropathic pain dosing • Post-operative patients: A baseline ECG is required prior to initiation of therapy. Cardiac monitoring is required for the first hour of infusion. After the first hour, continuous ECG monitoring is not required for doses up to and including 2 mg/kg/hour for a duration of up to 48 hours. • All patients not meeting the above criteria require FULL MONITORING (continuous ECG monitoring) **Continuous Subcutaneous Infusion:** • Palliative Care Unit **IV direct:** • Emergency, ICU, Operating Room, PACU **Continuous IV infusion:** • Post-operative pain: HAU, ICU, NCCU, PACU, 3E, 3W, 6E, 6W, 7E
metoprolol	**IV direct:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU, Radiology • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **IV intermittent:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU, Radiology • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: . Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable

Drug	Location Restrictions for Drug Administration (LGH)
midazolam	**Subcutaneous injection:** • Palliative Care Service –any nursing unit • May be given on any nursing unit for COVID-19 palliative patients (no prescriber restrictions) **Continuous Subcutaneous Infusion:** • Palliative Care Service –any nursing unit **IM:** • Emergency, ICU, Operating Room, PACU **IV Routes** require the following (Palliative Patients exempt): • Procedural Sedation and Analgesia – follow patient care guidelines. • In other areas: ▪ A designated person (physician or nurse trained in basic life support) whose responsibility is to monitor the patient's vital signs and ventilation ▪ Use of pulse oximeter and BP monitor ▪ Readily available oxygen, bag, and mask ▪ ECG monitoring is recommended, where possible, in patients on concomitant opioids. **IV direct:** • Emergency, ICU, Operating Room, PACU • HAU for comfort care only • Palliative Care Service –any nursing unit **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU • HAU for comfort care only • Palliative Care Service –any nursing unit
milrinone	**Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU
naloxone	**Continuous IV Infusion:** • Emergency, HAU, ICU, Operating Room, PACU
neostigmine	**IV direct:** • ICU, Operating Room, PACU
nitroglycerin	**IV direct:** • Physician only **Continuous IV Infusion:** • Emergency, HAU, ICU, Operating Room, PACU • Obstetric Units: by physician only

Drug	Location Restrictions for Drug Administration (LGH)
nitroprusside	**Continuous IV Infusion:** • Emergency, ICU, Operating Room
NORepinephrine	**Continuous IV Infusion:** • Emergency, HAU (maximum rate 20 mcg/min), ICU, Operating Room, PACU
phentolamine	**IV direct:** • Physician only with Full Monitoring **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU **Local Infiltration** • Physician only or practitioner with specialized training
PHENYLephrine	**IV direct:** • Emergency, ICU, Operating Room, PACU • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU
potassium acetate	**IV Intermittent:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU for rates 21 to 40 mmol/hour
potassium chloride	**IV Intermittent:** • Emergency, HAU, ICU, Operating Room, PACU, NCCU for rates 21 to 40 mmol/hour
POTASSIUM phosphate	**IV intermittent:** • Emergency, HAU, ICU, Operating Room for rates above 15 mmol over 2 hours
pralidoxime	**IM:** • Emergency, ICU, Operating Room **IV direct:** • Emergency, ICU, Operating Room **IV Intermittent:** • Emergency, ICU, Operating Room **Continuous IV Infusion:** • Emergency, ICU, Operating Room

Drug	Location Restrictions for Drug Administration (LGH)
procainamide	**IV direct:** • Emergency, ICU, Operating Room, PACU **IV intermittent:** • Emergency, ICU, Operating Room, PACU **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU
proPOfol	**IV direct:** • Emergency, ICU, Operating Room, PACU with physician present • Other areas - physician only with Full Monitoring **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU **Intracarotid:** • Only in VGH EEG Lab
proPRANolol	**IV direct:** • Emergency, ICU, Operating Room, PACU, NCCU • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **IV intermittent:** • Emergency, ICU, Operating Room, PACU, NCCU • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU, NCCU
ranitidine	**IV intermittent:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician
ROcuronium	**IV direct:** • Emergency, ICU, Operating Room, PACU **Continuous IV Infusion:** • Emergency, ICU, Operating Room, PACU
salbutamol	**Continuous IV Infusion:** • Emergency, ICU, Operating Room

Drug	Location Restrictions for Drug Administration (LGH)
sincalide	**IV intermittent:** • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician • Other areas: by physician only
sodium bicarbonate	**IV direct:** • Emergency, ICU, Operating Room, PACU • Other areas - physician only **IV intermittent:** • Emergency, ICU, Operating Room, PACU for rates above 50 mmol/hour **Continuous IV infusion:** • Emergency, ICU, Operating Room, PACU for rates above 50 mmol/hour
SODIUM phosphate	**IV intermittent:** • Emergency, HAU, ICU, Operating Room for rates above 15 mmol over 2 hours
succinylcholine	**IM:** • Physician only with Intensive Monitoring **IV direct:** • Physician only with Intensive Monitoring
SUFentanil	**Subcutaneous:** • Palliative Care Unit
sugammadex	**IV direct:** • Physician only in Emergency, ICU, Operating Room, PACU
tenecteplase	**IV direct:** • Emergency, ICU, Operating Room
thyrotropin alfa	**IV intermittent:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician
vasopressin	**Continuous IV infusion:** • Emergency, HAU, ICU, Operating Room, PACU

Drug	Location Restrictions for Drug Administration (LGH)
verapamil	**IV direct:** • Emergency, HAU, ICU, Operating Room • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable **Continuous IV Infusion:** • Emergency, HAU, ICU, Operating Room
verteporfin	**IV Intermittent:** • Only used at VGH Eye Care Centre
vitamin B12	**IM:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician

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Site Specific Administration Restrictions

Coastal Community Care - BB, BC, qGH, SGH, SH, WHCC, PHCC

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Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Legend:			
Site names:	Bella Bella - R.W. Large Hospital SGH – Squamish General Hospital PHCC- Pemberton Health Care Centre	Bella Coola – Bella Coola General Hospital SH – Sechelt Hospital	qGH – qathet General Hospital WHCC – Whistler Health Care Centre
Unit names:	CCU – Critical Care Unit PACU – Post Anesthesia Care Unit	ICU – Intensive Care Unit PCU – Palliative Care Unit	OR – Operating Room

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
adenosine	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU, in presence of physician • Other areas - physician only with Full Monitoring	√	√	√	√	√	√	√
	IV intermittent: • Physician only							
alteplase (rtPA)	**IV direct:** • CCU, Emergency, ICU, Operating Room, Radiology			√		√		
	IV intermittent: • CCU, Emergency, ICU, Operating Room			√		√		
	Intra-arterial or Continuous IV infusion: • ICU • Radiology (must be transferred to ICU)			√				
aminophylline	**IV direct:** • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician • Other areas: by physician only							

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
amiodarone	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas – physician only with Full Monitoring	√	√	√	√	√	√	√
	IV intermittent: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
	Continuous IV infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
atropine	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas: by physician only, and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q15MIN x 3	√	√	√	√	√	√	√
	Continuous IV infusion: • CCU, Emergency, ICU, Operating Room	√	√	√	√	√	√	√
bivalirudin	• Percutaneous Coronary Intervention Sites only: VGH, SPH • Heparin-induced thrombocytopenia (HIT): All areas, may be administered as outlined in the PDTM monograph	√	√	√	√	√	√	√
bleomycin	**Intra-arterial and intralesional:** • Only given in VGH Radiology							
calcium chloride	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas – in emergency situations, in presence of physician	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
calcium gluconate	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas – in emergency situations, in presence of physician	√	√	√	√	√	√	√
carboprost	**IM:** • In Labour/Delivery/Post-partum, following consultation with obstetrician or obstetric GP	√	√	√	√	√	√	√
cisatracurium	**IV direct** • CCU, ICU, Operating Room, PACU	√	√	√	OR only	√		
	Continuous IV Infusion: • Not currently approved at Coastal Sites							
dantrolene	**IV direct** • CCU, ICU, PACU, Operating Room • Other areas - physician only	√	√	√	√	√		
	IV intermittent: • Not currently approved at Coastal Sites							
	Continuous IV Infusion: • Not currently approved at Coastal Sites							
dexmedeTOMidine	**Continuous Subcutaneous infusion** • Not currently approved at Coastal Sites							
	IV intermittent • For post ECT postictal agitation: by Anesthesiologist only			OR only		OR only		
	Continuous IV infusion • Operating Room			√	√	√		
diacetylmorphine	**Not currently approved at Coastal Sites;** no formalized iOAT program in place							

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
diltiazem	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU, Radiology • Other areas: by physician only, and physician must be present for 15 minutes after the dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√	√	√
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU, Radiology	√	√	√	√	√	√	√
dipyridamole	**IV Intermittent:** • Nuclear Medicine and Radiology: Nuclear medicine technologists may administer under supervision of a physician							
DOBUTamine	**Continuous IV Infusion:** • CCU, Emergency ICU, PACU • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician	√	√	√	√	√	√	√
DOPamine	**Continuous IV Infusion:** • CCU, Emergency ICU, PACU	√	√	√	√	√	√	√
enalaprilat	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas – physician only with Full Monitoring	√	√	√	√	√		
ePHEDrine	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

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Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
EPInephrine	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas - physician only with Full Monitoring	√	√	√	√	√	√	√
	Continuous IV infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
eptifibatide	**IV direct:** • CCU, Emergency, ICU, Operating Room	√	√	√	√	√		
	Continuous IV Infusion: • Emergency, ICU, Operating Room				√			
esmolol	**IV direct:** • CCU, Emergency, ICU, Operating Room	√	√	√	OR only	√		
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room	√	√	√	OR only	√		
etomidate	**IV direct** • Emergency, ICU, Operating Room	√	√	√	√	√	√	√
famotidine	**IV intermittent:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician	√	√	√	√	√	√	√
fat emulsion	**IV direct:** • Anesthesiologist or Emergency physician (or under their supervision) for cardiac arrest/ cardiovascular collapse	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
fentanyl	**Continuous Subcutaneous Infusion:** • Areas with the CADD SOLIS VIP pump for Palliative Care patients	√	√	√	√	√		
	IV direct: (high-dose for opioid withdrawal indication) • Not approved for use at Coastal yet for this indication							
fluorescein	**IV direct:** • Only at VGH Eye Care Centre							
furosemide	**IV direct:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician	√	√	√	√	√	√	√
gemcitabine	**Intravesical (bladder instillation):** • Ambulatory Care			√	√			
haloperidol	**IV direct:** • CCU, Emergency, ICU, Operating Room • Other areas - physician only with Full Monitoring	√	√	√	√	√	√	√
hydralazine	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU, Labour/Delivery • Other areas: by physician only and physician must be present for 15 minutes after the dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q15MIN x 3	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

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Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
hyoscine BUTYLbromide	**IV direct:** • All areas, may be administered as outlined in the PDTM monograph • Medical Imaging: Medical imaging technologists may administer under the supervision of a physician	√	√	√	√	√	√	√
insulin	**Continuous IV Infusion:** • ***high-dose antidote:*** CCU, Emergency, ICU			√	√	√	√	√
isoproterenol	**Continuous IV Infusion:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	OR only	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
ketamine	**Subcutaneous** • For treatment-resistant depression pilot project (DST-00-13-30294): Ambulatory Clinic (the physician must be immediately available during ketamine treatment)				√			
	Continuous Subcutaneous Infusion: • Palliative Care	√	√	√	√	√		
	IM • CCU, Emergency, ICU; if physician is present	√	√	√	√	√	√	√
	IV direct: • CCU, Emergency, ICU; if physician is present	√	√	√	√	√	√	√
	IV intermittent: • For analgesia: Emergency, PACU • For refractory depression (in presence of physician): Emergency, PACU, Ambulatory Clinic	√	√	√	√	√	√	√
	IV intermittent: • For treatment-resistant depression pilot project (DST-00-13-30294): Ambulatory Clinic (the physician must be immediately available during ketamine treatment)				√			
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
	Continuous IV Infusion: • Surgical units (for peri-operative pain as per protocol)	√	√	√		√		

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
labetalol	**IV direct** • CCU, Emergency, ICU, Operating Room, PACU • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√	√	√
	Continuous IV infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
lidocaine	**ECG Requirements:** • Patients in Palliative Care Unit require a baseline ECG prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 3 mg/kg/hour, or for IV intermittent neuropathic pain dosing • Post-operative patients: A baseline ECG is required prior to initiation of therapy. Cardiac monitoring is required for the first hour of infusion. After the first hour, continuous ECG monitoring is not required for doses up to and including 2 mg/kg/hour for a duration of up to 48 hours. • All patients not meeting the above criteria require FULL MONITORING (continuous ECG monitoring)	√	√	√	√	√		
	Subcutaneous Continuous Infusion: • Palliative Care Unit	√	√	√	√	√		
	IV direct: • Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
	Continuous IV infusion: • Post-operative pain: CCU, ICU			√		√		

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

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Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
metoprolol	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU, Radiology • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√	√	√
	IV intermittent: • CCU, Emergency, ICU, Operating Room, PACU, Radiology • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√	√	√
midazolam	**Subcutaneous injection:** • Emergency (procedural sedation) • Palliative Care Service –any nursing unit • May be given on any nursing unit for COVID-19 palliative patients (no prescriber restrictions)	√	√	√	√	√	√	√
	Subcutaneous Continuous Infusion: • Palliative Care Service –any nursing unit	√	√	√	√	√		
	IM: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
midazolam	**IV Routes** require the following (Palliative Patients exempt): • Procedural Sedation and Analgesia – follow patient care guidelines. • In other areas: o A designated person (physician or nurse trained in basic life support) whose responsibility is to monitor the patient's vital signs and ventilation o Use of pulse oximeter and BP monitor o Readily available oxygen, bag, and mask o ECG monitoring is recommended, where possible, in patients on concomitant opioids.	√	√	√	√	√	√	√
	IV direct: • CCU, Emergency, ICU, Operating Room, PACU • Palliative Care Service –any nursing unit	√	√	√	√	√	√	√
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU • Palliative Care Service –any nursing unit	√	√	√	√	√	√	√
milrinone	**Continuous IV Infusion:** • Not currently approved at Coastal Sites							
naloxone	**Continuous IV Infusion:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
neostigmine	**IV direct:** • Operating Room				√	√		

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

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Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
nitroglycerin	**IV direct:** • physician only	√	√	√	√	√	√	√
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
nitroprusside	**Continuous IV Infusion:** • CCU, Emergency, ICU, Operating Room	√	√	√	√	√		
NORepinephrine	**Continuous IV Infusion:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
phentolamine	**IV direct:** • physician only with Full Monitoring	√	√	√	√	√	√	√
	Continuous IV Infusion: • Not currently approved at Coastal Sites							
phentolamine	**Local Infiltration** • physician only or practitioner with specialized training	√	√	√	√	√	√	√
PHENYLephrine	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU, Operating Room • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√	√	√
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
potassium acetate	**IV Intermittent:** • Not currently approved at Coastal Sites							

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
POTASSIUM chloride	**IV Intermittent:** • CCU, Emergency, ICU, Operating Room, PACU for rates 21 to 40 mmol/hour	√	√	√	√	√	√	√
POTASSIUM phosphate	**IV intermittent:** • CCU, Emergency, ICU, Operating Room for rates above 15 mmol over 2 hours	√	√	√	√	√		
pralidoxime	**IM:** • CCU, Emergency, ICU, Operating Room	√	√	√	√	√		
	IV direct: • CCU, Emergency, ICU, Operating Room	√	√	√	√	√		
	IV Intermittent: • CCU, Emergency, ICU, Operating Room	√	√	√	√	√		
	Continuous IV Infusion: • Emergency, ICU, Operating Room				√			
procainamide	**IV direct:** • Emergency, ICU, Operating Room, PACU • CCU, in presence of Physician				√	√		
	IV intermittent: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√		
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√		
propofol	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU with physician present • Other areas - physician only with Full Monitoring	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
proPOfol	**Continuous IV Infusion:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
propranolol	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: . Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√		
	IV intermittent: • Not currently approved at Coastal Sites							
	Continuous IV Infusion: • Not currently approved at Coastal Sites							
ranitidine	**IV intermittent:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician	√	√	√	√	√	√	√
ROcuronium	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
	Continuous IV Infusion: • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
salbutamol	**Continuous IV Infusion:** • Emergency, ICU, Operating Room	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
sincalide	**IV intermittent:** • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician • Other areas: by physician only							
sodium bicarbonate	**IV direct:** • CCU, Emergency, ICU, Operating Room, PACU • Other areas - physician only	√	√	√	√	√	√	√
	IV intermittent: • CCU, Emergency, ICU, Operating Room, PACU for rates above 50 mmol/hour	√	√	√		√		
	Continuous IV infusion: • CCU, Emergency, ICU, Operating Room, PACU for rates above 50 mmol/hour	√	√	√	√	√		
sodium phosphate	**IV intermittent:** • CCU, Emergency, ICU, Operating Room for rates above 15 mmol over 2 hours	√	√	√	√	√		
succinylcholine	**IM:** • Physician only with Intensive Monitoring							
	IV direct: • Physician only with Intensive Monitoring	√	√	√	√	√	√	√
SUFentanil	**Subcutaneous** • Not currently approved at Coastal Sites							
sugammadex	**IV direct:** • Physician only in Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
tenecteplase	**IV direct:** • CCU, Emergency, ICU, Operating Room	√	√	√	√	√	√	√

Coastal Community of Care – BB, BC, qGH, SGH, SH, WHCC, PHCC

PDTM Site-Specific Administration Restrictions

September 2023

Latest updates in blue text

Drug	Location Restrictions for Drug Administration	Bella Bella	Bella Coola	qGH	SGH	SH	WHCC	PHCC
thyrotropin alfa	**IV intermittent:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician	√	√	√	√	√	√	√
vasopressin	**Continuous IV infusion:** • CCU, Emergency, ICU, Operating Room, PACU	√	√	√	√	√	√	√
verapamil	**IV direct:** • CCU, Emergency, ICU, Operating Room • Other areas: by physician only and physician must be present for 15 minutes after dose. If ECG unavailable: Advanced monitoring with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable	√	√	√	√	√	√	√
	Continuous IV Infusion: • Emergency, ICU, Operating Room				√			
verteporfin	**IV Intermittent:** • Only used at VGH Eye Care Centre							
vitamin B12	**IM:** • All areas, may be administered as outlined in the PDTM monograph • Nuclear Medicine: Nuclear medicine technologists may administer under supervision of a physician	√	√	√	√	√	√	√

Site Specific Administration Restrictions

Providence Health Care

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PHC (SPH and MSJ)

PDTM Site-Specific Administration Restrictions

Critical Care Areas

ED (Emergency Department)
ICU (Intensive Care Unit)
MSJ HAU (MSJ High Acuity Unit)
SPH CC-HAU (SPH Critical Care HAU)
OR (Operating Room)
PACU (Post Anesthesia Care Unit)
CICU (Coronary Intensive Care Unit)
CSICU (Cardiac Surgery Intensive Care Unit)
5CD (includes Cardiac Cath Labs, EP (Electrophysiology) Labs, CSSU (Cardiac Short Stay Unit), CPR (Cardiac Procedure Room)

Drug	Administration
adenosine	**IV direct:** • by physician only except in cardiac arrest **IV intermittent:** • by physician or can be given by nuclear medicine technologists, under the supervision of a physician following a physician's order and provided full resuscitative equipment is readily available in the cardiac catheter lab • by physician in Radiology provided full resuscitative equipment is readily available
alteplase (rtPA)	**IV direct** • Critical Care Areas (for MSJ HAU, see specific restriction below) o MSJ HAU: by RN in presence of physician only for use during cardiac arrest associated with highly suspected/known massive pulmonary embolism **IV intermittent:** • When used for massive pulmonary embolism: Critical Care Areas (except MSJ HAU), SPH Surgical HAU, and Radiology • When used for acute ischemic stroke or prosthetic valve thrombosis: Critical Care Areas (except MSJ HAU) and SPH Surgical HAU. Infusions may be started in Radiology provided the patient is to be moved to a Critical Care Area or SPH Surgical HAU. **Intra-arterial or continuous IV infusion** • Radiology area for vascular surgery patients

aminophylline	**IV direct:**
	• Restricted to physicians.
	• Nuclear medicine technologists may administer under the supervision of a cardiologist (who must be immediately available but not necessarily in the same room at the time the drug is being given) provided that:
	  o an intravenous dose of 50 to 100 mg aminophylline is employed to reverse the side effects of IV dipyridamole;
	  o the patient is currently under ECG monitoring;
	  o an order is placed by the physician;
	  o full resuscitative equipment is immediately available

PHC (SPH and MSJ)

PDTM Site-Specific Administration Restrictions

Drug	Administration
amiodarone	**IV direct** • Critical Care Areas • Other Nursing Units: by physician only **IV intermittent**: • Critical Care Areas and SPH Surgical HAU **Continuous IV infusion:** • Critical Care Areas and SPH Surgical HAU • May be started in Radiology Department provided patient can be transferred for immediate hemodynamic monitoring
arsenic	**IV intermittent:** • by chemotherapy certified nurse at SPH only
asparaginase erwinia (ERWINASE)	**Subcutaneous:** • by chemotherapy certified nurse at SPH only **Intramuscular:** • by chemotherapy certified nurse at SPH only
asparaginase-PEG (ONCASPAR)	**Intramuscular:** • by chemotherapy certified nurse at SPH only **IV intermittent:** • by chemotherapy certified nurse at SPH only
atropine	**IV direct:** • Critical Care Areas, 5A, 5B, Cardiology Lab, X-Ray, MSSU • GI Clinic (in presence of physician) • Maternity Care Centre (MCC)**:** CICU RN must administer atropine and stay in attendance for 15 minutes after administration. The patient must be monitored via telemetry in the MCC. • Other Nursing Units: by physician only **Continuous IV infusion:** • Critical Care Areas
azacitidine	**Subcutaneous:** • by chemotherapy certified nurse at SPH only
BCG	**Intravesical (bladder instillation):** • by RN with specialized training in SPH MSSU only
bendamustine	**IV intermittent:** • by chemotherapy certified nurse at SPH only
bivalirudin	**Continuous IV Infusion:** • For use in PCI: Cardiac Catheterization Lab, CICU, CSICU, 5A and 5B • For use in heparin induced thrombocytopenia (HIT): no administration restrictions

PHC (SPH and MSJ)
PDTM Site-Specific Administration Restrictions

Drug	Administration
bleomycin	**IV direct:** • not administered at PHC **IV intermittent:** • by chemotherapy certified nurse at SPH only **Intra-arterial:** • not administered at PHC **Intralesional:** • not administered at PHC
blinatumomab	**IV intermittent:** • by chemotherapy certified nurse at SPH only
bortezomib	**Subcutaneous:** • by chemotherapy certified nurse at SPH only **IV direct:** • by chemotherapy certified nurse at SPH only
brentuximab	**IV intermittent:** • by chemotherapy certified nurse at SPH only
busulfan	**IV intermittent:** • by chemotherapy certified nurse at SPH only
calcium chloride	**IV direct:** • Critical Care Areas and SPH Surgical HAU under physician supervision • by physician in Maternity Care Centre
calcium gluconate	**IV direct** • Critical Care areas and SPH Surgical HAU • Medicine/surgical units and the Maternity Care Centre (MCC): by physician only
CARBOplatin	**IV intermittent:** • by chemotherapy certified nurse at SPH only
carboprost	**IM:** • Maternity Care Centre or PACU: in the presence of a physician • Other Nursing Units: by physician only
carfilzomib	**IV intermittent:** • by chemotherapy certified nurse at SPH only
carmustine	**IV intermittent:** • by chemotherapy certified nurse at SPH only
cisatracurium	**IV direct** • Critical Care Areas **Continuous IV infusion** • Critical Care Areas
CISplatin	**IV intermittent:** • by chemotherapy certified nurse at SPH only **Intraperitoneal:** • Not administered at PHC

PHC (SPH and MSJ)
PDTM Site-Specific Administration Restrictions

Drug	Administration
cladribine	**Subcutaneous:** • by chemotherapy certified nurse at SPH only **IV intermittent:** • by chemotherapy certified nurse at SPH only
cyclophosphamide	**IV direct:** • by chemotherapy certified nurse at SPH only **IV intermittent:** • For Oncology Indications: by chemotherapy certified nurse at SPH only • For Non-Oncology Indication: at SPH only **Intrapleural:** • Not administered at PHC **Intraperitoneal:** • Not administered at PHC
cytarabine	**Subcutaneous:** • by chemotherapy certified nurse at SPH only **IV intermittent:** • by chemotherapy certified nurse at SPH only **Intrathecal** • by physician only
dacarbazine	**IV intermittent:** • by chemotherapy certified nurse at SPH only
dantrolene	**IV direct** • Critical Care Areas • Other Nursing Units: by physician only **IV intermittent** • Critical Care Areas **Continuous IV infusion** • Critical Care Areas
daratumumab	**IV intermittent:** • by chemotherapy certified nurse at SPH only **Subcutaneous:** • by chemotherapy certified nurse at SPH only
DAUNOrubicin	**IV direct:** • by chemotherapy certified nurse at SPH Medical Short Stay Unit only **IV intermittent:** • by chemotherapy certified nurse at SPH only
degarelix	**Subcutaneous:** • PHC residential sites and MSJ must contact SPH Pharmacy to discuss transport arrangements

PHC (SPH and MSJ)
PDTM Site-Specific Administration Restrictions

dexmedeTOMidine	**IV intermittent** • For post ECT postical agitation: by anesthesiologist in SPH PACU or MSJ 4W **Continuous IV infusion:** • CSICU, ICU, CICU, OR, PACU, MSJ HAU, SPH CC-HAU, ED, SPH Surgical HAU, Palliative Care Unit **Continuous subcutaneous infusion:** • Palliative Care Unit
dexrazoxane	**IV intermittent:** • by chemotherapy certified nurse at SPH only
diacetylmorphine	**IM:** • No administration restrictions at PHC **IV direct:** • No administration restrictions at PHC
diltiazem	**IV direct:** • Critical Care Areas **Continuous IV infusion:** • Critical Care Areas • May be started in X-Ray provided patient can be transferred immediately for hemodynamic monitoring
dipyridamole	**IV intermittent** • Nuclear medicine area only • Restricted to administration by physicians, and by nuclear medicine technologists **under supervision of a physician** following a physician's order and provided full resuscitative equipment is readily available
DOBUTamine	**Continuous IV infusion:** • Critical Care Areas, Cardiology Lab • Cardiac Units and Palliative Care Unit as per site-specific protocols • May be started in X-ray and provided the patient is to be transferred immediately for hemodynamic monitoring. • Nuclear medicine technologists at SPH may administer under the direct supervision of a physician following a physician's order and provided full resuscitative equipment is readily available
DOPamine	**Continuous IV infusion:** • Critical Care Areas, SPH Surgical HAU, and NICU. May be started in X-ray provided the patient is to be transferred immediately for hemodynamic monitoring
DOXOrubicin	**IV direct:** • by chemotherapy certified nurse at SPH Medical Short Stay Unit only **IV intermittent:** • by chemotherapy certified nurse at SPH only **Intraperitoneal:** • not administered at PHC
DOXOrubicin pegylated liposomal	**IV intermittent:** • by chemotherapy certified nurse at SPH only

PHC (SPH and MSJ)
PDTM Site-Specific Administration Restrictions

enalaprilat	**IV direct:** • Critical Care Areas
ePHEDrine	**IV direct:** • Critical Care Areas • Other Nursing Units: by physician only
EPInephrine	**IV direct:** • Critical Care Areas under supervision of physician • Maternity Care Centre: by physician only **Continuous IV infusion:** • Critical Care Areas. May be started in X-Ray provided patient can be transferred immediately for hemodynamic monitoring.
epirubicin	**IV direct:** • by chemotherapy certified nurse at SPH Medical Short Stay Unit only
eptifibatide	**IV direct:** • ED, ICU, CCU, Cardiac Catheterization Lab, 5A, 5B, MSJ HAU **Continuous IV infusion:** • ED, ICU, CCU, Cardiac Catheterization Lab, 5A, 5B, MSJ HAU **Intra-arterial:** • not administered at PHC
esmolol	**IV direct:** • CSICU or CICU • Other Nursing Units: by physician only **Continuous IV infusion:** • Critical Care Areas
etomidate	**IV direct:** • No administration restrictions at PHC
etoposide	**IV intermittent:** • by chemotherapy certified nurse at SPH only
famotidine	**IV intermittent:** • Nuclear medicine technologists may administer under supervision of a physician (following a physician's order)
fat emulsion (INTRALIPID 20%)	**IV direct:** • Critical Care areas in the presence of an Anesthesiologist, Critical Care or Emergency Department Physician for suspected local anesthetic toxicity
fentanyl	**Continuous Subcutaneous Infusion:** • No administration restrictions at PHC **IV direct:** (high-dose for opioid withdrawal indication) • No administration restrictions at PHC
fludarabine	**IV intermittent:** • by chemotherapy certified nurse at SPH only
fluorescein	**IV direct:** • Ophthalmology clinic • Other Nursing Units: physician only

fluorouracil	**IV direct:** • by chemotherapy certified nurse at SPH only **IV intermittent:** • by chemotherapy certified nurse at SPH only **Subconjunctival:** • by physician only
furosemide	**IV direct:** • Nuclear medicine technologists may administer under supervision of a physician (following a physician's order)
gemcitabine	**IV intermittent:** • by chemotherapy certified nurse at SPH only **Intravesical (bladder instillation):** • by chemotherapy certified nurse in the Medical Short Stay Unit for treatment and maintenance doses • by physician only when used intra-operatively
gemtuzumab ozogamicin	**IV intermittent:** • by chemotherapy certified nurse at SPH only
goserelin	**Subcutaneous:** • no administration restrictions at PHC
haloperidol	**IV direct:** • Critical Care Areas • Other Nursing Units, physician only
hydralazine	**IV direct:** • If ECG unavailable: Advanced Monitoring with blood pressure and pulse rate following administration and Q15 MIN x 3 **Continuous IV infusion:** • Critical Care Areas
hyoscine BUTYLbromide	**IV direct:** • Medical imaging technologists may administer under the supervision of a physician
ifosfamide	**IV intermittent:** • by chemotherapy certified nurse at SPH only
inotuzumab ozogamicin	**IV intermittent:** • by chemotherapy certified nurse at SPH only
insulin	**Continuous IV infusion (when used as a high-dose antidote):** • Critical Care Areas
irinotecan	**IV intermittent:** • by chemotherapy certified nurse at SPH only
isatuximab	**IV intermittent:** • by chemotherapy certified nurse at SPH only
isoproterenol	**Continuous IV infusion:** • Critical Care Areas. May be started in X-Ray provided patient can be transferred immediately for hemodynamic monitoring.

ketamine	**Subcutaneous:** • No administration restrictions at PHC **Continuous Subcutaneous Infusion:** • Palliative Care Unit **IM** • Critical Care Areas and SPH Surgical HAU **IV direct:** • Critical Care Areas and SPH Surgical HAU provided that a physician has administered the first dose and it did not result in respiratory depression or oxygen desaturation **IV intermittent:** • Critical Care Areas and SPH Surgical HAU **Continuous IV infusion:** • SPH: Critical Care Areas, SPH Surgical HAU, Medical Surgical Units, and Palliative Care Unit • MSJ: Critical Care Areas • Concentration of 250 mg/250 mL D5W for chronic neuropathic pain restricted to SPH PACU, SPH Surgical HAU, and 8D • Concentration of 10 mg/mL for fluid restricted patients with asthma or status epilepticus restricted to Critical Care areas only
labetalol	**IV direct** • Critical Care Areas and SPH Surgical HAU • Maternity Care Centre: by physician only **Continuous IV infusion:** • Critical Care areas and SPH Surgical HAU. May be started in X-Ray provided the patient can be transferred immediately for hemodynamic monitoring.
leuprolide	**Subcutaneous:** • no administration restrictions at PHC **Intramuscular** • no administration restrictions at PHC
lidocaine	**Continuous subcutaneous infusion:** • SPH: Initiation by Chronic Pain Anesthesiologist in PACU, SPH Surgical HAU, Chronic Pain Inpatient Beds, and Chronic Pain Block Clinic, and by Chronic Pain Anesthesiologist or Skill-Checked RN in the Chronic Pain Block Clinic. Maintained by RN in PACU, SPH Surgical HAU, Chronic Pain Inpatient Beds, and Chronic Pain Block Clinic. **ECG monitoring is required for IV administration as follows:** • Post-operative/ spine and neuropathic pain patients: A baseline ECG is required prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 2 mg/kg/hour for a duration of up to 72 hours. Refer to applicable nursing care standards. o Lidocaine infusions for post-operative pain are restricted to Critical Care Areas, MSJ PACU/HAU, and SPH 10A, 10B, and 10C • Patients in PCU: A baseline ECG is required prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 3 mg/kg/hour. BP, HR and signs of toxicity are to be monitored every 15

	minutes x 4, then every hour for 3 hours, then Q4H and PRN (PCU also requires baseline serum potassium, renal function and liver function) • **All patients not meeting the above criteria, require continuous ECG monitoring.** **IV direct:** • Critical Care Areas, 5A, 5B • Other Nursing Units: by physician only
lipid emulsion (INTRALIPID 20%)	**IV direct:** • Critical Care areas in the presence of an Anesthesiologist, Critical Care or Emergency Department Physician for suspected local anesthetic toxicity
melphalan	**IV intermittent:** • by chemotherapy certified nurse at SPH only
methotrexate	**IV direct:** • when used for oncology indications: by chemotherapy certified nurse at SPH only **IV intermittent:** • when used for oncology indications: by chemotherapy certified nurse at SPH only **Intrathecal:** • by physician only

metoprolol	**IV direct**
	• Critical Care Areas, SPH Surgical HAU, and Cardiology Lab
	• Medical/Surgical units and the Maternity Centre: by physician or nurse practitioner
	  o If ECG monitoring is not available, ADVANCED MONITORING with vital signs monitoring as per site-specific protocol
	  o For each dose given, physician or nurse practitioner must be present for the first 15 minutes and must monitor the blood pressure and the pulse rate at the completion of the dose and again after 15 minutes
	• Radiology: by physician only
	IV intermittent
	• Critical Care Areas and SPH Surgical HAU

midazolam	**Subcutaneous:** • No administration restrictions at PHC **Subcutaneous Continuous Infusion:** • No administration restrictions at PHC **IM:** • No administration restrictions at PHC **IV use requires the following monitoring (palliative patients exempt):** • A designated person (physician or nurse trained in basic life support) whose responsibility is to monitor the patient's vital signs and ventilation • Use of pulse oximeter and blood pressure monitor • Readily available oxygen, bag and mask • ECG monitoring is recommended where possible, in patients on concomitant narcotics **IV direct:**

	• Critical Care areas, Palliative Care Unit, SPH Surgical HAU, GI Clinic, X-Ray, Bronchoscopy Suite, MSJ DT Procedure Room, and MSJ Endoscopy Suite, or by Anesthesiologist, ED physician, Gastroenterologist (GI clinic only), Intensivist, Neurologist (ICU setting only), Palliative Care Service Physician, Radiologist or Respirologist. **Continuous IV infusion:** • Critical Care Areas and Palliative Care Unit
milrinone	**Continuous IV infusion:** • Critical Care Areas • Cardiac Units and Palliative Care Unit as per site-specific protocols
mitomycin	**IV direct:** • by chemotherapy certified nurse at SPH Medical Short Stay Unit only **Topical ophthalmic:** • by physician only **Intravesical:** • by physician only **Intraperitoneal:** • not administered at PHC
mitoxantrone	**IV intermittent:** • when used for oncology indications: by chemotherapy certified nurse at SPH only
naloxone	**Continuous IV Infusion:** • Critical Care Areas
neostigmine	**IV direct:** • Critical Care Areas
nitroglycerin	**IV direct:** • by physician only in Critical Care Areas **Continuous IV infusion:** • Critical Care Areas only; may be started in X-Ray provided patient can be transferred immediately for hemodynamic monitoring
nitroprusside	**Continuous IV Infusion:** • Critical Care Areas; may be started in X-Ray provided patient can be transferred immediately for hemodynamic monitoring.
NORepinephrine	**Continuous IV infusion:** • Critical Care Areas and SPH Surgical HAU; may be started in X-Ray provided patient can be transferred immediately for hemodynamic monitoring.
oxaliplatin	**IV intermittent:** • by chemotherapy certified nurse at SPH only **Intraperitoneal:** • by physician only
PACLitaxel	**IV intermittent:** • by chemotherapy certified nurse at SPH only **Intraperitoneal:** • by physician only
pegaspargase (ONCASPAR)	**Intramuscular:**

	• by chemotherapy certified nurse at SPH only **IV intermittent:** • by chemotherapy certified nurse at SPH only
phentolamine	**IV direct:** • by physician only **Continuous IV infusion:** • Critical Care Areas only **Local Infiltration:** • by physician only
PHENYLephrine	**IV direct:** • Critical Care Areas and SPH Surgical HAU • Maternity Care Centre: by physician only **Continuous IV infusion:** • Critical Care areas and SPH Surgical HAU
polatuzumab vedotin	**IV intermittent:** • by chemotherapy certified nurse at SPH only
potassium acetate	**IV intermittent:** • Critical Care Areas and SPH Surgical HAU: maximum infusion rate by central line is 40 mmol/hour
POTASSIUM chloride	**IV intermittent:** • Critical Care Areas and SPH Surgical HAU: maximum infusion rate by central line is 40 mmol/hour
POTASSIUM phosphate	**IV intermittent:** • Critical Care Areas and SPH Surgical HAU: maximum infusion rate by central line is 15 mmol phosphate per hour
pralidoxime	**IM:** • Critical Care Areas **IV direct:** • Critical Care Areas **IV intermittent:** • Critical Care Areas **Continuous IV infusion:** • Critical Care Areas
procainamide	**IV direct:** • Critical Care Areas **IV intermittent:** • Critical Care Areas **Continuous IV Infusion:** • Critical Care Areas

PHC (SPH and MSJ)
PDTM Site-Specific Administration Restrictions

proPOfol	**IV direct:**
	• Restricted to Anesthesiologist, ED physician, ICU physician or fellow in Critical Care Areas; Exceptions:
	  ▪ Nurses in ED may give for procedural sedation as long as an ED physician is at the bedside
	  ▪ Nurses in ICU and CSICU may give in intubated mechanically ventilated patients
	Continuous IV infusion:
	• Critical Care Areas, Palliative Care Unit, or by Anesthesiologist
	Intracarotid:
	• by physician only

proPRANolol	**IV direct:** • Critical Care Areas **IV intermittent:** • Critical Care Areas **Continuous IV infusion:** • Critical Care Areas
raltitrexed	**IV intermittent:** • by chemotherapy certified nurse at SPH only
REMifentanil	**IV direct:** • By Anesthesiologist only **Continuous IV infusion:** • By Anesthesiologist only; Exception: ▪ Nurses in ICU, ED, CICU, CSICU, and Cath Lab may administer for intubated and ventilated patients when used for targeted temperature control (TTM)
riTUXimab	**Subcutaneous:** • by chemotherapy certified nurse at SPH only
ROcuronium	**IV direct:** • Critical Care Areas **Continuous IV Infusion:** • Critical Care Areas
salbutamol	**Continuous IV Infusion:** • Critical Care Areas • May be started in X-Ray provided the patient can be transported immediately for cardiac monitoring
siltuximab	**IV intermittent:** • by chemotherapy certified nurse at SPH only
sincalide	**IV intermittent** • Restricted to administration by physicians, and by nuclear medicine technologists under the supervision of a physician (following a physician's order)
sodium bicarbonate	**IV direct:** • Critical Care Areas • Other Nursing Units: by physician only **IV intermittent:** • Critical Care Areas: via central line (preferred) at maximum rate 100 mmol/hour; or via peripheral line into a large vein at maximum rate of 50 mmol/hour

	• General wards: via central line (preferred) or via peripheral into a large vein: maximum rate 50 mmol/hour **Continuous IV infusion:** • Critical Care areas: via central line (preferred) at maximum rate 100 mmol/hour; or via peripheral line into a large vein at maximum rate of 50 mmol/hour • General wards: via central line (preferred) or via peripheral into a large vein: maximum rate 50 mmol/hour
SODIUM phosphate	**IV intermittent:** • Critical Care Areas and SPH Surgical HAU: maximum infusion rate by central line is 15 mmol phosphate per hour
succinylcholine	**IM:** • by physician only **IV direct:** • Nurse may administer under direct supervision of MD
sufentanil	**Subcutaneous:** • Palliative Care Unit **Continuous subcutaneous infusion:** • Palliative Care Unit
sugammadex	**IV direct:** • by Anesthesiologists, Code Blue Team, or ED Physicians in OR, PACU, ED, ICU, and Cardiac Catheterization Lab
tenecteplase	**IV direct:** • Critical Care Areas
thiotepa	**IV direct:** • not administered at PHC **IV intermittent:** • by chemotherapy certified nurse at SPH only
thyrotropin alfa	**IM:** • No administration restrictions at PHC
topotecan	**IV intermittent:** • by chemotherapy certified nurse at SPH only
trastuzumab	**IV intermittent:** • by chemotherapy certified nurse at SPH only
vasopressin	**Continuous IV Infusion:** • Critical Care areas only
verapamil	**IV direct:** • Critical Care Areas and Cardiology Lab (initial dose must be given and effects monitored by physician) • Maternity Care Centre: by physician only **Continuous IV infusion:** • Critical Care Areas (initial dose must be given and effects monitored by physician) • May be started in X-Ray provided the patient can be transferred immediately for hemodynamic monitoring

PHC (SPH and MSJ)
PDTM Site-Specific Administration Restrictions

verteporfin	**IV intermittent:** • Only to be used at VGH Eye Care Centre
vinBLAStine	**IV intermittent:** • by chemotherapy certified nurse at SPH only • peripheral line infusion restricted to chemotherapy certified nurse on SPH Medical Short Stay Unit
vinCRIStine	**IV intermittent:** • by chemotherapy certified nurse at SPH only • peripheral line infusion restricted to chemotherapy certified nurse on SPH Medical Short Stay Unit
vinorelbine	**IV intermittent:** • by chemotherapy certified nurse at SPH only • peripheral line infusion restricted to chemotherapy certified nurse on SPH Medical Short Stay Unit
vitamin B12	**IM:** • Nuclear medicine technologists may administer under supervision of a physician (following a physician's order)

Site Specific Administration Restrictions

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Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
adenosine	**IV direct:** • Critical Care Areas • Code Blue team attending cardiac arrest may administer in life-threatening situations • Other areas – physician only. Physician must be present for 15 minutes after dose **IV intermittent:** • Critical Care Areas • Other areas – physician only. Physician must be present for 15 minutes after dose.
alteplase (rtPA)	**IV direct:** • Critical Care Areas **IV intermittent:** • Critical Care Areas **Intra-arterial or Continuous IV infusion:** • Not applicable at RH **Intra-cannular (intra-catheter) dwell:** • Qualified infusion program members and individuals who have successfully completed the CVAD Champion Workshop may perform occlusion management for patients with PICCs and IVADs only
aminophylline	**IV direct:** • Physician only. • Nuclear medicine: Nuclear medicine technologists may administer as per scope of practice under physician supervision
amiodarone	**IV direct** • Critical Care Areas • Other areas - Physician only. • Code Blue team attending cardiac arrest may administer for life-threatening situations. **IV intermittent**: • Critical Care Areas **Continuous IV infusion**: • Critical Care Areas
atropine	**IV direct:** • Critical Care Areas • Other areas – physician only. • if ECG unavailable; ADVANCED MONITORING with blood pressure and heart rate following administration and Q15MIN x 3 **Continuous IV infusion:** • Critical Care Areas
bivalirudin	**Continuous IV infusion** • All areas for patients with Heparin Induced Thrombocytopenia (HIT) • Use in PCI not applicable to RH

Richmond Community of Care

Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
bleomycin	**Intra-arterial:** • Not applicable at RH, only given in VGH Radiology **Intralesional:** • Not applicable at RH, only given in VGH Radiology
calcium chloride	**IV direct:** • Critical Care Areas • Other areas – physician only.
calcium gluconate	**IV direct:** • Critical Care Areas • Other areas – physician only.
carboprost	**IM:** • Birth Centre, OR, following consultation with obstetrician or obstetric GP **Intramyometrially** • Other areas – physician only.
cisatracurium	**IV direct** • Critical Care Areas **Continuous IV infusion** • Critical Care Areas
dantrolene	**IV direct** • Critical Care Areas • Other areas – physician only. **IV intermittent** • Critical Care Areas **Continuous IV infusion** • Critical Care Areas
dexmedeTOMidine	**Continuous subcutaneous infusion** • Palliative Care Unit only **Continuous IV infusion** • Critical Care Areas • Palliative Care Unit for palliative sedation **IV intermittent** • For post ECT postictal agitation, will not be utilized by RH Anesthesiology for now
diacetylmorphine	**IM:** • Not currently approved at RH; no formalized iOAT program in place **IV direct:** • Not currently approved at RH, no formalized iOAT program in place

Richmond Community of Care

Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
dilTIAZem	**IV direct:** • Critical Care Areas • Other areas - physician only. Physician must be present for 15 minutes after completion of the dose. • If ECG monitoring unavailable, *ADVANCED MONITORING* with blood pressure and pulse rate monitored at end of dose, then Q5MIN x 15 minutes **Continuous IV infusion:** • Critical Care Areas
dipyridamole	**IV intermittent** • Other areas – physician only. • Nuclear medicine: Nuclear medicine technologists may administer as per scope of practice under physician supervision
DOBUTamine	**Continuous IV infusion:** • Critical Care Areas
DOPamine	**Continuous IV infusion:** • Critical Care Areas
enalaprilat	**IV direct:** • Critical Care Areas • Other areas - physician only.
ePHEDrine	**IV direct:** • Critical Care Areas
EPInephrine	**IV direct:** • Critical Care Areas • Code Blue team attending cardiac arrest may administer for life-threatening situations • Other areas – physician only. **Continuous IV infusion:** • Critical Care Areas • May be started in a cardiac arrest situation. However, the patient must be transferred to a critical care area as soon as possible for hemodynamic monitoring
eptifibatide	**IV direct:** • Not applicable to RH, only for use in cardiac catheterization lab **Continuous IV infusion:** • Not applicable to RH, only for use in cardiac catheterization lab **Intra-arterial:** • Not applicable at RH
esmolol	**IV direct:** • Critical Care Areas, Diagnostic Imaging **Continuous IV infusion:** • Critical Care Areas

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Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
famotidine	**IV intermittent:** • Nuclear medicine: Nuclear medicine technologists may administer as per scope of practice under physician supervision
fat emulsion (INTRALIPID 20%)	**IV direct:** • By Anesthesiologist, Critical Care or Emergency Department Physician for cardiac arrest only
fentanyl	**Continuous subcutaneous infusion** • Palliative Care Unit **IV direct**: (high-dose for opioid withdrawal indication) • Not approved for use at RH yet for this indication
fluorescein	**IV direct:** • Not applicable at RH
furosemide	**IV direct:** • Nuclear medicine: Nuclear medicine technologists may administer as per scope of practice under physician supervision.
gemcitabine	**Intravesical (bladder instillation):** • Operating Room or Oncology Clinic by trained staff
haloperidol	**IV direct:** • Critical Care Areas • Other areas – physician only.
hydralazine	**IV direct:** • Critical Care Areas • Other areas – physician only and physician must be present for 15 minutes after the dose. • If ECG monitoring is not available, *ADVANCED MONITORING* with blood pressure and pulse rate following administration and Q15MIN x 3. **Continuous IV infusion:** • Critical Care Areas
hyoscine BUTYLbromide	**IV direct:** • Medical imaging: Medical imaging technologists may administer as per scope of practice under physician supervision
insulin	**Continuous IV infusion (when used as a high-dose antidote):** • Critical Care Areas
isoproterenol	**Continuous IV infusion:** • Critical Care Areas • May be started in a cardiac arrest situation with *FULL MONITORING*. However, the patient must be transferred to a critical care area as soon as possible for hemodynamic monitoring

Richmond Community of Care

Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
ketamine	**Continuous subcutaneous infusion:** • Palliative Care Unit **IM:** • Critical Care areas if physician present **IV direct:** • ICU-HAU • ED, PACU, Operating Room if physician present **IV intermittent:** • Critical Care Areas or if physician present **Continuous IV infusion:** • Critical Care Areas • Chronic neuropathic pain 250 mg/ 250 mL D5W concentration only at Saint Paul's Hospital PACU and HAU.
labetalol	**IV direct** • Critical Care Areas • Other areas – physician only and physician must be present for 15 minutes after dose. • If ECG monitoring is unavailable, *ADVANCED MONITORING* with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable. **Continuous IV infusion:** • Critical Care Areas
lidocaine	**ECG Requirements:** • Patients in Palliative Care Unit require a baseline ECG prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 3 mg/kg/hour, or for IV intermittent neuropathic pain dosing • Post-operative patients: A baseline ECG is required prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 2 mg/kg/hour for a duration of up to 72 hours. • All patients not meeting the above criteria require FULL MONITORING (continuous ECG monitoring) **Continuous subcutaneous infusion:** • Palliative Care Unit **IV direct:** • Critical Care Areas • Other areas - physician only. • See above "ECG Requirements" section **Continuous IV infusions:** • Critical Care Areas • For post-operative pain, approved for PACU and ICU-HAU

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Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
metoprolol	**IV direct:** • Critical Care Areas • Other areas – physician only and physician must be present for 15 minutes after dose. If ECG unavailable, *ADVANCED MONITORING* with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable. **IV intermittent:** • Critical Care Areas • Other areas – physician only and physician must be present for 15 minutes after dose. If ECG unavailable, ADVANCED MONITORING with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable.
midazolam	**Subcutaneous injection:** • Any nursing unit for patients who are deemed palliative or comfort care (no prescriber restrictions) **Continuous subcutaneous infusion:** • Palliative Care Service – any nursing unit **IM:** • Critical Care Areas **IV direct:** • Ambulatory Care (for procedural sedation), Critical Care Areas • Palliative Care Service – any nursing unit **Continuous IV infusion:** • Critical Care Areas (ventilated patients), Palliative Care
milrinone	**Continuous IV infusion:** • Critical Care Areas
mitomycin	**Intravesical (bladder instillation):** • Operating Room or Oncology Clinic by trained staff
naloxone	**Continuous IV infusion:** • Critical Care Areas
neostigmine	**IV direct:** • Critical Care Areas • Other areas - physician only.
nitroglycerin	**IV direct:** • Physician only. **Continuous IV infusion:** • Critical Care Areas
nitroprusside	**Continuous IV infusion:** • Critical Care Areas • May be started in an emergency situation short-term with *FULL MONITORING*.

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Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
NORepinephrine	**Continuous IV infusion:** • Critical Care Areas • May be started in an emergency situation short-term with *FULL MONITORING*
phentolamine	**IV direct:** • Critical Care Areas • Other areas - physician only. **Continuous IV infusion:** • Critical Care Areas **Local infiltration:** • Critical Care Areas • By physician or practitioner with specialized education
PHENYLephrine	**IV direct:** • Critical Care Areas • Other Nursing Units, physician only and physician must be present for 15 minutes after dose. If ECG unavailable, *ADVANCED MONITORING* with blood pressure and heart rate at completion of dose, then Q5MIN x 3, then Q15 MIN until stable **Continuous IV infusion:** • Critical Care Areas • May be started in an emergency situation short-term with *FULL MONITORING*
potassium acetate	**IV intermittent:** • Critical Care Areas for rates 21-40 mmol/hour
POTASSIUM chloride	**IV intermittent:** • Critical Care Areas for rates 21-40 mmol/hour
POTASSIUM phosphate	**IV intermittent:** • Critical Care Areas, for rates above 15 mmol over 1 hour
pralidoxime	**All routes (IM, IV direct, IV intermittent, Continuous IV infusion:** • Critical Care Areas
procainamide	**IV direct:** • Critical Care Areas **IV intermittent:** • Critical Care Areas **Continuous IV infusion:** • Critical Care Areas
proPOfol	**IV direct:** • Critical Care Areas **Continuous IV Infusion:** • Critical Care Areas, Palliative Care Unit (if group decides to implement) **Intra-carotid:** • **Not applicable at RH**

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Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
proPRANolol	**IV direct:** • Critical Care Areas • Other areas – by physician only and physician must be present for 15 minutes after dose. If ECG monitoring unavailable, *ADVANCED MONITORING* with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable. **IV intermittent:** • Critical Care Areas • Other areas – by physician only and physician must be present for 15 minutes after dose. If ECG monitoring unavailable, *ADVANCED MONITORING* with blood pressure and pulse rate following administration and Q5MIN x 3, then Q15MIN until stable. **Continuous IV infusion:** • Critical Care Areas
ranitidine	**IV intermittent:** • Nuclear medicine: Nuclear medicine technologists may administer as per scope of practice under physician.
rocuronium	**IV direct:** • Critical Care Areas (ventilated patients only) **Continuous IV infusion:** • Critical Care Areas (ventilated patients only)
salbutamol	**Continuous IV infusion:** • Critical Care Areas
sincalide	**IV intermittent** • Physician only • Nuclear medicine: Nuclear medicine technologists may administer as per scope of practice under physician supervision.
sodium bicarbonate	**IV direct:** • Critical Care Areas • Other areas - by physician only **IV intermittent:** • Critical Care Areas for rates above 50 mmol/hour **Continuous IV infusion:** • Critical Care Areas for rates above 50 mmol/hour
SODIUM phosphate	**IV intermittent:** • Critical Care Areas for rates above 15 mmol over 2 hours
succinylcholine	**IM:** • Physician only **IV direct:** • Physician only • Code Blue Team under direct supervision of physician in life-threatening situations
SUfentanil	**Subcutaneous:** • Palliative Care Unit
sugammadex	**IV direct:** • Code Blue Team, anesthesiologists, ICU physicians, ED physicians in critical care areas
tenecteplase	**IV direct:** • Critical Care Areas
thyrotropin alfa	**IM:** • No restrictions, not administered by nuclear medicine technologists at RH

Richmond Community of Care

Site-Specific Administration Restrictions for Drug Administration

Drug	Administration
vasopressin	**Continuous IV infusion:** • Critical Care Areas
verapamil	**IV direct:** • Critical Care Areas • Other areas - by physician only and physician must be present for 15 minutes after the dose. If ECG monitoring is not practical, *ADVANCED MONITORING* with blood pressure and pulse rate monitored following administration and Q5MIN x 3, then Q15MIN until stable **Continuous IV infusion:** • Critical Care Areas
verteporfin	**IV intermittent:** • **Not applicable at RH**
vitamin B12	**IM:** • No restrictions, not administered by nuclear medicine technologists at RH

Richmond Hospital and Community of Care Critical Care Areas

Emergency Department
ICU-HAU – Intensive Care Unit / High Acuity Unit
PACU – Post Anesthesia Care Unit
OR – Operating Room

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Site Specific Administration Restrictions

Vancouver Acute (VGH, UBCH and GF Strong)

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VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
adenosine	**IV direct:** • Critical Care Areas **IV intermittent:** • Critical Care Areas, Medical Imaging • Nuclear Medicine technologists may administer for myocardial perfusion imaging in CT under supervision of a physician and ▪ Medication is ordered by a physician ▪ Full resuscitative equipment is readily available
alteplase (rtPA)	**IV direct:** • ICU, CCU, Emergency, NICU, Neuroradiology, Radiology, Cardiac Cath Lab **IV intermittent:** • ICU, CCU, Emergency, VGH HAU, NICU, Neuroradiology, Radiology, Cardiac Cath Lab, Stroke unit • Occluded CVC, fistula, graft – Hemodialysis unit **Continuous IV or intra-arterial infusion:** • ICU, CCU, Emergency, VGH HAU, Neuroradiology, Radiology • Vascular surgery patients on other Nursing Units if initiated in Radiology **Intra-cannula (intra-catheter):** • Requires practitioner with specialized training. Refer to site specific protocol.
aminophylline	**IV direct:** • Physician only or • In Medical Imaging, Nuclear Medicine technologists may administer for reversal of dipyridamole or adenosine side effects under supervision of a cardiologist provided that: • aminophylline 50 to 100 mg IV is employed • ECG monitoring is used • Medication is ordered by a physician • Full resuscitative equipment is readily available
amiodarone	**IV direct:** • Critical Care areas. • Other Nursing Units, physician only. • FULL MONITORING required for administration **IV intermittent**: • Critical Care Areas, VGH and UBCH HAU, SSCU **Continuous IV infusion**: • Critical Care Areas, VGH and UBCH HAU, SSCU

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
atropine	**IV direct:** • Critical Care Areas, Radiology, BTHA (cardiac monitored patients), NICU, SSCU, Cardiac Sciences (VGH-L10A), PCU, UBCH HAU • CCOT team nurse or under direct supervision of a CCOT physician • Other areas, physician only • if ECG unavailable; ADVANCED MONITORING with blood pressure and heart rate following administration and Q15MIN x 3 **Continuous IV infusion:** • Critical Care Areas
bivalirudin	**Continuous IV infusion and IV direct** • PCI: Cardiac Cath Lab, CCU, CIU, Cardiac Sciences (VGH L10A), Radiology • Heparin induced thrombocytopenia (HIT): no restrictions
bleomycin	**Intra-arterial:** • VGH radiology **Intra-lesional:** • VGH radiology
calcium chloride	**IV direct:** • Critical Care Areas. • Other Nursing Units, physician only
calcium gluconate	**IV direct:** • Critical Care Areas • Other Nursing Units, physician only
carboprost	**IM:** • By physician only
cisatracurium	**IV direct:** • Critical Care Areas **Continuous IV infusion:** • Critical Care Areas
dantrolene	**IV direct:** • Critical Care Areas • By physician only; Exception: nurses in PACU may administer **IV intermittent:** • Critical Care Areas • By physician only **IV infusion:** • PACU

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
dexmedeTOMidine	**IV intermittent:** • ECT Treatment Area by Anesthesiologist **Continuous SC infusion:** • PCU **Continuous IV infusion:** • CCU, CSICU, ICU, OR, PACU, VGH HAU, PCU • 20 mcg/mL strength restricted to PCU
diacetylmorphine	**Intramuscular:** • No restrictions apply **IV direct:** • No restrictions apply
dilTIAZem	**IV direct:** • Critical Care Areas, Radiology, NICU, BTHA (cardiac monitored beds), SSCU. • Cardiac Sciences (VGH L10A) may administer provided the physician has administered the first dose. • Other Nursing Units, physician only. On general nursing units, physician must be present for 15 minutes after completion of the dose. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at end of dose, then Q5MIN x 15 minutes **Continuous IV Infusion:** • Critical Care Areas, VGH HAU

dipyridamole	**IV intermittent:**
	• By Physician only or
	• In Medical Imaging, Nuclear Medicine technologists may administer under supervision of a physician provided that:
	  • Medication is ordered by a physician
	  • Full resuscitative equipment is readily available

DOBUTamine	**Continuous IV Infusion:**
	• Critical Care Areas, VGH HAU, Echocardiography, Nuclear Medicine
	• Surgical Day Care may initiate for stabilization of patients until transfer to an appropriate critical care area.
	• Echocardiography and Nuclear Medicine may administer for diagnostic purposes.
	• Nuclear Medicine technologists may administer under supervision of a physician provided that:
	  • Medication is ordered by a physician
	  • Full resuscitative equipment is readily available

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
DOPamine	**Continuous IV infusion:** • Critical Care Areas, VGH and UBCH HAU, NICU • Cardiac Sciences (VGH L10A) • Up to 5 mcg/kg/min • SSCU: SSCU Intensivist only
enalaprilat	**IV direct:** • Critical Care Areas • Other Nursing Units, physician only • If ECG monitoring is not practical, ADVANCED MONITORING for the first 2 doses and for the first 2 doses after any dosage increase: blood pressure and pulse rate monitored at 15, 30 and 60 minutes, then 4 hours after the dose.
ePHEDrine	**IV direct:** • Critical Care Areas and VGH HAU • Other Nursing Units, physician only • FULL MONITORING required for administration
EPInephrine	**IV direct:** • Critical Care Areas, NICU, Cardiac Sciences (VGH L10A) • Other Nursing Units, physician only • FULL MONITORING required for administration **Continuous IV infusion:** • Critical Care Areas, VGH HAU • Surgical Day Care may initiate for stabilization of patients until transfer to an appropriate critical care area
eptifibatide	**IV direct:** • Critical Care Areas • Day Bed Unit, Cardiac Sciences (VGH L10A), Interventional Radiology/ Neuroradiology – by physician only **Continuous IV Infusion:** • Critical Care Areas, Day Bed Unit, Cardiac Sciences (VGH L10A), Interventional Radiology/ Neuroradiology, NICU **Intra-arterial:** • Interventional Radiology/ Neuroradiology – by physician only
esmolol	**IV direct:** • By physician only in ICU, VGH HAU, OR, Nuclear Medicine • By physician in CCU for treatment of refractory hypertension or aortic dissection **Continuous IV Infusion:** • ICU, VGH HAU, OR • CCU for treatment of refractory hypertension or aortic dissection
ethacrynic acid	**IV direct:** • Nuclear Medicine technologists may administer under supervision of a physician • Other health care providers can administer as outlined in the PDTM monograph

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
etomidate	**IV direct:** • Emergency Department • Anesthesia – for use in any nursing unit where Full Monitoring is available
famotidine	**IV intermittent:** • Nuclear Medicine technologists may administer under supervision of a physician • Other health care providers can administer as outlined in the PDTM monograph
fat emulsion (INTRALIPID 20%)	**IV direct:** • By anesthesiologist, critical care physician, or emergency department physician for cardiac arrest only
fentanyl	**Subcutaneous Continuous infusion:** • PCU and L/BMT units (T15A, T15B, T14H)
fluorescein	**IV direct:** • Eye Care Centre
furosemide	**IV direct:** • Nuclear Medicine technologists may administer under supervision of a physician • Other health care providers can administer as outlined in the PDTM monograph
gemcitabine	**Intravesical (bladder instillation):** • By physician only
haloperidol	**IV direct:** • Critical Care Areas, BTHA (cardiac monitored patients) • Other Nursing Units, physician only • FULL MONITORING required for administration
hydralazine	**IV direct:** • Critical Care Areas, Radiology, BTHA (cardiac monitored patients), NICU, SSCU, Cardiac Sciences (VGH L10A), UBCH HAU • Other Nursing Units, physician only • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored 15 and 30 minutes after each dose. **Continuous IV Infusion:** • Critical Care Areas, HAU (VGH and UBCH)
hyoscine BUTYLbromide	**IV direct:** • Medical Imaging technologists may administer under supervision of a physician
insulin	**Continuous IV Infusion - for high-dose insulin antidote for hemodynamic support in some overdoses** • Critical Care Areas

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
isoproterenol	**Continuous IV infusion:** • Critical Care Areas, VGH HAU • Surgical Day Care may initiate for stabilization of patients until transfer to an appropriate critical care area. • Concentration of 16 mcg/mL (4000 mcg in D5W 250 mL) only for use at Providence Health Care
ketamine	**Subcutaneous Injection:** • May be given on any nursing unit if prescribed by a Palliative Care Physician • Treatment resistant depression – ECT treatment area **Subcutaneous Continuous infusion:** • PCU **IM:** • Critical Care Areas if physician is present • Treatment resistant depression – ECT treatment area **IV direct:** • ICU, Emergency, PACU • UBCH HAU if physician is present at bedside **IV intermittent:** • Critical Care Areas for analgesia • Treatment resistant depression – ECT treatment area **Continuous IV Infusion:** • Critical Care Areas, VGH and UBCH HAU • Other Nursing Units: may be given on any nursing unit with a completed POPS order • PCU does not require a POPS consult • Concentration of 1 mg/mL (250 mg/250 mL D5W) only for use at Providence Health Care
labetalol	**IV direct:** • Critical Care Areas, Radiology, NICU, BTHA (cardiac monitored patients), SSCU, UBCH HAU • Other Nursing Units, physician only • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored 5, 10 and 15 minutes after each dose. **Continuous IV infusion:** • Critical Care Areas, VGH and UBCH HAU, NICU

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
lidocaine	**ECG Requirements:** • Patients in PCU require a baseline ECG prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 3 mg/kg/hour, or for IV intermittent neuropathic pain dosing • Post-operative and spine patients: A baseline ECG is required prior to initiation of therapy. Continuous ECG monitoring is not required for doses up to and including 2 mg/kg/hour for a duration of up to 72 hours. • All patients not meeting the above criteria require continuous ECG monitoring **Subcutaneous Continuous Infusion:** • PCU **IV direct:** • Critical Care Areas, Cardiac Sciences (VGH L10A). • Other Nursing Units, physician only • See above "ECG Requirements" section **Continuous IV infusion:** • Post-operative pain: No site restrictions at VA
metoprolol	**IV direct:** • Critical Care Areas, VGH HAU • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. The nurse may administer subsequent doses. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at the completion of the dose and again after 15 and 30 minutes. **IV intermittent:** • Critical Care Areas, VGH HAU • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. The nurse may administer subsequent doses. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of dose and again after 15 and 30 minutes.

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration

midazolam	Anesthesia, Endoscopy, Radiology, Critical Care Areas, Day Bed Unit, NICU, SSCU, Dental Clinic, ECT Treatment Area, In Vitro Fertilization Clinic, Eye Care Centre OR, Cardiac Sciences (VGH L10A)
	
	Subcutaneous Continuous Infusion:
	• May be given on any nursing unit if prescribed by a Palliative Care Physician
	Subcutaneous Injection:
	• Areas listed above, plus L/BMT
	• May be given on any nursing unit for palliative patients (no prescriber restrictions)
	IM:
	• Areas listed above
	• May be given on any nursing unit if prescribed by a Palliative Care Physician
	IV direct:
	• Areas listed above
	• HAU (VGH and UBCH) for comfort care only
	• May be given on any nursing unit if prescribed by a Palliative Care Physician
	• Monitoring as follows (Palliative patients exempt):
	  • A designated person (physician or nurse trained in basic life support) whose responsibility is to monitor the patient's vital signs and ventilation (refer to CPD Procedural sedation and Analgesia)
	  • Use of pulse oximeter and BP monitor
	  • Readily available oxygen, bag, and mask
	  • ECG monitoring is recommended, where possible, in patients on concomitant opioids.
	Continuous IV Infusion:
	• Areas listed above
	• HAU (VGH and UBCH) for comfort care only
	• May be given on any nursing unit if prescribed by a Palliative Care Physician
	• Monitoring as per IV direct (Palliative patients exempt)

milrinone	**Continuous IV Infusion:** • Critical Care Areas, VGH HAU, NICU • Surgical Day Care may initiate for stabilization of patients until transfer to an appropriate critical care area.
mitomycin	**Intravesical (bladder instillation):** • By physician only
naloxone	**Continuous IV infusion:** • Critical Care Areas, VGH HAU
neostigmine	**IV direct:** • Critical Care Areas, NICU, BTHA (cardiac monitored patients) • Other Nursing Units, physician only • FULL MONITORING required for administration

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
nitroglycerin	**IV direct:** • by Physician only **Continuous IV Infusion:** • Critical Care Areas, VGH HAU, NICU, Cardiac Sciences (VGH L10A)
nitroprusside	**Continuous IV Infusion:** • Critical Care Areas, VGH HAU, NICU
NORepinephrine	**Continuous IV Infusion:** • Critical Care Areas, VGH and UBCH HAU, NICU, SSCU • NICU may initiate for elevation of blood pressure for treatment of vasospasm • Surgical Day Care may initiate for stabilization of patients until transfer to an appropriate critical care area.
phentolamine	**IV direct:** • Critical Care Areas, VGH HAU • Other Nursing Units, physician only • FULL MONITORING required for administration **Continuous IV Infusion:** • Critical Care Areas, VGH HAU **Local Infiltration:** • by physician only
PHENYLephrine	**IV direct:** • Critical Care Areas • UBCH HAU if physician is present at bedside • Other Nursing Units, physician only • If ECG unavailable: ADVANCED MONITORING with blood pressure and heart rate at completion of dose, then Q5MIN x 3, then Q15 MIN until stable **Continuous IV Infusion:** • Critical Care Areas, VGH HAU • Surgical Day Care may initiate for stabilization of patients until transfer to an appropriate critical care area.
potassium acetate	**IV intermittent:** • Critical Care Areas, NICU, BTHA (cardiac monitored patients), SSCU: maximum 40 mmol/100 mL over 1 hour
POTASSIUM chloride	**IV intermittent:** • Critical Care Areas, NICU, BTHA (cardiac monitored patients), SSCU, UBCH HAU: maximum 40 mmol/100 mL over 1 hour
POTASSIUM phosphate	**IV intermittent:** • Critical Care Areas: for rate 15 mmol phosphate over 1 hour
pralidoxime	**All routes (IM, IV direct, IV intermittent, Continuous IV Infusion:** • Critical Care Areas

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
procainamide	**IV direct:** • Critical Care Areas, Cardiac Sciences (VGH L10A). • VGH HAU if physician is present. • Other Nursing Units, physician only • FULL MONITORING required for administration **IV intermittent:** • FULL MONITORING required for administration **Continuous IV Infusion:** • FULL MONITORING required for administration

proPOfol	Anesthesia and selected nursing units as listed below:
	
	IV direct:
	• Restricted to physician only; Exceptions:
	  • Emergency nurses may give for procedural sedation as long as an Emergency physician is at the bedside
	  • ICU nurses may give for procedural sedation and refractory agitation in intubated, mechanically ventilated patients
	Continuous IV Infusion:
	• Restricted to physician only; Exceptions:
	  • CSICU nurses may titrate IV infusion downwards after cardiac surgery
	  • ICU, PACU, CCU, Hyperbaric Unit and Emergency nurses may administer in intubated, mechanically ventilated patients for refractory agitation or to facilitate ventilation
	  • ICU, PACU, Emergency nurses may administer and titrate infusions
	  • Palliative Care Unit - nurses may administer and titrate infusions

proPRANolol	**IV direct:** • Critical Care Areas • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. The nurse may administer subsequent doses to a maximum of 2 mg in any four hour period. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of the dose and again after 15 and 30 minutes. **IV intermittent:** • Critical Care Areas • Other Nursing Units, physician must administer the initial dose and all changes in dosages and be present for the first 15 minutes after its completion. The nurse may administer subsequent doses to a maximum of 2 mg in any four hour period. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of the dose and again after 15 and 30 minutes. **Continuous IV Infusion:** • Critical Care Areas
REMIfentanil	**IV direct:** • By anesthesiologist only in OR, PACU, Lithotripsy, BTHA, Cardiac Cath Lab, ECT Treatment Area **Continuous IV Infusion:** • By anesthesiologist only in OR, PACU, Lithotripsy, BTHA, ECT Treatment Area

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
ROcuronium	**IV direct:** • Critical Care Areas **Continuous IV Infusion:** • Critical Care Areas
salbutamol	**Continuous IV infusion:** • Critical Care Areas
sincalide	**IV intermittent:** • Physician only or • In Medical Imaging, Nuclear Medicine technologists may administer under the supervision of a physician
sodium bicarbonate	**IV direct:** • Critical Care Areas, NICU, SSCU, BTHA (cardiac monitored patients), UBCH HAU • Other Nursing Units, physician only **IV intermittent:** • Critical Care Areas: for rates above 50 mmol/hr. Maximum rate 100 mmol/hr **Continuous IV infusion:** • Critical Care Areas: for rates above 50 mmol/hr. Maximum rate 100 mmol/hr
SODIUM phosphate	**IV intermittent:** • Critical Care Areas: for rate 15 mmol phosphate over 1 hour
succinylchonline	**IM:** • Critical Care Areas, Code Team **IV direct:** • Critical Care Areas, Code Team
SUfentanil	**Subcutaneous Injection:** • PCU
sugammadex	**IV direct:** • Anesthesia only in OR, Emergency, ICU, and Code Blue Team
tenecteplase	**IV direct:** • Emergency, ICU, CCU, Cardiac Cath Lab, NICU, UBCH Urgent Care
thyrotropin alfa	**IM:** • No restrictions at VA
vasopressin	**Continuous IV Infusion:** • ICU, VGH HAU, CSICU, CCU • UBCH HAU – for stabilization of patients until transfer to an appropriate critical care area • Organ Donor– restricted to ICU, Emergency, CCU

VGH/UBCH/GFS

Site-Specific Administration Restrictions

	Administration
verapamil	**IV direct:** • Critical Care Areas, Radiology, NICU, BTHA (cardiac monitored beds), SSCU • Cardiac Sciences (VGH L10A) may administer provided the physician has administered the first dose. • Other Nursing Units, physician only. The physician must be present for 15 minutes after completion of the dose. • If ECG monitoring is not practical, ADVANCED MONITORING with blood pressure and pulse rate monitored at completion of the dose and again Q5MIN x 15 minutes. **Continuous IV Infusion:** • Critical Care Areas, VGH HAU
verteporfin	**IV intermittent:** • Eye Care Centre
vitamin B12	**IM:** • Nuclear Medicine technologists may administer under supervision of a physician • Other health care providers can administer as outlined in the PDTM monograph

Critical Care Areas	
Cardiac Care Unit (CCU)	Emergency Department (ED)
Cardiac Cath Lab	Hyperbaric Unit
Cardiac Intervention Unit (CIU)	Intensive Care Unit (ICU)
Cardiac Surgery ICU (CSICU)	Operating Room (OR)
Electroconvulsive Therapy (ECT) Treatment Area	Post Anesthesia Care Unit (PACU)

Other Specialty Care Areas	
Burns Trauma High Acuity (BTHA)	Spinal Special Care Unit (SSCU)
High Acuity Unit (HAU)	Palliative Care Unit (PCU)
Neurosciences Intensive Care Unit (NICU)	