El Shatbi pediatrics Drugs Protocol

1) Pediatric doses
   - IV Administration
   - Storage conditions
   - Preparation
   - Monitoring Parameters

Prepared by clinical pharmacy team in

Alexandria university children's hospital (EL-Shatbi)

1. Dr. Heba Fikry.(Supervisor of pediatric internal medicine units)
2. Dr. Nouran Atef.
3. Dr. Reem Mohamed.
4. Dr. Esraa Salem.
5. Dr. Amira Mostafa.
6. Dr. Esraa Adel.
7. Dr. Alaa Hamdy.
8. Dr. Passant Sameh (NICU department)

Revised by

Dr. Heba sabry

Supervisor of clinical pharmacies in Elshatbi pediatric hospital.

Note: The drug stability may be changed according to the manufacturer

Analgesics

1. **Acetaminophen**
2. **Opioid narcotics**
   - Alfentanil
   - Nalbuphine
3. **NSAID**
   - ketorolac

Antidotes

1. **Acetylcysteine**
2. **Flumazenil**

Anti-infectives

Antibacterial

1. Amikacin
2. Amoxicillin& Clavulanate
3. Ampicillin &Sulbactam
4. Cefotaxime
5. Ceftriaxone
6. Ceftazidime
7. Ceftazidime &Avibactam
8. Cefepime
9. Cefoperazone &Sulbactam
10. Ceftaroline fosamil
11. Ciprofloxacin
12. Colistimethate
13. Clindamycin
14. Ertapenem
15. Gentamicin
16. Imipenem & Cilastin
17. Linezolid
18. Levofloxacin
19. Meropenem
20. Metronidazole
21. Piperacillin&Tazobactam
22. Teicoplanin
23. Tigecycline
24. Vancomycin

Antifungals

1. Amphotericin b
2. Amphotericin b liposomal
3. Anidulafungin
4. Caspofungin
5. Fluconazole
6. Voriconazole

Antiviral agents

1. Acyclovir
2. Ganciclovir

Antineoplastic agents

Alkylating agents

1. Cyclophosphamide.

Cardiovascular agents

Antiarrhythmic agents

1. Adenosin
2. Amiodarone

Anticholinergic chronotropic agents

1. Atropine

Catecholamines, Vasopressors

1. Epinephrine
2. Norepinephrine

Inotropic agents

1. Dopamine
2. Dobutamine
3. Digoxin
4. Milrinone

Non-cardioselective beta blockers

1. Propranolol

Vasodilators

1. Alprostadil
2. Nitroglycerin(antianginal)

Central nervous system agents

Anticonvulsants

1. Diazepam
2. Levetiracetam
3. Midazolam
4. Phenobarbital
5. Phenytoin

CNS stimulants

1. Caffeine

General anesthetics

1. Ketamine
2. Propofol

Chelating agents

1. Deferoxamine

Coagulation modifiers

Anticoagulant reversal agents

1. Phytonadione

Anticoagulants

1. Enoxaparin
2. LMW Heparin

Miscellaneous coagulation modifiers

1. Ethamesylate
2. Tranexamic acid

Antihemophilic factor

1. Antihemophilic factor/von willebrand factor
2. Factor XIII
3. Coagulation factor ix

Colony stimulating factors

1. Filgrastim

Electrolytes and minerals

1. Calcium gluconate
2. Magnesium sulfate
3. Potassium chloride
4. Sodium bicarbonate

Glucocorticoids

1. Dexamethasone

2. Hydrocortisone
3. Methylprednisolone
4. Prednisone
5. Somatostatin
6. Octreotide

Diuretics

1. Furosemide

Gastrointestinal agents

Antiemetic

1. Ondansetron

Proton Pump Inhibitors

1. Esomeprazole
2. Pantoprazole

Hepatic drugs

1. l-ornithine l-aspartare50%

Immunological agents

1. Tocilizumab

Plasma expanders

1. Albumin human

Metabolic agents

1. Regular Insulin

Respiratory agents

Bronchodilators

Adrenergic bronchodilators

1. Albuterol

Anticholinergic bronchodilators

1. Ipratropium

Inhaled Corticosteroids

1. Budesonide

Drug Name	Dose	Maximum dose	Administration	Reconstitution& Dilution	Storage &stability	Monitoring parameters
Analgesic						
Acetaminophin **Perfalgan® IV** **1gm/ 100ml.** **Paramol ®syrup** **120mg/5ml** **Paramol ® Drops** **100mg/ml**	**Pain or fever:** **Oral** 10 to 15 mg/kg/dose every 4- 6 hrs as needed; do not exceed 5 doses in 24 hours. **IV** **Infants and Children <2 years:** 7.5 to 15 mg/kg/dose every 6 hr. **Children ≥2 years, Adolescents:** **<50 kg:** 15 mg/kg/dose every 6 hrs.(75mg/kg/day). Up to 750 mg/kg/dose every 6 hrs. **≥50 kg:** 15 mg/kg/dose every 6 hrs.(75mg/kg/day) Up to 1000 mg/kg/dose every 6 hrs.	**Maximum daily dose:** **Oral** 75 mg/kg/day not to exceed 4,000 mg/day. **IV** **Infants and Children <2 years:** 60 mg/kg/day. **Children ≥2 years, Adolescents:** **<50 kg:** Up to 750 mg/dose; not to exceed 3,750 mg/day. **>50 kg:** Up to 1,000 mg/dose; not to exceed 4,000 mg/day.	**Oral** Administer with food. shake drops and suspension well before use. **IV infusion only.** Administer undiluted or diluted over 15 -30 minutes.	**Parenteral:** Injectable solution may be administered directly from the vial without further dilution.	Store at 20°C to 25°C . Some products must be protected from light. Compatible in D5W , NS. **- Use within 6 hours of opening vial or transferring to another container.** **- Discard any unused portion; single-use vials only.**	**Monitor** -Liver enzymes in patients with prolonged use or in populations with reduced hepatic function . -Serum concentrations when acute overdose is suspected or with long-term use in patients with hepatic disease. **Warning** **Risk of medication errors and hepatotoxicity (injection).**

Note: The drug stability may be changed according to the manufacturer

Opioid narcotics

Fentanyl 100mcg/2ml. **Fentanyl ®**	**Acute Pain & sever:** **Intermittent IV doses:** <50 kg: **IV:**0.5 to 1 mcg/kg/dose; repeat every 1- 2 hour; every 30 min if necessary. ≥50 kg:**IV:** 25 to 50 mcg; repeat every 1- 2 hour, or every 30 min if necessary. **Continuous IV infusion:** <50 kg: 0.5 to 2.5 mcg/kg/**hour**; initiate at the lower end and titrate to effect; an initial rate of 1mcg/kg/**hour** in the ICU. ≤50kg: 25 to 100 mcg/**hour**; initiate at the lower end of dosage range and titrate to effect; an initial dose of 50 mcg/**hour** in the ICU. **Pain & sedation for critically ill in ICU:** Infants & children: **Initial** 1-2mcg/kg, then 1-3 mcg/kg/hour, titrate dose. Adolescents: ≤50kg: **Initial** 0.5-2mcg/kg, then	**Usual maximum dose**: 50 mcg/dose. 100 mcg/dose may be considered in critically ill patients in the ICU. **Some patients may require higher rates.** **5 mcg/kg/hr.** **Renal dose adjustments:** **For IV dose** GFR 10-50 (ml/min/m2): 75% of the usual dose. GFR<10, Hemodialysis, Peritoneal dialysis: 50% of the usual dose. **Hepatic & renal adjustments may be required in transdermal patch.**	***Slow IV push*** over 3-5min. if↑ bolus dose (>5mcg/kg), over 5-10min, ***Continuous IV infusion.*** Note: Avoid rapid IV (i.e., within <2min), to ↓risk of chest rigidity	**Dilute in** NS, D5W to 10 or 50mcg/ml.	Store at 15-30°C. Protect from light. **Diluted solution** 24 hours at 15-30°C. or refrigerated protected from light.	**Monitor** -Respiratory rate. -Heart rate, BP. -O2 saturation, chest wall rigidity (if IV), -Pain relief, level of sedation, -Monitor bowel sounds, abdominal distension, constipation. -Urinary retention. -Signs of misuse. Hypoadrenalism signs(not common). -Withdrawal symptoms, suicidal ideation -If patient is on CYP3A4 inducers/inhibitors! May significantly affect levels of fentanyl

	0.5-2mcg/kg/hour. >50kg: **Initial** 25-100 mcg/dose, then 25-200mcg/hour. **Rapid sequence intubation: IV:** 1mcg/kg/dose (may repeat every 3min. **Anesthesia: Induction & maintenance:** 2-12 yrs.: 2-10mcg/kg/dose, Then **continuous IV:** 2-5mcg/kg/hour. Adolescents: 0.5-50 mcg/kg/dose. **Procedural pain/sedation: IV:** Infant & children: 1-2mcg/kg/dose 3 minutes prior & may repeat ½ dose every 3-5 minutes. Adolescents: 0.5-1mcg/kg/dose, May repeat full dose in 1-2 min.	Mild to moderate impairment: Initial: Reduce dose by 50%.				
Nalbuphine 20mg/ml **Nalufin®** **Nalbuphine®**	**For acute, moderate to severe pain:** **IV, IM, SC:** 0.05-0.2 mg/kg/dose every 3-6hrs as needed. a single dose of 0.3 mg/kg/dose has been used perioperatively.	**Max single dose:** 20mg/dose **Max daily dose:** 160mg/day	**IV:** Administer undiluted over 2 to 3 min. **IM, SC:** Administer undiluted.	**Dilute in** NS, D5W **Final concentration** 0.1 mg/ml.	Store at 15 to 30˚C. Protect from light.	**Monitor** -Blood pressure. -Respiratory and mental status. **High risk medication**

Non-Steroidal anti-inflammatory drugs

Ketorolac **15mg/ml** **Ketolac®**	**Pain management** **Infants and Children** **<2 years: IV:** 0.25- 0.5 mg/kg/dose every 6 to 8 hours. **Children ≥2 years and Adolescents ≤16 years:** IM, IV: 0.5 mg/kg/dose every 6 to 8 hours. **Adolescents ≥17 years:** **<50 kg:** **IM:** 30 mg as a single dose or 15 mg every 6 hours. **IV:** 15 mg as a single dose or 15 mg every 6 hours. **≥50 kg:** **IM:** 60 mg as a single dose or 30 mg every 6 hours. **IV:** 30 mg as a single dose or 30 mg every 6 hours.	Maximum dose: 15 mg/dose. Maximum dose: 30 mg/dose. Maximum daily dose: 60 mg/**day**. Maximum daily dose: 120 mg/**day**.	**IM:** Administer slowly and deeply into muscle. **IV bolus:** Undiluted over at least 15 seconds. In children, ketorolac has been infused over 1 to 5 minute s.	**Dilute in** D5W, NS, LR. 0.6mg/ml	Store at 20°-25°C. Protect from light. **Diluted solution** 48 hours. **Note** The injection is clear and has a slight yellow color. Precipitation may occur at relatively low pH values.	**Monitor** -Response -Inflammation. -Observe for weight gain, edema. -Renal function (serum creatinine, BUN, urine output). -CBC and platelets, liver function. -Chemistry profile. blood pressure. -Observe for bleeding, bruising; evaluate GI effects. mental confusion, disorientation. -Signs and symptoms of hypersensitivity.

Antidotes

Acetylcysteine **300mg/3ml** **Fluimucil®**	**Acetaminophen poisoning:** ***Three-bag method*:** Infants, Children, and Adolescents: 21-hour regimen: **IV**: **Loading:** 150 mg/kg over 60 min. **Second dose:** 50 mg/kg over 4 hours. **Third dose:** 100 mg/kg over 16 hrs. ***Two-bag method:*** Children ≥12 years and Adolescents: 20-hour regimen: **IV: First dose:** 200 mg/kg over 4 hours. **Second dose:** 100 mg/kg over 16 hrs. **Respiratory conditions, adjuvant:** **Nebulized inhalation 10%sol. (undiluted):** Infants: 2-4 ml 3 -4 times daily. Children: 6-10 mL 3-4 times daily. Adolescents: 6-10 mL 3- 4 times daily. **Diagnostic bronchogram** **Nebulization or endotracheal:** 2- 4 mL of 10% solution administered 2 to 3 times prior to procedure.	**Loading dose:** 15 **g**/dose. **Second dose:** 5 **g**/dose. **Third dose:** 10 **g**/dose. **Note:** Patients should receive an aerosolized bronchodilator 10-15 minutes prior to acetylcysteine.	**IV: Acetadote:** Three-bag method(3 doses): Over 60 minutes. Over 4 hours. Over 16 hours. Two-bag method(2 dose): Over 4 hours. Over 16 hours. **Inhalation solution:** May be administered by nebulization either undiluted (both 10% and 20%) or diluted in NS.	**Dilute in** D5W,$^{1}/_{2}$NS, SWFI. **Neonates <5 kg:** Three-bag method(3 doses): 100 mg/ml,100 mg/ml, 50 mg/ml. **≥5 kg:** 5 to 20 kg: 3 ml/kg, 7 ml/kg, 14 ml/kg. 21 to 40 kg: 100 ml, 250 ml, 500 ml. 41 to 100 kg: 200 ml, 500 ml, 1,000 ml. In patients requiring fluid restriction, decrease diluent volume by 50%. Two-bag method 500 ml NS. 1,000 ml NS. **Solution for inhalation:** The 20% solution may be diluted with sodium chloride or sterile water; the 10% solution may be used undiluted.	Store at 20°- 25°C. **Diluted solution** 24 hours at room temperature. **Note** A color change may occur in opened vials (light pink or purple) and does not affect the safety or efficacy. Discard unused portion. -Undiluted injection, solution (Acetadote) is hyperosmolar (2,600 mOsmol/L); when the diluent volume is decreased for patients <40 kg or requiring fluid restriction, the osmolarity of the solution may remain higher than desirable for intravenous infusion. To ensure tolerance of the infusion, osmolarity should be adjusted.	**Monitor** **Acetaminophen overdose:** -Development of anaphylaxis. -Serum acetaminophen concentration -AST, ALT, bilirubin, PT, INR, serum creatinine, BUN, serum glucose, hemoglobin, hematocrit, and electrolytes. -Assess patients for nausea, vomiting, and skin rash following oral administration.

Flumazenil **0.5mg/5ml** **Anexate®** **https://atlanticcanadapoisoncentre.ca/flumazenil-pediatric.html**	**Benzodiazepine intoxication/overdose** **-IV:** Initial dose: 0.01 mg/kg May repeat every minute if needed. -**Continuous IV infusion:** 0.005 to 0.01 mg/kg/hour **Benzodiazepine reversal, procedural sedation** 0.01 mg/kg; over 15 seconds; if needed, may repeat same dose after 45 seconds, and then every minute to a maximum cumulative dose of 0.05 mg/kg or 1 mg total. ***If resedation occurs:** Consider IV infusion of 0.1 mg -1 mg/hour ***Hepatic encephalopathy** 0.01 mg/kg/ iv bolus followed by a continuous infusion (0.01 mg/kg/h).	-**Max initial dose:** 0.2 mg/dose. -Maximum cumulative dose of 1 mg total. Maximum dose: 0.2 mg/dose.	**- IV use only** Rapid IV injection over 15- 30 seconds. **Maximum rate** 0.2 mg/minute. -Administer through a freely running IV infusion into larger vein (to decrease chance of pain, phlebitis).	**Dilute in** D5W, LR, or NS. **Final concentration** 0.04 mg/ml. -Add 1 mg (10 mL of 0.1 mg/mL solution) to 15 mL diluent.	Store at 20°-25°C. **Diluted solution** 24 hours after dilution. **Note** Discard any unused solution after 24 hours.	**Monitor** - Level of consciousness and resedation. -Blood pressure, heart rate, respiratory rate, continuous pulse oximetry. -Monitor for resedation for 1 to 2 hours after reversal of sedation in patients who receive benzodiazepine sedation.

Anti-Infective drugs

Anti-Bacterial drugs

Amikacin **500mg/2ml** **Amikin®**	15 to 30 mg/kg/**dose** every 24 hours. **Or** 15 to 22.5 mg/kg/**day** divided every 8 to 12 hours. **Cystic fibrosis:** 30 to 35 mg/kg/**dose** every 24 hours. **Or** 10 mg/kg/**dose** every 8 hours. **CNS infection:** **IV:** 20 to 30 mg/kg/**day**/ 8 hours. **IT:** 5 to 50 mg/**day**. **Endocarditis:** 15 mg/kg/**day** divided every 8 to 12 hours.	1,500 mg/**day**	**-IM (undiluted)** **-IT** **-Intermittent IV infusion:** Over 30 to 60 minutes. (20 minutes in neonates). **-Slow IV bolus:** Over 1 to 5 minutes. **Note** Avoid infusing concomitantly with penicillin or cephalosporins.	**Dilute:** In: NS, D5W Final concentration **0.25 to 5 mg/ml.** (500mg in ≥100ml) **In Fluid restriction** **10 mg/ml.** (500mg in 50ml)	Store at 20°- 25°C. **Diluted solution:** 24 hours at 25°C. 60 days at 4°C.	**Monitor** -Renal function test. -Urine output. -Hearing test with prolonged therapy (Ototoxicity). -Neurotoxicity. -Vital signs. -Severe or bloody diarrhea.
Amoxicillin& Clavulanate **1.2gm** (1000mg+200mg) **Augmentin®**	**Based on amoxicillin dose.** 5:1 formulation. Infants <3 months or weighing <4 kg: 25 mg /kg/dose every 12 hours. Infants ≥3 months weighing ≥4 kg, Children, and Adolescents: 25 mg /kg/dose every 8 hours.	1,000 mg amoxicillin /**Dose.** Some experts recommend not exceeding 10 mg clavulanate /kg/day or 125 mg clavulanate /dose	**-Slow IV injection** Over 3-4 minutes. **-Intermittent infusion** Over 30-40 minutes.	**Reconstitute** 1-2gm vial with 20 mL of SWFI. **Dilute** **In NS** **Final concentration of 10 to 20 mg amoxicillin/mL** (1-2gm in 100 mL for larger patients).	Store at 20°- 25°C. **Reconstituted solution**: 15 minutes at 15-30°C. **Diluted solution:** 1 hour at 25°C. 4 hours at 4°C.	**Monitor** - Signs of hypersensitivity reaction. -Renal functions. -Hepatic functions. -CBC.

Ampicillin &Sulbactam **750mg, 1.5 gm** (500mg+250mg) (1gm+ 500mg) **Unasyn®** **Sulbin®**	**Based on ampicillin dose.** **Mild to moderate infection:** 100 to 200 mg ampicillin/kg/**day** divided every 6 hours . **Severe infection:** 200 to 400 mg ampicillin/kg/**day** divided every 6 hours.	2,000 mg ampicillin /**Dose.**	**-IM** **-Slow IV injection:** Over 10 to 15 minutes. **-Intermittent IV infusion** Over 15 to 30 minutes.	**Reconstitute** 1.5 g vial with 3.2 mL SWFI (375mg/ml total unasyn) **(250mg/mL ampicillin)** **Dilute** **Final concentration** (3-45mg/ml total unasyn) **(2 to 30 mg/mL of ampicillin).**	Store at 20°- 25°C. **Reconstituted solution**: Used within1 hr. **Diluted solution:** **Concentration 30 (20-10) mg/ml.** ***In NS** 24 hours at 25°C. 3 days at 4°C. ***In D5W** 2 hours at 25°C. 4 hours at 4°C. **Note** The stability is better in NS than in D5W. ***Refer to manufacturer's labeling for specific storage instructions after reconstitution and dilution.**	**Monitor** - Signs of hypersensitivity reaction. -Renal functions. -Hepatic functions. -CBC.
Cefotaxime **500mg, 1gm** **Cefotax®**	150 to 180 mg/kg/**day** every 6 to 8 hours. **Endocarditis:** 200 mg/kg/**day** every 6 hours. **Meningitis:** 225 to 300 mg/kg/**day** every 6 to 8 hours.	2,000 mg/**dose** 12 **g/day**	**-IM.** **-Slow IV bolus:** Over 3 to 5 minutes. **-Intermittent IV infusion:** Over15 to 30 minutes. **Note** Avoid rapid IV Push.	**Reconstitute** 1gm vial with 10 mL SWFI. **max. conc.** (200 mg/ml). **Dilute** In NS, D5W, LR. **Final concentration** (10 to 40 mg/mL) (1gm in 50-100ml diluent).	Store below 30°C. Protect from light. **Reconstituted solution**: 12- 24 h at 25°C. 7-10 days at 4°C. **Diluted solution:** 24 hours at 25°C. 5 days at 4°C.	**Monitor** -Signs of hypersensitivity reaction. -Severe or bloody diarrhea. - CBC with differential (especially with long courses). -Renal function tests.

Ceftriaxone **500mg, 1gm** **Rocephin®**	50 to 75 mg/kg/**day** every 12 to 24 hours. **Endocarditis:** 50 mg/kg/dose every 12 hours. **Or** 80 mg/kg/dose every 24 hours. **Meningitis:** 80 to 100 mg/kg/**day** every 12 to 24 h.	2,000 mg/**day** 4,000 mg/**day,** divided into 2 doses.	**-IM.** **-Slow IV bolus** Over 2-4 minutes. **-Intermittent IV infusion:** Over 15- 30 minutes. (60minutes in neonates). **Note** Avoid rapid IV Push.	**Reconstitute** 1gm vial with 10 mL SWFI. **(100 mg/mL).** **Dilute** In D5W, D10W, NS. **Final concentration** (10 to 40 mg/ml) (1gm in 50-100ml diluent). **Note** **Don't co-administrate with calcium-containing solutions.**	Store below 30°C. Protect from light. **Reconstituted solution**: 2 days at 25°C. 10 days at 4°C. **Diluted solution:** 2 days at 25°C. 10 days at 4°C.	**Monitor** -Signs of hypersensitivity reaction. -Severe or bloody diarrhea. -Prothrombin time/INR. -Flush IVs well if administering calcium and ceftriaxone sequentially.
Ceftazidime **500mg, 1gm.** **Fortum®**	90 to 150 mg/kg/**day** every 8 hours. **Cystic fibrosis:** 200- 400 mg/kg/**day** every 8 hours. Continuous infusion method 100 to 200 mg/kg/**day** over 24 hours (60mg/kg loading). **Endocarditis:** 100 to 150 mg/kg/**day** every 8 hours. **Meningitis:** 150 to 200 mg/kg/**day** every 8 hours.	6,000mg/**day.** 12 **g**/**day**. 4,000 mg/**day** 6,000 mg/**day**	**-IM** **-IV slow bolus** Over 3- 5 minutes. **-Intermittent IV infusion** Over 15- 30 minutes. May be (2-4 h.) **-Continuous IV infusion:** Infants ≥6 months, Children, and Adolescents Loading in 20ml over 5min. then over 24h.	**Reconstitute** 1gm vial with 10 mL SWFI. **(100 mg/ml).** **Dilute** In D5W, NS. **Final concentration** ≤40 mg/ml. (1gm in 50 ml diluent). **Note** **For continuous infusion avoid dilution with D5W**.	Store below 30°C. Protect from light. ***Reconstituted solution**: 24 h at 25°C. 7 days at 4°C. ***Diluted solution:** 12-24 h at 25°C. 5-7 days at 4°C. ***According to the manufacturer.**	**Monitor** -Renal function. - Signs of hypersensitivity reaction. -Severe or bloody diarrhea. -Signs of neurotoxicity.

Note: The drug stability may be changed according to the manufacturer

Ceftazidime &Avibactam **2.5gm (2gm+500mg)** **zavicefta®**	**Based on ceftazidime dose.** **-Pneumonia:** **-Urinary tract infection:** **-Intra-abdominal infection:** Infant ≥3 to <6 months: 40 mg/kg/**dose** every 8 hours. ≥6 months, to <18 years: 50 mg/kg/**dose** every 8 hours. Adolescents ≥18 years: 2gm/8 hours.	2000mg/**dose**	**Intermittent IV infusion** Over 2 hours.	**Reconstitute** 2.5 g vial with 10 mL of NS, D5W, SWFI, LR. **(167 mg Ceftazidime/ml)** **Dilute** In NS, D5W. **Final ceftazidime concentration 8 to 40 mg/ml.** (2.5gm in > 50ml) **Note:** Solution ranges in color from **clear to light yellow.**	Store at 15-30°C. Protect from light. **Reconstituted solution:** Used within 30 minutes. **Diluted solution:** 12 hours at 25°C. 24 hours at 2-8°C.	**Monitor** -Renal function. -Signs of hypersensitivity reaction. - Severe or bloody diarrhea. - Change in neurological activity.
Cefepime **1gm, 2gm** **Maxipim®**	50 mg/kg/**dose** every 12 hours. **Pseudomonas spp. infections** (suspected or proven): 50 mg/kg/**dose** every 8 hours. **Febrile neutropenia** 50 mg/kg/**dose** every 8 hours.	2000mg/**dose**	**-IM** **-IV push:** Over 3-5 minutes. **-Intermittent IV infusion** Over 30 minutes. **-Extended IV infusion:** Over 3- 4hours.	**Reconstitute** 1-2gm vials with 10 mL SWFI, D5W, NS. **(100-160 mg/ml).** **Dilute** In D5W, NS. **Final concentration ≤40 mg/ml** in (1gm in ≥ 25ml)	Store below 30°C. Protect from light. **Reconstituted solution**: 24 h at 25°C. 7 days from 2-8°C. **Diluted solution:** 12h at 25°C.	**Monitor** -Renal function. -Signs of hypersensitivity reaction. -Severe or bloody diarrhea

Cefoperazone &Sulbactam **1.5gm, 3gm** (1gm+500mg) (2gm+1gm) **Sulperazon®**	**Based on cefoperazone dose.** 40-80 mg/kg/**day** every 6-12h. **In serious or refractory infections**: 160 mg/kg/**day** every 6-12hours. **Note** For neonates the drug should be given every 12 hours.	Maximum daily dosage of **sulbactam** in pediatrics should not exceed. 80mg/kg/**day.**	**-IM** **-IV push:** Over 3-5 minutes. **-Intermittent IV infusion** Over 15-60 minutes in 20ml diluent. .	**Reconstitute** 1.5gm vial: 3.2ml 3gm vial : 6.2 ml SWFI, D5W, NS **Maximum concentration** (250+125 mg/ml) **Dilute** In D5W, NS. **Concentrations ranging from** 10 to 250 mg/ml of diluent.(**≤ 100ml)**	Store below 25°C. Protect from light. **Reconstituted solution** 24 hours at 25°C. 7 days at 2-8°C.	**Monitor** -Signs of hypersensitivity reaction. - CBC, Liver function. - Coagulation profile. -Severe or bloody diarrhea.
Ceftaroline fosamil **400mg, 600mg** **Zinoforo®**	**For pneumonia:** ≥2 months and< 2 years: 8 mg/kg/**dose**/8hours. ≥2 years: **≤33 kg:** 12 mg/kg/**dose**/8hours. **≥33kg:** 400mg/8 hours, **or** 600mg/12 hours. Infants <2 month (in skin infection) 6 mg/kg/**dose** every 8hr. **Cystic fibrosis (CF) MRSA**: Children ≥6 years and Adolescents**:** 15 mg/kg/**dose** every 8 hours.	600mg/**dose** for children ≥6 years in **cystic fibrosis.**	**-IV infusion:** ≤2 months: Over 30-60 min. ≥2 months: Over 5- 60 min. **Note** IV infusion over 120 minutes in complicated community-acquired pneumonia and high doses.	**Reconstitute:** 400 mg or 600 mg with 20 ml SWFI, NS, D5W. **(20-30mg/ml)** **Dilute:** In NS, D5W. **Final concentration.** **(≤12 mg/ml.)** (400mg in ≥ 33ml diluent) (600mg in ≥ 50ml diluent)	Store at 25°C. **Diluted solution:** 6 hours at 25°C. 24 hours at 2-8°C.	**Monitor** -Signs of hypersensitivity reaction. -Culture based prior to the first dose. -Renal function. -CBC (base line and on prolonged use). -Severe or bloody diarrhea.

Note: The drug stability may be changed according to the manufacturer

Ciprofloxacin **200mg/100ml** **200mg/20ml** **Ciprofloxacin®** **Cipro®**	10 mg/kg/**dose** every 8 to 12 hours. **-Intra-abdominal infection:** **-Endocarditis:** 10-15 mg/kg/**dose** every 12 hours. **-Pneumonia** **-Meningitis:** 15 mg/kg/**dose** every 12 hours.	400 mg/**dose**	**Slow IV infusion** Over 60 minutes. **Note** Administration into a large vein (reduces risk of venous irritation)	**Dilute** In NS, D5W, SWFI, D10W. **Final concentration** of 0.5 to 2 mg/ml. (200mg ≥100 ml diluent). **Note** Vials of 200mg/100ml administer undiluted.	Store at 5-25°C. Protect from light. **Diluted solutions** 14 days at 5-25°C.	**Monitor** - Signs of hypersensitivity reaction. -CBC during prolonged therapy. -Renal functions. -Hepatic functions. -Signs of tendinopathy, peripheral neuropathy, disordered glucose regulation.
Colistimethate **1million IU** **Colistin ®** **Colo-mycin®** **1mg CBA= 30.000-unit CMS.**	**Based on CBA** 2.5 to 5 mg CBA/kg/**day** divided every 6 to 12 hours. **Cystic fibrosis:** **IV:** ≥5 years 3 to 5 mg CBA/kg/**day** divided every 8 hours. **Systemic infections (eg, bacteremia, pneumonia)** Loading dose: 2.5 to 5 mg CBA/kg Followed by 5 mg CBA/kg/**day** divided every 8 – 12hr. **Inhaled Nebulization** ≥5 years 75 -150 mg CBA /12h. Infants: 4mg/kg/dose/12hours. (maximum75mg/dose)	8mg CBA/kg /**day.** **Cystic fibrosis:** 100mg CBA/**dose** **Systemic infections (bacteremia, pneumonia):** Loading dose 300 mg CBA/**dose.** Maintenance dose. 180mg CBA/ **dose.**	**-IM.** **-IV push:** Over 3 to 5 - minutes. **Intermittent IV infusion:** Over 20- 60 minutes. **Neonate** Over 30 minutes. **-Inhalation:** **Note:** Use of a bronchodilator (albuterol) within 15 minutes prior to administration by **Inhalation.**	**Reconstitute:** The vial with 2 mL of SWFI. Avoid frothing. **Dilute:** In: D5NS, D5W, NS. **Inhalation** Reconstitute vial with 2 mL SWFI, then further dilute correct volume for patient dose in 3 mL preservative-free NS.	Store at 20- 25°C. **Reconstituted Solutions:** 7 Days at 25°C. 7 Days at 2- 8°C. **Diluted solutions:** 24 hours.	**Monitor** -Renal function test. -Serum electrolytes. -Signs of neurotoxicity. -Signs of bronchospasms.

Clindamycin **300mg/2ml** **600mg/4ml** **Dalacin C®** **Clindacin®** **Alfaclindamycin®**	20 to 40 mg/kg/**day** divided every 6 to 8 hours. **Necrotizing soft tissue infections:** 10 to 13 mg/kg/**dose** every 8 hours.	2,700 mg/**day** 2,700 mg/**day**	**-IM** Max 600 mg in a single injection. **-Intermittent IV infusion:** Over 10-60 minutes **Maximum rate:** 30 mg/minute.	**Dilute** In D5W, NS **Final concentration** of ≤18 mg/ml. (300mg in≥ 15ml). **Note:** **Rapid IV** administration: hypotension or cardiopulmonary arrest.	Store at 25°C. **Reconstituted solution:** Discard any unused portion of vial after 24 hours. **Diluted solution:** 16 days at 25°C. 32 days at 2-8°C.	**Monitor** - CBC. -Hepatic function tests periodically. -Renal function -Observe changes in bowel frequency - Use with caution in patients with a history of GI disease, particularly colitis.
Ertapenem **1gm** **Invanz®**	Infant & Children: 15mg/kg/**dose** twice daily. Adolescent: 1000 mg once	**For children:** 500mg/**dose**	**-IM** **-Intermittent IV infusion:** Over 30 minutes.	**Reconstitute:** 1g vial with 10 ml SWFI. (100mg/ml) **Dilute:** In NS **Final concentration** ≤20mg/ml (1gm in ≥ 50ml) **Note:** **Don't D dilute in dextrose.**	Store below 25°C. **Reconstituted solution:** 6 hours at 25°C. 24hours at 5°C. **Note:** Used within 4 hr. after removal from refrigeration.	**Monitor on prolonged therapy.** -Renal function test. -Liver function test. -CBC -Severe or bloody diarrhea -Neurological assessment.

Gentamicin **80mg/2ml** **Garamycin®**	2 to 2.5 mg/kg/**dose** every 8 hours. **Or** 5 to 7.5 mg/kg/**dose**/ 24 hours. **CNS infection:** 7.5mg/kg/**day** divided every 8 hours. **Cystic fibrosis, pulmonary infection:** 3.3mg/kg/**dose**/ 8 hrs. **Or**10 to 12 mg/kg/dose/24 hours. **Endocarditis:** Gram-positive bacteria: Children and Adolescents: IV: 3 to 6 mg/kg/**day**/8hours. Gram-negative bacteria: 7.5mg/kg/**day**/8hours.	12 to 20 mg/kg/**dose** every 24 hours in case of **cystic fibrosis.**	**-IM**:(Undiluted). **-Intermittent IV infusion** Over 30 to 60 minutes. High doses 60 to 120 minutes. **Note:** Avoid infusing concomitantly with penicillin's or cephalosporins.	**Dilution:** In NS or D5W **Final concentration:** 1 and 10 mg/ml. (80mg in 8-80ml diluent) **Note:** Dilution of 50-200ml is recommended.	Store at 20- 25°C. **Diluted solutions:** 48 hours at 5-25°C.	**Monitor** -Renal function test. -Urine output. -Hearing test with prolonged therapy (Ototoxicity). -Neurotoxicity. -Vital signs. -Severe or bloody diarrhea. -CBC with differential. -Serum electrolytes.
Imipenem & Cilastin **500mg+500mg** **Tienam®**	**Based on Imipenem** 60-100 mg/kg/**day** divided every 6hr.	4000mg/**day**	**-Intermittent IV infusion:** **Dose≤500 mg:** Over 20-30 minutes. **Doses≥500 mg**: over 40-60 minutes. **Note** *If nausea and/or vomiting occur during administration, decrease the rate of IV infusion.	**Reconstitute:** With 10ml NS, D5W **Note:** Don't reconstitute with SWFI. **Dilute:** In NS, D5W **Final concentration.** ≤ 5mg/ml. (500mg in 100ml) (1 gm in 250ml)	Store at 25°C. **Reconstituted solution:** 4 hours at 25°C. 24 hours at 5℃. **Diluted solution:** 3 hours at 25°C. **Note:** Brown in color solution should be discarded	**Monitor** -Signs of hypersensitivity reaction at first dose. -Renal function test. -Liver function test. -CBC -Severe or bloody diarrhea. - CNS adverse events (Seizures).

Linezolid **200mg/100 ml** **600mg/300 ml** (2mg/ml) **Averozolid®** **Linezomentin**	Infants and Children <12 years: 10 mg/kg/**dose** every 8 hours. Children ≥12 years and Adolescents: 600 mg every 12 hours. **Meningitis:** Infants and Children <12 years: 10 mg/kg/**dose** every 8 hours. Children ≥12 years and Adolescents: 10mg/kg/**dose** every 12 hours.	600 mg/**dose.** 600 mg/**dose.** 600 mg/**dose.**	**-Intermittent IV infusion:** Over 30 to 120 minutes. **Note** When the same IV line is used for other medications, flush line with D5W, NS, or LR before and after infusing linezolid.	Administer undiluted. **Note** The yellow color of the injection may intensify over time **without** affecting potency.	Store at 25°C. Protect from light. **Should be used immediately after opening.**	**Monitor** -Weekly CBC in patients (causes myelosuppression, thrombocytopenia) -Weekly liver function tests. -Peripheral sensory and visual function with extended therapy due to neuropathy. -Periodic serum bicarbonate & lactate with extended use. - Diarrhea and hyponatremia.
Levofloxacin **500mg/100ml** **500mg/20ml** **Tavanic®** **Levoxin®**	6 months to <5 years: 8 to 10 mg/kg/**dose** every 12 hours. ≥5 years: 10 mg/kg/**dose** once daily.	750 mg/**day.**	**Slow IV infusion** 250 to 500 mg Over 60 minutes. 750 mg Over 90 minutes. **Note** -Too rapid infusion can lead to hypotension. -Maintain adequate hydration.	**Dilute** In D5W, NS **Final concentration** ≤ 5 mg/mL. Avoid administration through an intravenous line with a solution containing multivalent cations (eg, magnesium, calcium).	Protect from light. **Diluted solution** 72 hours at 25°C. 14 days at 5℃.	**Monitor** - Signs of hypersensitivity reaction. -Renal functions. -Hepatic functions. -CBC with differential. -Signs of tendinopathy. -Crystalluria. - Peripheral neuropathy. -Signs of disordered glucose regulation.

Note: The drug stability may be changed according to the manufacturer

Meropenem **500mg, 1gm** **Meronem®** **Mirage®**	**General (non-CNS) infections:** 20mg/kg/**dose** every 8 hours. **Severe infections:** 40mg/kg/dose every 8 hours.	1000mg/**dose** 2000mg/**dose**	**-IV push:** Over 3-5 min **-Intermittent infusion:** Over 15-30 min **-Extended infusion:** Over 3- 4 hrs.	**Reconstitute:** 500 mg vial with 10 ml SWFI, NS. **(50mg/ml)** **Dilute:** With D5W or NS. **Final concentration range from 1-20 mg/ml.** (1gm in 50 ml diluent)	Store at 20- 25℃. **Reconstituted solution:** **In SWFI** 3 hours at 25℃. 13 hours at 5℃. **Diluted solution:** **In NS(1-20mg/ml)** 1hour at 25℃. 15 hours at 5℃. **Concentration 10- 14 mg/ml** 7 hours at 25℃. **Note** **If diluted in D5W used: use immediately.**	**Monitor** -Signs of hypersensitivity reaction at first dose. -Renal function test. -Liver function test. -CBC -Severe or bloody diarrhea. -Neuromotor impairment.
Metronidazole **500mg/100ml** **Flagyl®** **Amrizole®**	22.5 to 40 mg/kg/**day** in divided doses 3 or 4 times.	4,000 mg/**day.**	**Intermittent IV Infusion** Undiluted over 30 to 60 minutes. **Note** Avoid contact of drug solution with equipment containing aluminum.	Undiluted (5 mg/mL).	-Store at 20- 25℃. -Protect from light. -Do not remove from overwrap until ready for use. -Discard unused solution.	**Monitor** -CBC with differential on prolonged therapy. -Patients with severe hepatic impairment or ESRD for adverse reactions. -Neurologic symptoms.

Piperacillin& Tazobactam **4.5 gm.** **4000mg+500mg** **Tazocin ®** **Piprataz®**	**Based on Piperacillin** 240-300 mg/kg/**day** divided in 3-4 doses. 2 to 9 months: 80 mg/kg/**dose**/ 6hrs. >9 months, ≤40 kg: 100 mg/kg/**dose**/6hrs. >40 kg:4,000 mg /6hrs. **Cystic fibrosis** 240 to 400 mg/kg/**day** divided every 8 hours. **Or** 450-600 mg/kg/day/ 4-6 hours.	16g /**day.** Piperacillin. **Endocarditis** 18g /**day.** Piperacillin. **Cystic fibrosis** 18-24 **g** /**day**. Piperacillin.	**-Intermittent infusion:** Over 30 minutes. **-Extended infusion:** Over 4 hours. 3hours in neonates	**Reconstitute:** 4.5 g vial with 20 ml NS, D5W or SWFI. **(180 mg/mL of piperacillin)** **Dilute:** In D5W or NS **Final concentration 20-80 mg piperacillin/ml** (4.5 gm vial in 50-200ml diluent)	Store at 20- 25℃. **Reconstituted solutions:** 24 hours at 25°C. 48 hours at 2-8°C. **Diluted solution:** In D5W or NS. 24 hours at 25°C. 1 week at 2-8°C.	**Monitor** -Signs of hypersensitivity reaction. -Renal functions. Liver functions. -Hematologic parameters (CBC, PT, PTT) -Severe or bloody diarrhea. -Skin rash. -CNS effects. -Serum electrolytes (K+)
Teicoplanin **200mg, 400mg.** **Targocid®**	Neonates and Infants <2 months: 16 mg/kg once day 1. **Maintenance dose:** 8 mg/kg once daily starting on day 2. Infants ≥2 months and Children ≤12 years: 10 mg/kg every 12 hours 3 doses. **Maintenance dose:** 6-10 mg/kg once daily. Adolescents: 6-12 mg/kg every 12 hours for 3 to 5 doses. **Maintenance dose:** 6 -12 mg/kg once	**Loading dose:** 800 mg. **Maintenance dose:** 400 mg	**-IM** **-IV push:** Over 3-5 minutes. **-Intermittent IV infusion** Over 30 minutes. **Note**: In neonates do not administer IM or IV push (must be infused over 30 minutes).	**Reconstitute** 200,400 mg with 3.14 mL SWFI. (200,400mg/3ml). - Gently rolling. -Avoid foaming of solution. -Use only clear yellowish to dark yellow solution. **Dilute** In D5W, NS. **Final concentration (1- 4mg/ml)**	-Store below 30°C. **Reconstituted &diluted solution**: 24 hours from 2-8°C. **Note**: Do not mix with aminoglycosides before injection.	**Monitor** -Signs of hypersensitivity reaction (red man syndrome). -Renal function. - CBC with differential and platelet count. Thrombocytopenia -Monitor for ototoxicity.

Note: The drug stability may be changed according to the manufacturer

Tigecycline **50mg** **Tygacil®**	Infants and Children <8 years: **Loading dose (optional):** 1.5 to 3 mg/kg **once.** **Maintenance dose:** 1 to 2 mg/kg/**dose** every 12 hours. **If no loading dose**: 2 mg/kg every 12 hours has been used. 8 to 11 years: 1.2 to 2 mg/kg/**dose** every 12 hours. ≥12 years: 50 mg every 12 hours.	50 mg/**dose**.	**IV:** Over 30 to 60 minutes.	**Reconstitute:** **50 mg** vial with **5.3 mL** NS, D5W. **(10 mg/ml).** **Dilution:** In NS, D5W, or LR **Final concentration does not exceed 1 mg/ml.** **(50mg in 50ml)** **Note:** A reconstituted solution should be yellow-orange, discard if not .	Store at 20- 25℃. **Reconstituted solution**: 6 hours at 25°C. **Diluted solution:** 24 hours at 25°C. 48 hours at 2- 8°C.	**Monitor** -Signs of hypersensitivity reactions. -Hepatic function test. -Coagulation parameters (PT, PTT). -Severe or bloody diarrhea.
Vancomycin **500mg, 1gm** **Vancocin®**	45 to 60 mg/kg/**day** divided every 6- 8 hrs. **C. difficile infection; treatment:** Oral: 40 mg/kg/**day** every 6 to 8 hours for 7 to 10 days. **Meningitis:** 15 mg/kg/**dose**/6 hrs. **Serious infections (MRSA):** 60 to 80 mg/kg/**day** every 6 to 8 hours. **Continuous infusion dosing** Loading dose: 10 to 15 mg/kg/**dose** over 1 to 2 hours, followed by maintenance infusion of 40 to 60 mg/kg/**day.**	2,000 mg**/day** 2,000 mg/**day.** 3600 mg**/day**	**-Intermittent IV infusion:** Over at least 60 minutes. **-Continuous IV infusion:** over 24 hours.	**Reconstitute** 500 mg with 10 mL SWFI. **(50mg/ml)** **Dilute** In D5W, NS. **Final concentration ≤ 5 mg/ml.** (500mg in ≥ 100ml diluent) **Note:** **In fluid restriction Concentration is 10mg/ml.**	-Store at 25°C. **Reconstituted solution**: 4 days at 2-8°C. **Diluted solution:** 24 hours at 25°C. 7 days at 2-8°C.	**Monitor** -Vancomycin infusion reaction (red man syndrome). - Renal function tests. - CBC - Hydration status. - Hearing test for ototoxicity. -Extravasation, Irritant.

Note: The drug stability may be changed according to the manufacturer

Antifungal drugs						
Amphotericin B(Conventional) **50mg** **Fungizone®**	**Initial dose** 0.25 to 0.5 mg/kg/dose, once daily. gradually increase daily, usually in 0.25 mg/kg. **Maintenance dose:** 0.25 to 1mg/kg/dose, Once daily **Test dose:** 0.1mg/kg/dose (Maximum 1mg)	1.5mg/kg/**day**	**Intermittent IV Infusion** Over 2-6 hours. **Note** **Premedication 30-60 mins**. With Acetaminophen diphenhydramine **or** Hydrocortisone.	**Reconstitute** 50 mg vial with 10ml SWFI to **(5mg/ml)** **Dilute** In D5W, D10W. **Final concentration (0.1mg/ml) in** peripheral administration. (50mg in 500ml diluent) **Note** -Don't dilute in NS. -In fluid restriction (0.25mg/ml) central line.	Store at 2-8°C. Protect from light. **Reconstituted solution**: 24 hours at 25°C. 7 Days at 2-8°C. **Diluted solution:** Solutions diluted in D5W should be used promptly after preparation. Protect from light.	**Monitor** -Infusion related anaphylactic reaction. -Renal functions. - Hepatic Function. -Serum electrolytes (potassium, magnesium). -CBC, PT, PTT. -Signs of hypokalemia.
Amphotericin B (Liposomal) **50mg** **Ambisome ®**	3 to 5 mg/kg/**dose** once daily.	10 mg/kg/**dose** once daily for life-threatening infection.	**-IV Infusion** Over > 2 hours. -Flush line with D5W. **Note** **Premedication 30-60 mins**. With Acetaminophen diphenhydramine **or** Hydrocortisone	**Reconstitute** 50mg vial with 12 ml SWFI. **(4mg/ml)** **Dilute** In D5W **Final concentration 1-2 mg/ml**. (50mg vial in 25-50ml diluent) **For infants** **Concentration is 0.2-0.5 mg/ml**	Store at ≤25°C. **Reconstituted solution**: 24 hours at 2-8 C. **Diluted solution:** 6 hours of dilution with D5W. **Note** -Don't dilute in NS -Adjust amount of Lipid if used with TPN.	**Monitor** -Infusion related anaphylactic reaction. -Renal function test. -Serum electrolytes (potassium magnesium). -CBC, PT, PTT. -Hepatic Function. -Signs of hypokalemia. -Cardiac function.

Note: The drug stability may be changed according to the manufacturer

Anidulafungin **50, 100 mg** **Ecalta®**	**Aspergillosis, invasive:** Initial: 1.5 to 3 mg/kg/**dose** once on day 1. On day 2 0.75 to 1.5 mg/kg/**dose.** **Candidemia; intra-abdominal or peritoneal candidiasis:** Initial: 3 mg/kg/**dose** once on day 1 On day 2 1.5 mg/kg/**dose** once daily.	**Day 1** 200 mg/dose **Day 2** 100 mg/dose	**-IV Infusion** at ≤1.1 mg/minute. (84 mL/hour for concentration of 0.77 mg/mL) **Note** **Don't concurrently infuse with other medications or electrolytes.**	**Reconstitute** 50mg vial with 15ml SWFI. 100 mg vial with 30 mL **(3.33 mg/mL)** **Dilute** In D5W or NS. **Final concentration of 0.77 mg/ml.** (50mg in 65ml diluent)	Store at 2-8°C. **Reconstituted solution** 24 hours ≤25°C. **Diluted solution:** 48 hours ≤25°C.	**Monitor** -Hypersensitivity and infusion reactions. -Liver function tests.
Caspofungin **50 mg, 70mg** **cancidas®**	**Aspergillosis, invasive; treatment:** Infants ≥3 months to <18year: **IV: Initial** 70 mg/m2/**dose** on day 1, then 50 mg/m2/**dose** once daily. Infants <3 months: Limited data available: IV: 25 mg/m2/dose once daily in candidemia.	70mg/**dose**	**-IV Slow infusion** Over 1-2 hours.	**Reconstitute** 50 or 70mg vials with 10.8 mL NS, SWFI. **(5mg/ml or 7mg/ml)** **Dilute** In NS, 1/2NS, 1/4 NS, or LR. **Final concentration ≤ 0.5 mg/ml.** (50mg in ≥ 100ml diluent)	Store at 2-8°C. **Reconstituted solution**: 1 hour at ≤25°C. **Diluted solution:** 24 hours at ≤25°C. 48 hours at 2-8°C.	**Monitor** -Liver Functions. -Hypersensitivity reactions.

Fluconazole **100mg/50ml** **Diflucan®**	**Loading:** 6-12 mg/kg/**dose** Followed by 3-12 mg/kg/**dose** Once daily. **Candidiasis, systemic, Neutropenia.** **Loading** 25 mg/kg/**dose** Followed by 12 mg/kg/**dose**	600mg /**dose** 800mg/**dose**	**-IV Infusion** Over 1 to 2 hours. Don't exceed 200mg /hr. Neonatal: Loading doses (25 mg/kg) have been infused over 2 hours.		Store at 5-30°C. **Note:** Do not unwrap unit until ready for use.	**Monitor** -Liver function tests. -Renal function tests. -Potassium level. -Rash. -ECG.
Voriconazole **200mg** **Vfend®**	**IV dose** Infants <2years: **Loading (2 doses)** 9 mg/kg/**dose**/12 hrs. **Maintenance** 12 to 71 mg/kg/**day/12h** **2 to 12 years:** **Loading (2 doses)** 9mg/kg/**dose/**12 hours **Maintenance** 8mg/kg/**dose**/12h. **≥12 y. and ≤14 years:** **<50 kg: Loading:** 9 mg/kg/**dose** /12 hrs. **Maintenance:** 4-8 mg/kg/**dose** /12 hr. **Adolescents ≥15y.** **≥50 kg: Loading**: 6 mg/kg/**dose**/12hrs. **Maintenance**: 3 to 4 mg/kg/**dose** every 12 hours.	**Maximum dose:** 350-400 mg/**dose**. (oral) **If dose >40mg/kg /Day.** Divide into 3 doses.	**-IV Infusion:** Over 1 to 3 hrs. Don't exceed 3mg/kg/hr. **Note** Don't infuse in the same line with other drugs including TPN.	**Reconstitute:** 200 mg vial with 19 ml SWFI. **(10mg/ml)** **Dilute** In NS, LR, D5W **Final conc** **0.5-5 mg/ml** (200mg in 40-400ml diluent) **Note** **Don't dilute with sodium bicarbonate.**	Store at 15-30° C. **Reconstituted solution:** 24 hours at 2- 8°C. **Diluted solution:** 24 hours at 2- 8°C.	**Monitor** -Hepatic Functions -Renal functions. -Serum electrolytes (especially calcium, Magnesium, Potassium). -Visual function on prolonged treatment. -Phototoxic reaction in pediatrics. -Pancreatic function. -Total body Skin examination. -Infusion reactions. -ECG.

Note: The drug stability may be changed according to the manufacturer

Antiviral drugs						
Acyclovir **250mg, 500mg** **Zovirax®**	10 to 15 mg/kg/**dose** every 8 hours. **Or** 500 mg/**m²**/**dose** every 8 hours. **Severe disseminated or CNS infection:** 15 to 20 mg/**kg**/**dose** every 8 hours.	20 mg/kg/**dose** every 8 hours.	**-Slow IV infusion** Over **≥** 1 hour. (Rapid infusion is associated with nephrotoxicity) **Note** -**Do not** administer IV push, IM, SubQ. -Irritant (7mg/ml)	**Reconstitute** 250- 500mg vials with 5-10 ml SWFI. **(50mg/ml)** **Dilute** In NS, D5W, D5NS or LR. **Final concentration** **(7 to 10 mg/mL)** (500mg in 50-70ml diluent)	Store at 20- 25°C. **Reconstituted solution:** 12 hours at 25°C. **Diluted solution:** 24 hours at 25°C **Note**: Do not refrigerate reconstituted solutions or solutions diluted for infusion as they may precipitate.	**Monitor** -Hydration status. -Neurotoxicity. -Nephrotoxicity with high-dose therapy. -Renal function. - Urine output. -Liver enzymes. -CBC with neutrophil count in neonates. -Infusion site for phlebitis.
Gancyclovir **500 mg/10 mL** **Cytovene®** **500 mg**	6 mg/kg/**dose** every 12 hours **Cytomegalovirus disease:** Induction therapy: 5 mg/kg/**dose** every 12 hours Dose may be increased to 7.5 mg. secondary prophylaxis), if indicated: 5 mg/kg/dose as a single daily dose 5 to 7 days/week.		**-Slow IV infusion** Over **≥** 1 hour. **Note** **-Flush** line well with NS before and after administration. **-Do not** administer IM or SUBQ -Irritant.	**Reconstitute** 500 mg with 10 mL SWFI. **(50mg/ml)** **Dilute** In D5W, NS **Final concentration** **≤10 mg/ml.** (500mg in 100ml)	Store at 25°C. **Reconstituted solution** 12 hours at 25°C. **Diluted solutions** 24 hours of at 2°C-8°C.	**Monitor** -CBC with differential. -Serum creatinine. -Frequent ophthalmological exams.

Note: The drug stability may be changed according to the manufacturer

Antineoplastic agents

Alkylating agents

Cyclophosphamide **1gm** **Endoxan®**	**Aplastic anemia, severe, refractory (limited data):** Children and Adolescents ≥2 years: High-dose therapy: IV: 45 to 50 mg/kg/day for 4 days. **Kawasaki Disease; refractory to multiple therapies:** Very limited data available: Infants and Young Children: **IV:** 2 mg/kg/dose once daily. **Nephrotic syndrome, minimal change (frequently relapsing):** Infants, Children, and Adolescents: Oral: 2 mg/kg/day for 8 to 12 weeks; reported range: 2 to 3 mg/kg/day; maximum cumulative dose: 168 mg/kg; dosing based on ideal bodyweight.		**IV push**: 20 mg/mL IV infusion **Intermittent or continuous infusion** Over 15- 60 minutes; larger doses (>1,800 mg/m^2) have been infused over 1 to 6 hours. **Note** To minimize bladder toxicity, increase normal fluid intake during and for 1 to 2 days after cyclophosphamide dose. High-dose regimens cyclophosphamide doses should be accompanied by vigorous hydration with mesna therapy.	**Reconstitute with SWFI or NS:** 1,000 mg with 50 ml; swirl gently to mix. Resultant concentration is 20 mg/ml. **Dilute** in **D5W, $^1/_2$NS, or D5NS.** to a minimum concentration of 2 mg/ml.	-Store at ≤25°C. **Reconstituted solution** **In NS** 24 hours at 25°C. 6 days at 2°- 8°C. **In SWFI** Diluted immediately. **Diluted solutions** **In D5W or D5NS** 24 hours at 25°C. 36 hours 2°- 8°C. **Note** Exposure to excessive temperatures may cause active ingredient to melt (vials with melting may have a clear to yellow viscous liquid which may appear as droplets); do not use vials with signs of melting.	**Monitor** -CBC with differential and platelets. -BUN, serum electrolytes, serum creatinine, urinalysis. -Signs/symptoms of hemorrhagic cystitis or other urinary/renal toxicity, pulmonary toxicity cardiac toxicity, hepatic toxicity, secondary malignancies, and/or wound healing impairment. **Irritant** **High risk medication**

Cardiovascular agents

Antiarrhythmic drugs

Adenosine **6 mg/2 mL** **Adenocard®**	**Supraventricular tachycardia** ***Hemodynamically unstable:*** Rapid IV:Initial dose: 0.1 mg/kg, increase to 0.2 mg/kg; follow each bolus with NS flush. ***Hemodynamically stable:*** Infants, Children, and Adolescents <50 kg: Rapid IV: Initial dose: 0.05 to 0.1 mg/kg; if not effective within 1 to 2 minutes, increase dose by 0.05 to 0.1 mg/kg increments every 1 to 2 minutes to a maximum single dose of 0.3 mg/kg or 12 mg (whichever is less) Children and Adolescents ≥50 kg: Rapid IV: Initial: 6 mg, if not effective within 1 to 2 minutes, 12 mg may be given; may repeat 12 mg bolus if needed; follow each bolus with NS flush.	**Initial:** 6 mg/dose. May increase to 12 mg/dose.	***Rapid bolus IV*** over 1 to 2 seconds at peripheral IV site closest to patient's heart (IV administration into lower extremities may result in therapeutic failure or requirement of higher doses); follow each bolus with NS flush.(Infants and children:5-10 mL; adults:20 ml).	**Doses ≥600 mcg:** Give undiluted. **Doses <600 mcg:** Further dilution of dose may be necessary to ensure complete and accurate administration **Dilution with** NS to a final concentration of 300 to 1,000 mcg/ml. To prepare a 300 mcg/mL solution, add 3 mg of adenosine (1 mL) to 9 mL of NS; to prepare a 1,000 mcg/mL, add 3 mg of adenosine (1 mL) to 2 mL of NS.	Stored at 20-25°C. Do **not** refrigerate; crystallization may occur (may dissolve by warming to room temperature).	-ECG, heart rate, blood pressure. -Adenosine could produce bronchoconstriction in patients with COPD or emphysema. **High risk medication**

Note: The drug stability may be changed according to the manufacturer

Amiodarone **150mg/3ml** **Cordaron®**	**Perfusing tachycardias & Ventricular fibrillation or pulseless ventricular tachycardia, shock-refractory:** **Loading dose:** 5mg/kg, may repeat twice up to maximum total dose of 15 mg/kg during acute treatment. **Note:** Dividing the 5 mg/kg loading dose into 1 mg/kg aliquots (each administered over 5 to 10 minutes) has been used; an additional 1 to 5 mg/kg loading dose was given in the same manner, if needed, after 30 minutes.	**Maximum dose:** 300 mg/dose Continuous IV infusion: maximum daily dose: 2,200 mg/day	**Oral:** Administer at same time. Don't administer grapefruit juice. **IV:** -Adjust administration rate to patient's clinical condition and urgency. -Rapid IV bolus in Pulseless VT,VF. **Neonates:** Loading dose over 60 minutes; followed by continuous infusion. **Infants, Children, and Adolescents:** Loading dose over 20 to 60 minutes; followed by continuous IV infusion. **Note:** -Slow the infusion rate if hypotension or bradycardia develops.	**Dilute to** Concentrations ≤2.5 mg/ml in D5W. -Central line is preferred with concentrations >2 mg/mL for infusions >1 hour. -Maximum concentration for IV infusion: 6 mg/ml. - Concentrations >3 mg/ml may cause phlebitis if administered peripherally. **Incompatible** with heparin; flush with saline prior to and following infusion. -Higher concentrations and slower infusion rate than recommended may result in leaching of plasticizers (DEHP) from intravenous tubing.	-Store at 20-25°C. -Protect from light. **Diluted solution** **-2 hours in polyvinyl chloride (PVC) bags**. -24 hours in glass, polyolefin bottles. -No need for light protection during administration.	**Monitor** -Heart rate and rhythm, BP, ECG. -Assess patients for signs of lethargy, edema of the hands or feet, weight loss, and pulmonary toxicity. -Thyroid function tests. -Serum glucose, electrolytes (especially potassium and magnesium), triglycerides. -Liver enzymes; signs or symptoms of clinical liver injury. - Perform regular ophthalmic exams. **Irritant with vesicant-like properties.**

Anticholinergic chronotropic agent						
Atropine sulfate 1mg/1ml **Atropine®**	**Bradycardia:** **IV, Intraosseous:** 0.02 mg/kg/dose; minimum dose: 0.1 mg/dose, may repeat once in 5 minutes; reserve use for those patients unresponsive to improved oxygenation and epinephrine. **Endotracheal:** 0.04- 0.06 mg/kg/dose; may repeat once. **Inhibit salivation and secretions:** **IM, IV, SUBQ:** Administer first dose 30 to 60 min. preoperatively and then repeat every 4 to 6 hours as needed. Infants and Children <12 years: 0.02 mg/kg/dose; maximum dose: 0.5 mg/dose. Children ≥12 years and Adolescents: 0.02 mg/kg/dose; maximum dose: 1 mg/dose. **Intubation; emergent (premedication)** **IV:** 0.02 mg/kg/dose with no minimum dose.	Maximum dose: 0.5 mg/dose. Maximum **total** dose: 1mg/procedure Maximum **total** dose: 2 mg/procedure.	**Endotracheal:** **Undiluted or diluted,** followed by flush with 1 to 5 mL of NS after endotracheal administration. **IV:** Administer undiluted by rapid IV injection; slow injection may result in paradoxical bradycardia.	**Undiluted or Dilute In NS** 1 to 2 mg in ≤10 mL of NS or sterile water.	-Store injection at room temperature. -Protected from light.	**Monitor** Heart rate, blood pressure, pulse, mental status; intravenous administration requires a cardiac monitor. **High risk medication**

Note: The drug stability may be changed according to the manufacturer

Catecholamines, Vasopressor

Adrenaline / epinephrine (1mg/ml) **Adrenamax®** **Epinephrine®** **Note:** 1:1000 (1mg/ml) 1:10,000 (0.1mg/ml)	**For increase in cardiac output /post-resuscitation stabilization/ in hypotensive & fluid resistant shock:** ***continuous IV infusion*:** 0.05 to 1 mcg/kg/min If <0.3→ B- effect (cardiac) If > 0.3→α- effect (vasoconstriction) **For asystole/pulseless arrest/symptomatic bradycardia** ***IV/IO*:** 0.01mg/kg ***ET:*** 0.1mg/kg (Immediately after CPR within 5 min of chest compression, Repeat every 3 to 5 min till return of circulation) **Anaphylaxis:** ***IM:*** 0.01mg/kg/dose = 0.01ml/kg/dose of 1mg/ml ampoule (To be repeated ev. 5 to 15min, up to 3-4 times) ***Continuous IV infusion:*** (Refractory case) 0.1 to 1mcg/kg/min	1mcg/kg/min 1mg/dose 2.5mg/dose **Prepuberty** 0.3mg/dose **Adolescent& those >30kg:** 0.5mg/dose 10mcg/min	***ET:*** Administer dose, flush with a minimum of 5 ml NS, followed by 5 manual ventilations. ***Direct IV/IO:*** flush with NS ***Continuous IV infusion:*** Must be via an infusion pump, **Central line** is preferred **(vesicant!)** (May use peripheral line in a large vein for short term!! ***IM*** ***SUBQ:*** Use only **1 mg/mL** solution for anaphylaxis	***ET:*** Use 1mg/ml. ***Direct IV/IO:*** Use 0.1mg/ml (must dilute the 1mg/ml) ***Usual Infusion conc:*** Must dilute! 16, 20, 32 & 40 mcg/ml. **Max:** 64mcg/ml. But in refractory anaphylaxis, Dilute to 1mcg/ml. ***IM*:** 1mg/ml **Compatible** D5W, D10W, (Favored to avoid oxidation) & NS (physically compatible) **Incompatible** HCO3/alkaline solutions	**Epinephrine USP injection,** Store at 20-25˚C Don't refrigerate Protect from freezing. Protect from light **Diluted solutions** Stable for 4hrs at RT& for 24 hrs. refrigerated. (In British, Australian monograph), stable for 24 hrs. at RT). **Note** Highly photo& air-sensitive! Photoprotection (Oxidation causes pink to brown discoloration), if it occurs or precipitation, discard!!	-IV site for extravasation -ECG, Heart rate, Blood pressure, i.e., vitals, -blood glucose levels -Pulmonary function test. **High risk medication**

Noradrenaline bitartarate/ Norepinephrine (1mg/ml noradrenaline base) **Levophrine®** **Noradrenaline® –MYLAN** **Note:** 2mg of norepinephrine tartarate = 1mg of norepinephrine base	**Hypotension shock, fluid resistant:** *Continuous IV/IO infusion:* Initial: 0.05-0.1 mcg/kg/min, then Titrate to desired effect. **Note:** Avoid abrupt withdrawal; reduce infusion flow rate slowly (as it may cause severe ↓BP)	2mcg/kg/min (Higher doses are reported in literature)	***Continuous IV infusion:*** Must be via an infusion pump, **Central line** is preferred **(vesicant!)** (May use peripheral line in a large vein /IO with more dilution but for short term!! Also avoid ankle/leg veins if patient has Vaso-occlusive disease).	***Usual infusion conc:*** 16, 32 & 64 mcg/ml **Compatible with:** D5W, D5NS (favored to protect against oxidation) & NS (NS is not recommended by manufacturer but studies show stability) **Incompatible with:** HCO3/alkaline solutions (may cause inactivation of drug).	Intact vial: Store at 20-25˚C. Protect from light, **Refrigerated product:** Store at 2- 8°C Discard solution if discolored /cloudy. **Diluted solutions** 24 hours at 20-25˚C. Protect from light.	-Iv site for extravasation -Blood pressure, -Heart rate, -Cardiac output, -Intravascular volume status, -Pulmonary capillary wedge pressure, -Urinary output, -Peripheral perfusion. **High risk medication**
Inotropes						
Dopamine **200 mg/5ml ampoules**	2- 20 mcg/kg/**min**. Titrate gradually by **5 to 10 mcg/kg/min** increments until optimal response is obtained. Inotropic actions predominate at lower doses. Vasoconstrictive actions predominate at higher doses.	**20** mcg/kg/min	***Continuous IV infusion:*** Must be via an infusion pump, **Central line** is preferred **(vesicant!)** (May use peripheral line in a large vein /IO with more dilution but for short term!!	**Dilute in** NS0.9% , D5W, D5NS, D51/2NS, LR, or D5LR , to a **Maximum concentration.** 3.2 mg/ml Neonates: 1.6 mg/mL	Stored at 20-25˚C. Protect from light. **Diluted solutions** 24 hours after dilution. ***Conc. up to 6 mg/mL have been reported.** **Incompatible with:** HCO3/alkaline solutions (may cause inactivation of drug).	-BP, heart rate, ECG. Hemodynamic parameters -End-organ perfusion (eg, urine output, mental status); -Infusion site for extravasation intravascular volume status. **High risk medication**

Dobutamine **250 mg/20 ml**	0.5- 1 mcg/kg/min; titrate gradually every few minutes until desired response achieved **(Usual range: 2 to 20 mcg/kg/min)**	**20-40** mcg/kg/min.	**Continuous IV infusion:** Must be via an infusion pump, **Central line** is preferred **(May be vesicant!)** (May use peripheral line in a large vein /IO with more dilution but for short term!	**Dilute in** NS 0.9% , G5% G10%,G5% NS ,LR, NS 0.45%. **Usual infusion conc:** 1-2-4 mg/ml. Neonates: 2 mg/mL **Maximum conc.** ≤5mg/ml. **Incompatible with:** HCO3/alkaline solution.	Stored at 20-25˚C. Protect from light. **Diluted solutions** 24 hours after dilution. **Note** Pink discoloration of solution indicates slight oxidation, but no significant loss potency.	-BP, heart rate, ECG, Hemodynamic parameters as appropriate . intravascular volume status. -kidney function; urine output. **High risk medication**
Digoxin **500 mcg/2 mL** (2 mL) **Lanoxin®**	**Heart failure:** -**Digitalizing dose** **Mcg/kg** (loading dose) may not be necessary; consider use if rapid titration is desired. -To avoid toxicity, consider doses at the lower end. -Give one-half, then give one-quarter for each of 2 doses at 6 to 8 hours. 1to 24 months: **IV dose** 30 to 50 mcg/kg **Oral** 35 to 60 mcg/kg 2 to 5 years: **IV dose** 25 to 35 mcg/kg.		***IV:*** May be slowly administered IV over ≥5 minutes. **(Vesicant)** -Avoid rapid IV infusion cause systemic and coronary arteriolar vasoconstriction ***IM:*** Not usually recommended due to local irritation, pain. ***Oral:*** Administer digoxin 1 hour before or 2 hours after.	***IV:*** May be administered undiluted or diluted at least fourfold in D5W, D10W, NS, or SWFI. **Note** less than fourfold dilution may lead to drug precipitation	Store at 20°C to 25°C Protect from light. **Diluted solutions** Immediate use recommended. -48 hours at 20-25˚C.	-Heart rate and rhythm Periodically -Monitor serum electrolytes (Potassium, magnesium, and calcium). -Renal function. **High risk medication** **Digoxin toxicity** Nausea, vomiting, visual disturbances. lethargy, and/or life-threatening arrhythmias.

	Oral 30 to 45 mcg/kg. 5 to 10 years: **IV dose**15 to 30 mcg/kg. **Oral** 20 to 45 mcg/kg. >10 years: **IV dose** 8 to 12 mcg/kg. **Oral** 10 to 15 mcg/kg. **Maintenance Dosage** **Mcg/kg/day /12hrs.** 1to 24 months: **IV dose** 9 to 15 **Oral** 10 to 15 2to 5 years: **IV** 6 -9 **Oral** 8 to 10 5 to 10 years **IV** 4 to 8 **Oral** 5 to 10 >10 years: **IV** 2 to 3 **Oral** 2.5 to 5					
Milrinon **10 mg/10ml** (10ml) **Primacor®**	**Hemodynamic support** **Loading dose** (Optional due to hypotension): 50 mcg/kg **followed by** a continuous infusion dose range: 0.25 to 0.75 mcg/kg/min; titrate dose to effect. **Low cardiac output** **Loading dose**	Not established; however, up to 1 mcg/kg/min. has been used.	**Loading dose** may be administered **undiluted or diluted** by slow IV push over at least 10 min to 60 mins.to minimize hypotension. **Or** divide LD into >2 doses , each dose is	**Loading dose** In 10-20ml. **Dilute in** $^{1}/_{2}$NS, NS, or D5W; usual concentration: **≤200 mcg/mL** (250 mcg/mL in NS is accepted) **Note:** Some pediatric centers use a concentration as	Stored at 20-25˚C. **Diluted solutions** 72 hours at 20-25˚C. In normal light. Stable at 0.2 mg/mL in 1/2NS, NS, or D5W for	-BP, heart rate, ECG, -Hemodynamic parameters as appropriate . -intravascular volume status. -kidney function; urine output. -Avoid extravasation. -Serum electrolytes

	75 mcg/kg **followed by** a continous infusion 0.75 mcg/kg/min.		administered over 10 min. ***Continuous IV infusion:*** **Central line** is preferred **(May be vesicant!)** (May use peripheral line in a large vein /IO with more dilution but for short term	high as 800 mcg/mL.		especially potassium level -Platelet count. **High risk medication**
Non-Cardioselective B.Blocker						
Propranolol **1 mg/mL** **Inderal®**	**Tachyarrhythmias:** **IV:** 0.01 to 0.15 mg/kg/**dose**; may repeat every 6 to 8 hours as needed. **Tetralogy spells:** Infants and Children: 0.15 to 0.25 mg/kg/**dose** ; alternatively, initiate lower doses of 0.015 to 0.02 mg/kg/**dose** and titrate to effect, up to 0.1 to 0.2 mg/kg/**dose.** **Thyroid storm**: IV: 0.5 to 1 mg, then may repeat dose with 1 to 3 mg every several hours with continuous cardiac monitoring until heart rate controlled or oral therapy initiated.	**Maximum dose** is age-dependent: Infants: 1 mg/**dose**. Children and adolescents: 3 mg/**dose.**	**Slow IV infusion** over 10-15 minutes. **Maximum rate:** 1mg/minute	**Dilute in** D5W or NS. 1mg in 50ml diluent. **Ref. Globalraph**	Store at 20°- 25°C. **Diluted solution** Stable for 24 hours at room temperature in D5W or NS. Protect from light. Solution has a maximum stability at pH of 3 and decomposes rapidly in alkaline pH.	**Monitor** -ECG, heart rate, and blood pressure. -Mental alertness. -Signs and symptoms of bronchospasm in patients with existing bronchospastic disease. -Serum glucose (in patients with diabetes). **High risk medication**

Vasodilators

Alprostadil **500 mcg/mL (1 mL)** **Prostin VR®**	**Ductus arteriosus patency, maintenance**: **Infants:** Continuous IV infusion: **Initial:** 0.05 to 0.1 mcg/kg/minute; once therapeutic response is achieved, reduce rate to lowest effective dosage; with unsatisfactory response, increase rate gradually. **Usual maintenance:** 0.01 to 0.4 mcg/kg/minute.		**Continuous IV infusion.** **Note** Avoid direct contact of undiluted alprostadil with the plastic walls of volumetric infusion chambers because the drug will interact with the plastic and create a hazy solution.	**Dilute** with D5W, D10W, or NS to a maximum concentration of 20 mcg/ml. **Standard concentration** Neonates: 10 mcg/ml. In pediatric patients: 5-10 mcg/ml.	Store at 2°- 8°C.	**Monitor** Blood pressure. Respiratory rate. Heart rate. Temperature. Degree of penile pain, duration of erection, adequate detumescence after dosing. Signs of infection, Signs of penile fibrosis. Vasospasm frequency and duration. Neonate: Monitor patient closely for apnea during first hour after administration.
Nitroglycerin Glyceryl trinitrate **50mg/50ml** **Nitronal®**	**Heart failure; cardiogenic shock:** Infants and Children: 0.25 to 0.5 mcg/kg/minute; titrate by 1 mcg/kg/minute every 15 to 20 minutes. **Usual dose range:** 1 to 5 mcg/kg/minute. Adolescents: 5 to 10 **mcg/minute**; titrate to a maximum dose of 200 **mcg/minute**	**Usual maximum dose:** 10 mcg/kg/minute. Doses up to 20 mcg/kg/minute may be used.	***Continuous IV infusion*** must be diluted prior to administration. **Note** Adsorption to soft plastic (eg, PVC) occurs.	**Dilute in** D5W or NS **Maximum concentration:** 400 mcg/ml. **Note** ASHP recommends standard concentrations of 200 mcg/mL and 400 mcg/mL for pediatric patients.	Store at 20- 25°C. Protect from light. **Diluted solution** 48 hours at room temperature. 7 days under refrigeration in glass containers.	**Monitor** -Blood pressure. -Heart rate.

Central nervous system agents

Anticonvulsant, Sedative

Diazepam **Epival®** **10 mg/2ml** **Neuril®** **10mg/**2ml **Valpam®** **5mg/ml**	**Status epilepticus:** **IV:** Infants >30 days, Children, Adolescents: 0.15-0.2 mg/kg/dose slow IV; may repeat dose once in 5 minutes. **Fixed dosing:** Infants, Children <5y. 0.2- 0.5 mg every 2 to 5 minutes repeat in 2 - 4 hours if needed(5mg). Children ≥5y. and Adolescents: 1 mg slow IV/ 2 to 5 minutes; (Max.10mg). **Tetanus-associated spasm: IV** 0.1-0.2 mg/kg/dose every 2 - 6 hours. **Fixed dosing:** Infants >30 day, children <5 years: **IV, IM**: 1-2 mg/ 3 to 4 hours. Children, Adolescents: 5- 10 mg/ 3 to 4 hours. **Sedation, anxiolysis, and amnesia: IV:** Infants and Children: 0.05- 0.1 mg/kg over 3 to 5 minutes. Adolescents: 5 mg; may repeat with 2.5 mg if needed	**Note:** Respiratory support should be available during therapy. **Maximum dose:** 10 mg/dose **Maximum total dose:** 0.25 mg/kg	**-IM:** Undiluted (5 mg/mL) deep into muscle mass. **Direct IV:** Undiluted (5 mg/mL). infants and children: Do not exceed 1 to 2 mg/minute IV push. **Note** -Rapid injection may cause respiratory depression or hypotension. -Continuous infusion is not recommended because of precipitation in IV fluids and absorption of drug into infusion bags and tubing. -Do not mix with other solutions or medications.	.	Store at 20°-25°C. Protect from light. Do not refrigerate.	**Monitor:** -Heart rate. -Respiratory rate. -Blood pressure. -Mental status. **with long-term therapy**: -Liver enzymes. -CBC. -Clinical signs of propylene glycol toxicity for continuous high-dose and/or long duration intravenous use) including serum creatinine, BUN, serum lactate, osmol gap. **Vesicant** **High risk medication**

Levetiracetam **500 mg/5 mL 100mg/ml** **Tiratam®**	**Myoclonic seizures with juvenile myoclonic epilepsy; adjunct:** Children ≥12 years and Adolescents: IV, Oral 500 mg twice daily; increase dosage every 2 weeks by 500 mg/dose, to the recommended dose of 1,500 mg twice daily. **Partial-onset (focal) seizures** **Tonic-clonic seizures; primary generalized; adjunct: IV, Oral** Infants 1 to <6 months: 7 mg/kg/dose twice daily; increase dosage every 2 weeks by 7 mg/kg/dose, to the recommended dose of 21 mg/kg/dose twice daily. Infants ≥6 months and Children <4 years: 10 mg/kg/dose twice daily; increase dosage every 2 weeks by 10 mg/kg/dose, to the recommended dose of 25 mg/kg/dose twice daily. Children ≥4 years and Adolescents <16 years	**Maximum daily dose** 3,000 mg/**day.** **Renal adjustment** GFR <50 mL/minute: Administer 50% of the dose. Hemodialysis, intermittent: Peritoneal dialysis**:** Administer 50% of normal dose every 24 hours; a supplemental dose after hemodialysis is recommended.	***Oral*** Administered without regard to meals. ***IV infusion*** Neonates: Over 10- 15 minutes. **Rate** 1 mg/kg/min. Infants, Children, and Adolescents: Over 15 min. **Rate** 2-5 mg/kg/min	**Dilute in** NS, LR, or D5W. **Final maximum concentration** 15 mg/mL or in 100 ml. In neonates, concentrations of 10- 20 mg/mL have been reported. **A 1:1 dilution** (50 mg/mL) has also been safely used in patients ≥6 months of age	Store at 25°C. **Diluted solution** 4 hours in PVC bags at room temperature.	**Monitor** -CNS depression. -Psychiatric and behavioral symptoms -Diastolic BP. -CBC (Recurrent infections or coagulation disorders) -Signs and symptoms of hypersensitivity reaction or rash.

	10 mg/kg/dose twice daily; increase dosage every 2 weeks by 10 mg/kg/dose, to the recommended dose of 30 mg/kg/dose twice daily. Adolescents ≥16 years: 500 mg twice daily; increase dosage every 2 weeks by 500 mg/dose, to a maximum recommended dose of 1,500 mg twice daily. **Seizure prophylaxis, traumatic brain injury** 20 to 55 mg/kg/day in divided doses twice daily. **Status epilepticus, urgent therapy/second-phase therapy or refractory:** 20 to 60 mg/kg as a single dose; initiate maintenance therapy based upon clinical response and type of seizure disorder.					

Midazolam **5mg/1ml** **15mg/3ml** **Dormicum®** **Midathetic®**	**IV:** **Anxiolytic , prior to procedures:** ≥6 M to <6 Y: 0.05- 0.1 mg/kg, titrate dose, total dose of 0.6 mg/kg. ≥6 y: 0.025- 0.05 mg/kg; titrate dose; total doses of 0.4 mg/kg. Adolescent: 1- 2.5 mg; titrate dose. **Sedation, mechanically ventilated:** **LD:** 0.05- 0.2mg/kg, **Then** continuous inf. 0.05 to0.12mg/kg/hour (0.8-2mcg/kg/minute) **Titrate** the dose. Sedation tapering after prolonged therapy: Consider. a slow taper of therapy or conversion to a long acting benzodiazepine. **Status epilepticus:** **LD:** IV: 0.2 mg/kg. **Then** continuous inf. 0.05- 2 mg/kg/hour. (0.83- 33.3 mcg/kg/minute) **Titrate** dose.	**Anxiolytic doses:** <6 y : 6 mg. >6 y:10 mg. Adolescent. 10 mg. **Sedation doses:** 10 mg/hours. Dose based on Ideal body weight in obese patients.	***Slow IV injection*** For loading dose over **≥2 to 5** min. **at a rate of 2 mg/min** ***Continuous IV infusion:*** Administer via an infusion pump.	**Dilute** with NS or D5W. 1mg/ml. Neonates: 0.5 mg/ml with SWFI to decrease amount of benzyl alcohol. **Continuous infusion** 0.5 mg/mL; in patients requiring high doses or fluid restriction conc. **up to 5 mg/mL (undiluted)** may be necessary. **Note** **ASHP recommends standard concentrations of 0.03, 1, or 5 mg/mL**	Stored at 20-25°C. Protect from light. **Diluted solution** 24 hours in D5W,NS. 4 hours in LR. (0.5mg/ml)	**Monitor** -Level of sedation. -Respiratory rate. -Heart rate. -Blood pressure. -Oxygen saturation. **High risk medication**

Phenobarbital **40mg/ml.** **Sominal ®** **Sominaletta®**	**Status epilepticus:** **Loading dose:** 15 to 20 mg/kg. **Maintains dose:** 5-10mg/kg. **Seizures, maintenance therapy:** **Oral:** Infants,Children≤5years : 3 to 5 mg/kg/day in 1 to 2 divided doses. Children >5 years and Adolescents: 2 to 3 mg/kg/day in 1 to 2 divided doses.	1000 mg/dose GFR <10 mL/min: ↓ dose by 50% and administer every 24 hours. Intermittent HD: moderate dialyzable (20% to 50%): Supplemental dose needed.	***Slow IV injection*** over 15 - 30 minutes. **Large LD** in neonates have been infused over 60 minutes. Stop administration any evidence of pain, swelling. **Irritant.**	**Dilute** with NS. Final conc. 10 mg/ml.	Stored at 20-25°C. Protect from light. **Diluted solution** According to the manufacturer.	**Monitor** -Phenobarbital serum concentration. -CNS status. -Liver enzymes. -CBC with differential. -Renal function. -Seizure activity; signs of suicidality. Dermatological reactions. -Respiratory rate. -Heart rate. -Blood pressure. -Monitor infusion site.
Phenytoin **250mg/5ml** **Epanutin®** **Epilog®**	**Status epilepticus:** **Loading dose: IV**: 20 mg/kg in a single or divided doses. **Maintenance dose** 12 hrs. after loading dose. An additional load of 5 to 10 mg/kg if status epilepticus is not resolved. **Seizures, focal (partial) onset seizures, generalized onset seizures: IV, Oral, Loading dose** (optional)	Maximum loading dose: 1,000 mg/dose. Total loading dose may reach. 20 mg/kg. Maximum daily maintenance dose: 300 mg/**day** **Some experts suggest higher maintenance**	**Slow IV** Neonates **Maximum recommended rate:** 0.5 to 1 mg/kg/minute. Infants, Children, and Adolescents 1 to 3 mg/kg/minute or maximum rate: 50 mg/minute, whichever is slower.	**Diluted in** NS to a final concentration ≥5 mg/ml. Following IV administration, NS should be injected through the same needle or IV catheter to prevent irritation. **Vesicant.**	Store at 15- 30°C. **Diluted solution** -Completed within 4 hours after preparation. - Discard any unused product. -Do not refrigerate. **Note** Use only clear solutions free of precipitate and haziness; slightly yellow solutions may be used. Precipitation may	**Monitor** -CBC, -Metabolic profile. -Liver function, 25-hydroxyvitamin D levels (chronic use). -Suicidality (eg, suicidal thoughts, depression, behavioral changes). -Signs of hematological change

	15 to 20 mg/kg **Oral loading dose should be divided into 3 doses and administered every 2 to 4 hours to decrease GI adverse effects.** **Maintenance therapy:** **IV, Oral:** Initial: 5 mg/kg/day in divided doses. Usual range: 4 to 8-10 mg/kg/day **Seizure prophylaxis, traumatic brain injury** **IV: Initial**: 18 to 20 mg/kg over 20 minutes, followed by 6 mg/kg/day divided every 8 hours for 48 hours.	**doses (8 to 10 mg/kg/day) may be necessary in infants and young children**. **Hepatic impairment** Monitor free phenytoin levels closely. Dosage adjustments may be necessary.			occur if the solution is refrigerated and may dissolve at room temperature.	-Signs of hypersensitivity reactions. -Plasma phenytoin concentrations. **High risk medication**
CNS Stimulant						
Caffeine citrate **10mg/ml (3ml)** **Caffeinospire®**	**Caffeine Citrate:** **The dose of caffeine base is one-half the dose when expressed as caffeine citrate.** **Apnea in prematurity** **Loading Dose:** 20 mg/kg IV over 30 minutes one time. **Maintenance Dose:** 5 mg/kg orally or IV over 10 minutes every 24 hours for not more than 21 days.	**Maximum dose** 20 mg/kg/day.	**IV:** Infuse loading dose over at least 30 minutes; maintenance dose may be infused over at least 10-30 minutes.	**Dilute** with D5W to a final concentration of 10 mg caffeine citrate/ml.	Store at 20°-25°C. **Diluted solution** Stable for at least 24 hours at room temperature when diluted to 10 mg/mL (as caffeine citrate).	**Monitor** **Apnea of prematurity:** Heart rate, number and severity of apnea spells, serum caffeine concentration. **Stimulant:** Insomnia, tachycardia.

General anesthetics

Ketamin **500mg/10ml** **Ketam®** **Ketamar®** **Ketamine®**	**General Anesthesia:** **Induction**: **IV:** ≥3mo & <16yr: 1-3 mg/kg ≥16yr: 1 to 4.5mg/kg **Maintenance: IV:** supplemental doses of one-half to the full induction dose. **Continuous IV:** 1-15yr: 1.5-6mg/kg/hr. ≥16yr: 0.1-0.5mg/min. **Endotracheal intubation:** 1-2mg/kg (as part of rapid sequence sedation) **Procedural sedation/analgesia**: ≥3mo-adolescent: IV: **(Without propofol):** 1-2mg/kg over 30-60 min. (if inadequate, additional doses of 0.5-1mg/kg every 5-15min) (**With propofol):** 0.5-0.75m/kg of each agent. **Sedation/analgesia of critically ill:** ≥5mo: **Initial IV:** 0.5-2mg/kg then **Continuous infusion** 5-20mcg/kg/min.	**don't use alone in operations involving pharynx/larynx/ bronchial tree/requiring skeletal muscle relaxation as ketamine doesn't inhibit these reflexes)** 60mcg/kg/min in **Refractory bronchospasm/ status asthmaticus,** **Note:** 1-Start low & Gradual titration in increments of 4-8 mcg/kg/min (0.25-0.5mg/kg/hr.) 2- purposeless tonic/clonic movements during anesthesia is not a sign of need of ↑ dose	***IV push*** 10 mg/mL and 50 mg/mL undiluted. Over 60 seconds, do not exceed 0.5 mg/kg/minute. ***IV continuous infusion:*** Over 24 hours.	**Dilute in** NS,D5W to 1 mg/ml. **if fluid restriction** 2mg/ml **Note:** ASHP Recommended Standard Concentrations for Pediatric Continuous Infusions: 2 mg/mL or 10 mg/mL	Stored at 20-25°C. Protect from light. **Note:** Do not mix with barbiturates or diazepam (precipitation may occur)	**Monitor** -Heart rate. -Blood pressure. -Respiratory rate. -level of sedation. -Cardiac function. (Continuously monitored in patients with increased blood pressure or cardiac decompensation). - LFTs. -Alkaline phosphatase, and gamma glutamyl transferase. **High risk medication**

Propofol 1% **10mg/ml** **Diprivan®**	**Anesthesia, general:** ***Induction of general anesthesia:*** Children ≥3 years and Adolescents <17 years: **IV:** 2.5 to 3.5 mg/kg over 20 to 30 seconds. ***Maintenance of general anesthesia:*** Infants ≥2 months, Children, and Adolescents: **Intermittent IV bolus:** **Initial: IV**: 1-4 mg/kg once; may administer additional smaller bolus doses if clinical signs of light anesthesia present. **Usual bolus dose:** 0.5 to 2 mg/kg/dose. **Continuous IV infusion:** 200 to 300 mcg/kg/minute (12 to 18 mg/kg/**hour**); then decrease dose after 30 minutes if clinical signs of light anesthesia are absent; usual infusion rate after initial 30 minutes: 125 to 150 mcg/kg/minute (7.5 to 9 mg/kg/**hour**).		May be administered undiluted or diluted. **Induction:** Administer bolus doses over 20 to 30 seconds. **Maintenance:** Administer at a concentration of 2 to 10 mg/mL as intermittent bolus injection at prescribed rate or as a continuous IV infusion via an infusion pump.	**IV:** **Diluted in** D5W to a concentration of ≥2 mg/mL; diluted emulsion is more stable in glass (stability in plastic: 95% potency after 2 hours). **Standard concentration:** 10 mg/mL in pediatric patients. To reduce pain associated with administration, add lidocaine to propofol immediately before administration. 20 mg lidocaine per 200 mg propofol.	Store between 4°-25°C. -Refrigeration is not required. -Do not freeze. -Shake well before use. Withdraw from vial into a syringe immediately after sterile vented spike inserted. -Administration should begin immediately and completed within 12 hours after the vial has been opened.	**Monitor** -Cardiac monitor, BP, oxygen saturation, arterial blood gas (with prolonged infusions). -Signs and symptoms of propofol-related infusion syndrome: Metabolic acidosis, hyperkalemia, rhabdomyolysis or elevated CPK, hepatomegaly, and progression of cardiac and renal failure. **High-risk medication**

	ICU sedation (critically ill): **Loading dose:** IV: 0.5 to 1 mg/kg once; maximum dose: 50 mg/dose. **Continuous IV infusion:** Usual range: 16 to 66 mcg/kg/minute (1 to 4 mg/kg/**hour**) **Procedural sedation:** ***Repeated IV bolus method*:** 1 to 2 mg/kg; higher initial doses of 2 mg/kg are recommended in infants and children <3 years of age; follow initial dose with 0.5 to 1 mg/kg every 3 to 5 minutes as needed until adequate level of sedation achieved. ***IV bolus followed by continuous IV infusion:*** 1 to 2 mg/kg followed by continuous IV infusion: Dose range: 50 to 250 mcg/kg/minute (3 to 15 mg/kg/**hour**); titrate to desired level of sedation. *Propofol with concurrent ketamine;*					

	emergency department procedures: **IV:** 0.5 to 0.75 mg/kg. **Status epilepticus; refractory:** **Loading dose:** 1 to 2 mg/kg once, then initiate continuous IV infusion at 20 mcg/kg/minute (1.2 mg/kg/**hour**); titrate to desired effect; usual dose range: 30 to 200 mcg/kg/minute (1.8 to 12 mg/kg/**hour**) *Breakthrough seizure while on propofol infusion:* **IV:** Increase continuous IV infusion rate by 5 to 10 mcg/kg/minute (0.3 to 0.6 mg/kg/**hour**) every 5 minutes with or without an additional 1 mg/kg IV bolus.					
Chelating agents						
Deferoxamin 500mg **Desferal®**	**Acute iron intoxication:** **Continuous IV infusion:** Initial: 15 mg/kg/hour and reduce rate as clinically indicated. **IV:** Initial:	**Maximum daily dose:** 80 mg/kg/**day**. not to exceed 6 **g/day.**	**IM:** **IV:** As intermittent IV infusion or as continuous IV infusion> **Maximum rate:** 15 mg/kg/hour;	**IM:** **Reconstitute with SWFI** 500 mg vial with 2 ml.(213 mg/ml). **IV, SUBQ:** **Reconstitute with SWFI**	Store at 20°-25°C **Reconstituted solution** Stored at 25°C for 24 hours, although the manufacturer recommends use begin within 3	**Monitor** -Serum ferritin, iron, total iron binding capacity. -CBC with differential. -Renal function tests, liver function

	20 mg/kg administered 15 mg/kg/hour followed by 10 mg/kg (max.500 mg) over 4-hour intervals for 2 doses; subsequent doses of 10 mg/kg over 4 to 12 hours may be repeated. **IM:** 90 mg/kg/dose for one dose, then 45 mg/kg/dose every 4 to 12 hours as needed. **Chronic iron overload:** **IV**: 20- 40 mg/kg/day over 8 to 12 hours, 5- 7 days/ week. Adolescents 40 to 50 mg/kg/day over 8 to 12 hours, 5- 7 days/week. **Aluminum-induced bone disease in chronic renal failure:** Test (diagnostic) dose: IV: 5 mg/kg as a single dose infused over the last hour of dialysis.	**Maximum single dose**: Children: 1,000 mg/dose. Usual maximum daily dose: Children: 40 mg/kg/**day**. Adolescents: 60 mg/kg/**day**. **(2000mg/day)**	may consider reducing infusion rate to <125 mg/hour after the first 1,000 mg have been infused. **SUBQ:** When administered for chronic iron overload, administration over 8 to 12 hours using a portable infusion pump is generally recommended.	500 mg vial with 5 ml. (95 mg/ml). **Dilute with** **NS, D5W, or LR** In 150 ml.(3- 3.5 mg/ml).	hours of reconstitution. -Do not refrigerate reconstituted solution.	tests, growth velocity, ophthalmologic exam, and audiometry. -Blood pressure (with IV infusions). -Dialysis patients: Serum aluminium.
Coagulation modifiers						
Anticoagulant reversal agent						
Phytonadione **Vitamin k** **1mg/0.5ml** **Konakion®**	**Parenteral nutrition, maintenance requirement:** Infants:		**IM:** Administer undiluted. for use in neonatal patients:	**Dilution:** **IV:** Dilute phytonadione injection in preservative-free	Store at 20°-25°C. Protect from light. -Administer shortly after preparation.	**Monitor** -PT. -INR. - Hypersensitivity reactions if administering IV.

	IV: 10 **mcg**/kg/day as an additive to parenteral nutrition solution. Children and Adolescents: **IV:** 200 **mcg**/day as an additive to parenteral nutrition solution. **Reversal of vitamin K antagonists(eg, Warfarin)** Infant, Children, Adolescents :IV 0.03mg/kg/dose. **Fixed dose:** **No bleeding, Rapid reversal, patient will require further oral anticoagulant therapy:** 0.5 to 2 mg. **No bleeding, Rapid reversal, patient will not require further oral anticoagulant therapy:** 2-5mg. **Significant bleeding, not life threatening:** 0.5-2mg.		verify appropriate concentration (1 mg/0.5 mL). **IV:** After dilution, infuse slowly. In pediatric patients, IV doses have been infused over 10 to 30 minutes. **Maximum rate of infusion:** 1 mg/minute.	NS, D5W, or D5NS. To reduce the incidence of anaphylactoid reaction upon IV administration dilution of dose is recommended (e.g., in adults, dilution of the dose in a minimum of 50 mL of compatible solution has been used).		**Note** Fatal hypersensitivity reactions have occurred during immediately after IV and IM injection. Therefore the INTRAVENOUS and INTRAMUSCULAR routes should be restricted to those situations where the subcutaneous route is not feasible and the serious risk involved is considered justified.
Anticoagulants						
Enoxaparin Clexane® 20mg/0.2ml 40mg/0.4ml 60mg/0.6ml	**Enoxaparin has ~100 anti-factor Xa units/mg.** **Thrombosis, prophylaxis:** **Infants 1 to <2 months:**		**-For SUBQ use only.** -Do not administer IM or IV. -In neonates, the thighs are the	**Dilute** Each 1 unit on a 30, 50, or 100 unit graduated insulin syringe is 0.01 ml. -Using a 100 mg/mL enoxaparin	Store at 15-30°C. -Do not freeze. -Do not store multiple-dose vials for >28 days after first use.	**Monitor** -CBC with platelets, stool occult blood tests. -Signs/symptoms of bleeding.

80mg/0.8ml	0.75 mg/kg/dose/12 hours **Infants ≥2 months, Children, and Adolescents:** 0.5 mg/kg/dose/12 hours. **Thrombosis, treatment:** **Infants 1 to <2 months:** 1.5 mg/kg/dose/12 hours. **Infants ≥2 months, Children, and Adolescents**: 1 mg/kg/dose/12 hours.		usual sites for injection. -When administering 30 mg or 40 mg SUBQ from a commercially prefilled syringe, do not expel the air bubble from the syringe prior to injection **(to avoid loss of drug).**	injection, each "1 unit" on the insulin syringe would provide 1 mg of enoxaparin.	**High risk medication**	-Serum creatinine and potassium. -Anti-factor Xa activity. -Bone density on long term use.
LMW Heparin sodium **5000IU/ml** **Heparin®**	**Congenital heart defect, thromboprophylaxis:** Continuous IV infusion: 10-15 units/kg/hour. **Extracorporeal membrane oxygenation (ECMO) (venoarterial [VA]/cardiac), anticoagulation:** IV: 100 units/kg prior to ECMO cannulation followed by continuous IV heparin infusion to maintain the activated clotting time (ACT) between 180 and 220 seconds.		**IV:** **IV bolus**: Over 10 minutes. **Continuous IV infusion:** Infuse via infusion pump. **Heparin lock Flush solution:** Intended only to maintain patency of IV devices and is **not** to be used for anticoagulant therapy. . Inject via injection cap	***Diluted in** -50-100 mL of D5W, NS(Intermittent infusion). -1000ml (Continuous IV infusion). **(ASHP monograph)** **Note** -After addition of heparin to the infusion solution, invert the solution at least 6 times to ensure adequate mixing and	Stored at room temperature. Protect from freezing and temperatures >40°C. **Stability at room temperature and refrigeration:** **Prepared bag:** refer to manufacturer's labeling.	**Monitor** -Hemoglobin, Hematocrit, Platelet count, PT, aPTT -Signs of bleeding; fecal occult blood test. **High risk medication**

	Parenteral nutrition (PN) additive, venous access patency: 1 unit/mL (final heparin concentration in PN), both central and peripheral. Small infant 0.5unit/ml/ **Peripheral arterial catheters in situ, thromboprophylaxis:** Intra-arterial (via arterial catheter): Continuous infusion of heparin at a final concentration of 5 units/mL at 1 mL/hour . **Thrombosis, treatment:** **Systemic heparinization:** IV: Initial loading dose: 75 units/kg over 10 minutes; then continuous IV infusion **Infants**: 28 units/kg/hour. **Children, Adolescents**: 20 units/kg/hour> ***Systemic to pulmonary artery shunt thrombosis :*** IV:50 to 100 units/kg, continuous infusion should be considered**.**		using positive pressure flushing. **Central venous catheters:** Must be flushed with heparin solution. **SubQ:** Not all preparation intended for SubQ administration. Inject in subcutaneous tissue only (not muscle tissue). Injection sites should be rotated (usually left and right portions of the abdomen, above iliac crest).	prevent pooling of heparin. -Products containing benzyl alcohol or derivatives should not be used to prepare products for neonates.		

Miscellaneous coagulation modifiers						
Etamsylate **250mg/2ml** **Dicynone®**	**Treatment and prophylaxis of periventricular haemorrhage** **Low birth-weight neonate:** 12.5mg/kg/6hours		**IM/IV**		Store at 20°-25°C. Protect from light.	**Monitor** Hypersensitivity.
Tranexamic acid **Kapron®**	**Diffuse alveolar hemorrhage.** **Children ≤25 kg:** **Inhaled:** 250 mg every 6hours. **Children >25 kg and Adolescents**: Inhaled: 500 mg every 6 hours for 3 to 4 doses (18 to 24 hours); if response occurs, continue treatment for another 2 to 3 doses after bleeding completely stops. **Prevention of bleeding associated with tooth extraction in hemophilic patients:** IV: 10 mg/kg immediately before surgery, then 10 mg/kg/dose 3 to 4 times daily for 2 to 8 days. **Prevention of perioperative bleeding**:	500mg/Dose (maximum dose: 1,000 mg/dose)	**Intermittent IV:** undiluted by direct IV injection at a maximum rate of 100 mg/minute; faster rates may cause hypotension. **Continuous IV infusion**: Loading dose: administered either undiluted or diluted; infuse over 5 to 15 minutes. Neonatal patients received loading doses over 60 minutes, then rate not to exceed 100 mg/minute. **Inhalation**: Administer undiluted (100	**Dilute in** **Loading dose:** 1 mL/kg or 20 mL NS. **IV infusion:** NS or D5W to a **Final concentration** of 1 mg/ml.	Store at 20°-25°C. Protect from light. ***Diluted solution** Up to 4 hours at 20°-25°C. 24 hours at 2-8°C. **Global raph.**	**Monitor** -Ophthalmic Examination -Symptoms of hypersensitivity reactions. -Seizures -Thrombotic events.

	General dosing(non-cardiac):IV: Loading dose: 10 to 30 mg/kg followed by a continuous IV infusion at 5 to 10 mg/kg/hour. **Trauma, hemorrhagic** **Children <12 years: IV:** Loading dose: 15 mg/kg over 10 minutes given within 3 hours of injury, followed by continuous IV infusion at 2 mg/kg/hour for ≥8 hrs. **Children ≥12 years and Adolescents: IV:** Loading dose: 1,000 mg over 10 minutes given within 3 hours of injury, followed by 1,000 mg infused over 8 hours		mg/mL) by jet nebulization .			
Anti hemophilic factors						
Antihemophilic Factor /von Willebrand Factor Complex (Human) **Immunate®** **500 IU FVIII/375 IU VW**	**Hemophilia A (Factor VIII deficiency):** **Required units =** body weight (kg) x desired factor VIII rise (%) x 0.5 **Hemorrhages and Surgery** 20-100 desired factor VIII level increase every 8-24 hours for 1 to 7 days according to the site of surgery. **Routine prophylaxis:**	**In general,** administration of factor VIII 1 unit/kg will increase circulating factor VIII levels by ~2% of normal. - Dosage is expressed in international units of von	**Slow IV infusion** Maximum rate: 2 ml/minute. according to the manufacturer. **Note** -Do not mix with drugs or other IV fluids. -Vasomotor reactions may result from rapid administration.	-For reconstitution use only the administration set provided in the pack. -Warm dried concentrate and diluent to room temperature before reconstitution. -Invert the transfer set with	Store intact vials at ≤25°C or 2-8°C according to the manufacturer. Protect from light. **Reconstituted solution** -Store at room temperature. -Use within 3 hours of reconstitution.	**Monitor** -Signs and symptoms of intravascular hemolysis or bleeding. -Heart rate and blood pressure (before and during IV administration).

References **Immunate drug monograph**	20 to 40 IU of factor VIII /kg 2-3 days. In some cases, especially in younger patients, shorter dosage intervals or higher doses may be necessary. **Von Willebrand (VWD), treatment:** Since Immunate contains a relatively high amount of factor VIII in relation to vWF, the treating physician should be aware that continued treatment may cause an excessive rise in factor VIII:C, which can lead to an increased risk of thrombosis.	Willebrand factor:	-Reduce the rate or interrupt administration in patients who experience a marked increase in pulse rate.	the attached solvent vial over the powder vial and insert the free needle through the rubber stopper of the powder vial. The solvent will be drawn into the powder vial by vacuum. -Gently swirl or rotate the vial after adding diluent. -Do not shake vigorously.	Do not refrigerate after reconstitution.	-Hypersensitivity reactions during the infusion. - AHF concentrations prior to and during treatment; in patients with circulating inhibitors, -Hematocrit; VWF activity.
Antihemophilic Factor **Factor VIII** **Koate®** 250 units. 500 units. 1000 units.	**General dosing for control and prevention of bleeding episodes or perioperative management:** **Infants, Children, and Adolescents.** Number of Factor VIII Units required = Body weight (in kg) x 0.5 units/kg per units/dL x desired factor VIII level increase (units/dL or %)		**Parenteral: IV** -Administer through a separate line. - Do not mix with drugs or other IV fluids. **Intermittent IV** Rate of infusion depend on patient tolerability. **Hemofil M, Koate**: 10 mL/minute.	**See individual product labeling for specific reconstitution.** -If refrigerated, the dried concentrate and diluent should be warmed to room temperature before reconstitution. -Gently swirl or rotate vial after adding diluent. -Do not shake.	Store at 2°-8°C. Do not freeze. Use within 3 hours of reconstitution. Do not refrigerate after reconstitution, precipitation may occur. **Koate**: May also be stored at 25°C for ≤6 months. Store in original package to protect from light.	**Monitor** -Heart rate and blood pressure (before and during IV administration) -Signs of hypersensitivity reactions -Signs and symptoms of bleeding. -Hemoglobin and hematocrit. -Intravascular hemolysis.

	Continuous IV infusion: Infants, Children, and Adolescents: Note: In general, administration of factor VIII 4 units/kg/hour will **increase circulating factor VIII levels by 1 unit/ml.** **Following initial bolus to achieve the desired factor VIII level**: Initial dosing: 2 to 4 units/kg/hour ***Perioperative manage ment:*** Initial: 25 to 50 units/kg prior to surgery, followed by continuous infusion at a rate of 3- 5 units/kg/hour.		**Monoclate-P**: 2 mL/minute. **Continuous IV infusion.**			
Factor IX (Human) **500 unit** **1000 unit**	**Hemophilia B (Christmas disease):** In general, administration of factor IX 1 unit/kg will increase circulating factor IX levels by ~1% of normal. **General dosing for control or prevention of bleeding episodes or perioperative management:**		**Parenteral: IV** Administration of antihistamine prior to infusion may be necessary. **Intermittent IV:** Should be infused **slowly over several minutes**: Rate of administration should be determined by	**Parenteral:** Use of plastic syringes is recommended for Mononine per the manufacturer; factor IX may stick to the surface of glass syringes. **Intermittent IV** -Allow the diluent and factor IX to reach room temperature.	Store 2°-8°C. Avoid freezing which may damage container for the diluent. **Reconstituted Solution:** **AlphaNine SD:** Used within 3 hours of preparation. **Mononine:**	**Monitor** -Heart rate and blood pressure (before and during IV administration) -Signs of hypersensitivity reactions. - Signs and symptoms of intravascular hemolysis. -Factor IX levels.

	Infants, Children, and Adolescents **IV:** **Formula for units required to raise blood level**: Number of Factor IX Units Required = body weight (in kg) x desired Factor IX level increase (% or units/dL) x 1 unit/kg per units/dL. **Continuous IV infusion:** Infants, Children, and Adolescents: administration of factor IX 7.5 units/kg/hour will increase circulating factor IX levels by 1 unit/ml. **Control and prevention of bleeding episodes and perioperative management:** Initial dosing: 4 to 6 units/kg/hour **Routine prophylaxis:** Infants, Children, and Adolescents: IV: **High dose:** 40-60 units/kg/dose 2 times weekly.		the response and comfort of the patient. **AlphaNine SD:** Administer IV at a rate not exceeding 10 mL/minute. **Mononine:** Administer IV at a rate of 2 mL/minute. **Continuous IV infusion:** Either as the reconstituted solution or further diluted in NS; diluted solution should be prepared every 12 hours.	before reconstitution, see individual product labeling for specific reconstitution details. -Gently swirl or rotate vial after adding diluent, **do not shake vigorously; do not refrigerate after reconstitution.** **Continuous IV infusion:** Diluted or undiluted. **Mononine** Diluted in NS to either 5 units/mL or 10 units/ml.	Used within 3 hours of preparation. **Diluted Solution** The preparation of solution for infusion is dependent upon prescriber discretion and should be replaced every 12 hours.	

	Intermediate dose: 20 -40 units/kg/dose 2 times weekly. **Low dose:** 10-15 units/kg/dose 2 times weekly.					
Colony Stimulating factor						
Filgrastim **Zarxio®** 300 mcg/0.5 mL **1 mcg = 100,000 units**	**Bone marrow transplantation** **IV:**10 mcg/kg/day adjust the dose according to the duration and severity. **Bone marrow transplantation, slow engraftment:** **IV, SubQ:** 5 mcg/kg/day administered ≥24 hours after chemotherapy and ≥24 hours after bone marrow infusion . **Chemotherapy-induced neutropenia:** **IV, SubQ:** 5 mcg/kg/day once daily beginning ≥24 hours after chemotherapy; Duration up to 14 days or until ANC reaches 10,000/mm^3; others have suggested 5,000/mm^3 . **Hematopoietic syndrome of acute radiation syndrome, acute:**		**SubQ:** **IV:** Neupogen (Vial only) Chemotherapy-induced neutropenia: Administer IV over 15 to 30 minutes. Bone marrow transplantation: Administer as an IV infusion over ≤24 hours. **Note** Zarxio syringes are not recommended for direct administration of doses <0.3 mL; dose cannot be accurately measured.	**Do not dilute with saline at any time; product may precipitate.** **Dilute in** D5W to 5-15 mcg/mL for IV infusion administration. Concentrations of 5 to 15 mcg/mL require addition of albumin (final albumin concentration of 2 mg/mL) to prevent adsorption to plastics; albumin should be added to the D5W prior to addition of G-CSF. Do not shake. May be prepared in glass if diluted with D5W or in PVC or polyolefin IV bags if diluted in D5W plus albumin. Discard unused portion of	Store at 2°- 8°C. Protect from light. Do not shake. Avoid freezing; if frozen, thaw in the refrigerator before administration. Discard if frozen more than once. Prior to injection, allow to reach room temperature for a minimum of 30 minutes and up to a maximum of 24 hours. Discard any vial or prefilled syringe left at room temperature for more than 24 hours. Zarxio: maximum of 4 days **Diluted solution** Stored at room temperature for up to 24 hours.	**Monitor** -CBC with differential and platelets prior to chemotherapy and twice weekly during growth factor treatment. -Signs/symptoms of acute respiratory distress syndrome allergic reactions, aortitis, capillary leak syndrome, cutaneous vasculitis, myelodysplastic syndrome and acute myeloid leukemia, and splenic rupture. -Do not administer within 24 hours before or after chemotherapy. -Educate patient on proper administration and

	SubQ: 10 mcg/kg/day once daily. **Neutropenia, severe, chronic:** Adjust the dose based on ANC and response. ***Congenital:*** **Initial:** 6 mcg/kg/day in 2 divided doses. ***Idiopathic:*** **Initial:** 5 mcg/kg/day in 1 or 2 divided doses; median dose: 1.2 mcg/kg/day. ***Cyclic*****: Initial:** 5 mcg/kg/day in 1 or 2 divided doses; median dose: 2.1 mcg/kg/day. **Neutropenia in HIV infection (eg, drug induced):** titrate every 3 days to maintain desired ANC. Infants and Children: **SubQ: Initial:** 1 mcg/kg/day. Doses as high as 20 mcg/kg/day. Adolescents: **Weight-based dosing:** **SubQ: Initial:** 1 mcg/kg/day. Doses as high as 20 mcg/kg/day **Fixed dosing: SubQ:** **Initial:** 300 mcg 1 to 3 times weekly. Maximum daily dose: 600 mcg/**day.**			vial/prefilled syringe.		disposal of syringes.

Concentrated electrolytes

Calcium gluconate **(0.5 g / 10 ml amp)** **1g cal.gluconate** =93 mg elemental Ca. =4.65 mEq Ca. =2.325 mmol.	**Hypocalcemia,treatment Asymptomatic: (elemental calcium):** Oral: 30-75 mg/kg/day in 4 to 5 divided doses. **Mild to moderate (calcium gluconate):** **Intermittent IV infusion:** 29- 60mg/kg/**dose**/ 6 hrs. **≥17 years** 1-2 g /**dose**/ 6 hrs. Continuous IV Infusion: Initial: IV: 8-13 mg/kg/hr. **≥17 years**: Initial:IV:5.4-21.5 mg/kg/hr **Severe symptoms(eg, seizures, tetany):** 100-200 mg/kg/**dose** over 5-10 mins, follow with a continuous IV infusion of 8- 32 mg/kg/hour. **Hyperkalemia, adjunctive treatment: (calcium gluconate):** 60-10mg/kg/**dose**. **Parenteral nutrition: (elemental calcium): Infant&Children≤50 kg:** 0.5 to 4 **mEq**/kg/day.	Maximum dose: 1-2 g/**dose**	**Oral formulas:** Administer with fluids with or following meals. **Intermittent IV infusion:** Must be diluted prior to administration. Infuse over 5-10 min. (not to exceed 100 mg/minute), except in emergency situations. **Continuous IV infusion.** **Maximum Rate** 0.7 to 1.8 mEq/minute. 1.5ml/minute. **Note** The 10% Calcium gluconate injection may be administered orally in young pediatric patients. **Vesicant**	**Dilute in** D5W or NS and use immediately. **Intermittent IV infusion:** Dilute to 10- 50 mg/ml. **Continuous IV infusion.** Dilute to 5.8-10 mg/ml. **Usual concentrations:** 1-2 g/100 mL D5W or NS. **Note** Dilutions assume peripheral line is used as well as D5W as the primary diluent. **Hydrofluoric acid toxicity** Inhalation: 2.5% nebulization solution: Mix 1.5 **mL** of 10% calcium gluconate solution with 4.5 mL NS to make a 2.5% solution and administer via nebulization	Store at 20°-25°C. Discard unused portions within 4 hours . **Note** If particulates are observed, place vial in a 60°C to 80°C water bath for 15 to 30 minutes (or until solution is clear)	**Monitor** -Serum calcium level. -Infusion site **(Extravasation).** -Vital signs and ECG. - Serum albumin, phosphate, and magnesium. -Constipation, bloating, and gas is common with oral Calcium. supplements -Use with caution in patients with chronic renal failure or kidney stones to avoid hypercalcemia.

	Children >50 kg, Adoles: 10 to 20 **mEq**/day. **Calcium channel blocker toxicity (calcium gluconate):** IV: 60 mg/kg/**dose** over 30-60 minutes. **Rickets, treatment:** Oral: 30-75 mg/kg/day in 3 divided doses.					
Magnesium Sulphate 10% **(500mg/5 ml amp)** **Magnesium Sulphate®** **1g MgSO4=** 98.6mg Mg= 8 mEq Mg= 4 mmol Mg. (elemental magnesium) **High risk medication**	Dose expressed as **magnesium sulfate:** **-Hypomagnesemia:** **-Torsade de pointes or ventricular fibrillation/pulseless ventricular tachycardia:** IV: 25-50 mg/kg/dose every 6 hours for 2 to 3 doses, then recheck serum concentration. **-Asthma, acute refractory exacerbation:** 25 to 75 mg/kg/dose as a single dose. -**Oral inhalation:** **Severe exacerbation:** Nebulized 150 mg/20min. for 3 doses with albuterol and ipratropium. **-Constipation** for 7 days.	**Maximum dose:** 2,000 mg/dose.	**Oral formulas:** -Dissolve in water , juice),administer on an empty stomach, with a lot of liquid following dose. **Nebulization** Administer over 15- 20 minutes. **IM:** Dilute prior to inj. **IV:** Dilute prior to administration. **Usual rate of infants.** 12.5mg/kg/hour of **magnesium sulfate**). **Emergent administration :**	**IM:** Dilute to a maximum concentration of 20%. **IV:** Dilute in D5W, NS to a usual concentration of 0.5 mEq/mL of **elemental Mg** (60mg/mL of **magnesium sulfate**). Maximum concentration 20% (200 mg/mL of **magnesium sulfate** .	-Store at 25°C. -Refrigeration of solution may result in precipitation or crystallization. **Diluted solution**	**Monitor** **Rapid administration:** -ECG monitoring, vital signs, deep tendon reflexes. -Magnesium concentrations if frequent or prolonged dosing is required. -Calcium, and potassium concentrations. - Renal function. **Note** Rate should be slowed if pt experiences diaphoresis, flushing, or a warm sensation. **Nebulization** May mix injectable solution with

	Oral (2 doses/ day). **6 to <12 years:** 1- 2 tsps.; repeat in 4hrs. **≥12 years & Adolescent** 2-4 tsps.; repeat in 4 hrs. **Parenteral nutrition,** Maintenance.Dose expressed as **elemental Mg:** **Infant& Children ≤50 kg:** IV: 0.3 to 0.5 mEq/kg/day. **>50 kg and Adolescent:** IV: 10 to 30 mEq/day.		Slow administration over 15- 20 min. ***Pulseless(VT)*** Administer as a bolus over several mins. ***Asthma exacerbation*** Over 15- 60 min. **Continuous IV infusion.**			albuterol ± ipratropium.
Potassium chloride 15% **Potassium chloride®** **10ml** **1ml=2mEq =(150mg).**	**Hypokalemia** **Intermittent IV infusion:** 0.5-1 mEq/kg/dose; **Maximum dose:** 40 mEq/dose. **Parenteral nutrition, maintenance potassium requirement** **Infant, Children ≤50 kg:** IV: 2-4 mEq/kg/day. **Adolescent >50 kg:** IV: 1-2 mEq/kg/day.	40 meq/dose.	**-Do NOT administer undiluted or by IV push; may cause fatal cardiac arrest.** **-Must be diluted prior to parenteral administration.** **Noncritical care settings:** Infusion at rate 0.2-0.5 mEq/kg/hour, in adults, up to 10 to 20 mEq/hour. **Critical care settings:**	**Diluted in** NS0.9%, G5%, G10%,NS G5%,NS 0.45%,LR. **For peripheral line:** **Final concentration:** 40-60 mEq/L (10-20mEq/250ml) **For central line:** **Concentrations from:** 120 to 300 mEq/L. **Note**	Store at 25 C. **Diluted solution** Store at room temperature for 24 hours. **Ref.** **Glopal rph**	**Monitor** -Electrolytes (serum potassium, calcium, chloride, magnesium, phosphate, sodium). -Acid/base balance. -Renal function. -Cardiac monitor. -IV infusion site(Extravasation) -Continuous ECG monitoring. **High risk medication**

			Infusion at a rate ≤0.5mEq/kg/hour ; maximum reported rate: 1- 2 mEq/kg/hour up to 40 mEq/hour. (Continuous cardiac monitoring if intermittent infusion or potassium infusion rates 0.5 mEq/kg/hour in children). **Vesicant/irritant**	Dextrose solution may lower serum potassium levels.		
Sodium bicarbonate 8.4% **Sodium bicarbonate®** 84mg/ml, **1mEq(mmol)/ml** 1g NaHCO3 = 12 mEq of HCO3-	**Cardiac arrest:IV** 1 mEq/kg/dose; repeat doses should be guided by arterial blood gases. **CKD acidosis:** ***Oral:*** Initial dose based on serum bicarbonate levels. **may divide dose for tolerability.** HCO_3^- (mEq) deficit = 0.5 × weight (kg) × [desired HCO_3^- (mEq/L) − measured serum HCO_3^- (mEq/L)] **Hyperkalemia: adjunct:** **IV:**1- 2 mEq/kg/dose.	**Note:** Routine use of sodium bicarbonate ($NaHCO_3$) in cardiac arrest is not recommended. -Targeted normal range (eg, children: 22 to 23 mEq/L. **Maximum dose in ↑K+, M. acidosis:**	**Mainly central route!!** **Direct IV injection:** **Neonate, infant** Administer 0.5 mEq/ml. **Children, Adolescents:** Administer 1 mEq/ml. **Maximum rate:** 10 mEq/minute. **IV infusion:** Over 4-8 hours **In neonates**, **Maximum rate:** 1mEq/kg/hour.	**Dilute in D5W** ASHP recommends standard concentrations, 0.5-1 mEq/ml. **Direct IV injection:** **For neonates and infants.** **1 mEq/ml.** **IV infusion:** Dilute in a dextrose solution to a maximum concentration of **0.5 mEq/ml.**	Store at 20°-25°C. **Diluted solution** 24 hours at 20°-25°C. 7 days at 2°-8°C.	**Monitor** -Serum electrolytes . -Urinary pH. -Arterial blood gases. -Infusion site to avoid extravasation. -Cardiac functions. -Ventilation (assure adequate ventilation to avoid hypercarbia), -If + loop diuretics/ thiazides (monitor for hyperchloremic acidosis)

	Metabolic acidosis, acute: **IV:** 0.5-1 mEq/kg/dose. over 5-15 minutes; Subsequent doses should be based on patient's acid-base status. **Overdose of Na+ channel blockers** **IV:**1-2 mEq/kg/dose; *may repeat* in 5 minutes if no response, *followed by* continuous IV infusion of 150 mEq $NaHCO_3$/L solution to maintain targeted pH. **Renal tubular acidosis:** ***Distal; type 1:* Oral:** 3-4 mEq /kg/**day** in divided doses. ***Proximal, type 2:* Oral**: 10-15 mEq/kg/**day** in divided doses.	50 mEq/dose. **Note:** Goal pH of 7.5 to 7.55 is recommended in TCA poisoning with hypotension, widened QRS ventricular arrhythmia. **Distal RTA** 5-10 mEq/kg/**day** and growing children need 4 to 8 mEq HCO3-/kg/**day**. **Proximal RTA** 20 mEq/kg/**day**	**Vesicant** **At concentrations ≥8.4%)!** So, ensure proper needle or catheter to avoid extravasation.	**Compatible with** D5W, D10W & NS		

Glucocorticoids						
Dexamethasone Fortacortin® 8mg/2ml	**COVID-19, treatment:** 0.15 to 0.3 mg/kg/dose once daily for 10 days. **Airway edema or extubation:** 0.5 mg/kg/dose/6- 12 hours then every 6 hours for 6 doses. **Anti-inflammatory:** 0.02 to 0.3 mg/kg/day Or 0.6 to 9 mg/m2/day/6-12 hours. **Asthma exacerbation:** 0.6 mg/kg once as single dose or 2 days. **Bacterial meningitis:** 0.15 mg/kg/dose/ 6 hrs. in the first 2 to 4 days of antibiotic treatment. **Cerebral edema:** **Loading dose:** 1-2mg/kg/dose once. **maintenance:** 1-2 mg/kg/day/ 4 to 6 hours, dose tapering. **Chemotherapy-induced nausea and vomiting, prevention:** 10 mg/m2/dose daily on chemotherapy days. **Usual range:** 8 to 14 mg/m2/dose. **Croup** 0.6 mg/kg once.	**COVID-19, treatment:** 6 mg/dose. **Airway edema or extubation:** 10 mg/dose. **Asthma exacerbation** 16 mg/dose. **Cerebral edema :** 16 mg/day. **Croups:** 10- 20 mg/dose.	**Slow IV push**: Over 1 to 4 minutes; rapid administration is associated with perineal discomfort.(May be undiluted) **IV intermittent infusion:** Over 15- 30 minutes for high doses should be diluted.	**Small doses:** May be undiluted. (4 mg/mL). **High doses:** Diluted in 50ml NS or D5W.	Store at 20°-25°C Protect from light. **Diluted solution** Store for 24 hours	**Monitor** -Hemoglobin. -Occult blood loss -Blood pressure. -Serum potassium and glucose. -Intraocular pressure with systemic use >6 weeks. -Weight and height in children.

Hydrocortisone 100mg/2ml **Solu-cortef®**	**Adrenal insufficiency, acute (adrenal crisis)** 2-3 mg/kg once; then **for infants:**1- 5 mg/kg/dose every 6 hours. **Or** 50-100 mg/m^2 once followed by 50 to 100 mg/m^2/day in 4 divided doses. **Congenital adrenal hyperplasia (CAH); chronic:** 8-15 mg/m^2/day in 3 divided doses. **Anti-inflammatory or immunosuppressive:** **Infants and Children:** **IM, IV:** 0.56- 8 mg/kg/day **or** 20- 240 mg/m^2/day in 3 or 4 divided doses. Alternate dosing: 1- 5 mg/kg/day **or** 30-150 mg/m^2/day divided every 12- 24 hour. **Adolescents:** **Oral, IM, IV, SubQ:** 15-240 mg every 12 hrs. **Stress dosing; supplemental** 20-50 or 100 mg/m^2/day divided into 3 or 4 doses; lower doses may be divided twice daily.	100 mg/dose	**-IM:** Avoid injection into deltoid muscle (high incidence of SubQ atrophy). **-IV bolus:** -Undiluted over at least 30 seconds; for large doses (≥500 mg), Over 10 minutes. **-Intermittent IV infusion:** Over 20 to 30 minutes after dilution.	**Reconstitute with** Bacteriostatic water or NS. **100 mg vial, reconstitute with a volume of diluent does not exceed 2 ml.** Concentration **≥ 50 mg/ml.** **Dilute in:** D_5W or NS Concentration should generally **not exceed 1 mg/ml.** *In pediatric patients, a concentration of **5 mg/ml** has been used. **Note** Concentrations up to 60 mg/mL (100 to 3,000 mg in 50 mL of D_5W or NS; stability limited to 4 hours) may be used.	Stored at 20°-25°C. protect from light. **Reconstituted solutions:** Stable for 3 days at 20°-25°C. Protect from light. **Diluted Solutions** Stable for at least 4 hours.	**Monitor** -Blood pressure. -Weight, growth in pediatric patients.. -Serum glucose. -Electrolytes. -presence of infection, bone mineral density. hypothalamic pituitary adrenal (HPA) axis suppression. -Signs and symptoms of behavioral or mood changes. - Signs and symptoms of Cushing syndrome every 6 months (pediatric patients <1 year of age may require monitoring every 3 to 4 months). -Monitor intraocular pressure with therapy >6 weeks.

Methyl prednisolone 500mg,1gm **Solu-medrol®** ***As sodium succinate**	**-Anaphylaxis, adjunctive therapy:** **-Graft-versus-host disease, acute (GVHD):** 1-2mg/kg/dose once daily. **Asthma Acute exacerbation:** **Infants and Children:** 1-2 mg/kg/**day** in 2 divided doses. **Children ≥12 years and Adolescents:** 40- 80 mg/**day** in 1 or 2 divided doses. **Status asthmaticus:** **Loading dose:** 2 mg/kg/dose, then 0.5-1 mg/kg/dose every 6hr. **-Immune thrombocytopenia:** **-Juvenile idiopathic arthritis, systemic:** **-Kawasaki disease:** **Pulse:** 30 mg/kg/dose once daily for 1-3 doses **Kawasaki disease:** **Primary adjunctive treatment, taper dose** 1.6 mg/kg/**day** every 8 hr. for 5 days or until afebrile. **Lupus nephritis** 10-30mg/kg/dose	Maximum dose: 125 mg/dose. **Asthma Acute exacerbation:** Maximum daily dose: 60 mg/**day** Maximum Pulse dose: 1,000 mg/dose. **Note:** Use in combination with IVIG and aspirin: Maximum daily dose: 48 mg/**day** In combination with IVIG	**IV push:** Slow IV injection over several minutes to over at least 5 minutes for doses ≤250 mg . **Intermittent infusion** Over 15- 60 minutes. -Administer doses >250 mg over at least 30 - 60 min. -Pulse doses infused over 1- 4 hours.	**Reconstitute** with provided diluent or bacteriostatic water. **Dilute** in D5W, NS, or D5NS. Pulse doses up to 1000mg dilute in 50-150 ml diluent. **Note** Neonates should only receive doses reconstituted with preservative-free SWFI.	Store at 20°- 25°C. Protect from light. **Reconstituted solution** Store at 20°-25°C for 48 hours. **Diluted solution** 4 hours at 20°-25°C. 24 hours 2°-8°C.	**Monitor** -Blood pressure. -Blood glucose. -Electrolytes; weight; intraocular pressure (use >6 weeks). -Creatine kinase. -Bone mineral density; growth and development in children; HPA axis suppression.

	or 500 to 1,000 mg/**m²**/dose once daily for 3 days. **Multisystem inflammatory syndrome in children associated with CoV-2** 1-2mg/kg/**day** twice. 10-30 mg/kg/day1-3 days **Nephrotic syndrome, steroid resistant:** 15-30 mg/kg/dose **or** 500 mg/**m²**/dose for 3 days. **Pneumocystis pneumonia (PCP):** 1 mg/kg/dose/6 hr.7 days 1 mg/kg/dose /12hr.days 8 to 9. 0.5 mg/kg/dose/12hr. days 10-11. 1 mg/kg/dose once daily days 12-16. **Adolescents:** 30 mg twice daily on days 1 - 5, then 30 mg once daily on days 6-10, then 15 mg once daily on days 11-21. **Ulcerative colitis, acute, severe** 1-1.5 mg/kg/**day** once daily or in divided doses 2 times daily; **for 3-5 days.**	maximum daily dose: 60 mg/**day**				

Diuretics						
Furosemide **20mg/2ml** **40mg/4ml** **Lasix®**	**Edema (diuresis):** Initial: **IM, Intermittent IV** 0.5-2 mg/kg/dose/ 6-12hr If initial dose ineffective after 2 hours, may increase dose by 1 mg/kg/dose. **-Continuous IV infusion:** IV bolus dose of 1 to 2 mg/kg (reported range, 0.1 to 2 mg/kg) followed by continuous IV infusion of 0.05 to 0.4 mg/kg/hour. **Adolescents:** 0.1- 2 mg/kg; usual adult bolus dose: 40 mg over 1 to 2 minutes, followed by continuous IV infusion of 0.1 to 0.4 mg/kg/**hour**.	6 mg/kg/**dose** not to exceed maximum adult dose: 200 mg/dose. 1mg/kg/**hour** **Usual adult dosing range: 10-40 mg/hour.** **Note** Oral and parenteral (IV, IM) doses may not be interchangeable due to differences in bioavailability.	**-IM (undiluted)** **- Intermittent IV:** Undiluted by direct IV at a usual rate 0.5- 1 mg/kg/minute (not to exceed 4 mg/minute). **- Continuous IV infusion:** Diluted or undiluted.	**Dilute** In NS or D5W to a concentration of 1- 2 mg/ml. **Maximum concentration: 10 mg/mL (undiluted)** **Continuous infusion** (10mg/ml). **Intermittent infusion** (2-10mg/ml).	-Store at room temperature. -Protect from light. -Refrigeration may result in precipitation or crystallization; however, resolubilization at room temperature may be done without affecting drug's stability. **Diluted solution:** Storage of solution diluted for infusion information is not provided in the manufacturer's labeling. **Do not use solutions if they have a yellow color.**	**Monitor** - Serum electrolytes. - Acid-base status. - Blood pressure. - Urine output, renal function - Fluid balance. - Hearing (with high doses or extended duration).
Gastrointestinal drugs						
Anti-emetics						
Ondansetron **4mg/2ml** **8mg/4ml** **Danset ®**	**Chemotherapy-induced nausea and vomiting, prevention:** **Oral, IV :**0.15 mg/kg/dose (5	**Maximum single dose:** 16 mg/dose. **Maximum daily dose:** 0.45	**IV push:** Over 2-5 min. **Intermittent infusion:** Over 15- 30 min.	**Dilute in** 10 to 50 mL D5W or NS. **Maximum concentration** 1mg/ml.	Store between 2°-30°C. Protect from light. **Diluted solution:** 48 hours at room temperature.	**Monitor** -ECG. -Electrolyte abnormalities [hypokalemia or

Note: The drug stability may be changed according to the manufacturer

	mg/**m²**/dose) every 4-12 hours **Fixed dosing:** Oral: 4 mg beginning 30 minutes before chemotherapy; repeat 4 and 8 hours. **Children ≥12 years and Adolescents:** Oral: 8 mg beginning 30 minutes before chemotherapy; repeat dose 8 hours. **Cyclic vomiting syndrome:** 0.3-0.4 mg/kg/dose every 4 to 6 hours as needed. **Gastroenteritis:** 0.15 or 0.3 mg/kg/dose. **Postoperative nausea and vomiting:** 0.05 to 0.1 mg/kg/dose as a single dose.	mg/kg/**day** or 32 mg/**day.** **Maximum dose:** 8 mg/dose. **Maximum daily dose:** 32 mg/**day**. **Maximum dose:** 16 mg/dose. **Maximum dose:** 4 mg/dose				hypomagnesemia] -Heart failure. -Signs/Symptoms of serotonin syndrome and hypersensitivity. -Decreased bowel activity. -Signs/symptoms of myocardial ischemia.
Proton pump Inhibitors						
Esomeprazole 40mg Nexium®	**Erosive esophagitis with GERD:** **-Acid suppression:** **Infants:** 0.5-1 mg/kg/dose once daily. **Children and Adolescents ≤17y:** <55 kg: 10 mg. ≥55 kg: 20 mg. once or twice daily.	40 mg**/dose** Acid suppression Maximum 80mg loading dose.	***Oral:*** Administer at least 1 hour before food or meals. Swallow whole do not chew or crush. You can open the capsule, and the enteric coated pellets	**Reconstitute** powder for injection. 20 or 40 mg with 5 mL of NS, LR, or D5W. **Dilute** to a final volume of 50 mL to achieve a final concentration of 0.4 mg/mL or	Store at 25°C. Protect from light. **Reconstituted &Diluted solution:** Stable 12 hours in NS or LR. 6 hours in D5W. **Note:**	**Monitor** Rebleeding in patients with upper GI bleeding or peptic ulcer bleeding. -Magnesium, Calcium baseline level

	Continuous IV infusion: 1 mg/kg IV bolus (maximum 80 mg), followed by infusion of 0.1 mg/kg/hour. **GERD, symptomatic:** **Oral:** 0.7 to 3.3 mg/kg/**day.** ***H.pylori* eradication** **15 to <25 kg:** 20 mg twice daily. **25 to 34 kg:** 30 mg twice daily. **>34 kg:** 40 mg twice daily.		may be mixed with 1 tablespoon of applesauce. ***Intermittent IV infusion:*** Over 10-30 minutes -Flush line prior to and after administration with NS, LR, or D5W. ***Continuous IV infusion:*** (Maximum 8 mg/hour)	0.8 mg/mL, respectively	Refrigeration is not required following reconstitution.	
Pantoprazole 40mg **Controloc®**	**GERD, symptomatic:** **Oral:** 1 to 2 mg/kg/day once daily. **Erosive esophagitis with GERD:** **Children 1 to 5 y:** **Oral:** 0.3, 0.6, or 1.2 mg/kg/day once daily. **Children ≥5 years and Adolescents:** **Oral:** ≥15 to <40 kg: 20 mg once daily for up to 8 weeks. ≥40 kg: 40 mg once daily for up to 8 weeks. **Gastric acid suppression:**	**Oral** 40 mg/**day**. **IV** 80mg/**day**	***IV push:*** Administer over 2 minutes. ***Intermittent IV infusion:*** Over 15 minutes at a rate not to exceed 7 mL/minute. ***Continuous IV infusion:*** Maximum 8 mg/hour. ***Oral*** Tablet: Should be swallowed whole; do not chew or crush.	**Reconstitute** powder for injection with 10 mL NS; final concentration: 4 mg/ml. **Dilute** In NS, D5W, or LR. to a final volume of 100 mL to achieve a final concentration of 0.4 mg/ml. **Note:** more concentrated solution (0.8	Store at 25°C. Protect from light. **Reconstituted solution** 6 hours at 25°C. **Diluted solution** 24 hours at 25°C in D5W, LR, or NS. **Note** Both the reconstituted solution and the admixed solution do not need to be protected from light.	**Monitor** Bone loss and fractures. -Magnesium, calcium baseline. -Liver enzymes periodically.

	Children and adolescents: <40 kg: 0.5 -1 mg/kg once or twice daily >40 kg: 20 - 40 mg once or twice daily. ***Continuous IV infusion:*** 1 mg/kg IV bolus (maximum 80 mg), followed by an infusion of 0.1 mg/kg/hour (maximum 8 mg/hour) **IV:** 0.8 or 1.6 mg/kg once daily or twice.		May be taken without regard to meals; however, best if taken 30 minutes before a meal; may be administered with antacids.	mg/mL) may be used.		
Hepatic drugs						
l-ornithine l-aspartare 50% **5g/10ml** **Hepa-merz®**	30 g daily (six ampoules containing 5 g of the drug in 10 ml solution) as an intravenous infusion over 24 h for 5 days. https://doi.org/10.1016/j.iceh.2022.04.003 1-2 ampoules per day. For patients with chronic hepatitis, cirrhosis: Dosage, 2-4 ampoules per day. Dosage, using 8 ampoules per day depends on the specific condition of the patient. Regarding the baud rate, the maximum can be 5g/hour.	Maximum dose of 6 ampoules/500 ml of infusion.	**-IV:** Diluted at a maximum infusion rate of 5g/hour.	**Dilute** Dilute with a compatible solution (D5W, NS) to a max concentration 60mg/ml (6 ampoules/500ml). Higher concentrations have been used (4 ampoules/250ml)	Store below 25°C. Protect from light. **Diluted solution:** Following dilution for infusion, use immediately.	**Monitor** -Serum and urine levels with high doses.

Immunologic agents						
Tocilizumab **80 mg/4 ml** **200 mg/10 ml** **400mg/20ml** **Actemra®**	**COVID-19, treatment:** **Children ≥2 years and Adolescents:** May repeat dose once ≥8 hours if clinical signs or symptoms worsen. **<30 kg: IV:** 12 mg/kg/dose once. **≥30 kg: IV:** 8 mg/kg/dose once. **cytokines release syndrome (CRS); severe, life threatening:** May repeat dose every 8 hours for up to 3 additional doses. **<30 kg: IV:** 12 mg/kg/dose once. **≥30 kg: IV:** 8 mg/kg/dose once. **Polyarticular juvenile idiopathic arthritis (PJIA):** **<30 kg: IV:** 10 mg/kg/dose every 4 weeks. **≥30 kg: IV:** 8 mg/kg/dose every 4 weeks. **SUBQ:** **<30 kg:** 162 mg/**dose**/ 3 weeks. **≥30 kg:** 162 mg/**dose**/ 2 weeks.	Maximum dose: 800 mg/dose.	**IV Infusion** Over 60 minutes using a dedicated IV line. -Allow diluted solution to reach room temperature prior to administration. -Do not use if opaque particles or discoloration are visible. **SUBQ:** in the prefilled syringe.	**Dilute in** **NS or $^1/_2$NS.** **Children <30 kg** Use a 50 mL diluent. **Children ≥30 kg and adolescents.** Use a 100 mL diluent. **Note** -Withdraw a volume of NS or $^1/_2$NS equal to the volume of the tocilizumab dose. -Slowly add tocilizumab dose into the infusion bag or bottle. -Gently invert to mix to avoid foaming.	Store at 2°- 8°C. Protect from light. **Diluted Solution** **In NS:** Store at 2°-8°C or room temperature for up to 24 hours. **In $^1/_2$ NS:** Store at 2°-8°C for up to 24 hours or at room temperature for up to 4 hours. -Protect from light. -Discard unused product remaining in the vials.	**Monitor** -ALT/AST, neutrophils, platelets. -Signs and symptoms of demyelinating disorders and new infections. -Signs and symptoms of infection.

	Systemic juvenile idiopathic arthritis (SJIA): **<30 kg:** 12 mg/kg/dose/2 weeks. **≥30 kg:** 8 mg/kg/dose/ 2 weeks. **SUBQ:** **<30 kg:** 162 mg/**dose**/ 2 weeks. **≥30 kg:** 162 mg/**dose**/ week.					
Plasma expanders						
Human albumin 20% **10g/50ml** **Flexbumin®**	**In hypoproteinemia with generalized edema, nephrotic syndrome, doses of albumin may be followed with IV furosemide: 0.5 to 1 mg/kg/dose.** **Ascites with hypoalbuminemia (25% albumin):** 0.5-1g/kg/dose over 2 to 3 hours; may repeat up to 3 times per day until albumin is >2.5 g/dL. **Hypovolemia (5% albumin):** 0.5-1g/kg/dose over 5 to 10 minutes. **Nephrotic syndrome edema (25% albumin):** 0.5 to 1 g/kg/dose over 30 to 60 minutes.	**Usual adult dose: 12.5 to 25 g/dose** 25 g/**dose**	**IV Infusion :** A too rapid infusion may result in vascular overload. **-5%:** Do not exceed 1 mL/minute in patients with normal plasma volume. **-25%:** Do not exceed 1-2 mL/minute in patients without shock. -Followed by diuretic therapy.	If 5% human albumin is unavailable, it may be prepared by diluting 25% human albumin with NS or D5W (if sodium load is a concern). **Note** **-Do not use sterile water to dilute albumin solutions.**	Store at ≤25°C. Do not freeze. **Note** -Use within 4 hours after opening vial (discard unused portion) -Do not use solution if it is turbid or contains a deposit.	**Monitor** - Signs of hypersensitivity reaction. -Signs of hypervolemia -Pulmonary edema -Cardiac failure -Vital signs -Fluid status -Hemoglobin& hematocrit -Urine specific gravity.

Metabolic agents						
Regular Insulin 100 units/mL (10 mL) **NovoLIN R®**	**Diabetes mellitus,type 1 :*General insulin dosing:* SubQ: Initial:** 0.4 to 0.5 units/kg/day in divided doses; usual dose0.4 to 1 unit/kg/day. **Diabetes mellitus, type 2: Children ≥10 years , Adolescents:SubQ:** The goal of therapy is to achieve an HbA1c <7% as quickly as possible. **Diabetic ketoacidosis (DKA):Continuous IV infusion:*Initial:*** 0.05 to 0.1 units/kg/**hour** ***Transition from IV to SubQ insulin:*** A dose of basal (long-/intermediate-acting) insulin should be administered in addition to rapid-/short-acting insulin. **SubQ:** 0.8 to 1 unit/kg/day in divided doses every 4 hours; titrate dose. **Calcium channel blocker or beta-blocker toxicity** **Initial loading dose:** 0.5 to 1 unit/kg bolus followed by a		**Parenteral:** use only if clear and colorless. **SUBQ:** 30 minutes before meals. **IV:** **Continuous IV Infusion** **Note** To minimize insulin adsorption to plastic IV tubing: Insulin loss will occur by adsorption to plastic (ie, PVC, polyethylene, polyolefin, polypropylene) IV containers and tubing . Therefore, flush IV tubing with a priming volume of 20 mL from the insulin infusion.	**SubQ:** Regular insulin may be mixed with other insulins; when mixing regular insulin with other insulin preparations, regular insulin should be drawn into syringe first. **Diluted Solution** ***Novolin R:*** May be diluted in NS, D5W, **or** D10W with 40 mEq/L potassium chloride at concentrations **of 0.05 to 1 unit/ml.** ***Humulin R:*** diluted in NS or D5W to concentrations of **0.1 to 1 unit/ml.** **Standard concentration** **Neonate** 0.1 or 0.5 units/ml. **Pediatric patients** 0.2 or 1 units/ml.	**Vials** Store at 2°-8°C or at room temperature ≤30°Cfor 31 days. Do not freeze. -Keep away from heat and sunlight. **In-use vials** Store at 2°-8°C or at room temperature ≤30°C and use within 31 days. **Diluted solution** Stable for 48 hours at room temperature or for 48 hours under refrigeration. **Note** Do not store diluted insulin in a plastic syringe.	**Monitor** -Blood glucose levels. -Serum electrolytes,(sodium, potassium, bicarbonate, phosphate). -Renal function; hepatic function; weight, anion gap, venous pH . -Fluid status (eg, blood pressure, fluid intake/output, signs/symptoms of dehydration or fluid overload, and mental status. **High risk medication**

	continuous IV infusion starting at 0.5 to 1 unit/kg/hour; titrate to clinical response; it has been suggested if patient remains hypotensive after initial 30 minutes of infusion to increase rate to 2 units/kg/hour. In severe cases, dose >10 units/kg/hour) **Hyperkalemia, treatment:** 1 unit of insulin for every 5 g of dextrose. **IV:** 0.1 unit/kg (maximum dose: 10 units/dose) combined with dextrose administered over 30 minutes. An alternate approach is dextrose bolus followed by 0.2 units of insulin per g of dextrose administered over 15 to 30 minutes then infused continuously as a similar amount per hour. **Hyperosmolar hyperglycemic state** Continuous IV infusion: Initial: 0.025 to 0.05 units/kg/**hour**; titrate dose.					

Respiratory agents for Inhalation

Albuterol **Farcolin®** 0.5% inhaled solution in 20ml	**Dose of Nebulization:** **Asthma:** Infants and Children ≤4 years: 0.63 to 2.5 mg every 4 to 6 hours. Children >4years and Adolescents: 1.25 to 5 mg every 4 to 8 hours as needed. **Acute exacerbation:** Infants, Children, and Adolescents: 0.15 mg/kg/dose (2.5-5 mg/dose) every 20 minutes for 3 doses then 0.15-0.3 mg/kg/dose(10 mg/dose) every1-4hrs. **Continuous nebulization:** Infants and Children <12 years: 0.5-1 mg/kg/hour. Children ≥12 years and Adolescents: 10 -15 mg/hour. **Bronchospasm** 2.5-5 mg every 20 minutes for 3 doses. **Hyperkalemia** (adjunct therapy): 2.5-10 mg nebulized over 10 minutes; dose	Asthma: acute care management: intermittent nebulization: maximum dose: 5 mg/dose continuous nebulization: maximum dose: 20 mg/hour	**-Oral inhalation:** Metered dose inhaler. Dry powder inhaler. **-Nebulization:** Concentrated solutions (≥0.5%) should be diluted prior to use. **Note** Compatibility with other medications (eg, budesonide, fluticasone, ipratropium) in nebulizer has been reported; also refer to institution-specific policies.	**Solution for nebulization:** **(0.5% solution)** Dilute 0.25 mL (1.25 mg dose) or 0.5 mL (2.5 mg dose) of solution to a total of 3 mL with NS. **Note** Compatible with ipratropium nebulizer solutions.	**Nebulization solution:** Store at 2-25°C. Do not use if solution changes color or becomes cloudy. Products packaged in foil should be used within 1 week (or according to the manufacturer's recommendations) if removed from foil pouch. **IV infusion solution** Store at 15-30°C. Protect from light. After dilution, discard unused portion after 24 hours.	**Monitor** -Asthma symptoms. -Pulmonary function tests. -Blood pressure, heart rate, and CNS stimulation. -Arterial or capillary blood gases. -Serum potassium , serum glucose, and serum creatinine.

Note: The drug stability may be changed according to the manufacturer

	may be repeated as needed.					
Budesonide **Pulmicort® 0.5mg/2 ml**	**Asthma, maintenance therapy:** **Infants ≥6 months:** 0.25 mg twice daily or 0.5 mg once daily. **Children and Adolescents:** *Symptomatic children not responding to nonsteroidal asthma medications: 0.25 mg once daily may be considered(Max 0.5mg/day). *Previously treated with oral corticosteroids: 0.5 mg twice daily or 1 mg once daily.	**Maximum daily dose:** 1 mg/**day**.	**Nebulization:** **Note** -Compatibility with other medications (e.g., albuterol, levalbuterol, ipratropium) in nebulizer has been reported. -Avoid exposure of nebulized medication to eyes. -Rinse mouth following treatments to decrease risk of oral candidiasis (wash face if using face mask).	Add enough normal saline for meet fill volume in nebulizer cup.	-Store upright at 5°- 30°C -Protect from light. -Once envelope is opened, use ampules within 3 months. -Opened ampules must be used within 12 hours.	**Monitor** **-Inhalation:** Check mucous membranes for signs of fungal infection. **Asthma:** FEV_1, peak flow, and/or other pulmonary function tests. **-long-term use:** Regular eye examinations and IOP, blood pressure, glucose, signs and symptoms of hypercorticism, or adrenal suppression.

Ipratropium **500mg/2ml** **250mg/2ml** **Atrovent®**	**Nebulization:** **Asthma, acute exacerbation:** 0.25-0.5 mg(250 to 500 mcg) every 20 min. for 1 h.,then as needed. **Asthma, maintenance therapy:** 0.25 to 0.5 mg (250 to 500 mcg) every 6 to 8 hours. **Bronchospasm, wheezing:** **Infants:**0.125 to 0.25 mg (125 to 250 mcg) every 4 hours.		**Nebulization:** Use of a nebulizer with a mouth piece, rather than a face mask, may be preferred to prevent contact with eyes.	**Dilute:** May be administered with or without dilution in NS.	**Nebulization solution:** Store at 15°- 30°C. Protect from light. Store unused vials in foil pouch. .	**Monitor** -FEV_1, peak flow. -Pulmonary function tests. -Signs/symptoms of glaucoma. -Hypersensitivity reactions. -Urinary retention.

2) Antimicrobial Pediatric doses adjustment

Antibacterial drugs			
Drug Name	**Renal dose adjustment**	**Hepatic Adjustment**	**Obese pediatric doses**
Amikacin	Renally adjusted dose recommendations are based on doses of **5 to 7.5 mg/kg/dose every 8 hours:** **GFR>50 mL/min:** No dosage adjustment necessary. **GFR 30-50 mL/min.** Administer every 12 to 18 hours. **GFR 10-29 mL/min.** Administer every 18 to 24 hours. **GFR <10 mL/min.** Administer every 48 to 72 hours. **Intermittent hemodialysis**, **Peritoneal dialysis:** 5 mg/kg/dose; redose as indicated by serum concentrations. **CRRT:** 7.5 mg/kg/dose every 12 hours.	No dosage adjustments	Use **Adjusted body weight.** **0.7 x TBW**
Ampicillin & Sulbactam	**GFR>30 mL/min:** No dosage adjustment necessary **GFR15 to 29 mL/min:** Administer every 12 hours. **GFR 5 to 14 mL/min:** Administer every 24 hours.	No dosage adjustments	Use **Total body weight** up to maximum dose.
Amoxicillin & Clavulanate	**GFR>30 mL/min:** No dosage adjustment necessary. **GFR10 -30 mL/min**: **<40 kg :** 25 mg amoxicillin/kg every 12 hours. **≥40 kg:** 1,000 mg amoxicillin followed by 500 mg amoxicillin every 12 hours. **GFR<10 mL/min**: **<40 kg:** 25 mg amoxicillin/kg every 24 hours. **≥40 kg:** 1,000 mg amoxicillin followed by 500 mg amoxicillin every 24 hours. **Hemodialysis:** **<40 kg:** 25 mg amoxicillin/kg every 24 hours; give an additional dose of 12.5 mg amoxicillin/kg at the end of each dialysis session. **≥40 kg:**1,000 mg amoxicillin followed by 500 mg amoxicillin every 24 hours; give an additional 500 mg at the end of each dialysis	No dosage adjustments Use with caution	Use **Total body weight** up to maximum dose.

Cefotaxim	Renally adjusted dose recommendations are based on doses of **100 to 200 mg/kg/day divided every 8 hours.** **GFR 30-50 mL/min.:** 35 to 70 mg/kg/dose every 8-12hrs **GFR 10-29 mL/min.:** 35 to 70 mg/kg/dose every 12 hrs. **GFR <10 mL/min.:** 35 to 70 mg/kg/dose every 24 hours. **Intermittent hemodialysis, Peritoneal dialysis (PD):** 35 to 70 mg/kg/dose every 24 hours. **CRRT**: 35 to 70 mg/kg/dose every 12 hours.	No dosage adjustments	Use **Total body weight** up to maximum dose.
Ceftriaxone	**Note:** If concurrent renal and hepatic dysfunction, a reduced maximum daily dose is required. **Not dialyzable.** In adults a maximum daily dose ≤2,000 mg/day is suggested.	No dosage adjustments.	Use **Total body weight** up to maximum dose.
Ceftazidime	Renally adjusted dose recommendations are based on a dose of **25 to 50 mg/kg/dose every 8 hours.** **GFR>50 mL/min:** No dosage adjustment necessary. **GFR 30 to 50 mL/min.:** 50 mg/kg/dose every 12 hours. **GFR 10 to 29 mL/min.:** 50 mg/kg/dose every 24 hours. **GFR <10 mL/min.:** 50 mg/kg/dose every 48 hours. **Hemodialysis, Peritoneal dialysis:** Dialyzable (50% to 100%): 50 mg/kg/dose every 48 hours, give after dialysis-on-dialysis days. **CRRT:** 50 mg/kg/dose every 12 hours.	No dosage adjustments.	Use **Total body weight** up to maximum dose.
Ceftazidime& Avibactam	**Based on ceftazidime dose.** **≥3 months, Children <2 years:** Insufficient data, use with caution. **Children ≥2 years and Adolescents <18 years:** **GFR 31-50 mL/min.** 25mg/kg/dose every 8 hrs.; (1gm /dose). **GFR 16 to 30 mL/min**. 19 mg/kg/dose every 12 hrs.; (750mg /dose). **GFR 6 to 15 mL/min**. 19mg/kg/dose every 24 hrs.;(750mg /dose). **GFR ≤5 mL/min.** Dialyzable (55%) 19 mg/kg/dose every 48 hrs.; (750 mg/dose)	No dosage adjustments.	Use **Total body weight** up to maximum dose.

Cefepime	Renally adjusted dose recommendations are based on a dose of **50 mg/kg/dose every 8-12 hours.(Max 1000- 2000mg/dose)** **GFR>60 mL/min:** No dosage adjustment necessary. **GFR 30 to 60 mL/min.:** 50 mg/kg/dose every 12-24 hrs. **GFR 11 to 29 mL/min.:** 25-50 mg/kg/dose every 24 hours. (Max 1000-2000mg/dose). **GFR <11 mL/min.:** 50 mg/kg/dose every 48 hrs. (Max 500-1000mg/dose). **-Hemodialysis:** 50mg/ kg(Max 1000mg) followed by 12.5-25mg/kg/dose once daily. (Max 500-1000mg/dose) **Peritoneal dialysis:** 25-50mg/kg/dose/48 hours. (Max 1000mg/dose). 25-50mg/kg/dose/24 hours. In sever infection(septic shock) (Max 2000mg/dose). **CRRT:** 50mg/kg/dose every 8-12 hours.	No dosage adjustments.	Use **Total body weight** up to maximum dose.
Cefoperazone& Sulbactam	**If concurrent renal and hepatic dysfunction.** **GFR 15- 30 ml/min.** Maximum of **1g / 12 hours.**(sulbactam). **GFR< 15 ml/min.** Maximum of **500 mg/12hours.** (sulbactam).	Dose modification in cases of severe biliary obstruction, hepatic disease.	Use **Total body weight.** Maximum 80mg/kg/ day sulbactam.
Ceftaroline fosamil	**Infants, Children, and Adolescents <18 years:** **GFR< 50 ml/min.** use with caution, dosage adjustment may be necessary. **Adolescents ≥18 years:** **GFR>50 mL/min:** No dosage adjustment necessary. **GFR >30 -50 mL/min.** 400 mg / 12 hours. **GFR ≥15 -30mL/min.** 300 mg/ 12 hours. **GFR<15 mL/min.** 200 mg/ 12 hours. **Hemodialysis: Dialyzable**: 200 mg /12hours.	No dosage adjustments.	Use **Total body weight** up to maximum dose.
Ciprofloxacin	**GFR>30 mL/min:** No dosage adjustment necessary. **GFR 10- 29 mL/min:** 10-15 mg/kg/dose every 18 hours. **GFR <10 mL/min, Hemodialysis, peritoneal dialysis:** Minimally dialyzable (<10%): 10 to 15 mg/kg/dose every 24 hours. **CRRT**: 10 to 15 mg/kg/dose every 12 hours.	No dosage adjustments. Use with caution in severe impairment.	Use **Adjusted body weight.** **EBW+0.45 (TBW-EBW)**

Clindamycin	No renal dose adjustment is recommended.	No dosage adjustments. Use with caution in severe impairment.	Use **Total body weight** (no max)
Colistimethate	**GFR > 80mL/min.**: No dosage adjustment necessary. **GFR 50-79mL/min.**: 2.5 to 3.8mg **CBA**/kg/**DAY** in two divided doses **GFR 30-49mL/min.**: 2.5mg **CBA**/kg/**DAY** in one OR two divided doses **GFR10-29mL/min.**: 1.5mg **CBA**/kg/dose 36 hourly **GFR< 10mL/min.:** avoid use	No dosage adjustments. Use with caution.	Use **Ideal body weight.** Actual body weight for patients with severe burns
Ertapenem	There are no pediatric specific recommendations; based on experience in adult patients, dosage adjustment suggested. **GFR30-50 mL/min.** No dosage adjustment necessary. **GFR10-30mL/min.** 50% or100% of the dose. **GFR <10 mL/min.** 50% of the dose or 1gm 3 times a week.	No dosage adjustments.	Use **Ideal body weight.**
Gentamicin	**Renally adjusted dose recommendations are based on doses of 2.5 mg/kg/dose every 8 hours:** **GFR > 50mL/min.**: No dosage adjustment necessary. **GFR 30-50 mL/min.** Administer every 12 to 18 hours. **GFR 10-29 mL/min.** Administer every 18 to 24 hours. **GFR <10 mL/min.** Administer every 48 to 72 hours. **Intermittent hemodialysis**, **Peritoneal dialysis** 2 mg/kg/dose; redoes as indicated by serum concentration. **CRRT:** 2 to 2.5 mg/kg/dose every 12 to 24 hours.	No dosage adjustments.	Use **Adjusted body weight.** (**0.7 x TBW**)
Imipenem & Cilastin	**Renally adjusted dose recommendations are based on doses of 60-100 mg/kg/day divided every 6 hours:** **GFR30-50 mL/min, CRRT :** 7-13 mg/kg/**dose** every 8 hours. **GFR10-29 mL/min.** 7.5 to 12.5 mg/kg/**dose** every 12hrs. **GFR <10 mL/min., Intermittent Hemodialysis, Peritoneal dialysis.** 7.5 to 12.5 mg/kg/**dose** every 24 hours.	No dosage adjustments. Use with caution in severe impairment.	Use **Total body weight** up to maximum dose.
Linezolid	The risk of thrombocytopenia is increased in patients with impaired kidney function. Specific recommendations are not available; utilize therapeutic drug monitoring and monitor efficacy closely. **Hemodialysis, Peritoneal dialysis:** Infants, Children, and Adolescents: 10 mg/kg/dose every 12 hours.	No dosage adjustments.	Use **Total body weight** up to maximum dose.

Levofloxacin	**Renally adjusted dose recommendations are based on doses of 5 to 10 mg/kg/dose every 12-24 hours.** **GFR ≥ 30mL/min.**: No dosage adjustment necessary. **GFR 10-29 mL/min**: 5 to 10 mg/kg/dose every 24 hours. **GFR <10 mL/min, Intermittent hemodialysis, Peritoneal dialysis:** 5 -10 mg/kg/dose every 48 hours. **Not Dialyzable**, no supplemental doses required. **CRRT**: 10 mg/kg/dose every 24 hours.	No dosage adjustments.	Use **Adjusted body weight.** **(EBW +0.45 (TBW-EBW))**
Meropenem	**Renally adjusted dose recommendations are based on doses of 20-40 mg/kg/dose every 8hours:** **GFR > 50mL/min.**: No dosage adjustment necessary. **GFR >25 -50 mL/min.** 20-40 mg/kg/dose every 12 hrs.(Max1000-2000mg/dose **GFR 10-25 mL/min.** 10-20 mg/kg/dose every 12 hrs.(Max 500-1000mg/dose) **GFR<10 mL/min., Peritoneal dialysis.** 10-20 mg/kg/dose every 24 hrs.(Max 500-1000mg/dose) **Hemodialysis, intermittent: Dialysable** Daily dosing: IV: 25 mg/kg/dose every 24hrs. Every-48-hour dosing: IV: 40 mg/kg/dose every 48 hours. **CRRT:** 20 mg/kg/dose infused over 1 to 4 hours every 8 hours; higher doses of 40 mg/kg/dose every 8 hours may be necessary in some situations.	No dosage adjustments.	Use **Total body weight** up to maximum dose.
Metronidazole	**Renally adjusted dose recommendations are based on doses of 15 to 30 mg/kg/day divided every 6 to 8 hours.** **GFR ≥ 10mL/min.**: No dosage adjustment necessary. **GFR <10 mL/min**, **Intermittent hemodialysis**, **Peritoneal dialysis:** 4 mg/kg/dose every 6 hours.	**Severe impairment** (Child-Pugh class C): Reduce dose by 50%OR administer every 12 hours instead of every 6hours.	Use **Total body weight.** *Adjusted body weight. Dosing weight = IBW + 0.45 (TBW-IBW) Ref. UpToDate 2023

Piperacillin& Tazobactam	**Renally adjusted doses are based on doses of 200-300 mg/kg/day or 300-400mg/kg/day piperacillin:** **GFR 20-40ml/min.** (35-50mg)-(45-70mg)/kg/dose/6-8 hours. (50-70mg)-(70-90mg)/kg/dose/6-8 hours. 70mg/kg/dose/8hr. extended infusion over 3hours. **GFR<20 ml/min** (35-50mg)-(45-70mg)/kg/dose/8-12 hours. (50-70mg)-(70-90mg)/kg/dose/8-1 2hours. 70mg/kg/dose/12 hours. extended infusion over 3hours. **Hemodialysis, Peritoneal dialysis.** 50 to 100 mg /kg/dose /12 hours. **CRRT:** 100 mg /kg/dose /8 hours.	No dosage adjustments.	Use **Total body weight** up to maximum dose.
Teicoplanin	Renal dose adjustment is recommended. (Dose adjustment starts after 3-4 days) **GFR 30-80mL/min.** use standard maintenance dose every 48hrs. **GFR <30 ml/min.** use standard maintenance dose every 72 hrs.	No dosage adjustments.	No data on dosing in obesity. Maximum doses in literature suggest 12 mg/kg q12h for 3 doses followed by 6–12 mg/kg q24h.
Tigecycline	No renal adjustment.	For severe Hepatic impairment, dosing adjustment suggested.	No doses above the standard 100 mg load followed by 50 mg q12h could be found. No change
Vancomycin	**Renally adjusted dose recommendations are based on doses of 10-15 mg/kg/dose every 6-8 hours:** **GFR 30 to 50 mL/min.** 10 mg/kg/dose every 12 hours. **GFR 10 to 29 mL/min.** 10mg/kg/dose every 18 to 24 hours. **GFR <10 mL/min., Hemodialysis, Peritoneal dialysis:** 10 mg/kg/dose; redose based on serum concentrations. **CRRT:** 10 mg/kg/dose every 12 to 24 hours; monitor serum concentrations.	No dosage adjustments.	1,500–2,000 mg/m2 /day. **Or** Loading dose : 20 mg/kg Then 60 mg/ kg/day divided every 6–8hours.

Anti-fungal drugs			
Amphotericin B (Conventional), Fungizone®	**If renal dysfunction is due to the drug:** The daily total can be decreased by 50%. **Or** The dose can be given every other day.	No dosage adjustments.	Use **Total body weight.**
Amphotericin B (Liposomal), Ambisome®	-No renal dose adjustment. -Administer after hemodialysis on dialysis days.	No dosage adjustments.	Use **Total body weight.**
Anidulafungin Ecalta®	No renal dose adjustment.	No dosage adjustments.	Use **Total Body weight.** (Max 250 mg Loading dose, then max 125 mg/day).
Caspofungin cancidas®	No renal dose adjustment. Poorly dialyzed; no supplemental dose or dosage adjustment necessary in patients on intermittent hemodialysis.	No dosage adjustments.	Use **Total body weight.** (Max 150 mg/day).
Fluconazole Diflucan®	**GFR ≥50 ml/min**. Administer the usual indication-specific dose every 24 hours. **GFR ≤50 ml/min**. Administer dose every 48 hours, **OR** Administer 100% of the loading dose initially, followed by 50% of the dose every 24 hours. **Hemodialysis:** Administer dose after dialysis session. **Note:** The manufacturer's labeling recommends that in addition to 100% of the dose given after dialysis-on-dialysis days, patients should also receive a reduced dose according to their creatinine clearance on non-dialysis days. **Peritoneal dialysis:** Administer 50% of the dose every 24 to 48 hours. **CRRT:** Loading dose: 6 to 12 mg/kg once, followed by 6 to 12 mg/kg/dose (as appropriate for patient-specific indication) every 24 hours; maximum dose: 800 mg/dose.	No dosage adjustments. Use with caution.	Use **Total body weight** to maximum dose. (1200mg/day).

Voriconazole Vfend®	**GFR≥50 mL/min.** There are no dosage adjustments provided in the manufacturer's labeling. **GFR<50 mL/min.** There are no dosage adjustments provided in the manufacturer's labeling. Due to accumulation of the intravenous vehicle (cyclodextrin), in adult patients, the manufacturer recommends the use of oral voriconazole in these patients unless an assessment of risk: benefit justifies the use of IV dose. If IV therapy is used, closely monitor serum creatinine, and change to oral voriconazole when possible.	**Children ≥2 years and Adolescents:** Based on adult data, dosage reduction may be necessary. (Reduce maintenance dose 50%. **Severe impairment:** Monitor closely for toxicity.	Use **Ideal body weight.** Therapeutic drug monitoring,
Antiviral drugs			
Acyclovir Zovirax®	**GFR>50 mL/min.** No dosage adjustment necessary. **GFR 25-50 mL/min.** Administer dose every 12 hours. **GFR 10-<25 mL/min**. Administer dose every 24 hours. **GFR <10 mL/min., Hemodialysis, Peritoneal dialysis** Administer 50% of the dose every 24 hours. **CRRT:** 10 mg/kg/dose every 12 hours.	No dosage adjustments.	Use **Ideal body weight.**
Gancyclovir	There are no pediatric-specific recommendations; based on experience in adult patients, dosage adjustment necessary. **GFR 50 to <70 mL/min.** **Induction:** 2.5 mg/kg/dose every 12 hours. **Prophylactic:** 2.5 mg/kg/dose every 24 hours. **GFR 25 to <50 mL/min.** **Induction:** 2.5 mg/kg/dose every 24 hours. **Prophylactic:** 1.25 mg/kg/dose every 24 hours. **GFR 10 to <25 mL/min.** **Induction:** 1.25 mg/kg/dose every 24 hours. **Prophylactic:** 0.625 mg/kg/dose every 24 hours. **GFR<10 mL/min, Hemodialysis, Peritoneal dialysis.** **Induction:** 1.25 mg/kg/dose 3 times weekly. **Prophylactic:** 0.625 mg/kg/dose 3 times weekly.	No dosage adjustments.	Use **ideal body weight.**

Abbreviations& Equations:

BMI, body mass index; **BW**, body weight; **EBW**, Expected or Ideal body weight; **TBW**, Total or Actual body weight; **ABW**, Adjusted body weight, **GFR**, Glomerular filtration rate.

BMI = weight(kg)/[height(m)]2

EBW(kg) = 50th percentile BMI for age x[height in m]2

ABW =EBW +[prespecified cofactor × (TBW−EBW)] ; The prespecific cofactor is medication specific.

Original Schwartz Equations: eGFR = k x (height in cm) ÷ serum Cr

- k = 0.33 in preemie infants
- k = 0.45 in term infants to 1 year of age
- k = 0.55 in children to 13 years of age
- k = 0.70 in adolescent males (females remain at 0.55 after age 13 years)

References:

1. Lexicomp 2023
2. Trissel's IV compatibility
3. MAGNEX/MAGNEX FORTE Injection, Pfizer 2020
4. 2020 Nelson's Pediatric Antimicrobial Therapy, Antibiotic Therapy for Children Who Are Obese
5. https://www.contemporarypediatrics.com/view/pediatric-obesity-presents-complexities-in-medication-dosing
6. https://pch.health.wa.gov.au/~/media/Files/Hospitals/PCH/General-documents/Health-professionals/ChAMP-Monographs/Colistimethate-Sodium.pdf
7. https://pch.health.wa.gov.au/~/media/Files/Hospitals/PCH/General-documents/Health-professionals/ChAMP-Monographs/Teicoplanin.pdf, Pediatric Formulary Committee. BNF for Children: 2019. London: BMJ Group Pharmaceutical Press; 2019
8. https://globalrph.com/dilution/vancomycin.
9. https://www.pediatriconcall.com/drugs/ertapenem/546 Ertapenem renal adjustment.
10. https://medilib.ir/uptodate/show/10283 linezolid renal adjustment.