

# **The Canadian Emergency Medicine Management Handbook:**

## a junior learner's guide to the management of common ED conditions

### **Creator**

Sami Alameddine, McMaster University Michael G. DeGroote School of Medicine

### **Contributors**

Kaleigh McLeod, Dalhousie University Faculty of Medicine

Kavneer Brar, University of Toronto Temerty School of Medicine

Kawami Cao, Queen's University School of Medicine

Rebecca Hey, University of Saskatchewan College of Medicine

Romaisa Ismaeel, University of Saskatchewan College of Medicine

Emma Lewis, University of Ottawa Faculty of Medicine

Teilo Siemens, University of Manitoba Max Rady College of Medicine

Allison Souter, Western University Schulich School of Medicine and Dentistry

Labib-Daiyan Syed, McGill University Faculty of Medicine

Eric Wang, Université de Montréal Faculté de Médecine

Sami Alameddine, Michael G. DeGroote School of Medicine, McMaster University

## **Editors**

Sydney Uglow, Michael G. DeGroote School of Medicine, McMaster University

Martin Wightman, Dalhousie University Faculty of Medicine

Xin Xin Yu, McGill University Faculty of Medicine

Kaleigh McLeod, Dalhousie University Faculty of Medicine

Teilo Siemens, University of Manitoba Max Rady College of Medicine

## **Resident Reviewers**

Abdullah Al-Makimi, M.D., McMaster University

Ali Ruheel, M.D., McMaster University

Deborah Ocholi, M.D., McMaster University

Erin Jacobs, M.D., McMaster University

Faisal Al Ghamsari, M.D., McMaster University

Farzan Ansari, M.D., McMaster University

Gurinder Sandhu, M.D., McMaster University

Jehan Irfan, M.D., McMaster University

Jason Wang, M.D., McMaster University

Kevin Gunther, M.D., McMaster University

Kylie Suwary, M.D., University of Western Ontario

Maggie Dalecki, M.D., McMaster University

Manpreet Kaur Kooner, M.D., McMaster University

Olivier Rabu, M.D., McMaster University

Rania Saxena, M.D., McMaster University

Ryan Elliott, M.D., McMaster University

Sara Wasef, M.D., McMaster University

Sauleha Farooq, M.D., University of Toronto

Si-Cheng Dai, M.D., McMaster University

Tali Fedorovsky, M.D., University of Toronto

Tessa Anzai, M.D., McMaster University

Tim Zhang, M.D., McMaster University

Zainab Bushehri, M.D., McMaster University

## **Staff Reviewers**

Alim Pardhan, M.D., FRCPC, Hamilton Health Sciences

Bilal Akil, M.D., CCFP(EM), Windsor Regional Hospital

Chad Singh, M.D., FRCPC, Hamilton Health Sciences

Dean Vlahaki, M.D., FRCPC, St. Joseph's Healthcare Hamilton

Erfun Hatam, M.D., FRCPC, Schulich School of Medicine & Dentistry

Erich Hanel, M.D., CCFP(EM), St. Joseph's Healthcare Hamilton

Farah Jazuli, M.D., FRCPC, St. Joseph's Healthcare Hamilton

Hayley Jones, M.D., CCFP(EM), Hamilton Health Sciences

Jana Balakumaran, M.D., FRCPC, St. Joseph's Healthcare Hamilton

Jonathan Sherbino, M.D., Med, FRCPC, FAcadMRd, DRCPSC, St. Joseph's Healthcare Hamilton

Lauren Cook-Chaimowitz, M.D., FRCPC, St. Joseph's Healthcare Hamilton

Maggie Vincent, M.D., FRCPC, Hamilton Health Sciences

Paula Sneath, M.D., FRCPC, Hamilton Health Sciences

Rebecca Barnfield, M.D., FRCPC, Schulich School of Medicine & Dentistry

Robert Primavesi, M.D., CCFP(EM), McGill University Health Centre

Sara Alavian, M.D., FRCPC, Hamilton Health Sciences

# Preface

Emergency medicine presents a unique set of challenges for junior learners. The acuity, complexity and time sensitivity of clinical presentations demand rapid decision-making and clear management plans. While medical education focuses heavily on pathophysiology, differential diagnoses and clinical skills, junior trainees are faced with the challenge of translating that knowledge into real-time management decisions, particularly in the high-stakes and often daunting environment of the ED.

*The Canadian Emergency Medicine Management Handbook: A Junior Learner's Guide to the Management of Common ED Conditions* was born out of this struggle. This handbook serves as a practical, comprehensive resource focused on the management of patients in the emergency department, from initial assessment to disposition.

This handbook is a collaborative effort, authored by Canadian medical students with a shared vision to provide a practical, accessible and evidence-based resource for all clerks and junior residents rotating through the ED. While each section has undergone review by residents and staff emergency physicians, this handbook is not intended to serve as a definitive or exhaustive resource. Rather, it provides *suggested approaches* to management that are grounded in current evidence and best practices, as interpreted by its contributors.

Importantly, this project is an independent academic initiative and does not represent the official curriculum, guidelines, or positions of any Canadian medical school, training program, or health authority. The authors and editors are solely responsible for the content.

We acknowledge that emergency medicine is a diverse specialty with a wide spectrum of acceptable management strategies that may vary based on clinical context, patient factors, provider experience, institutional preferences, and resource availability. This handbook does not seek to dictate practice or serve as a guideline, but rather to offer a framework to support clinical reasoning and decision-making.

All treatment suggestions are evidence-informed and references are provided throughout. Unless otherwise noted, all original content reflects the independent, non-commercial work of the student contributors. Generative artificial intelligence was used solely to assist in the generation of visual aids or figures, where appropriate.

This handbook should be used at the discretion of the individual healthcare provider or learner, in accordance with their scope of practice, training, and local institutional guidelines. It is not a substitute for clinical judgment, supervision, or formal medical education. As such, learners are advised to seek out help from seniors and staff when appropriate, or when managing certain conditions falls outside their comfort level or level of training.

We hope this resource serves as a stepping stone to bridge the gap between didactic learning and efficient, evidence-based emergency management, empowering learners to approach the timeless question – “What do you want to do for this patient?” – with clarity and assurance.

**Sami Alameddine, McMaster University**  
*Creator, contributor and editor*

# Case Acuity & Risk Indicators



= acute and/or complex cases; life-threatening, requires **senior presence at bedside without delay**. Do not attempt to assess or manage on your own!



= potentially serious or variable presentations; safe for learners to assess *if stable*, but must recognize early red flags.



= low risk; cases suitable for independent assessment.

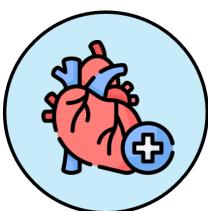


= wear PPE; high infectious risk.



= safety concern; safety plan & precautions recommended.

# TABLE OF CONTENTS



Cardiology



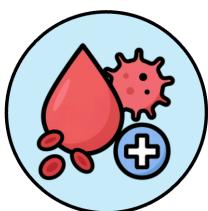
Dermatology/Skin



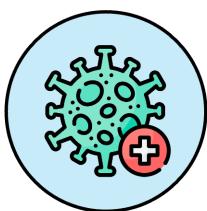
ENT, Head & Neck, Oral



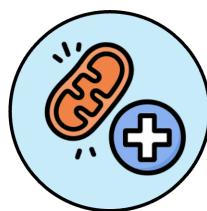
Gastroenterology



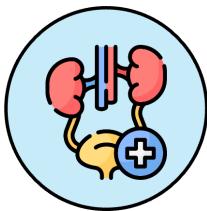
Hematology &  
Oncology



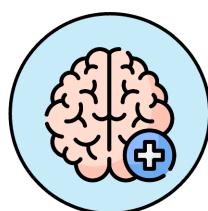
Infectious &  
Inflammatory



Metabolic



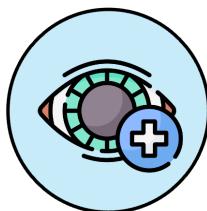
Nephrology &  
Urology



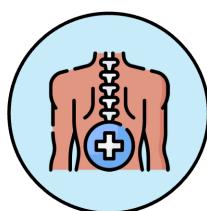
Neurology



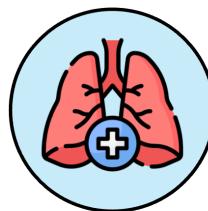
OBGYN



Ophthalmology



Orthopedics



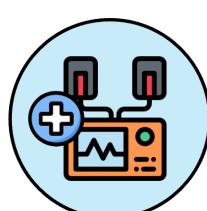
Respirology



Toxicology &  
Psychiatry



Trauma

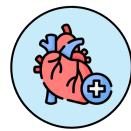


Procedures



# Cardiology

Acute Pericarditis	4
Aortic Dissection	6
Atrial Fibrillation, Atrial Flutter	8
Congestive Heart Failure Exacerbation	10
Infective Endocarditis	13
Hypertension/Hypertensive Emergency	15
Myocarditis	17
NSTEMI	19
Stable Angina	22
STEMI	25
Supraventricular Tachycardia (SVT)	29
Symptomatic Bradycardia, Heart Block	31
Unstable Angina	33
Vasovagal Syncope	35
Ventricular Tachycardia (VTach)	37



## Acute Pericarditis

### 1. ABCDE pearls

**Breathing:** monitor for pleuritic chest pain. In rare cases, constrictive pericarditis may also lead to acute heart failure/cardiogenic shock, leading to respiratory compromise.

**Circulation:** monitor for Beck's triad of pericardial tamponade (hypotension, elevated JVP/JVD, muffled heart sounds).

**Exposure:** monitor for signs of obstructive shock from tamponade (cool, clammy or mottled extremities) and indications of viral illness (fever).

### 2. Monitoring: monitor vitals closely for signs of obstructive shock secondary to cardiac tamponade (HR, BP, O<sub>2</sub> Sats).

### 3. Special considerations

Head of the bed at 45 degrees to reduce positional pain.

### 4. Medications

#### NSAID

**Ibuprofen** 600 mg to 800 mg PO TID.

OR

**Aspirin** 650 mg to 1000 mg PO TID.

OR (if recurrence)

**Indomethacin** 25 mg to 50 mg PO TID.

AND



## Colchicine

Patients  $\geq$  70 kg take 0.5 mg PO BID

Patients  $<$  70 kg take 0.5 mg PO OD

## 5. Procedure

Pericardiocentesis ([Link to procedural video](#)) in patients presenting with tamponade, a large/symptomatic pericardial effusion, suspected infection/malignancy, or recurrent pericardial effusion of unclear cause

## 6. Dispo

**Consult** medicine and/or cardiology for admission of hemodynamically stable patients with high-risk features including: fever, subacute course, immunosuppression, acute trauma, on oral anticoagulation, or elevated cardiac troponin.

**Consult** CICU for admission of patients that are presenting with hemodynamic instability with/or without cardiac tamponade.

Most patients with low-risk acute pericarditis can be discharged with outpatient follow up from their primary care provider. Instruct patients to avoid strenuous activity until symptoms resolve.

For outpatient management prescribe:

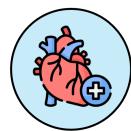
- Continuation of the NSAID selected for treatment until resolution of symptoms (~2 weeks) and then taper dose.
- Continuation of colchicine at  $<$  or  $\geq$  70 kg dose for 3 months. If treating a recurrence, extend the duration to 6 months.

Refer patients to outpatient cardiology for follow-up.

### References:

Imazio, M. Acute pericarditis: Clinical presentation and diagnosis. *M. LeWinter, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed July 7, 2025.*

Imazio, M. Acute pericarditis: Treatment and prognosis. *M. LeWinter, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed July 8, 2025.*



# Aortic Dissection

## 1. ABCDE pearls

**Airway, Breathing:** consider intubation if severely altered LOC and/or hemodynamically unstable secondary to shock, unable to protect airway.

**Circulation:** watch for signs of cardiogenic and/or hypovolemic shock (hypotension, tachycardia, mottled extremities).

## 2. Oxygen: target spO<sub>2</sub> of >94% to avoid hypoxic injury

Escalate as necessary: NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

Hyperventilate **ONLY** if signs of herniation are present (target PaCO<sub>2</sub> 30-35 mmHg).

## 3. Monitoring: monitor LOC and vitals closely, particularly BP (cycle q5min until arterial line placed – see arterial line), strict I/Os.

## 4. Analgesia

**Morphine** 2-4 mg IV q2-3h PRN

OR

**Hydromorphone** 0.5-1 mg q2-3h PRN

Note: persistent pain may indicate ongoing dissection.

## 5. HR control, then BP control

Target HR 50-60 bpm and SBP 100-120 mmHg.

**Esmolol** IV bolus 500 mcg/kg over 1 min, then infusion 50-300 mcg/kg/min

OR



**Labetalol** 20 mg IV over 2 min, then repeat 20-80 mg q10min to total 300 mg or infusion 0.5–2 mg/min

If BP remains high after HR control, add vasodilator:

**Nicardipine** 5 mg/hr IV infusion, titrate q5min to max 15 mg/hr

## 6. Dispo

**Consult** Cardiac Surgery for Type A dissection

**Consult** Thoracic Surgery for Type B dissection

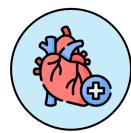
**CICU** admission if persistently hemodynamically unstable, requiring pressors and/or inotropes.

### References:

Reed M. J. (2024). Diagnosis and management of acute aortic dissection in the emergency department. *British journal of hospital medicine (London, England : 2005)*, 85(4), 1–9. <https://doi.org/10.12968/hmed.2023.0366>

UpToDate, 2025. Overview of acute aortic dissection and other acute aortic syndromes

Farkas, J. (2024, September 28). *Aortic dissection*. In *The Internet Book of Critical Care (IBCC)*. EMCrit Project



# Atrial Fibrillation, Atrial Flutter

## 1. ABCDE pearls

Circulation: monitor vitals and assess for hemodynamic instability (SBP <90, chest pain, altered LOC). If unstable, immediate synchronized cardioversion is indicated (see [Cardioversion](#)).

**2. Monitoring:** Place all rapid atrial fibrillation patients on telemetry and monitor vitals and LOC closely for instability. Transfer to the cardiac section of ED if available in your department.

## 3. Medications for rapid atrial fibrillation

Consider clinical context: Elevated HR may be an important compensatory mechanism in shock. Consider fluid resuscitation as a first line therapy before initiating medications.

**Rate control** (preferred for most stable patients)

**Metoprolol** 2.5-5 mg IV q5-10 min PRN (max 15 mg)

OR

**Diltiazem** 0.25 mg/kg IV over 2 min, then 0.35 mg/kg (if inadequate response) (note: avoid in heart failure patients)

OR

**Amiodarone** 150 mg IV over 10 min if above agents contraindicated or ineffective

**Rhythm control** (if new onset afib for <48h, >48h with at least 3 weeks of adequate anticoagulation or TEE proving absence of LA thrombus)

**Amiodarone** 150 mg IV over 10 min, then 1 mg/min for 6 h, then 0.5 mg/min



OR

**Procainamide** 15 mg/kg IV over 60 min, then maintenance at 1-4 mg/min

(avoid if hypotensive or prolonged QT)

OR

**Synchronized electrical cardioversion:** 100–200 J biphasic if unstable (see [Cardioversion](#))

**Anticoagulation** (if >48h or uncertain duration then anticoagulate before rhythm control). Discuss with thrombosis on call if available at your centre.

**Apixaban** 10 mg PO BID

OR

**Rivaroxaban** 15 mg PO BID

#### 4. Dispo

**Consult** cardiology for unstable afib/flutter, suspected AF with WPW, high thromboembolic risk, or if failed rate/rhythm control.

Can otherwise decide to **discharge** patient if hemodynamically stable (after monitoring), properly rate controlled and underlying cause (if present) addressed.

Consider outpatient cardiology referral for definitive management (possible cardioversion when safe, and/or ablation). Recommend follow-up with primary care provider.

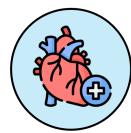
#### References:

Andrade, J. G., et al. (2020). 2020 CCS/CHRS guidelines for the management of atrial fibrillation. *Canadian Journal of Cardiology*, 36(12), 1847–1948.

Thrombosis Canada. (2023). *Atrial Fibrillation – Anticoagulation*.

BC Emergency Medicine Network. (2022). *Atrial fibrillation clinical pathway*

UpToDate. (2024). *Acute management of atrial fibrillation and flutter in adults*. [www.uptodate.com](http://www.uptodate.com)



# Congestive Heart Failure Exacerbation

## 1. ABCDE pearls

**Airway and Breathing:** watch for signs of respiratory distress, altered LOC and/or pulmonary edema (crackles, orthopnea).

Intubation is generally not recommended in patients with CHF unless in the setting of myocardial infarction requiring a secure airway for cardiac catheterization.

**Circulation:** assess degree of fluid overload (lower extremity edema, abdominal distention, crackles). Note that patients in acute heart failure may be hypotensive, normotensive, or hypertensive.

## 2. Monitoring: closely monitor work of breathing, BP, and O<sub>2</sub> saturation. Continually reassess lung auscultation.

## 3. Oxygen: target spO<sub>2</sub> of >92%

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

Indications for NIPPV: RR >25 or hypoxemic despite 100% FiO<sub>2</sub> by NRB

## 4. Diuretics

If Furosemide naive:

**Furosemide** 20-40 mg IV (starting dose)

OR

If on home Furosemide:

**Furosemide** home (PO) dose x2 IV

Patients with renal impairment may require higher doses to achieve adequate diuresis.



Consider consulting cardiology for gradual inpatient addition of **metolazone** 2.5-5 mg PO if poor response to furosemide.

## 5. Vasodilators (if hypertensive)

**Nitroglycerin** 0.4 mg SL followed by IV infusion starting at 10-20 mcg/min, titrate q5-10 min

(avoid if hypotensive, suspected concomitant RV infarct, or taking phosphodiesterase inhibitors such as sildenafil)

Note that hypertensive patients with sudden onset severe respiratory distress may be experiencing **Sympathetic Crashing Acute Pulmonary Edema (SCAPE)** and require higher doses of nitroglycerin

Initiate **NIPPV** (BiPAP)

AND

**Nitroglycerin** bolus

IV: 1000 mcg over 2 minutes

SL: 3 sprays = 1200 mcg (if no IV access)

Followed by **nitroglycerin** IV infusion

Start at 100 mcg/min and uptitrate aggressively to target reduction in sBP.

Monitor BP and downtitrate quickly when sBP <140 and SCAPE symptoms resolve to avoid hypotension. Consider inserting an arterial line for continuous BP monitoring.

## 6. Inotropes (if hypotensive cardiogenic shock)

**Norepinephrine** infusion at 0.05 mcg/kg/min, uptitrate to MAP >60.

Consider **LR or NS** bolus (500 cc) if hypovolemia suspected.

Look for causes of cardiogenic shock (e.g., acute myocardial infarction) and treat accordingly.



Consider **Milrinone** or **Dobutamine** in consultation with cardiology colleagues if persistent hypotension is not responsive to the above.

## 7. Dispo

**Consult** medicine for moderate to severe symptoms, elevated O<sub>2</sub> requirements, new arrhythmia or ischemia, persistent/refractory volume overload, desaturation with 3-minute walk test, unsafe for discharge, lack or caregiver, expected non-compliance with medications

**Discharge** only if mild symptoms improved with ED treatment, hemodynamically stable, oxygenating well on room air, known CHF, normal or improving renal function, reliable and with good primary care/outpatient follow-up access. Urine output must be in keeping with diuresis from lasix given in ED.

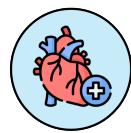
Can recommend increasing home Furosemide dose pending follow-up with primary care physician to review CHF management.

### References:

Colucci, W. S. (2024). *Treatment of acute decompensated heart failure: Specific therapies*. UpToDate. [www-upToDate-com.uml.idm.oclc.org/contents/treatment-of-acute-decompensated-heart-failure-specific-therapies](http://www-upToDate-com.uml.idm.oclc.org/contents/treatment-of-acute-decompensated-heart-failure-specific-therapies)

Gupta, A., Ghimire, G., & Hage, F. G. (2014). Guidelines in review: 2013 ACCF/AHA guideline for the management of heart failure. *Journal of Nuclear Cardiology*, 21(2), 397–399. <https://doi.org/10.1007/s12350-013-9832-x>

Velasco, C. E., Diercks, D., & Levy, P. D. (2017). Emergency department therapy of Acute Heart Failure. *Contemporary Cardiology*, 165–183. [https://doi.org/10.1007/978-3-319-44006-4\\_13](https://doi.org/10.1007/978-3-319-44006-4_13)



# Infective Endocarditis

## 1. ABCDE pearls

**Airway and Breathing:** monitor for signs of pulmonary emboli, such as shortness of breath or hypoxia. Monitor for altered LOC, declining GCS, hemodynamic instability; intubate accordingly.

**Circulation:** monitor for signs of cardiogenic shock secondary to severe valvulopathy such as hypotension, tachycardia, murmurs, and heart failure. Remember to assess distal limb perfusion, as septic emboli may deposit in the extremities and lead to ischemia.

**Exposure:** observe for petechiae, Janeway lesions, Osler nodes, and splinter hemorrhages.

## 2. Monitoring: monitor vitals closely, including temperature, for infective endocarditis.

## 3. Oxygen supplementation

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

## 4. Antibiotics

If clinically stable, antibiotics may be deferred until blood culture results are available.

If unstable, initiate empiric treatment with the following:

**Vancomycin** 15 mg/kg IV q12h

AND

**Ceftriaxone** 2 g IV q24h

Reassess sensitivity when blood cultures are available.



## 5. Dispo

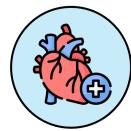
**Consult** internal medicine for all endocarditis cases for admission.

**Consult** ICU if hemodynamically unstable, requiring vasopressors or inotropes.

### References:

Tackling G, Lala V. Endocarditis Antibiotic Regimens. [Updated 2023 Apr 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK542162/>

Wang A. Overview of management of infective endocarditis in adults. *A. Bolger, ed. UpToDate. Waltham, MA: UpToDate Inc. http://www.uptodate.com. Accessed July 6, 2025.*



# Hypertension/Hypertensive Emergency

## 1. ABCDE pearls

**Airway and Breathing:** monitor for severely altered LOC, declining GCS, inability to protect airway +/- vomiting; intubate accordingly.

**Circulation:** monitor for hypotension, tachycardia, aLOC for signs of hemorrhage and/or end organ failure; check for unequal pulses (aortic dissection); resuscitate accordingly.

**Disability:** assess for signs of hypertensive encephalopathy (confusion, headache, nausea, vomiting, seizure).

## 2. Monitoring: closely monitor HR, BP and conduct frequent neuro vitals.

## 3. IV antihypertensives: titrate to desired BP

\*Blood pressure should almost never be rapidly lowered (except in aortic dissection and severe pre-eclampsia/eclampsia); rule is no more than 25%

**Labetolol** 20 mg IV bolus over 2 min, then 20-80 mg IV q10min PRN (up to max 300mg IV) or infusion at 1-2mg/min

OR

**Nitroglycerin** 5 mcg/min IV infusion, titrate up q5min (first line for pulmonary edema or ACS) (max 2mcg/min)

OR

**Hydralazine** 5-10 mg IV q20min

OR

**Nicardipine** 5 mg/hr IV infusion, then increase by 2.5 mg/hr q5-15min



## 4. Dispo

**Consult** ICU for admission if patient has ongoing end-organ damage (encephalopathy, stroke, ACS, dissection, pulmonary edema, acute renal failure) or persistent requirements for IV titratable antihypertensives.

**Consult** medicine/step-down if hypertensive emergency has stabilized with initial IV therapy and can transition to oral agents, or if close monitoring (telemetry, q1h vitals) is required.

**Discharge** usually inappropriate for hypertensive emergency (i.e. with signs of end-organ damage). Discharge if hypertensive urgency, with no signs of end-organ damage and BP improved with oral therapy, with reliable follow-up by primary care provider.

### References

Rabi, D. M., McBrien, K., Sapir-Pichhadze, R., et al. (2020). Hypertension Canada's 2020 Comprehensive Guidelines for the prevention, diagnosis, risk assessment, and treatment of hypertension in adults and children. *Canadian Journal of Cardiology*, 36(5), 596–624. <https://doi.org/10.1016/j.cjca.2020.02.086>

Emergency Care BC. (2020). *Hypertensive Emergencies (Clinical Summary)*

Canadian Stroke Best Practices. (2022). *Acute Stroke Management: Blood Pressure Management*. Heart & Stroke Foundation

CorHealth Ontario. (2023). *Acute Aortic Dissection: Guide for ED Clinicians (Version 1, June 2023)*.

Magee, L. A., Smith, G. N., et al. (2022). Guideline No. 426: Hypertensive disorders of pregnancy: Diagnosis, prediction, prevention, and management. *Journal of Obstetrics and Gynaecology Canada*, 44(5), 547–571.e1

Hospital Formulary – Hamilton Health Sciences & London Health Sciences Centre. (2023). *Adult IV Opioid Dosing for Acute Pain*. Retrieved from institutional formulary guidance (available to Canadian clinicians).



# Myocarditis

## 1. ABCDE pearls

**Breathing:** patients often feel short of breath, and may require respiratory support. Severe cases of myocarditis may lead to acute heart failure which may require NIPPV or intubation.

**Circulation:** monitor closely for arrhythmias (VT, VF, AV Block), and signs of cardiogenic shock (hypotension, tachycardia, weak peripheral pulses).

**Exposure:** monitor for signs of cardiogenic shock (cool, clammy or mottled extremities), and look for signs of viral illness (fever) and/or autoimmune etiology (rash).

## 2. Monitoring:

Monitor vitals closely for signs of cardiogenic shock (including HR, BP, O<sub>2</sub> sats).

Monitor for arrhythmia (VT, VF, AV block) and fulminant myocarditis (rapid decline in LVEF, multi-organ failure). Repeat ECG PRN for new symptoms.

Consider performing bedside POCUS in the ED to assess for gross LV contractility/function.

## 3. Special considerations

Head of the bed at 45 to 90 degrees if in acute heart failure

## 4. Medications

**Acetaminophen** 1 g PO q6h PRN for analgesia, max 4 g/day

AND

If volume overloaded and hemodynamically stable:

**Furosemide** 20-40 mg IV q12h PRN

AND



If hemodynamically stable with ventricular arrhythmia:

**Amiodarone** 150 mg IV over 10 minutes then 1 mg/minute IV infusion for 6 hours

Avoid NSAIDs unless associated pericarditis

## 5. Disposition

**Consult** cardiology for all cases of myocarditis for assessment and/or admission and further workup.

**Consult** ICU if the patient is hemodynamically unstable, requiring vasopressors and/or inotropes

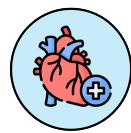
### References:

Acetaminophen (paracetamol): Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed June 16, 2025.

Amiodarone: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed July 11, 2025.

Cooper, L. Treatment and prognosis of myocarditis in adults. W. McKenna, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed July 11, 2025.

Norepinephrine (noradrenaline): Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 18, 2025.



## NSTEMI

### 1. ABCDE Pearls

**Airway, Breathing:** watch for aLOC, declining GCS, respiratory distress and inability to protect airway requiring intervention; intubate accordingly.

**Breathing:** assess for respiratory distress. Provide supplemental oxygen PRN to target SpO<sub>2</sub> >94%.

**Circulation:** monitor for signs of hemodynamic instability (hypotension, bradycardia, altered mental status) for signs of cardiogenic shock and resuscitate accordingly.

### 2. Monitoring

- a. Monitor vitals closely (HR, BP, O<sub>2</sub> sats) for signs of cardiogenic shock. These patients should be placed in a monitored setting with the ability for continuous cardiorespiratory monitoring/telemetry.
- b. Repeat ECG q15-30min if ongoing symptoms or concern regarding dynamic ECG changes
- c. Serial troponins q3h

### 3. Anti-Ischemic Therapy

**Nitroglycerin** 0.4 mg SL (one spray) q5min x3 PRN for chest pain (avoid systolic BP <90 mmHg, signs of inferior infarct, or if the patient has taken phosphodiesterase inhibitors within the past 24-48 hours)

### 4. Antiplatelet Therapy

**Aspirin** 160-325 mg (nonenteric coated) PO – chewed

AND

P2Y12 inhibitor:

**Ticagrelor** 180 mg PO loading dose



OR

**Clopidogrel** 300-600 mg PO loading dose

## 5. Anticoagulation

Patients receiving primary PCI (for high risk patients with recurrent angina, significant arrhythmias, signs of heart failure or hemodynamic instability):

**Unfractionated heparin** (UFH) initial IV bolus of 50-70 units/kg up to maximum of 5000 units

Patients receiving fibrinolysis:

**Enoxaparin** for patients not at high bleeding risk

Loading dose of 30 mg IV bolus followed by 1 mg/kg SC q12h; maximum of 100 mg for the first 2 subcutaneous doses (if < 75 years old)

No IV loading dose; administer 0.75 mg/kg SC q12h; maximum of 75 mg for the first 2 doses (if ≥75 years old)

**Fondaparinux** for patients at high bleeding risk

2.5 mg IV, followed by 2.5 mg subcutaneously every 24 hours

**aPTT-driven UFH** for patients who may receive PCI after fibrinolysis

IV bolus 60-100 units/kg to a maximum of 4000 units, followed by infusion of 12 units/kg/h (maximum 1000 units/h); adjust to achieve aPTT of 50-70 seconds

## 6. Disposition

Consult **cardiology** for assessment and/or admission (note: depending on the centre, some admissions may go to internal medicine overnight so check local practice guidelines)

**Admit** to CICU for cardiogenic shock and needing vasopressors



References:

Amsterdam, E. A., Wenger, N. K., Brindis, R. G., Casey, D. E., Ganiats, T. G., Holmes, D. R., ... & Zieman, S. J. (2014). *2014 AHA/ACC guideline for the management of patients with non-ST-elevation acute coronary syndromes*. Journal of the American College of Cardiology, 64(24), e139–e228. <https://doi.org/10.1016/j.jacc.2014.09.017>

Basit H, Malik A, Huecker MR. Non-ST-Segment Elevation Myocardial Infarction. [Updated 2023 Jul 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK513228/>

UpToDate, 2025. Non-ST-elevation acute coronary syndromes: Selecting a management strategy

UpToDate, 2025. Overview of the acute management of non-ST-elevation acute coronary syndromes



## Stable Angina

### 1. Monitoring:

Monitor vitals closely (HR, BP, O<sub>2</sub> sats).

Serial ECGs and troponins are not indicated if the pain is clearly typical stable angina without change in pattern, severity, or duration. If pain is atypical, prolonged, or worsening, **treat as possible ACSs**.

### 2. Antiplatelet Therapy

**Aspirin** 160-325 mg PO

The loading dose of aspirin is still indicated for those already taking aspirin at home.

### 3. Anti-Ischemic Therapy

**Nitroglycerin** 0.4 mg sublingually q5min x 3 doses for chest pain relief. (if persists after 3 doses consider ACS)

(avoid if systolic BP <90 mmHg or if the patient has taken phosphodiesterase inhibitors within the past 24-48 hours)

### 4. Disposition

**Admission** is warranted if:

- New, worsening, or unstable features (rest pain, crescendo angina, prolonged pain, syncope).
- Positive troponin or dynamic ECG changes.
- Moderate/high HEART score.



**Discharge** if the following are met:

- Chest pain is clearly indicative of stable angina
- OR
- Chest pain is not typical for stable angina but all of the following criteria are met.
- Symptoms fully resolved
- Normal vitals and physical exam
- ECG and troponin x2, drawn at a minimum of 2 hours apart, are negative

### ***Risk Stratification:***

**HEART Score** – short-term risk (30-day) of a major adverse cardiac event

**History** (Slight, Moderate, or Highly suspicious)

**ECG** (Normal, non-specific changes, or significant ST-depression)

**Age** (<45, 45–64, ≥65)

**Risk factors** (None, 1-2, or ≥3 or known CAD)

**Troponin** (Normal, 1-3x normal, or >3x normal)

**0–3: Low risk** – suitable for discharge with follow-up

**4–6: Moderate risk** – consider observation and further testing

**7–10: High risk** – cardiology consult and probable admission

Discharge instructions:

Follow up with primary care provider or refer to outpatient cardiology clinic

Counsel on taking nitroglycerin as prescribed for chest pain (max 3 doses in 15 min; if no relief after 1st dose, call 911)

### References:

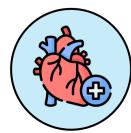
Knuuti, J. (2020). Corrigendum to: 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. *European Heart Journal*, 41(3):407.



Mahler, S. A. (2025). *Approach to the patient with suspected angina pectoris*. UpToDate.  
<https://www-upToDate-com.uml.idm.oclc.org/contents/approach-to-the-patient-with-suspected-angina-pe>

Mancini, G. B. J., et. al. (2014). Canadian Cardiovascular Society guidelines for the diagnosis and management of stable ischemic heart disease. *Canadian Journal of Cardiology*, 30(8), 837–849.  
<https://doi.org/10.1016/j.cjca.2014.05.013>

Six, A. J., et. al. (2008). Chest pain in the emergency room: Value of the heart score. *Netherlands Heart Journal*, 16(6), 191–196. <https://doi.org/10.1007/bf03086144>



## STEMI

### 1. ABCDE pearls

**Airway, Breathing:** watch for aLOC, declining GCS and inability to protect airway requiring intervention; intubate accordingly

Watch for early signs of cardiogenic shock (pulmonary edema) and provide respiratory support as necessary, including consideration of intubation if clinically indicated

**Circulation:** watch for hypotension, tachycardia as signs of cardiogenic shock and resuscitate accordingly. Watch for bradycardia or lethal arrhythmias as well

**Disability:** watch for altered LOC which may be suggestive of cardiogenic shock limiting cerebral perfusion

### 2. Oxygen

O<sub>2</sub> therapy to target spO<sub>2</sub> of >90%

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP (avoid BiPAP in right-sided infarct)

### 3. Monitoring

- a. monitor vitals closely (BP, HR, O<sub>2</sub> sat)
- b. Move patient to monitored setting
- c. Apply defibrillation pads

### 4. Antiplatelets

All patients: **Aspirin** 160-325 mg (nonenteric coated) chewed

(can be administered as rectal suppository if unable to tolerate PO)



AND (consult cardiology for guidance)

For patients receiving primary PCI

**Ticagrelor** 180 mg (loading dose)

For patients receiving fibrinolysis

**Clopidogrel** 300 mg (loading dose) if  $\leq$  75 years old, 75 mg if  $>75$

## 5. Anticoagulants (consult cardiology for guidance)

Patients receiving primary PCI:

**Unfractionated heparin** (UFH) initial IV bolus of 50-70 units/kg up to maximum of 5000 units

(if given ticagrelor or prasugrel antiplatelet)

OR

**Bivalirudin** initial bolus of 0.75 mg/kg IV followed by IV infusion of 1.75 mg/kg per hour

(if given clopidogrel antiplatelet)

Patients receiving fibrinolysis:

**Enoxaparin** for patients not at high bleeding risk

Loading dose of 30 mg IV bolus followed by 1 mg/kg SC q12h; maximum of 100 mg for the first 2 subcutaneous doses (if  $< 75$  years old)

No IV loading dose; administer 0.75 mg/kg SC q12h; maximum of 75 mg for the first 2 doses (if  $\geq 75$  years old)

**Fondaparinux** for patients at high bleeding risk

2.5 mg IV, followed by 2.5 mg SC q24h

**aPTT-driven UFH** for patients who may receive PCI after fibrinolysis



IV bolus 60-100 units/kg to a maximum of 4000 units, followed by infusion of 12 units/kg/h (maximum 1000 units/h); adjust to achieve aPTT of 50-70 seconds

## 6. Analgesia

For persistent chest discomfort, hypertension, or signs of heart failure **AND** no contraindications, give:

**Nitroglycerin** 0.4 mg tablet x3 sublingually q5min (if sBP > 90 mmHg)

OR

**Nitroglycerin** x1 sublingual spray (0.4mg/spray) q5min x 3 doses

If chest discomfort persists, give:

**Morphine** 2-4 mg slow IV push q5-15min

OR

**Fentanyl** 25-50 mcg

*(Contraindications include: signs of hemodynamic compromise, use of phosphodiesterase inhibitors, inferior MI with right ventricular involvement)*

## 7. Disposition

Consult **interventional cardiology** for definitive management:

**Primary Percutaneous Coronary Intervention (PCI)** is the gold standard of treatment for patients with symptom onset <12h.

**Fibrinolysis** is considered for patients with symptom onset <12h, PCI not available within 120 minutes of medical contact, and no contraindications. Often performed with tenecteplase (TNK) vs alteplase (tPA) given equivalent mortality rates but lower risk of hemorrhage with TNK.

**Reperfusion therapy** is **NOT** indicated if patients who present >12h after symptom onset. Emergent PCI may be considered for patients with ongoing ischemia or risk of death.



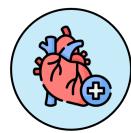
**Consult** cardiac ICU in cases of hemodynamic instability requiring pressors and/or inotropes, altered level of consciousness, cardiogenic shock, free wall rupture, or papillary rupture.

References:

Silver, S. A., et. al. (2025). 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients With Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*, 151(13)

UpToDate, no date. *STEMI and NSTEACS: Rapid overview of emergency management*. [online] Available at: <https://www.uptodate.com/contents/image?imageKey=CARD%2F75032>

Twiner, M.J., Hennessy, J.L., Wein, R. & Levy, P.D., 2022. Nitroglycerin use in the emergency department: Current perspectives. *Open Access Emergency Medicine*, 14, pp.327–333. doi:10.2147/OAEM.S340513



# Supraventricular Tachycardia (SVT)

## 1. ABCDE pearls

**Airway and Breathing:** ensure airway protection. Monitor for severely altered LOC, low GCS, hypoventilation/cardiorespiratory arrest; intubate accordingly.

**Circulation:** Watch for hemodynamic instability (hypotension, tachycardia, altered LOC, heart failure) for possible cardiogenic shock; resuscitate accordingly.

## 2. Monitoring:

most patients with supraventricular tachycardia should be placed on telemetry and vitals/LOC observed closely (unless hemodynamically stable, responsive to treatment).

## 3. Procedures

Attempt **Modified-Valsalva** manoeuvre to terminate rhythm (i.e. bearing down, blowing through syringe).

**Note:** The Modified-Valsalva manoeuvre incorporates orthostatic position change (patient transferred from upright to supine with legs held elevated). For patients unable to blow on syringe, consider trial of position change alone for manoeuvre.

**Carotid massage** can terminate SVT rhythm. Performed by massaging the carotid artery for five seconds. Note: avoid in older patients or vasculopathies given risk of carotid artery thrombosis.

**Synchronized cardioversion** if failed vagal manoeuvres and medication attempts or if hemodynamic instability (see [Cardioversion](#)). Start at 50-100 joules and titrate up as necessary for termination. Stable patients undergoing cardioversion should receive moderate sedation and analgesia.

If patient is hemodynamically unstable, IMMEDIATE cardioversion.



## 4. Medications

If failed vasovagal manoeuvres, give **Adenosine** 6 mg IV

If first dose unsuccessful, give **Adenosine** 12 mg IV after 2 minutes

OR

Antiarrhythmic infusions (if adenosine ineffective)

**Procainamide** 20-50mg/min IV until SVT suppressed and/or hemodynamically stable (avoid if prolonged QT or CHF)

OR

**Amiodarone** 150 mg IV over 10 minutes

Note: If giving adenosine, patient should have defibrillator pads placed in case of deterioration into ventricular dysrhythmia, particularly for those with Wolf-Parkinson-White accessory pathway (high risk)

## 5. Disposition

**Consult** cardiology for assessment and/or admission, especially if refractory to medical management, hemodynamically unstable, or recurrent presentation.

**Consult** CICU for hemodynamic instability requiring pressors and/or inotropes, cardiogenic shock.

**Discharge** in case of cessation of SVT and hemodynamically stable, full recovery from sedation (if cardioverted), no signs of heart failure or other arrhythmias. Usually SVT is seen in younger patients, without cardiac risk factors and is unlikely to recur.

Recommend follow-up with primary care provider.

Outpatient referral to EP for follow-up, possible Holter monitoring and/or ablation.

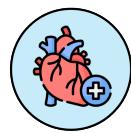
### References:

Lytvin, Y. and Qazi, M.A. (2022). Toronto Notes 2022. S.L.: Toronto Med Society.

2020 American Heart Association (2020). Adult Tachycardia With a Pulse Algorithm.

JAMA Network (2024). Carotid Sinus Massage

Patti, L. and Ashurst, J.V. (2023b). Supraventricular Tachycardia



## Symptomatic Bradycardia, Heart Block

### 1. ABCDE pearls

**Airway and Breathing:** assess for altered LOC, declining GCS, inability to protect airway secondary to cerebral hypoperfusion; intubate accordingly (rare).

**Circulation:** monitor vitals and assess for hemodynamic instability (hypotension, altered LOC), syncope, chest pain, signs of heart failure. If present, immediate atropine and/or transcutaneous pacing (see below).

### 2. Monitoring:

place all symptomatic bradycardia patients on telemetry and monitor vitals and LOC closely for instability.

### 3. Medications

**Atropine** 1 mg IV bolus. Repeat q3-5min as needed (max 3 mg total)

If atropine ineffective, especially in (Mobitz II, 3rd-degree heart block)

**Epinephrine** 2-10 mcg/min IV infusion, titrated to effect

OR

**Isoproterenol** 0.02-0.06 mg, then 5mcg/min

OR

**Dopamine** 5-20 mcg/kg/min IV infusion (use sparingly only as a very temporary bridging medication)

### 4. Pacing if pharmacological treatment ineffective

**Transcutaneous pacing (TCP)** (first line if unstable). Start at 60-80 bpm; titrate current until capture achieved.



Note: provide sedation if possible (see [Procedural Sedation](#))

OR

**Transvenous pacing** (if transcutaneous pacing ineffective or prolonged pacing is required)

## 5. Treat reversible causes

- Stop offending medications, reverse if possible (beta blocker, calcium channel blockers, digoxin)
- Supplement with O<sub>2</sub> (target spO<sub>2</sub> >92%, NP > VM > NRM > high-flow > BiPAP)
- If ischemic cause suspected/confirmed, see [STEMI, NSTEMI, UA](#)
- Reverse electrolyte abnormalities (see [Acute Hyperkalemia](#))
- Others: see [Hypothermia, SDH, SAH, ICH](#)
- If Mobitz II, 3rd degree or bifascicular heart block: requires EP involvement for definitive management (**permanent pacemaker**)

## 6. Disposition

**Consult** cardiology for stabilized patients with Mobitz II, 3rd degree or bifascicular heart block for definitive management

**Consult** CICU/CCU for persistently unstable patient, patients on transcutaneous or transvenous pacing, +/- requiring pressors

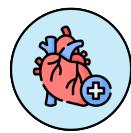
**Discharge** patients if hemodynamically stable after monitoring, only if reversible cause identified and addressed. Ensure outpatient cardiology referral and recommend follow-up with primary care provider.

### References:

American Heart Association. (2020). 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, 142(16\_suppl\_2), S366–S468.

Neumar, R. W., Otto, C. W., Link, M. S., Kronick, S. L., Shuster, M., Callaway, C. W., ... & Morrison, L. J. (2010). Part 8: Adult advanced cardiovascular life support: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, 122(18\_suppl\_3), S729–S767.

Zipes, D. P., & Jalife, J. (2018). *Cardiac electrophysiology: From cell to bedside* (7th ed.). Philadelphia, PA: Elsevier



## Unstable Angina

### 1. ABCDE pearls

**Airway:** Watch for aLOC and inability to protect airway requiring intervention (intubation).

**Breathing:** assess for respiratory distress. Provide supplemental oxygen prn to target SpO<sub>2</sub> >90%.

**Circulation:** monitor for signs of hemodynamic instability (hypotension, bradycardia, tachyarrhythmias, altered mental status) for signs of cardiogenic shock and resuscitate accordingly.

### 2. Oxygen – O<sub>2</sub> therapy to target spO<sub>2</sub> of >90%

Escalate as necessary:

Nasal cannula → Venturi mask → non-rebreather mask → high flow nasal cannula

### 3. Monitoring: monitor vitals closely (BP, HR, O<sub>2</sub> sat). Serial ECGs (0 and 3-6 hours standard, or q15-30min if patient continues to be symptomatic)

### 4. Antiplatelet therapy

**Aspirin:** 160-325 mg PO

AND

**P2Y12 Inhibitor:** consider addition (e.g., **Clopidogrel** 300 mg loading dose

### 5. Anti-ischemic therapy

**Nitroglycerin** 0.4 mg sublingually q5min x 3 doses for chest pain relief. (avoid systolic BP <90 mmHg or if the patient has taken phosphodiesterase inhibitors within the past 24-48 hours)



## 6. Anticoagulation

**Enoxaparin** for patients not at high bleeding risk

Loading dose of 30 mg IV bolus followed by 1 mg/kg SC q12h; maximum of 100 mg for the first 2 subcutaneous doses

If <75 years old; No IV loading dose; administer 0.75 mg/kg SC q12h; maximum of 75 mg for the first 2 doses (if ≥75 years old)

**Fondaparinux** for patients at high bleeding risk

2.5 mg IV, followed by 2.5 mg subcutaneously every 24 hours

## 7. Analgesia

**Morphine** 2 mg IV q5-15min PRN (for persistent chest pain refractory to nitrates)

OR

**Fentanyl** 25-50 mc q6-20min PRN

## 8. Disposition

For true unstable angina, **consult** cardiology or medicine for assessment and/or admission

Follow-up with a cardiologist and/or primary care provider

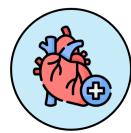
### References:

Fitchett, D. H., et. al. (2011). Assessment and management of Acute Coronary Syndromes (ACS): A Canadian perspective on current guideline-recommended treatment – part 1: Non-ST-Segment Elevation ACS. *Canadian Journal of Cardiology*, 27(6).

Silver, S. A., et. al. (2025). 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients With Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*, 151(13)

Simons, M., & Breall, J. A. (2025). UpToDate

Six, A. J., et. al. (2008). Chest pain in the emergency room: Value of the heart score. *Netherlands Heart Journal*, 16(6), 191–196.



# Vasovagal Syncope

## 1. ABCDE pearls

**Airway and Breathing:** typically not compromised unless injured during fall, with declining GCS, altered LOC.

**Circulation:** monitor HR and BP. Brief hypotension/bradycardia is common but self-limiting.

**Exposure:** look for any signs of trauma secondary to fall.

## 2. Monitoring: closely monitor vitals, place patient on tele until fully recovered with stable vitals.

## 3. Fluids if prolonged symptoms or persistent orthostatic changes

**NS** or **LR** 500-1000 mL bolus, then consider infusion to replace losses

## 4. Supportive care

### Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN to max 4g/day

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN

OR

**Ketorolac** 15-30 mg IV q6h PRN to max 120 mg/day

AND /OR

**Hydromorphone** 0.5-2 mg IV q4h PRN



**Antiemetics** (if nausea present)

**Ondansetron** 4-8 mg IV/PO

## 5. Disposition

**Discharge if all the following are met:**

- Classic vasovagal presentation (e.g. known trigger, prodrome, full recovery, short LOC)
- Normal ECG
- Reliable for follow-up in place
- No red flags or significant comorbidities

Red flags: Chest pain, syncope during exertion, abnormal ECG, age >60 with comorbidities, recurrent unexplained falls.

Otherwise, **consult** medicine for assessment +/- admission, or cardiology/EP if ECG concerning for cardiac etiology (see *Heart Block*).

**Discharge instructions:**

Educate on benign nature and when to return (e.g. exertional syncope, recurrent episodes, chest pain).

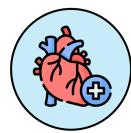
Advise on proper hydration, salt intake, and rest.

### References:

Benditt, D. (2024). *Syncope in adults: Management and prognosis*. UpToDate.

Sandhu, R. K., et. al. (2020). Canadian Cardiovascular Society Clinical Practice Update on the assessment and management of syncope. *Canadian Journal of Cardiology*, 36(8), 1167–1177.

Shen, W.-K., et. al. (2017). Correction to: 2017 ACC/AHA/HRS guideline for the Evaluation and management of patients with syncope: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the heart rhythm society. *Circulation*, 136(16).



## Ventricular Tachycardia (VTach)

### 1. ABCDE pearls

Note: VTach that is sustained >30 seconds or with hemodynamic instability or end organ malperfusion (altered LOC, chest pain or severe SOB) are medical emergencies and should be shocked STAT.

Non-sustained VTach: <30 seconds, no hemodynamic instability

Sustained VTach: >30 seconds with hemodynamic instability

Ventricular tachycardia may progress into Vfib and cardiac arrest.

**Airway and Breathing:** ensure airway protection. Monitor for severely altered LOC, low GCS, hypoventilation/cardiorespiratory arrest; intubate accordingly.

**Circulation:** Watch for hemodynamic instability (hypotension, tachycardia, altered LOC, heart failure, cardiac arrest); resuscitate or initiate ACLS protocol accordingly.

### 2. Monitoring: all patients with suspected or confirmed ventricular tachycardia of any duration should be placed on telemetry and vitals/LOC observed very closely

**Patient location:** move patient to resus bay or cardiac bed for close monitoring. All patients should have pads placed with a defibrillator at the bedside in case of decompensation.

### 3. Call RT to bedside for airway management (in case of cardiac arrest or decompensated heart failure resulting in hypoxia)



## 4. Medications

**Hemodynamically stable ventricular tachycardia** (note: may decide not to manage ventricular tachycardia that is chronic, short-lived, well-tolerated and with a long-term management plan [e.g. ICD])

**Procainamide** 20-50mg/min IV, then maintenance infusion 1-4mg/min to a max dose of 1g until rhythm ceases, or patient becomes hypotensive, or QRS duration increases >50% (avoid if QT prolonged or CHF)

OR

**Amiodarone** 150 mg IV over 10 minutes. Repeat as needed if Vtach reoccurs. Follow with maintenance infusion 1mg/min IV x 6 hours

Note: Procainamide has been shown to be more effective at converting to sinus rhythm and associated with less clinically significant side effects (hypotension).

**Hemodynamic instability:** Treat according to ACLS algorithm

**Synchronized cardioversion** (see [Cardioversion](#))

THEN

**Amiodarone** infusion (see doses above)

**5. Consult Cardiology** for assessment and possible admission for stable Vtach refractory to chemical cardioversion, Vtach with a pulse/intermittent episodes of Vtach for definitive management (ICD insertion or ablation)

+/- ICU if post-cardiac arrest, hemodynamically unstable requiring pressors and/or inotropes.

### References:

American Heart Association, n.d. *2020 algorithms*. [online]

*Toronto notes 2022.* (2022). TORONTO MED SOCIETY.

Foth, C., Gangwani, M.K., Ahmed, I., Alvey, H. (2023) *Ventricular Tachycardia*. [Updated 30 July 2023]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.

Tang P.T., Do D., Li, A., Boyle, N. (2018) *Team Management of the Ventricular Tachycardia Patient* [Online].



# Dermatology/Skin

Abscesses	40
Burns	43
Cellulitis	47
Rashes	50
Ulcers	53
Wound Dehiscence	56



# Abscesses

## 1. ABCDE pearls

**Airway:** rare, ensure patients with deep space abscesses in the neck and oropharynx regions maintain their airway. Be prepared to intubate if airway protection is needed.

**Breathing:** Watch for tachypnea or respiratory distress in the context of lung abscess if present.

**Circulation:** monitor for signs of sepsis or septic shock (tachycardia, hypotension).

**Disability:** monitor for altered level of consciousness associated with brain abscess. Be prepared to intubate if airway protection is required.

**Exposure:** look for skin changes of a surrounding cellulitis. Be wary of necrotizing fasciitis.

## 2. Monitoring: monitor vitals if the patient is severely altered or showing signs of sepsis including hypotension and tachycardia. Monitor HR and BP closely.

## 3. Medications

### Analgesia

**Acetaminophen** 1000 mg PO q6h PRN to max 4g/day

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN

OR

**Ketorolac** 10 mg IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg IV or PO q4h PRN



## Antibiotics

Mild: Abscess ≤ 2 cm: I&D alone, no antibiotics required

Mild: Abscess > 2cm or other indication for antibiotics (surrounding cellulitis, multiple lesions, immunocompromised, high-risk location such as face, hand, or genital): I&D and consider antibiotics

If no MRSA concerns:

**Cephalexin** 500-1000 mg PO QID

If MRSA Concerns or β-lactam allergy select 1 of the following:

**TMP/SMX** 1-2 DS tabs PO BID

**Doxycycline** 100 mg PO BID

**Clindamycin** 300-450 mg PO TID

Moderate: I&D and 7-10 days antibiotics

If no MRSA concerns select one of the following:

**Cefazolin** 1-2 G IV q24h

If MRSA concerns:

**Vancomycin** 15 mg/kg IV q12h, max 2 g/dose

Severe: I&D, broad spectrum antibiotics, consult infectious disease for antibiotic guidance.

## 4. Fluids

**IV Normal Saline** 500-1000 mL bolus (if hypotensive)



## 5. Procedure

POCUS can help to confirm diagnosis prior to I&D.

See [Abscess Drainage](#)

## 6. Disposition

**Consult** surgery for large abscesses requiring drainage in an OR.

**Consult** medicine for assessment and admission for patients with signs of systemic illness or sepsis, complicated abscess, and those requiring OR drainage.

**Discharge** patients with fully drained abscess, pain controlled, no signs of systemic infection, and reliable follow up. If indicated, ensure the patient has received a prescription for antibiotics.

Discharge instructions: keep the site of drainage clean and dry, instruct the patient to return to the ED if they develop a fever, increased redness/ swelling, or worsening pain. If packing is placed it should be removed by primary care within 24 to 48 hours. If no packing is used follow up with primary care in 7-14 days.

### References:

D. Spelman, L. Baddour. Skin abscesses in adults: Treatment. S. Nelson, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 8, 2025.



# Burns

## 1. ABCDE pearls

**Airway, Breathing:** intubate early if severely aLOC, unable to protect airway, (early) signs of neck/soft tissue edema threatening airway, burns >40% TBSA or signs of inhalation injury (soot, singed nasal hairs, stridor, hoarse voice).

**Circulation:** monitor for signs of hypovolemic shock (severely altered LOC, hypotension, tachycardia) and resuscitate accordingly. Ensure IV access is through unburned skin.

**Exposure:** remove any burned clothing, debris, jewellery.

**2. Monitoring:** closely monitor vitals (temperature, BP, HR, O<sub>2</sub> sat). Avoid hypothermia secondary to burns, potentially leading to lethal triad (acidosis, hypothermia, coagulopathy).

**3. Call anesthesia, RT to bedside** if concern for threatened airway.

## 4. O<sub>2</sub> supplementation

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

## 5. Fluid resuscitation

Calculate the TBSA using Parkland formula or rule of 9s for adults (not including superficial thickness burns).

**For burns >15% TBSA:**

Modified Parkland formula: 2mL x %TBSA x weight in kg



Use 500 cc/hr as an upfront resuscitation rate if estimation cannot be completed promptly.

Use the formula as a guide to determine an estimate of the amount of fluid required over the first 24 hours, with half given in the first 8 hours.

Use balanced fluids such as **LR**.

Titrate to a target of 0.3-0.5 mL/kg/hr urine output for adult. Consider early use of a Foley catheter for accurate ins/outs.

## 6. Pain management:

titrate as needed, depending on severity of pain and burn.

**Acetaminophen** 650-1000 mg PO q6h PRN to max 4g/day

AND/OR

**Ibuprofen** 400-600 mg q6h PRN (if no contraindication)

AND/OR

**Hydromorphone** 0.5-2mg PO/IV q4-6h PRN

Consider continuous morphine or lidocaine infusions for severe burns with PRN doses for breakthrough pain. Consider IN or IV ketamine for severe burns.

## 7. Wound Care

### Superficial Burns

No dressing required.

### Partial and full thickness burns

Cover with sterile, non-adhesive dressing

+/- topical antibiotic: Silvadene, Polysporin.



## 8. Disposition

Transfer to a burn centre if:

- Partial thickness burns >10% TBSA
- Burns involving face, hands, feet, genitalia, perineum, major joints
- Any full thickness burns
- Electrical burns, including lightning injury
- Chemical burns
- Inhalation injury
- Burns in patients with pre-existing conditions that can complicate management, prolong recovery, or contribute to mortality
- Burns and concomitant trauma where the burn poses the greatest risk of morbidity and mortality
- Burns in a child who presents to non-pediatric hospital
- Burns in a patient who will require special social, emotional, or rehabilitative intervention

**Consult** plastic surgery for admission if requiring surgical management, debridement or escharotomy.

**Consult** ICU/burn unit for admission if patient is intubated, failed extubation or otherwise hemodynamically unstable, requiring pressors, inotropes.

**Consult** medicine for admission for ongoing rehydration, as necessary.

**Discharge** home if minor burn, hemodynamically stable, reliable follow-up/safe disposition.

### References:

Long, B., Graybill, J. C., & Rosenberg, H. (2021). Just the facts: evaluation and management of thermal burns. *Canadian Journal of Emergency Medicine*, 24(2), 128–130.

*Burn Centre Consultation Guidelines - Critical Care Services Ontario.* (2024). Critical Care Services Ontario.

Orgill, D. P. (2024, February 20). *Emergency care of moderate and severe thermal burns in adults*. UptoDate.



# Cellulitis

## 1. ABCDE pearls

**Airway, Breathing:** watch for altered level of consciousness, GCS <8, signs of septic shock or necrotizing fasciitis compromising airway protection and intubate accordingly (rare).

If cellulitis involves face/neck, monitor for stridor, voice changes, trismus, excessive salivation/drooling and intubate urgently to protect airway.

**Circulation:** assess for signs of severe sepsis or septic shock (hypotension, tachycardia, aLOC) and resuscitate with IV fluids and/or pressors

**Exposure:** expose and mark skin margins to monitor progression.

Assess for extent of cellulitis, bullae, necrosis, crepitus, pain out of proportion and/or rapidly spreading erythema (see [\*Necrotizing Fasciitis\*](#))

## 2. Monitoring: monitor vitals, strict I/Os in cases of sepsis, suspected necrotizing fasciitis.

## 3. Oxygen: if clinically unstable, O<sub>2</sub> therapy to target spO<sub>2</sub> of >94%.

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → NIPPV

## 4. Special considerations

Consider etiology of infection, which may guide specific therapy and disposition (e.g., infected animal bite, diabetic foot infection, etc.)



## 5. Antibiotics

**Mild cellulitis** (localized, no systemic symptoms, adequate for outpatient management):

**Cephalexin** 500 mg PO QID

OR

**Cefuroxime** 500 mg PO BID (if Penicillin and cephalexin allergy, or if unable to comply with QID dosing)

OR

**Clindamycin** 300 mg PO TID (if Cefuroxime allergy or concern for MRSA, will cover both Strep and MRSA)

OR

**Trimethoprim-sulfamethoxazole** 160/800 mg BID (if concern for MRSA and allergic to Clindamycin, combine with beta-lactam if Strep coverage desired)

**Moderate cellulitis** (purulent or inadequate for/failed outpatient management):

**Cefazolin** 2 g IV

OR

**Ceftriaxone** 2 g IV daily (if penicillin or cefazolin allergy)

OR

**Clindamycin** 600 mg IV q8h (if beta-lactam allergy or MRSA risk factors)



**Severe cellulitis** (systemic illness, hemodynamic instability, signs of severe sepsis or shock, immunocompromised):

**Vancomycin** 15 mg/kg IV q12h

AND

**Piperacillin-tazobactam** 3.375-4.5 g IV q6h

AND

**Clindamycin** 900 mg IV q8h (if necrotizing fasciitis suspected)

## **6. IV fluids** (if septic, hypotensive, clinically hypovolemic, no risk of overload)

**NS** or **LR** 500 mL to 1 L bolus

## **7. Analgesia**

**Acetaminophen** 975-1000 mg PO q4-6h PRN

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN or **Naproxen** 500 mg PO q12h PRN

OR

**Ketorolac** 15 mg IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg q2-4h PRN

Consider elevating affected limb (upper limb above shoulder, lower limb above hip) to reduce edema.



## 8. Disposition

**Discharge home** if mild, localized cellulitis, stable vitals, no systemic symptoms, ambulatory, reliable.

Rx: **Cephalexin** 500 mg PO QID x 5-7 days OR **Cefuroxime** 500 mg BID x 5 days OR **Clindamycin** 300 mg PO QID x 5 days

**Admit to medicine** for monitoring and IV antibiotics if extensive cellulitis, immunosuppressed, failed outpatient therapy, poor social supports. Admit on IV Cefazolin or Ceftriaxone.

**Refer to surgery, urology, ENT, ophthalmology, IR** if abscess requiring drainage, cellulitis involving orbital, facial, perineal or genital regions, necrotizing fasciitis suspected.

### References:

Stevens, D.L. et al., 2014. Practice guidelines for the diagnosis and management of skin and soft tissue infections. Clinical Infectious Diseases, 59(2), pp.e10–e52

UpToDate, 2024. Cellulitis and skin abscess: Management in adults

Liu, C. et al., 2011. Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of MRSA infections in adults and children. Clinical Infectious Diseases, 52(3), pp.e18–e55

National Institute for Health and Care Excellence (NICE), 2019. Cellulitis and erysipelas: antimicrobial prescribing



## Rashes

### 1. Hives (urticaria)

If anaphylactic: see [Anaphylaxis](#)

#### Antihistamines

**Cetirizine** 10 mg PO daily (or if taking PO at home, increased to BID)

OR

**Diphenhydramine** 25-50 mg PO/IV q6h PRN

**Glucocorticoids** (only if severe urticaria or persistent symptoms)

**Prednisone** 40-60 mg PO daily x 3-5 days

### 2. Eczema (atopic dermatitis)

**Unscented moisturizer/emollient** (Vaseline, Aquaphor)

AND

**Hydrocortisone** 2.5% OR **Betamethasone** 0.1% cream BID

AND (PRN for itch relief)

#### Antihistamines

**Cetirizine** 10 mg PO daily

OR

**Diphenhydramine** 25-50 mg PO/IV q6h PRN (sedating)



### 3. Contact dermatitis

Avoid or remove trigger (clothing, accessories/jewelry) and wash the skin

AND

**Triamcinolone** 0.1% cream BID x1-2 weeks (not to be used on face or groin unless mild symptoms)

AND (PRN for itch relief)

#### Antihistamines

**Cetirizine** 10 mg PO daily

OR

**Diphenhydramine** 25-50 mg PO/IV q6h PRN (sedating)

AND

**Glucocorticoids** (only if severe, disabling contact dermatitis)

**Prednisone** 40-60 mg PO daily x2-3 week taper

### 4. Plaque psoriasis

**Unscented moisturizer/emollient** (Vaseline, Aquaphor)

AND

**Clobetasol** 0.05% BID

AND (PRN for pain)

#### Analgesia

**Acetaminophen** 975-1000 mg PO q4-6h PRN

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN OR **Naproxen** 500 mg PO q12h PRN

Avoid systemic steroids – may cause severe rebound psoriasis.



## 5. Disposition

For urticaria: **Discharge** if no sign of anaphylaxis, stable. Discharge with epi auto-injector and at-home treatment recommendations as above.

For eczema: **Discharge** with at-home treatment recommendations as above, including daily emollient and steroid taper. May consider a referral to outpatient dermatology for severe and/or refractory eczema.

For contact dermatitis: **Discharge** with proper education to avoid (suspected) trigger(s), and at-home treatment recommendations as above, including prednisone taper if needed. May consider a referral to outpatient dermatology for recurrent contact dermatitis.

For psoriasis: **Discharge** if stable plaque psoriasis, recommend at-home treatment recommendations as above, including topical steroids and emollient use. Ensure outpatient dermatology follow-up.

**Consult** dermatology and/or medicine for admission for pustular, erythrodermic psoriasis +/- hemodynamically unstable or systemically symptomatic.

### References:

- Bieber, T. (2008). Atopic dermatitis. *New England Journal of Medicine*, 358(14), 1483–1494.
- Fonacier, L., Aquino, M., & Kim, J. (2015). Contact dermatitis: A practice parameter. *Annals of Allergy, Asthma & Immunology*, 115(5), 413–425.
- Greaves, M. W. (2010). Chronic urticaria. *New England Journal of Medicine*, 362(8), 656–665.
- Menter, A., Gelfand, J. M., Connor, C., Armstrong, A. W., Cordoro, K. M., Davis, D. M. R., & Elmets, C. A. (2019). Joint AAD–NPF guidelines of care for the management of psoriasis with topical therapy. *Journal of the American Academy of Dermatology*, 80(4), 1029–1072.
- Simons, F. E. R. (2011). Anaphylaxis and urticaria. *Middleton's Allergy: Principles and Practice* (7th ed.). Elsevier.



## Ulcers

### 1. ABCDE pearls

**Airway and Breathing:** monitor for signs of respiratory distress, severely altered LOC, declining GCS for necrotizing infection and/or sepsis/septic shock in severe ulcers; intubate accordingly

**Circulation:** assess for signs of hemodynamic instability (hypotension, tachycardia, aLOC), especially in large or infected ulcers; resuscitate accordingly

**Disability:** assess pain level, mobility, paresthesias and sensation in affected limb for diabetic neuropathy

**Exposure:** fully expose and inspect lower extremities and other suspected affected areas. Look for ulcer depth, drainage, necrosis, cellulitis, gangrene, bone visualization

### 2. Protective dressing

Moisture-retentive dressings (e.g., hydrogels, foam, alginate)

### 3. Analgesia

Mild–moderate pain:

**Acetaminophen** 500 to 1000 mg PO q6h PRN

AND/OR

**NSAIDs** (e.g. Ibuprofen) 400 to 600 mg PO q6-8h PRN

OR

**Ketorolac** 15 to 30 mg IV q6h PRN



Neuropathic pain (diabetic ulcers):

**Gabapentin** 100 to 300 mg PO at bedtime

Severe or Ischemic Pain (*arterial ulcers*):

**Morphine** 2.5 to 5 mg PO q4h PRN

OR

**Hydromorphone** 0.5 to 2 mg IV q2-4h PRN

#### **4. Antibiotics:** for infected ulcers

See cellulitis, osteomyelitis for antibiotic recommendations.

Obtain wound cultures before starting antibiotics, if possible.

#### **5. Disposition**

**Discharge** stable patients with no signs of systemic, deep or necrotizing infections, safe discharge and reliable follow-up with primary care provider.

For pressure and diabetic ulcers: recommend offloading (e.g. total contact cast, removable cast walkers, specialized offloading shoes), frequent repositioning, frequent inspection of ulcers.

**Consult** medicine for assessment and/or admission for signs of spreading cellulitis, sepsis, osteomyelitis, severe ischemia, uncontrolled pain, or for unsafe discharge, need for IV antibiotics.

**Consult** appropriate surgical service in cases of suspected ischemia (vascular surgery), complex or non-healing wounds, tissue necrosis (plastics/orthopedics).

**Consult** ICU for hemodynamic instability requiring vasopressors and/or inotropes, failed extubation, necrotizing fasciitis.



References:

- Armstrong, D. G., & de Asla, R. J. (2024). *Management of diabetic foot ulcers*. UpToDate.
- Berlowitz, D. (2025). *Clinical staging and general management of pressure-induced skin and soft tissue injury*.
- Lipsky, B. A., et al. (2020). Guidelines on the diagnosis and treatment of foot infection in persons with diabetes. *Diabetes/Metabolism Research and Reviews*, 36(S1).
- Taradaj, J. (2017). Prevention and treatment of pressure ulcers by newest recommendations from European Pressure Ulcer Advisory Panel (EPUAP): Practical reference guide for GPS. *Family Medicine & Primary Care Review*, 1, 81–83.



# Wound Dehiscence

## 1. ABCDE pearls

**Airway:** Usually not affected unless wound dehiscence is overlying airway anatomy or sequelae of intra-thoracic surgery (rare)

**Breathing:** May see tachypnea due to pain, or related to location of wound dehiscence (ie. large laparotomy incisional dehiscence). Could consider intubation based on predicted clinical course (ie. if patient requires a repeat OR)

**Circulation:** watch closely for signs of hypotension, tachycardia as these may indicate possible complications such as hemorrhage, peritonitis or intra-abdominal sepsis; resuscitate accordingly

**Disability:** monitor GCS closely for signs of altered level of consciousness (aLOC) secondary to hemodynamic instability or critical illness

**Exposure:** expose wound and assess extent of dehiscence (superficial or deep), visible bowel, signs of necrosis, or signs of surgical site infection (purulent discharge, surround erythema, swelling out of proportion)

## 2. Monitoring:

closely monitor vitals (HR, BP) and LOC if concerned for sepsis.

## 3. (Strict) NPO

if concern for intraabdominal surgical site dehiscence

## 4. Analgesia

**Acetaminophen** 975 mg PO x1, then q6h PRN

AND/OR

**Hydromorphone** 0.5-1 mg IV q10-15min or 1-2 mg PO q2-4h PRN

Avoid NSAIDs given poor healing, bleeding risk



## 5. Wound management

For superficial dehiscence:

- Clean wound and apply a moist, sterile dressing
- DO NOT re-suture lacerations or close wounds >24h since time of injury unless wound is gaping given risk of infection → these will heal by secondary intention

For deep fascial dehiscence, protruding bowel (evisceration):

- DO NOT push viscera back into wound
- Apply saline-soaked sterile gauze on top of wound
- Reduce abdominal muscle contraction by laying patient supine with knees flexed
- Start antibiotics as outlined below

## 6. Antibiotics if signs of infected wound (erythema, purulence, sepsis)

**Cefazolin** 2 g IV q12h (for superficial dehiscence, no bowel involvement)

OR

**Ceftriaxone** 2 g IV AND **Metronidazole** 500 mg IV (for bowel involvement)

OR

**Piperacillin-tazobactam** 3.375 g to 4.5 g IV (for severe systemic infection, sepsis, concerns of pseudomonas infection)



## 7. Disposition

**Consult** surgery STAT for all deep fascial dehiscence +/- bowel involvement for take-back to the OR and re-closure

**Consult** surgery or medicine for admission if superficial wound dehiscence requiring inpatient wound care

**Consult** ICU for hemodynamic instability requiring vasopressors and/or inotropes

**Discharge** patient if clinically stable and minor wound dehiscence not requiring admission. May require outpatient wound care & close follow up advised

Consider course of oral antibiotics +/- requisition for PRN analgesia

### References:

Cleveland Clinic. (2023). *Wound dehiscence: What it is, symptoms, treatment.*

Rosen, R. D. (2023). *Wound dehiscence.* In *StatPearls*

TeachMeSurgery. (2023, June 18). *Wound dehiscence - Infection.*

Sandy-Hodgetts, K. (2023). *Surgical wound dehiscence (SWD) – International consensus statement on assessment, diagnosis, and management.* Wounds International.

Wounds UK. (2023). *Prevention, identification, and management of surgical wound dehiscence: Early intervention and treatment.*



# ENT, Head & Neck, Oral

Acute Sinusitis	60
Anterior and Posterior Epistaxis	62
Benign Paroxysmal Positional Vertigo (BPPV)	65
Foreign Body – Airway	67
Gingivitis and Dental Infections	69
Mastoiditis	71
Otitis Externa	73
Otitis Media	75



## Acute Sinusitis

### 1. Supportive care

#### Analgesia/antipyretics:

**Ibuprofen** 600 mg PO q6-8 hours PRN

AND/OR

**Acetaminophen** 650-1000 mg PO q6h PRN

**Nasal saline sprays/rinses** (OTC) BID-QID.

#### Intranasal corticosteroids:

**Fluticasone** 1-2 sprays/nostril daily

OR

**Mometasone** 2 sprays/nostril daily

**+/- Decongestants** (3 days max to avoid rebound rhinitis):

**Oxymetazoline** 2-3 sprays/nostril q12h PRN

OR

**Pseudoephedrine** 60 mg PO q4-6h PRN (avoid in CAD, pregnancy)

**+/- Antihistamines** (if only if (suspected) allergic sinusitis):

**Rupatadine** 10 mg PO daily

OR

**Cetirizine** 10 mg PO daily



OR

**Loratadine** 10 mg PO daily

**2. Antibiotics** if symptoms >10 days without improvement, with either facial pain or fullness, AND one other PODS symptom: facial pain/pressure/fullness, nasal obstruction, purulent discharge or lack of/decreased smell

**Amoxicillin-clavulanate** 875/125 mg PO BID x 5-7 days

OR

**Doxycycline** 100 mg PO BID x 5-7 days (in case of penicillin allergy)

**3. Discharge** most patients with uncomplicated sinusitis (+/- on antibiotics as above). Recommend follow up with primary care provider.

References:

American Academy of Family Physicians. (2016). Adult sinusitis: Clinical practice guideline. *American Family Physician*, 94(2), 97–99.

American Academy of Otolaryngology–Head and Neck Surgery Foundation. (2015). Clinical practice guideline (update): Adult sinusitis. *Otolaryngology–Head and Neck Surgery*, 152(2 Suppl), S1–S39.

Chow, A. W., Benninger, M. S., Brook, I., Brozek, J. L., Goldstein, E. J. C., Hicks, L. A., ... & File, T. M. (2012). IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clinical Infectious Diseases*, 54(8), e72–e112.

Hayward, G., Heneghan, C., Perera, R., Thompson, M. J., & Del Mar, C. B. (2014). Intranasal corticosteroids for acute sinusitis. *Cochrane Database of Systematic Reviews*, 2014(6), CD008115.

Rosenfeld, R. M., Piccirillo, J. F., Chandrasekhar, S. S., Brook, I., Ashok Kumar, K., Kramper, M., ... & Corrigan, M. D. (2015). Clinical practice guideline (update): Adult sinusitis. *Otolaryngology–Head and Neck Surgery*, 152(2 Suppl), S1–S39.

Williams, J. W., Aguilar, C., Cornell, J., Chiquette, E., Makela, M., Holleman, D. R., & Simel, D. L. (2003). Antibiotics for acute maxillary sinusitis. *Cochrane Database of Systematic Reviews*, 2003(2), CD000243.

Young, J., De Sutter, A., Merenstein, D., van Essen, G. A., Kaiser, L., Varonen, H., & Bucher, H. C. (2008). Antibiotics for adults with clinically diagnosed acute rhinosinusitis: A meta-analysis of individual patient data. *Lancet*, 371(9616), 908–914.



## Anterior and Posterior Epistaxis

### 1. ABCDE pearls

**Airway and Breathing:** ensure airway protection and suction blood from airway as required. Severe posterior epistaxis or altered LOC may require intubation for airway protection.

**Circulation:** monitor for hemodynamic instability secondary to hemorrhage, including hypotension, tachycardia, altered LOC.

**2. Monitoring:** monitor vitals closely, including BP and HR, if the patient is severely comorbid, on anticoagulation, or signs of severe blood loss.

**3. Special room considerations/positioning of patient:** Keep the patient seated in an upright position with head tilted forward. Have the patient squeeze and hold the alae of their nose together or place nose clip for 10 minutes. Ensure suction is available in the patient's room if needed.

### 4. Medications/fluids

Topical anesthetic: swabs soaked with 2% **Lidocaine** with or without Epinephrine.

AND

Vasoconstriction: **Oxymetazoline** (Otrivin) 2 sprays intranasal given once in each nostril.

OR

Vasoconstriction: Soak gauze in a solution of **Tranexamic Acid** (TXA) AND **Oxymetazoline** (Otrivin) AND **Lidocaine with Epinephrine** and pack the nostril.



**5. Procedure:** Visualize with nasal speculum to identify the source (most often Kiesselbach's area)

#### **Anterior source likely**

chemical (silver nitrate) AFTER bleeding is controlled/stopped OR electrical cauterity

Note: Do NOT attempt cauterity if bilateral epistaxis - septum may perforate

IF unsuccessful: insert anterior nasal packing (nasal tampon +/- soaked in 500 mg of **Tranexamic Acid**, anterior balloon, gauze, thrombogenic gel or foam)

IF unsuccessful: insert bilateral anterior nasal packing

#### **Posterior source likely**

insert posterior nasal packing (posterior plus anterior balloon or Foley catheter to tamponade the bleed).

urgent consult to **ENT** and admit the patient

## **6. Disposition**

Consult **ENT** for uncontrolled hemorrhage despite ED management, posterior epistaxis, airway compromise, severe blood loss, or need for definitive management.

Consult **ICU** if signs of hemorrhagic shock (hypotension, tachycardia, altered LOC) or hemodynamic instability requiring vasopressors or inotropes.

Instruct the patient to return to ED if they experience re-bleeding refractory to squeezing for 10-15 minutes, or signs of toxic shock syndrome after nasal packing including fever, hypotension, desquamation, and mucosal hyperemia.

Note: If patient is discharged with packing in situ, return to ED in 48 hours for removal, reassessment +/- ENT consult if bleeding is ongoing.



If vitally stable, the patient should have a follow up appointment with ENT 24 to 48 hours after discharge.

However, ENT follow up may not be needed in patients with uncomplicated bleeding from a visualized source that resolves with cauterization or one-time packing.

References:

Alter, H. (2024). Approach to adult with epistaxis. UpToDate, Waltham, MA (Accessed on June 11, 2025).



## Benign Paroxysmal Positional Vertigo (BPPV)

### 1. Epley manoeuvre

This can be attempted in the ED. Alternatively, discharge the patient with instructions to perform Epley manoeuvre at home.

- A. While in a seated position on the examination table, turn the head 45 degrees to the right (for right-dominant symptoms) or to the left (for left-dominant symptoms)
- B. While supporting the patient's head/back, quickly drop the patient so shoulders land on the pillow and the head hangs 20-30 degrees off the table in an extended position, still rotated 45 degrees to the side
- C. Hold for 30-60 seconds after nystagmus or vertigo stops (or 60-90 seconds if none observed)
- D. Without lifting the patient's head, rotate it 90 degrees to the opposite side (now 45 degrees to the opposite side of midline), with neck still extended, and hold 30-60 seconds
- E. Ask the patient to roll onto their left side (for right-dominant symptoms) or to the right (for left-dominant symptoms)
- F. As they roll, turn the head another 90 degrees so the nose points toward the floor (face angled down ~45 degrees), and hold 30-60 seconds
- G. Sit the patient up by swinging the legs off the bed and supporting them up while keeping the chin tucked. Sit quietly 1-2 minutes.

Note: if significant symptoms occur, stop the manoeuvre

### 2. Disposition

Discharge with following handout containing instructions to perform Epley manoeuvre at home daily until symptom resolution:

<https://www.stjoes.ca/patients-visitors/patient-education/patient-education-a-e/pd-8567-self-treatment-of-benign-paroxysmal-positional-vertigo.pdf>



Follow up with primary care provider as necessary.

**References:**

- Bhattacharyya, N., & Edlow, J. A. (2025). *Benign paroxysmal positional vertigo*. In *UpToDate*.



## Foreign Body – Airway

### 1. ABCDE Pearls

**Airway, Breathing:** assess for ability to speak, coughing, stridor, hoarseness, excess secretions, respiratory distress, cyanosis etc.

Encourage the patient to cough and expel the foreign body.

If the patient is in significant respiratory distress prepare a double set up for both intubation and surgical airway.

Have McGill forceps ready for retrieval during intubation. If the foreign body is visualized in the carina, but is not able to be retrieved proceed with intubation of the unaffected lung. Consider consulting anesthesia/ ENT/ or ICU for bronchoscopy.

### 2. Monitoring: closely monitor vitals if concerned for significant burden of obstruction, significant respiratory distress and/or desaturation

### 3. Oxygen supplementation

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

### 4. Removal

If severe foreign body obstruction (unable to speak, silent cough, cyanotic): immediate Heimlich maneuver, back blows

If foreign body visualized in the upper airway: use available forceps or laryngoscopy to remove object

Note: do not attempt to remove with blind finger sweeps, could deepen foreign body



## 5. Disposition

**Consult** ENT +/- anesthesia STAT if unable to remove foreign body or worsening symptoms. (Awake) rigid bronchoscopy is the gold standard

**Discharge** if resolution of symptoms after removal, otherwise hemodynamically stable. Recommend follow up with primary care physician as needed

### References:

White JJ, Cambron JD, Gottlieb M, Long B. Evaluation and Management of Airway Foreign Bodies in the Emergency Department Setting. *J Emerg Med*. 2023 Feb;64(2):145-155. doi: 10.1016/j.jemermed.2022.12.008. Epub 2023 Feb 17. PMID: 36806432.



# Gingivitis and Dental Infections

## 1. ABCDE pearls

**Airway and Breathing:** assess for signs of deep space infection (trismus, stridor, cervical/mandibular lymph nodes, hoarseness and voice changes), (early) signs of neck/soft tissue edema threatening airway, and/or severely altered LOC secondary to sepsis/septic shock in severe infections; intubate accordingly.

**Circulation:** Monitor for signs of sepsis and/or septic shock (tachycardia, hypotension, aLOC); resuscitate accordingly.

## 2. Monitoring: monitor temperature, BP, HR, and RR for signs of sepsis in case of (suspected) severe infection. Consider ETCO<sub>2</sub> monitoring as well

## 3. Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN to max 4g/day

AND/OR

**Ibuprofen** 400-600 mg q6h PRN

AND/OR

**Hydromorphone** 0.5-2mg PO/IV q4-6h PRN

\*Can consider oral nerve block such as inferior alveolar nerve block for situations where patient is unable to follow up with dentist in a timely manner (ie: weekends, stat holidays, etc.).

## 4. Antibiotics: note: for dental abscesses, an empiric 5-day course of antibiotics is used as an adjunct to definitive dental treatment.

**Amoxicillin** 500 mg PO TID

OR



**Penicillin** VK 300-600 mg PO QID

OR

**Cefuroxime** 500 mg PO BID

OR

**Doxycycline** 100 mg PO BID

## 5. Procedure

Incision & Drainage of a dental abscess can be done in the ED under local or consulted to OMF or ENT for I&D.

## 6. Disposition/discharge with instructions

**Consult** OMF or ENT if a dental abscess with red flags is identified. Red flags: stridor, odynophagia, rapid progression, involvement of multiple spaces and secondary anatomic spaces.

### References:

Acetaminophen (paracetamol): Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.

Chow, A, Complications, diagnosis, and treatment of odontogenic infections. Durand, Marlene, D, ed. UpToDate. Waltham, MA: UpToDate Inc.

Hydromorphone: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.

Morphine: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.



# Mastoiditis

## 1. ABCDE Pearls

**Airway, Breathing:** Assess for complications such as deep neck space infection or worsening neck edema which may require intubation. Watch for signs of shock, severely aLOC and intubate if indicated.

**Circulation:** watch for signs of sepsis and/or shock (fever, hypotension, aLOC).

**Disability:** Assess for altered mental status or focal neurological deficits (e.g. may be concerning for intracranial extension).

## 2. Antibiotics

**Ceftriaxone** 2g IV q24h

OR

**Cefotaxime** 2g IV q6-8h

## 3. Supportive measures

### Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN to max 4g/day

AND/OR

**Ibuprofen** 400-600 mg q6h PRN (if no contraindication)

AND/OR

**Hydromorphone** 0.5-2 mg IV or PO

### Antiemetics

**Ondansetron** 4-8 mg PO or IV q8h PRN



## 4. Disposition

**Discharge** not typically appropriate unless very early/mild case in a well-appearing and systemically healthy child or adult with ENT follow-up arranged within 24-48 hours. Clear instructions to return to ED for any worsening

**Consult** ENT for assessment +/- admission if admitting services

**Consult** medicine otherwise for admission for all cases of mastoiditis

### References:

Mastoiditis: Canadian Paediatric Society. (2019). *Acute Mastoiditis in Children*. <https://www.cps.ca> Also supported by: UpToDate – “Acute mastoiditis in children: Clinical features and diagnosis” and “Acute mastoiditis: Treatment and prevention”



## Otitis Externa

### 1. ABCDE pearls

**Airway, Breathing:** Assess for complications such as progression to necrotizing otitis externa with potential airway compromise from soft tissue extension. Watch for stridor, respiratory distress, or significant edema of the external ear canal/face.

**Circulation:** Monitor vitals closely for signs of sepsis, although rare from AOE (fever, hypotension, aLOC).

**Disability:** Assess for altered mental status, cranial nerve involvement (facial weakness, dysphagia), or focal neurological deficits which may suggest intracranial extension (although rare for AOE).

### 2. Topical therapy (first-line)

**Ciprodex** (ciprofloxacin-dexamethasone) otic suspension 4 drops in affected ear BID x 7–10 days

OR

**Ofloxacin** 0.3% otic solution: 10 drops daily

Ensure adequate canal cleaning prior to drop instillation. If canal is tight, may use a wick

Goal: Coverage for *Pseudomonas aeruginosa* and *Staphylococcus aureus*

### 3. Systemic antibiotics: if severe infection, immunocompromised, suspected extension

**Ciprofloxacin** 500 mg PO BID

If unable to tolerate PO or severe systemic infection:

**Ciprofloxacin** 400 mg IV q12h



## 4. Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN

AND/OR

**Ibuprofen** 400–600 mg PO q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg PO/IV q4-6h PRN

## 5. Disposition/discharge with instructions

Outpatient management is appropriate for most otherwise healthy patients with mild-to-moderate otitis externa.

Discharge on 7-10 course of **Ciprofloxacin** (+/- Ciprofloxacin as necessary)

### Discharge instructions:

- Keep ear canal dry (avoid water exposure)
- Return to ED if fever, spreading cellulitis, persistent/worsening pain, hearing loss, or cranial nerve symptoms
- Recommend follow-up with primary care physician +/- ENT referral to the discretion of the emergency provider

### Consult ENT or medicine for admission if:

- Concern for necrotizing (malignant) otitis externa (elderly, diabetic, immunocompromised, severe pain out of proportion, granulation tissue at canal floor, cranial nerve deficits, concerning imaging findings)
- Failure of topical and/or systemic therapy
- Systemic illness or rapid progression

### References:

Canadian Paediatric Society. (2019). Management of Otitis Externa in Children. <https://www.cps.ca>

UpToDate – External Otitis: Treatment and Prevention  
Canadian Guidelines for Antimicrobial Stewardship in Otitis Externa (Canadian Antimicrobial Resistance Alliance)



## Acute Otitis Media

**For adults:** a course of antibiotics is generally recommended for uncomplicated acute otitis media.

**Pediatrics:** antibiotics are indicated in children <6 months of age or a child >6 months of age and moderately/severely ill OR fever  $\geq 39$  C OR >48h of symptoms.

**For AOM with effusion:** most resolve on their own within 3 months with watchful waiting. For non-resolving effusion, consider referral to ENT.

### 1. Discharge medications

**Amoxicillin-Clavulonate** 875-125 mg BID x 7-10 days

OR

**Cefuroxime** 500 mg BID x 7-10 days

If perforation also include:

**Ciprofloxacin and Dexamethasone (Ciprodex)** otic suspension 4 drops BID x 5 days

### 2. Disposition

**Discharge** with follow up with primary care physician for reassessment if not clinically improving. Return to ED for reassessment if worsening within 24-48 hours

Watch for mastoiditis symptoms such as fever, ear pain, or swelling behind the ear (see [Mastoiditis](#)) and return to ED if concerns for same

**Consult** ENT for myringotomy and tympanostomy if  $\geq 4$  recurrent infections with effusions within one year

#### References:

Lytvyn, Y. and Qazi, M.A. (2022). *Toronto Notes 2022*. S.L.: Toronto Med Society



# Gastroenterology

Acute Cholecystitis	77
Acute Diverticulitis	79
Acute Pancreatitis	81
Appendicitis	83
Ascites & Spontaneous Bacterial Peritonitis (SBP)	85
Bowel Perforation	87
Chronic Cholecystitis	89
Esophageal Varices	91
Foreign Body – GI Tract	94
Gastritis/Gastric Ulcer	97
Gastroenteritis	100
Hepatic Encephalopathy	102
Inflammatory Bowel Disease (IBD) Flare-Up	104
Mesenteric Ischemia	106
Small Bowel Obstruction	108



## Acute Cholecystitis

### 1. ABCDE pearls

**Circulation:** Check for signs of hypotension, tachycardia, altered LOC for sepsis in rare complications including perforations; resuscitate accordingly.

**Exposure:** assess abdomen for signs of rigidity, pain out of proportion concerning for peritonitis.

### 2. Monitoring: monitor vitals (BP, HR, SpO<sub>2</sub>) and GCS closely if concerned for complication(s).

### 3. NPO pending surgery consult

### 4. IV fluids: if concerned re poor PO intake, hypovolemia, or NPO for surgery

**Lactated Ringer** IV bolus 500-1000 mL over 15-30 min, then maintenance of 75-125 mL/hr

### 5. Supportive care

#### Analgesia

**Acetaminophen** 650–1000 mg PO q6h PRN for mild pain

AND/OR

**Ketorolac** 15–30 mg IV q6h PRN

AND/OR

Opioids

**Morphine** 2–4 mg IV q4-6h PRN

OR



**Hydromorphone** 0.5–2 mg PO or IV q4-6h PRN

## Antiemetics

**Ondansetron** 4 mg IV q6-8h

## 6. Antibiotics

**Ceftriaxone** 2 g IV

AND

**Metronidazole** 500 mg IV q8h (dual therapy)

OR

**Piperacillin-tazobactam** 4.5 g IV q6h if unstable, highly suspicious of or confirmed perforation (monotherapy)

## 7. Disposition

**Consult** general surgery for all cases of acute cholecystitis for definitive management

**Consult** ICU for perforation, septic shock and hemodynamic instability requiring vasopressors and/or inotropes

### References:

UpToDate, 2025. Treatment of acute calculous cholecystitis



## Acute Diverticulitis

### 1. ABCDE pearls

**Circulation:** monitor for signs of hypotension, tachycardia, altered LOC for sepsis in rare complications including perforation

**Exposure:** expose abdomen and palpate for rigidity, pain out of proportion for possible peritonitis

### 2. Monitoring: monitor vitals closely (BP, HR, SpO<sub>2</sub>) if concerned about perforation, hypovolemia secondary to hematochezia

### 3. Supportive care

#### Analgesia

**Acetaminophen** 650–1000 mg PO q6h PRN

OR

**Hydromorphone** 0.5–2 mg PO or IVq4-6h PRN

#### Antiemetics

**Diphenhydramine** 25–50 mg q4–6h PRN

OR

**Ondansetron** 4–8 mg q6–8h PRN



## 4. Disposition

**Consult** general surgery for admission in case of CT evidence complicated diverticulitis (abscess, perforation, obstruction, fistulization), sepsis, hemodynamic instability responsive to initial resuscitation, polymorbid, immunosuppressed, uncontrolled abdominal pain, social factors limiting effectiveness of outpatient management.

**Consult** ICU in complicated diverticulitis with hemodynamic instability requiring vasopressors and/or inotropes.

**Discharge home:**

Prescribe oral pain medication (avoid NSAIDs) and bowel rest (liquid diet and slow progression as tolerated).

Recommend follow-up with primary care physician +/- refer to outpatient GI/general surgery for outpatient colonoscopy on a non-urgent basis at the discretion of the emergency provider.

Uncomplicated diverticulitis does not require antibiotics: tolerating PO, well controlled pain, no co-morbidities. Otherwise, give antibiotics (Amoxicillin-clavulanate or ciprofloxacin-metronidazole)

Laxative (Sennokot, PEG) and soft diet recommended at discharge.

### References:

UpToDate, 2025. Acute colonic diverticulitis: Outpatient management and follow-up



# Acute Pancreatitis

## 1. ABCDE pearls

**Airway:** Prepare for intubation if severely aLOC and vomiting, unable to protect airway (rare, but may occur in complications)

**Circulation:** watch for shock (hypotension, tachycardia aLOC, declining GCS); resuscitate with IV fluids and/or pressors accordingly

## 2. NPO

## 3. Fluid resuscitation

**Lactated Ringers (LR) or Normal Saline (NS)** 10-20 mL/kg bolus initially followed by 5-10 mL/kg/hr infusion

- LR is thought to be better choice in initial resuscitation, evidence is not strong though.
- Large volumes of NS can lead to hyperchloremic metabolic acidosis.
- Ensure frequent reassessment of volume for patient with history of cardiac and/or kidney disease.

## 4. Analgesia

**Mild pain:**

**Acetaminophen** 1g PO q6h PRN

AND/OR

**NSAID**

**Ibuprofen** 400mg PO q6hrs PRN

OR

**Naproxen** 500mg PO q12hrs PRN



OR

**Ketorolac** 15mg IV/IM q6h PRN

### **Moderate-Severe pain:**

Add **hydromorphone** 0.5-2mg IV q2-4h PRN for moderate/severe pain

## **5. Supportive Care**

**Ondansetron** 4mg IV q8h PRN for nausea/vomiting

**Note: Antibiotics** typically NOT recommended unless concern for extrapancreatic infection or infected necrosis

**Vasopressors** may be required for critically ill patients,  
Norepinephrine is usually first choice

## **6. Disposition**

**Consult** general surgery or medicine for all acute pancreatitis patients depending on your centre.

**Consult** ICU if (multi) organ dysfunction, persistent SIRS, hemodynamic instability requiring pressors and/or inotropes, significant AKI and/or electrolyte abnormalities.

### References:

Leppäniemi, A., Tolonen, M., Tarasconi, A. et al. 2019 WSES guidelines for the management of severe acute pancreatitis. *World J Emerg Surg* 14, 27 (2019)

Rosen's Emergency Medicine : Concepts and Clinical Practice. St. Louis :Mosby, 2002.



# Appendicitis

## 1. ABCDE pearls

**Airway, Breathing:** Assess for respiratory distress, declining GCS, altered LOC, vomiting and inability to protect airway; intubate accordingly (although very unlikely in uncomplicated appendicitis).

**Circulation:** monitor for signs of hypotension, tachycardia for dehydration secondary to poor intake, or septic shock secondary to perforation; resuscitate accordingly.

**Exposure:** assess abdomen for rigidity, pain out of proportion for peritonitis.

## 2. Monitoring: monitor vitals (BP, HR, O<sub>2</sub> stat) and GCS closely if concerned re complication(s).

## 3. NPO pending surgery consult

## 4. IV fluids: if concerned re poor PO intake, hypovolemia, or NPO for surgery

**Lactated Ringer** IV bolus 500–1000 mL over 15–30 min, then maintenance of 75–125 mL/hr

## 5. Supportive care

### Analgesia

**Acetaminophen** 650–1000 mg PO q6h PRN for mild pain

AND/OR

**Ketorolac** 15–30 mg IV q6h PRN

AND/OR

Opioids



**Morphine** 2-4 mg IV q4-6h PRN

OR

**Hydromorphone** 0.5-2 mg PO or IV q4-6h PRN

## **Antiemetics**

**Ondansetron** 4 mg IV q6-8h

## **6. Antibiotics** pending surgery

**Ceftriaxone** 2 g IV AND **Metronidazole** 500 mg IV q8h

OR

**Piperacillin-tazobactam** 4.5 g IV q6h if unstable, highly suspicious of or confirmed perforation

## **7. Disposition**

**Consult** general surgery for appendectomy consideration

### References:

Lytvyn, Y. and Qazi, M.A. (2022). *Toronto Notes 2022*. S.L.: Toronto Med Society.



# Ascites & Spontaneous Bacterial Peritonitis (SBP)

## 1. ABCDE pearls

**Airway, Breathing:** assess for shortness of breath, respiratory distress.  
Ascites can often be accompanied by pleural effusions or iatrogenic pulmonary edema (from fluid resuscitation)

**Circulation:** assess for signs of severe sepsis/shock (hypotension, tachycardia, altered LOC, oliguria/anuria) and resuscitate cautiously with crystalloids and/or pressors

**Disability:** assess for signs of encephalopathy (confusion, memory loss, aLOC) – see [Hepatic encephalopathy](#).

**Exposure:** look for signs of bleeding or liver disease (asterixis, jaundice etc.) and palpate abdomen for peritonitis.

## 2. Monitoring:

closely monitor BP, HR, strict I/Os for signs of sepsis/septic shock.

## 3. Resuscitation

**LR** 500 mL IV bolus if hypotensive, then reassess

Can continue resuscitating with small boluses if persistently hypotensive, but avoid overloading patients (risk for pulmonary edema)

*Note: may not respond appropriately to fluid resuscitation. May need to move to pressors promptly*

+/- **Norepinephrine** starting at 0.05–0.1 µg/kg/min for septic shock

(target MAP >65)



## 4. Antibiotics

For SBP treatment (if fever, abdominal pain, encephalopathy, unexplained hypotension, or new or worsening ascites in cirrhotic patients):

**Ceftriaxone 1 g IV q24h**

## 5. Paracentesis

**Diagnostic paracentesis** for all new ascites, suspected SBP or worsening clinical picture

**Therapeutic paracentesis** for tense ascites with symptoms (abdominal pain/tightness, SOB)

**Note:** initiate 20% albumin IV transfusion if >5L removed (6-8 g/L of fluid removed)

## 6. Disposition

Consult **GI** and/or **medicine** for suspected or confirmed SBP, recurrent or refractory tense ascites, renal dysfunction, hepatic encephalopathy, or associated UGIB.

Consult **ICU** for signs of septic shock and hemodynamic instability requiring pressors, airway compromise and/or multi-organ failure.

**Discharge** if proper outpatient follow-up within 48-72 hours, mild, known ascites with no SBP symptom.

### References:

Runyon, B.A. et al., 2021. AASLD Practice Guidance: Management of Adult Patients with Ascites Due to Cirrhosis. *Hepatology*, 74(2), pp.1014–1048

Moore, K.P. et al., 2003. The management of ascites in cirrhosis: report on the consensus conference of the International Ascites Club. *Hepatology*, 38(1), pp.258–266

European Association for the Study of the Liver (EASL), 2018. EASL Clinical Practice Guidelines for the management of patients with decompensated cirrhosis. *Journal of Hepatology*, 69(2), pp.406–460

UpToDate, 2025. Evaluation and management of ascites in adults. [online]

Sort, P. et al., 1999. Effect of intravenous albumin on renal impairment and mortality in patients with cirrhosis and spontaneous bacterial peritonitis. *New England Journal of Medicine*, 341(6), pp.403–409



## Bowel Perforation

### 1. ABCDE pearls

**Airway, Breathing:** watch for signs of septic/distributive shock including altered LOC, declining GCS, vomiting or hematemesis with poor airway protection and intubate accordingly to secure airway

**Circulation:** assess for signs of shock (hypotension, tachycardia, altered LOC); resuscitate aggressively accordingly (start with 1L LR or NS, then reassess responsiveness. Low threshold to further resuscitate with fluids and/or pressors (Levophed first choice))

**Exposure:** expose abdomen and look for signs of peritonitis, including rigidity, rebound tenderness

### 2. Monitoring: closely monitor BP, HR, strict I/Os for signs of septic shock

Insert arterial line for close monitoring, central line

### 3. NPO

### 4. NG tube set to low intermittent suction (see [nasogastric tube insertion](#))

### 5. Analgesia

**Morphine** 2-4 mg IV q10 min PRN

OR

**Hydromorphone** 0.5-1 mg IV q10-15min PRN



## 6. Antibiotics

**Piperacillin-tazobactam** 4.5 g IV (first line)

OR

**Ceftriaxone** 2 g IV + **Metronidazole** 500 mg IV

## 7. Disposition

Consult **general surgery** STAT for urgent operative management

Consult **ICU** for if in septic shock, hemodynamically unstable requiring vasopressors and/or inotropes, multi-organ failure



## Chronic Cholecystitis

### 1. ABCDE pearls

Airway, Breathing usually not compromised

Circulation: in severely symptomatic patients with persistent vomiting, assess for signs of hypovolemia and associated electrolyte derangements. Resuscitate accordingly.

### 2. Supportive care

#### Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN for mild pain

AND/OR

**Ketorolac** 15-30 mg IV q6h PRN

AND/OR

Opioids

**Morphine** 2-4 mg IV q4-6h PRN

OR

**Hydromorphone** 0.5-2 mg PO or IV q4-6h PRN

#### Antiemetics

**Ondansetron** 4 mg IV q6-8h



### 3. Disposition

**Consult** general surgery for unremitting pain, inability to tolerate oral fluids, or severe electrolyte disturbance due to persistent vomiting.

**Discharge** if pain controllable, hemodynamically stable, no evidence of cholecystitis, cholangitis, pancreatitis, or obstructive jaundice.

Refer to outpatient general surgery for elective cholecystectomy. Consider prescriptions for analgesics and antiemetics. Recommend avoiding fatty foods and follow-up with primary care provider.

If any concern for acute cholecystitis, see [Acute cholecystitis](#).



## Esophageal Varices

### 1. ABCDE pearls

**Airway, Breathing:** watch for altered LOC, GCS <8, hematemesis with poor airway protection. **Circulation:** assess for signs of shock (hypotension, tachycardia, altered LOC, oliguria/anuria).

Begin cautious resuscitation accordingly (see below).

### 2. Monitoring: closely monitor BP, HR, strict I/Os for signs of hemorrhagic shock.

Insert arterial line for close monitoring.

### 3. Oxygen: O<sub>2</sub> therapy to target spO<sub>2</sub> of >92%

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

### 4. Special considerations

Head of the bed at 30 degrees to reduce aspiration risk

### 5. Vasoconstriction (start ASAP for suspected acute variceal bleed)

**Octreotide** 50 mcg IV bolus, followed by 50 mcg/hr infusion

### 6. Antibiotic prophylaxis (for SBP)

**Ceftriaxone** 1 g IV q24h



## 7. Resuscitate (cautiously to avoid worsening portal hypertension)

**1-2 units pRBC** with close vitals monitoring, consider when Hb <70

Can consider additional units if ongoing bleeding, worsening LOC, hypotension, or permissible BP (avoid hypertension)

Massive transfusion protocol once >4 units, >1,500 mL blood loss

## 8. Reverse anticoagulation

### For warfarin reversal

Vitamin K 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

PCC 25 units/kg (INR 2-4) OR 35 units/kg (INR 4-6) OR 50 units/kg (INR >6)

### For dabigatran reversal

Idarucizumab 2 x 2.5 mg within 15 minutes from one another

### For apixaban, rivaroxaban reversal

Andexanet alfa

**4 mg/min infusion** for 2 hours

(apixaban <5 mg or rivaroxaban <10 mg, last dose >7 hrs ago)

OR

**8 mg/min infusion** for 2 hours

(apixaban >5 mg or rivaroxaban >10 mg, last dose <7 hrs ago)

OR

PCC 25 units/kg, then repeat INR

Administer platelets (as necessary)



## 9. Blakemore insertion (bridge to endoscopy/TIPS, particularly for uncontrolled hematemesis and bleeding, persistent hemodynamic instability)

Equipment: Sengstaken-Blakemore tube, 50 mL syringes, suction, clamp, traction device

### Note: requires intubated patient

Step 1: Insert Blakemore nasally or orally until the 50 cm mark reaches teeth

Step 2: Confirm gastric position (CXR, air insufflation and auscultation)

Step 3: Inflate gastric balloon 50 mL at a time (250-300 mL max) and apply gentle traction

Step 4: Secure Blakemore to traction device

Step 5 (optional, if bleeding persists): Inflate esophageal balloon 25-30 mL at a time (40 mL max) for 6 hours maximum

Step 6: Deflate balloon for 5 minutes q6h

## 10. Disposition

Consult **ICU** for all acute bleeds.

Consult **GI** STAT for endoscopic ligation (definitive management).

Consult **IR** as backup for TIPS/embolization (second line).

### References:

European Society of Gastrointestinal Endoscopy (ESGE), 2022. Endoscopic management of acute esophageal variceal hemorrhage. *Endoscopy*.

Garcia-Tsao, G. et al., 2017. Portal hypertensive bleeding in cirrhosis: Risk stratification, diagnosis, and management. *Hepatology*, 65(1), pp.310–335

UpToDate, 2025. Acute variceal bleeding in adults: Initial management [online]

Sethi, A. et al., 2019. Use and complications of Sengstaken-Blakemore tube placement: A review. *World Journal of Gastrointestinal Endoscopy*, 11(4), pp.327–333

Biecker, E., 2011. Diagnosis and therapy of portal hypertension and variceal bleeding. *World Journal of Gastroenterology*, 17(15), pp. 1853–1860



## Foreign Body – GI Tract

### 1. ABCDE pearls

**Airway:** assess for airway obstruction (particularly if large foreign body) including hoarseness, excessive secretions, stridor.

**Breathing:** assess for tachypnea or hypoxia as signs of respiratory distress requiring intervention.

**Circulation:** watch closely for signs of hypotension, tachycardia for possible complications, including perforation, peritonitis, mediastinitis and/or esophageal rupture.

**Disability:** watch for altered level of consciousness.

### 2. NPO

**3. Monitoring:** closely monitor vitals (HR, BP, O<sub>2</sub> saturation) and LOC if concerned for complications as mentioned above.

### 4. Oxygen supplementation

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

Would avoid BiPAP in this situation to avoid complications of positive pressure



## 5. Watch and wait approach:

If small blunt object and otherwise asymptomatic, stable, and tolerating PO

Closely watch with serial x-rays to monitor for passage into the stomach

OR

If no access to endoscopy consider insertion of a **Foley catheter** into esophagus, past foreign body, inflate and slowly pull object out

## 6. Urgent Endoscopy:

Indications for urgent endoscopy: airway compromise, inability to swallow secretions, foreign body that is sharp or long (>5 cm), high-powered magnets, signs and symptoms of rupture, lodged >24 hours or unknown duration, button battery.

Consult appropriate specialty service (GI, thoracics, or general surgery).

Prepare for support of urgent endoscopy in ED & need for provision of procedural sedation during procedure (see [Procedural Sedation](#)).

## 7. Supportive care

### Analgesia

**Ketorolac** 10-30 mg IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg IV

### Antiemetics

**Ondansetron** 4-8 mg IV q6-8h PRN

### Spasmolytic

**Glucagon** 1 mg IV q15-30 min PRN



## 8. Disposition

**Discharge** if small blunt object, uncomplicated removal.

**Consult** GI if urgent endoscopy indicated for removal of sharp objects, magnets and chemical foreign bodies(e.g. batteries).

**Consult** general surgery if concerned for perforation, peritonitis, small or large bowel obstruction, failed endoscopy.

### References:

ASGE Standards of Practice Committee, Ikenberry SO, Jue TL, Anderson MA, Appalaneni V, Banerjee S, et al. Management of ingested foreign bodies and food impactions. *Gastrointest Endosc*. 2011;73(6):1085–1091. doi:10.1016/j.gie.2011.01.010.

Fung, B. M., Sweetser, S., Song, L. M. W. K., & Tabibian, J. H. (2019). Foreign object ingestion and esophageal food impaction: An update and review on endoscopic management. *World Journal of Gastrointestinal Endoscopy*, 11(3), 174–192. <https://doi.org/10.4253/wjge.v11.i3.174>

UpToDate. Initial management of ingested foreign bodies in adults [Internet]. Waltham, MA: UpToDate; 2025



## Gastritis/Gastric Ulcer

### 1. ABCDE pearls

Circulation: watch for signs of hypotension or shock secondary to bleeding ulcer or hypovolemia secondary to vomiting/diarrhea; evaluate for higher risk of ulceration like hx of same, or chronic NSAID use; assess for signs of UGIB due to ulceration (melena, hematemesis, coffee ground emesis); resuscitate accordingly.

### 2. Supportive management

**Fluid resuscitation** if volume deplete

Note: without signs of volume depletion, **PO resuscitation** (water, pedialyte, sports drinks and broths) is sufficient

**NS** or **LR** 500-2000 mL bolus. Can repeat boluses as needed or consider 100-200 mL/hr infusion to correct fluid deficit (titrated to severity of hypovolemia)

### Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN

OR

**Hydromorphone** 0.5-2 mg PO or IVq4-6h PRN

OR

**Pink Lady** 10ml 2% viscous lidocaine + 30ml Maalox

A pink lady cocktail can aid in diagnosis and management if gastritis is suspected in an individual with abdo pain. It can help manage pain and improve PO tolerance, allowing for discharge with appropriate outpatient management.



## Antiemetics/ Antacids

**Bismuth subsalicylate** 262 mg x2 PO q30-60 minutes PRN

OR

**Diphenhydramine** 25–50 mg q4–6h PRN

OR

**Ondansetron** 4-8 mg q6-8h PRN

## 3. PPI

In UGIB or not tolerating PO intake, IV PPI is recommended. PO can be considered for outpatient management or if tolerating PO

**Pantoprazole** 40 mg BID

OR

**Lansoprazole** 40 mg BID

OR

**Omeprazole** 20-40 mg BID

## 4. Antibiotics if known *H. Pylori* infection

**Metronidazole** 500 mg QID

AND

**Tetracycline** 500 mg QID



## 5. Disposition

**Consult** medicine and/or GI if suspected upper GI bleed, persistent symptoms despite treatment.

**Consult** ICU for significant bleeding, hemorrhagic/hypovolemic shock requiring vasopressors and/or inotropes.

**Discharge** with follow up from primary care provider if hemodynamically stable, improved symptoms, +/- referral to outpatient GI for endoscopy.

### References:

Malfertheiner P, et al.; European Helicobacter and Microbiota Study group. Management of *Helicobacter pylori* infection: the Maastricht VI/Florence consensus report. Gut. 2022 Aug 8:gutjnl-2022-327745. doi: 10.1136/gutjnl-2022-327745. Epub ahead of print. PMID: 35944925.



## Gastroenteritis

### 1. ABCDE pearls

Circulation: Monitor for signs of hypotension, tachycardia, altered LOC from hypovolemic shock secondary to vomiting, diarrhea; resuscitate accordingly

### 2. Fluid repletion is mainstay

Note: without signs of volume depletion, **PO resuscitation** (water, pedialyte, sports drinks and broths) is sufficient.

**NS** or **RL** 500-2000 mL IV bolus

Can repeat boluses as needed or consider 100-200 mL/hr infusion to correct fluid deficit (titrated to severity of hypovolemia)

Note: Point of care urine ketones are a good indication of fluid status

### 3. Antiemetics

**Ondansetron** 4-8 mg ODT or IV q6-8h PRN

OR

**Diphenhydramine** 25-50 mg q4-6h PRN

### 4. Disposition

Acute gastroenteritis is often of viral etiology and symptoms are often self-limiting. Most patients can be managed in an outpatient setting.

**Consult** medicine for admission for severe volume depletion requiring longer resuscitation, intractable vomiting, abnormal electrolytes or renal function, significant melena or hematochezia or rectal bleeding, uncontrolled abdo pain, polymorbid, failure to cope at home or pregnancy

(note: nausea, vomiting in pregnancy is also worrisome for other causes - molar, ectopic pregnancy etc.)



**Discharge** if hemodynamically stable, tolerable symptoms on supportive management (rehydration, electrolyte repletion, anti-emetics) and follow up with primary care provider

References:

Acute viral gastroenteritis in adults. UpToDate



# Hepatic Encephalopathy

## 1. ABCDE pearls

**Airway:** prepare for intubation for severely altered LOC, declining GCS, vomiting with severe aLOC etc.

**Disability:** frequently reassess GCS, monitor for worsening cognitive impairment, confusion.

## 2. Special considerations

Safe environment: room without many obstacles or objects to prevent patients from having unwitnessed falls

## 3. Supportive care

If dehydrated or hypovolemic:

**LR** or **NS** 250-500 mL IV bolus, then infusion at 1-2 mL/kg/hr

Replace electrolytes as needed (see *Hypokalemia*, *Hypoglycemia*)

## 4. Medication

**Lactulose** 30 mL TID-QID PO or NG or enema

AND

If recurrence of HE in the past 6 months: **Rifaximin** 550 mg BID

If recurrence despite above treatment:

**Neomycin** 1g PO q6-8h

OR

**Metronidazole** 250-500 mg PO q6-8h



## 5. Consult

**Consult** medicine for admission

**Consider** ICU or step down bed if persistent decreased GCS, failed extubation, hemodynamic instability, pressors requirements, etc.

References:

UpToDate. Hepatic encephalopathy in adults: Treatment [Internet]. Waltham (MA): UpToDate; 2024



## Inflammatory Bowel Disease (IBD) Flare-Up

### 1. ABCDE pearls

Circulation: monitor for signs of severe hypovolemia such as tachycardia, hypotension, aLOC secondary to diarrhea, if present.

**2. Monitoring:** monitor vitals closely (BP, HR) and LOC if patient exhibiting signs of hypovolemia secondary to losses.

### 3. Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN

AND/OR

**Morphine** 5-10 mg IV q4h PRN

OR

**Hydromorphone** 0.5-2 mg IV q4-6h PRN

(avoid NSAIDs as they may worsen/predispose to flare-up)

### 4. Disposition

**Consult** GI if severe abdominal pain, vomiting, high fever, signs of systemic infection/sepsis or GI bleeding. May recommend starting steroids in the ED

**Consult** general surgery if complications such as perforation, abscess(es), fistula, or obstruction identified.

**Consult** ICU if severe in septic/hypovolemic shock secondary to complication, requiring pressors and/or inotropes.

**Discharge** once pain controlled. Recommend follow-up with outpatient gastroenterologist and/or primary care physician.

Some patients can be managed as an outpatient, still consider **consulting** GI for assistance with steroid therapy/taper and close GI follow up.



**References:**

UpToDate, 2025. Overview of the management of Crohn disease in children and adolescents



## Mesenteric Ischemia

### 1. ABCDE pearls

**Airway/Breathing:** monitor for severely altered LOC, declining GCS, inability to protect airway +/- vomiting; intubate accordingly.

**Circulation:** high risk for shock. Monitor for hypotension, tachycardia, altered LOC, hypoxia; resuscitate accordingly.

**Environment:** Keep patient NPO. Insert NG tube if vomiting or ileus suspected. Foley catheter to monitor urine output if shock suspected.

### 2. Monitoring: monitor vitals closely (BP, HR, O<sub>2</sub> sat). Place patient on telemetry. Strict I/Os. Non-invasive ETCO<sub>2</sub> monitoring.

Obtain serum lactate and trend.

### 3. NPO

### 4. NG tube: if vomiting or ileus suspected (see [NG tube insertion](#))

### 5. Antibiotics

**Piperacillin-Tazobactam** 4.5 g IV q8h

OR

**Meropenem** 1 g IV q8h (If penicillin allergy)



## 6. Resuscitation

**NS or LR** 1-2 L IV bolus if hypotensive; reassess for fluid responsiveness

May need to start patient on vasopressors if in shock: **norepinephrine** 0.05–0.1 mcg/kg/min if refractory to fluid resuscitation

## 7. Supportive care

### Analgesia

**Hydromorphone** 0.5-2 mg IV q4h PRN

OR

**Fentanyl** 25-50 mcg IV q1h PRN (shorter acting, titratable)

### Antiemetics

**Ondansetron** 4-8 mg IV q4-6h PRN

## 8. Disposition

**Consult** general surgery STAT.

**Admit to ICU** if evidence of bowel necrosis, hemodynamically unstable, requiring pressors and/or inotropes.

### References:

Canadian Association of Emergency Physicians (CAEP). (2022). *CAEP Position Statement: Acute Mesenteric Ischemia Management in the ED*.

CAMEO. (2023). *Emergency Medicine Best Practices in Vascular Emergencies*. Canadian Emergency Medicine Online (CAMEO).

Moore, J. E., & Ovens, H. J. (2021). Diagnosis and management of acute mesenteric ischemia in the emergency department. *Canadian Journal of Emergency Medicine*, 23(6), 785–792

Natarajan, N., & Roberts, D. J. (2019). Acute mesenteric ischemia. *UpToDate*.



## Small Bowel Obstruction

### 1. ABCDE pearls

**Airway, Breathing:** Assess for respiratory distress, declining GCS, altered LOC, vomiting and inability to protect airway; intubate accordingly (although very unlikely in uncomplicated SBO).

**Circulation:** monitor for signs of hypotension, tachycardia for dehydration secondary to poor intake, or septic shock secondary to perforation; resuscitate accordingly.

**Exposure:** assess abdomen for rigidity, pain out of proportion for peritonitis.

### 2. Monitoring: monitor vitals (BP, HR, O<sub>2</sub> stat) and GCS closely if concerned re complication(s).

### 3. NPO pending surgery consult

### 4. IV fluids: if concerned re poor PO intake, hypovolemia, or NPO for surgery

**Lactated Ringer** IV bolus 500-1000 mL over 15-30 min, then maintenance of 75-125 mL/hr

### 5. Correct electrolyte abnormalities as necessary (see *Hypokalemia*)

### 6. Supportive care

**Hydromorphone** 0.5-2 mg IV q4-6h PRN

AND

**Ondansetron** 4 mg IV q6-8h



## 7. Non-operative management

If SBO secondary to hernia, consider bedside reduction

**Gastrointestinal decompression** with NG tube if vomiting refractory to antiemetics, and/or if severely distended, altered

If concerned for perforation:

**Piperacillin-tazobactam** 4.5 g IV q6-8h

## 8. Interventional treatment

Patients with suspected complication (perforation, necrosis, or ischemia) or expected surgical management (closed loop, strangulated hernia):

**Consult General Surgery STAT** (should be P1 to OR)

### **Antibiotics:**

Start **Ceftriaxone** 2 g IV

AND

**Metronidazole** 500 mg IV q8h (dual therapy)

OR

**Piperacillin-tazobactam** 4.5 g IV q6h if unstable, highly suspicious of perforation (monotherapy)

## 9. Disposition

Consult **General Surgery** for ALL patients with small bowel obstruction for assessment and +/- admission.

### References:

UpToDate, 2025. Management of small bowel obstruction in adults



# Hematology & Oncology

Anemia	111
Deep Vein Thrombosis (DVT)	114
Febrile Neutropenia	116
Tumor Lysis Syndrome	118



# Anemia

## 1. ABCDE pearls

**Circulation:** monitor for tachycardia, hypotension, and orthostasis if concerned for acute blood loss. Monitor for tachycardia, lethargy in severe anemia. Place 2 large-bore IVs for potential resuscitation.

**Disability:** monitor GCS and LOC in severe anemia.

**Exposure:** look for signs of bleeding (such as hematemesis, melena, menorrhagia, ecchymoses etc.).

## 2. Monitoring:

Monitor vitals (HR, BP, O<sub>2</sub> Sats) for severe anemias, particularly in patients presenting with aplastic crisis, hemorrhage, or with a symptomatic hemoglobin <70 g/L (chest pain, dyspnea, syncope).

Repeat hemoglobin 3-4 hours after initial blood work to trend.

## 3. Oxygen:

O<sub>2</sub> therapy to target spO<sub>2</sub> of >92%.

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP



## 4. Treatment

### Symptomatic/Unstable

#### Transfusion threshold based on risk factor/demographic

**Hgb <60** – Sickle Cell Anemia with non-occlusive crisis or chronic nutritional deficiency without cardiac symptoms

**Hgb <70** – Healthy young adults with no cardiovascular disease

**Hgb <80** – Patients with cardiovascular disease (ie heart failure)

**Hgb <90** – Evidence of impaired tissue oxygenation

**Hgb 90-110** – Patients with active acute coronary syndrome (MI)

**1 unit of pRBC** increases Hgb **+10 g/L** in adult

### Asymptomatic, Stable, Hgb >70 g/L

**Microcytic Anemia:** suspected iron deficiency anemia

**Ferrous sulfate** 325 mg PO TID (65 mg elemental iron)

OR

**Venofer** 200 mg IV bolus in the ED

**Normocytic Anemia:** suspected acute blood loss

Treat underlying cause, **TXA** 2g IV if gynecological.

**Macrocytic Anemia:** suspected B12 deficiency

**Vitamin B12** (cyanocobalamin) 1000 mcg IM q4w

OR

**Vitamin B12** 1,000-2,000 mcg PO daily as outpatient



## 5. Disposition

Most patients can be **discharged** if no active bleeding, asymptomatic, and remain hemodynamically stable. Recommend follow up with primary care physician and discharge on medications as above.

Consult **medicine** or specific admitting subspecialty based on underlying etiology if patient unable to be safely discharged, severely comorbid, hemodynamically unstable, persistently low hemoglobin or to treat underlying cause.

### References:

Choosing Wisely Canada; Canadian Blood Services; Héma-Québec. (2020, July). *Using Blood Wisely: Guidelines*

Ferrous sulfate: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>.

Killeen RB, Adil A. Macrocytic Anemia. [Updated 2025 Apr 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing

Verbillion, M. B.; Dupre, A. A. Anemia and Polycythemia. In R. M. Walls, R. S. Hockberger, M. Gausche-Hill, T. B. Erickson, & S. R. Wilcox (Eds.). (2023). Rosen's emergency medicine: Concepts and clinical practice (10th ed., Vol. 2, pp. 1462–1478). Elsevier.



## Deep Vein Thrombosis (DVT)

### 1. ABCDE pearls

**Airway and Breathing:** Usually not compromised unless massive clot burden leads to PE.

### 2. Anticoagulation

**DOACs** are first line unless pregnant, breastfeeding, low risk of bleeding

**Apixaban** 10 mg PO BID x 7 days, then 5 mg PO BID

OR

**Rivaroxaban** 15 mg PO BID x 21 days, then 20 mg PO daily

If DOAC contraindicated or high bleeding risk:

**Dalteparin** 200 IU/kg SC daily x 30 days, then 150 IU/kg SC daily

OR

**Enoxaparin** 1.5 mg/kg SC daily

(if renal impairment, may prefer **UFH** 8000-10,000 IU SC q8h before transitioning to warfarin)

### 3. Disposition

**Consult** medicine and/or thrombosis if extensive clot, high bleeding risk, concern for extension, or social barriers to outpatient management.

**Discharge** appropriate if hemodynamically stable, pain controlled, low bleeding risk, and follow-up with primary care provider within 7-14 days.



Discharge on DOAC or LMWH prescription for 3 months. Can be extended by primary care physician or thrombosis specialist.

Advise compression stockings if no contraindications (PAD, Severe peripheral neuropathy).

Follow up with primary care provider within 7-14 days.

Return to ED if signs of PE present (dyspnea, pleuritic chest pain, hemoptysis).

References:

American College of Chest Physicians. (2012). *Antithrombotic therapy and prevention of thrombosis, 9th ed: CHEST Guideline*. *Chest*, 141

Kakkos, S. K., et al. (2021). *European guidelines on venous thrombosis—Anticoagulants: systemic review and meta-analysis*. *European Journal of Vascular and Endovascular Surgery*, 61(2), 234–250.

UpToDate. (2024). *Evaluation and management of lower extremity DVT*.



# Febrile Neutropenia

## 1. ABCDE pearls

**Airway, Breathing:** assess for respiratory distress, desaturations or hypoxia (may indicate pneumonia or sepsis as focus of infection).

**Circulation:** monitor for signs of septic shock (hypotension, tachycardia, warmed, flushed extremities, fever); begin early fluid resuscitation if hypotensive.

**Disability:** monitor for altered LOC, declining GCS as patients are at high risk for sepsis

**Environment:** strict infection control; mask patient and isolate when possible (especially if pancytopenic).

## 2. Oxygen: O<sub>2</sub> supplementation as necessary

Escalate as necessary:

NP → standard oxygen mask → Venturi mask → non-rebreather → high-flow → BiPAP

## 3. Antibiotics: broad spectrum

**Piperacillin-Tazobactam** 4.5 g IV q6h

+/- **Vancomycin** if: previous MRSA growth, suspected catheter infection, soft tissue infection, pneumonia, or hemodynamic instability

If penicillin allergy: **Meropenem** 1g IV q8h

## 4. Resuscitation

**NS** 1-2 L bolus if hypotensive

+/- **Norepinephrine** if persistently hypotensive or hypoperfused



## 5. Analgesia, Antipyretic

**Acetaminophen** 650-1000 mg POq6h PRN

AND/OR

**Hydromorphone** 1-2 mg PO or 0.5-1 mg IV q4h PRN

## 6. Disposition

**Discharge** in very rare cases if very low risk, hemodynamically stable, tolerating PO antibiotics, reliable follow-up, good outpatient supports AND if cleared by oncology.

Ensure outpatient oncology follow-up.

Discharge on fluoroquinolone + amoxicillin-clavulanate with clear instructions to return to ED.

**Consult** medicine or oncology for admission and continued IV antibiotic regimen for all other cases of febrile neutropenia.

### References:

Canadian Association of Emergency Physicians (CAEP). (2022). *Febrile Neutropenia in Cancer Patients: ED Management Guidelines*.



# Tumor Lysis Syndrome

## 1. ABCDE pearls

**Airway:** assess for severely aLOC, associated vomiting, declining GCS; intubate accordingly for airway protection.

**Circulation:** assess for hypotension and resuscitate accordingly; assess for arrhythmias secondary to possible electrolyte abnormalities.

## 2. Monitor vitals (BP, HR) and place on telemetry for arrhythmias concern (may be caused by hyperkalemia or hypocalcemia).

## 3. Resuscitation

**NS** or **LR** 500 mL to 1 L IV bolus

## 4. Electrolyte correction

### Hyperkalemia

**Calcium gluconate** 10 mL IV 10% solution (1000mg) over 2-3 minutes (can repeat if persistent ECG changes)

AND

**Insulin** 10 units IV

AND

**Dextrose** 50% 50 mL IV

AND (as necessary)

**Albuterol** x 10 puffs

AND (if concurrent metabolic acidosis, as necessary)

**Sodium bicarbonate** 1-3 amps IV over 15-30mins



## Hyperphosphatemia

Restrict dietary phosphate

(admitting service to add phosphate binders as needed)

## Hypocalcemia

Only treat if symptomatic (electrocardiographic changes, tetany, and convulsions)

**Calcium gluconate** 10 mL IV 10% solution

## Hyperuricemia

**Allopurinol** 100 mg/m<sup>2</sup> every 8 hours (maximum 800 mg/day)

OR

**Rasburicase** 0.2 mg/kg in 50 mL of NS for 30 minutes IV daily for 1-7 days

## 5. Disposition

**Consult** oncology for assessment and admission.

**Consult** nephrology early for consideration of dialysis.

### References:

Rafique, Z., Peacock, F., Armstead, T., Bischof, J. J., Hudson, J., Weir, M. R., & Neuenschwander, J. (2021). Hyperkalemia management in the emergency department: An expert panel consensus. *Journal of the American College of Emergency Physicians Open*, 2(5)

Ñamendys-Silva, S. A., Arredondo-Armenta, J. M., Plata-Menchaca, E. P., Guevara-García, H., García-Guillén, F. J., Rivero-Sigarroa, E., & Herrera-Gómez, A. (2015). Tumor lysis syndrome in the emergency department: challenges and solutions. *Open access emergency medicine : OAEM*, 7, 39–44.

Klemencic, S., & Perkins, J. (2019). Diagnosis and Management of Oncologic Emergencies. *The western journal of emergency medicine*, 20(2), 316–322.

Farkas, J. (2024, July 19). Tumor Lysis Syndrome. In Internet Book of Critical Care (IBC)



# Infectious & Inflammatory

Anaphylaxis	121
Bites	124
Gout Flare	129
Herpes Zoster Virus (Shingles)	131
Mononucleosis (EBV)	134
Osteomyelitis	136
Sexually Transmitted Infections (STIs)	139
Streptococcal Pharyngitis (Strep Throat)	141
Temporal (Giant Cell) Arteritis	143
Viral Upper Respiratory Tract Infection	145



# Anaphylaxis

## 1. ABCDE Pearls

**Airway and Breathing:** watch for stridor, facial edema, dropping O<sub>2</sub> saturations. Low threshold to secure airway if severely aLOC, stridor, drooling, and tongue or facial edema.

**Circulation:** watch for signs of anaphylactic shock (hypotension, tachycardia, aLOC) and resuscitate accordingly (IV fluids +/- pressors – start with IV norepinephrine (Levophed) 0.03-1.5mcg/kg/min).

**2. Call RT to bedside** for airway management as needed.

**3. Monitoring:** continuous CRM for all anaphylaxis patients

## 4. Oxygen

Supplement and escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

## 5. Medications

**IM Epinephrine** (1:1000) 0.01 mg/kg (maximum dose of 0.5 mg) per single dose, injected IM into the mid-outer thigh q5min x 3 or earlier PRN

Weight >50kg can be given 0.5mg IM

Weight >25 to 50kg can be given 0.3mg IM

Weight 10 to 25 kg can be given 0.15 mg by autoinjector or by drawing up 0.15 mL of the 1 mg/mL solution

Weight <10 kg should be given an exact weight-based dose (not estimated) whenever possible



**IV Epinephrine** infusion (routine 1mcg/mL) for when anaphylaxis is refractory to at least 3 doses of IM epinephrine

In adults (concentration is 1mcg/mL), start the infusion at 0.1 mcg/kg/minute and increase every two to three minutes by 0.05 mcg/kg/minute until BP and perfusion improvements

In infants and children (concentration of 10mcg/mL to prevent overload), starting infusion rate is 0.1 to 1 mcg/kg/minute

## 6. Adjunct Therapies

**H1 antihistamines** (for residual itching or urticaria)

**IV Cetirizine** (adults: 5mg, 6-11 years: 5-10mg, 5mo-6 years: 2.5mg)

**IV Diphenhydramine** (adults: 25 to 50 mg q4-6h PRN up to max daily dose of 400 mg per 24 hours)

**H2 antihistamines** (for residual itching or urticaria)

**IV Famotidine** (adults: 20 mg)

**Bronchodilators** (for the treatment of bronchospasm not responsive to epinephrine)

Inhaled bronchodilators including albuterol and salbutamol are reasonable choices. There is no specific regimen recommended in anaphylaxis, see [asthma exacerbation](#) for reasonable dosing.

**Glucocorticoids** (for patients with persistent bronchospasm, those with known asthma, or severe symptoms requiring more than two doses of IM epinephrine or requiring IV epinephrine)

**IV Methylprednisolone** (adults: 80 to 125 mg)

OR

**PO Prednisone** (adults: 40 to 60 mg)



## 7. Refractory Anaphylaxis

**Additional vasopressors** (If patient continues to be hypotensive despite maximal IV epinephrine and fluid resuscitation. Vasopressin and norepinephrine are reasonable options.

**Methylene blue** single bolus of 1 to 2 mg/kg given over 20 to 60 minutes

**Extracorporeal membrane oxygenation** (last line)

## 8. Disposition

### **Discharge Criteria:**

Patients should be observed being symptom-free for at least 4h in the ER.

### **At Discharge:**

Provide prescription for Epinephrine auto-injector.

Follow up with allergist or arrange referral if available.

Create anaphylaxis emergency plan.

### References:

McHugh, K. & Repanshek, Z. (2021). Anaphylaxis: Emergency Department Treatment. ScienceDirect. Available at: <https://www-sciencedirect-com.cyber.usask.ca/science/article/pii/S0733862721000778?via%3Dihub> [Accessed 9 July 2025].

Lytvyn, Y. and Qazi, M.A. (2022). Toronto Notes 2022. S.L.: Toronto Med Society



## Bites

### 1. Wound care

Copious irrigation for 5 mins under tap water followed by 500-1000 mL of saline

+/- debridement if necessary

Close uncomplicated wounds that are well debrieded and irrigated.

### 2. Dog bites

**Amoxicillin-clavulanate** 875-125mg PO BID x 5 days if:

- Moderate or severe wounds
- Puncture wounds, especially if bone, joint, or tendon sheath is penetrated
- Bites to the hand, face, feet, or genital area
- Immunocompromised or asplenic patients
- Wounds that require primary closure

Consider **Piperacillin-Tazobactam** if immunosuppressed or asplenic.

Primary closure may be performed for low-risk wounds, especially on the face, but is generally avoided in high-risk locations (hands, feet) or in infected wounds.

**Tetanus (Tdap)** immunization if unknown year of last dose, >5 years ago for dirty wounds or >10 years ago for clean wounds.

If dog's rabies status is unknown or the bite is from a wild or unvaccinated dog, consult public health for **postexposure prophylaxis** (see below).

If the dog is healthy, available for observation, and can be monitored for 10 days, post exposure prophylaxis is generally not indicated unless the animal develops clinical signs of rabies during the observation period.



### 3. Cat bites

**Amoxicillin-clavulanate** 875-125 mg PO BID x 5 days indicated for all cat bites.

Primary closure – generally avoided for cat bites due to the risk of deep tissue infection; delayed closure may be considered after 4 days if no signs of infection are present.

Consider X-ray for the affected area if there is concern for any retained teeth, these should be removed.

**Tetanus (Tdap)** immunization if unknown year of last dose, >5 years ago for dirty wounds or >10 years ago for clean wounds.

If the cat's rabies status is unknown, the attack was unprovoked, or the animal is unavailable for observation, consult public health for **postexposure prophylaxis** (see below).

### 4. Rodent bites

Antibiotic prophylaxis: not routinely indicated unless

- immunocompromised
- wound is moderate/severe
- wound involves the hand/face

**Tetanus** immunization (if last dose >5 years ago).

Rat-bite fever (*streptobacillus moniliformis*) should be considered in febrile patients after rat bites.

Most small rodent bites (e.g., mice, rats, squirrels, hamsters) do not require rabies post-exposure prophylaxis, but bites from large rodents (e.g., beavers, groundhogs) may warrant rabies risk assessment, especially in regions with enzootic rabies.

Consult public health before initiating **post-exposure prophylaxis**.



## 5. Bat bites

Wound irrigation is recommended.

Rabies post-exposure prophylaxis within 24–48 hours (see below).

**Tetanus** immunization (if last dose >5 years ago).

## 6. Snake bites

Assess for envenomation; monitor vital signs.

Clean and inspect the wound for retained fangs/teeth.

**Antivenom** is the definitive treatment for envenomation and should be administered early if indicated. Dosage is by vial, adjusted to clinical response; children require at least the same dose as adults.

**Tetanus** immunization (if last dose >5 years ago).

Pain control with opioids is preferred; avoid NSAIDs and aspirin due to bleeding risk (e.g. **Fentanyl** 50-100 mcg IV q30min in initial phase then transition to **Hydromorphone** 0.5-2 mg PO q4-6h PRN).

## 7. Human bites

**Amoxicillin-Clavulanate** 875-125mg PO BID x 5 days for

- Bites to the hand, face,
- Those with moderate/severe injury,
- Immunocompromised patients
- Injuries penetrating periosteum or joint capsule

Depending on the depth of injury, presence of a foreign body, or other potentially operative requirement, patients may require admission (See 8. Disposition).

Clean, debride, and leave wounds open aside from facial wounds.

HIV, hepatitis B, and hepatitis C transmission risk should be assessed; consider postexposure management as appropriate.

**Tetanus** immunization (if last dose >5 years ago).



## Rabies post-exposure prophylaxis:

Contact Public Health for guideline assistance.

### 1. Rabies Vaccine

1 mL IM (deltoid) on days 0, 3, 7, and 14

### 2. Human Rabies Immune Globulin (HRIG)

20 IU/kg infiltrated into and around the bite wound as much as possible

AND remainder IM at a site distant and contralateral from vaccine injection

(never mix HRIG and rabies vaccine in the same syringe or site)

## 8. Disposition

**Consult** appropriate surgical service (e.g. plastics) for assessment for complex facial laceration, wound near bone, tendon, joint, or other major structure, neurovascular compromise, retained foreign body

**Discharge** home if hemodynamically stable, reliable follow up and no signs of severe infection requiring IV antibiotics

Instructions:

- Return to ED if signs of infection – spreading erythema, heat, purulence, fevers.
- Follow up with primary care physician.
- If primary closure was required with non-absorbable sutures, ensure suture removal timeline is discussed depending on body location.
- If rabies exposure prophylaxis, ensure adequate follow up for additional doses of the vaccine at days 3, 7, and 14.

### References:

Baddour, L. (2024, November 19). *Animal bites (dogs, cats, and other mammals): Evaluation and management*.

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Management of patients with suspected rabies exposure: guidance for health care providers working with your local public health unit. Toronto, ON: Queen's Printer for Ontario; 2017



*Cat and Dog Bites : Emergency Care BC.* (n.d.).

Bunzli, W. F., Wright, D. H., Hoang, A. T., Dahms, R. D., Hass, W. F., & Rotschafer, J. C. (1998). Current management of human bites. *Pharmacotherapy, 18*(2), 227–234.

Kanaan, N. C., Ray, J., Stewart, M., Russell, K. W., Fuller, M., Bush, S. P., Caravati, E. M., Cardwell, M. D., Norris, R. L., & Weinstein, S. A. (2015). Wilderness Medical Society Practice Guidelines for the Treatment of Pitviper Envenomations in the United States and Canada. *Wilderness & environmental medicine, 26*(4), 472–487



## Gout Flare

### 1. Non-pharmacologic management

Ice, elevation, and adequate hydration

### 2. Medications

**NSAIDs** Ibuprofen 600-800 mg PO q6-8h or naproxen 500 mg PO BID (analgesic and first-line treatment for acute gout flare)

AND/OR

**Colchicine** 1.2 mg PO, followed by 0.6 mg PO BID until flare resolves (Contraindicated in renal or hepatic insufficiency)

AND/OR

**Prednisone** 30-40 mg PO until symptoms resolve, with tapering (especially if NSAIDs contraindicated, or flare-up refractory to NSAIDs)

AND/OR

**Hydromorphone** 0.5-2 mg PO/IV q4-6h PRN (for analgesia)

OR

Intra-articular **methylprednisolone** acetate injection 40-60 mg if no concern for infection and cannot tolerate oral corticosteroids

**Note:** avoid NSAIDs + corticosteroids combination. Monotherapy recommended unless severe polyarticular gout attack.

### 3. Aspiration (see [Joint aspiration](#))

Perform joint aspiration (+/- with orthopedic surgery) to r/o septic arthritis if the patient is experiencing systemic infectious symptoms such as tachycardia and fever, and/or hemodynamic instability. Also consider joint aspiration if the patient is otherwise high-risk, has no known risk factors for gout, no history of gout, red/hot joint, immunocompromised, or atypical presentation.



## 4. Disposition

**Discharge** most patients who are appropriate for outpatient treatment. Recommend follow-up with primary care physician. Consideration for allopurinol if recurrent exacerbations, or prophylaxis for flare-ups.

Advise the patient about avoiding triggers (e.g. alcohol, meats), and stopping precipitating medications such as thiazide diuretics.

If prednisone started, continue 30-40 mg by mouth for 3-5 days. If colchicine started, reduce colchicine dose to 0.5-0.6 mg BID until 48h after resolution of flare.

**Consult** medicine for admission if septic arthritis suspected, unable to ambulate, or for management of severe, uncontrolled pain

### References:

Badlissi, F. Gout. *BMJ Best Practice*. Nov 2022.

DynaMed. Management of Acute Gout. *EBSCO Information Services*. Accessed August 5, 2025.

Gaffo, A.L. Gout: Treatment of flares. *UpToDate*. Wolters Kluwer. [Accessed on August 26, 2026].

Hanlon, D. and Meyer, J. Crystal-Induced Arthritis. In: Swadron S, Nordt S, Mattu A, and Johnson W, eds. *CorePendum*. 5th ed. Burbank, CA: CorePendum, LLC.



## Herpes Zoster Virus (Shingles)

### 1. ABCDE pearls

**Disability:** assess visual acuity (if concerned for herpes zoster ophthalmicus) as well as for any hearing loss, vertigo, facial nerve paralysis (if concerned for herpes zoster oticus).

**Exposure:** assess for ocular or peri-ocular lesions, conjunctival erythema (herpes zoster ophthalmicus), or for lesions in the auditory canal (herpes zoster oticus). Also assess for lesions outside the primary dermatome for disseminated HZV.

### 2. Analgesia

**Acetaminophen** 650-1000 mg PO q4-6h PRN

AND/OR

**Ibuprofen** 400-600mg q6h

OR

**Ketorolac** 10 mg IV or IM q6h PRN

AND/OR

**Hydromorphone** 0.5-2mg q4-6h PRN

For post-herpetic neuralgia (may be started in ED if patient in severe pain, refractory to analgesia options above)

**Nortriptyline OR Amitriptyline** 10-25 mg PO

AND/OR (one of)

**Gabapentin** 600mg PO/day

OR

**Pregabalin** 75mg PO BID



### 3. Antivirals and Supportive Care

For localized, uncomplicated herpes zoster

**Acyclovir** 800mg PO 5x/d

OR

**Valacyclovir** 1g PO TID (Preferred)

OR

**Famciclovir** 500mg PO TID

Medications should be initiated within 72 hours of symptom onset

For ophthalmic herpes zoster (Herpes Zoster Ophthalmicus)

**Acyclovir** 800mg PO 5x/d

OR

**Acyclovir** 10 mg/kg IV q8h

if severe ocular involvement, immunocompromised, not tolerating PO

OR

**Valacyclovir** 1g PO TID (Preferred)

+ topical antivirals and/or corticosteroids as per ophthalmology recommendations

For Ramsay Hunt syndrome (Herpes Zoster Oticus)

**Acyclovir** 800mg PO 5x/d

OR

**Valacyclovir** 1g PO TID (Preferred)

+/- **Prednisone** 1 mg/kg/day PO (up to 60 mg)



For disseminated HZV

Start **acyclovir** 10 mg/kg IV q8h OR **valacyclovir** 1g PO TID and admit to medicine or neurology

#### 4. Disposition

**Consult** ophthalmology STAT for ophthalmic HZV

**Consult** neurology or medicine for admission in case of immunodeficiency, disseminated HZV, uncontrollable pain, facial nerve palsy (Ramsay Hunt) or IV acyclovir requirements as above

**+/- ICU** for complications such as diaphragmatic paralysis, Guillain-Barré syndrome, CNS involvement (myelitis, encephalitis), hemodynamic instability, requiring pressors/inotropes

**Discharge** if localized HZV, manageable pain, no CNS or ophthalmic involvement, expected adherence to discharge plan.

**7 day** oral antiviral prescription (for localized HZV) up to **10 day** prescription (for ophthalmic shingles) as above upon discharge

Recommend Shingrix/ Zostavax immunization if >60 years old for family members/friends

Can use cold compress with normal saline or betadine solution, can use OTC Tylenol/Advil for analgesia, or short course of oral opioids with provider discretion for severe pain

Follow up with primary care physician

#### References:

Nair, P.A. & Patel, B.C. (2025) *Herpes Zoster*. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.

Lytvyn, Y. and Qazi, M.A. (2022). *Toronto Notes 2022*. S.L.: Toronto Med Society.

RxFiles. (n.d.) *Antibiotic Prescribing for Viral Infections*

McKeage, K. and Keam, S.J. (2009) 'Pregabalin: in the treatment of postherpetic neuralgia', *Drugs & Aging*, 26(10), pp. 883-892

Jean, W.H., Wu, C.C., Mok, M.S. and Sun, W.Z. (2005) 'Starting dose of gabapentin for patients with post-herpetic neuralgia: a dose-response study', *Acta Anaesthesiologica Taiwanica*, 43(2), pp. 73-77.



## Mononucleosis (EBV)

### 1. ABCDE pearls

**Airway, Breathing:** Assess for upper airway obstruction from tonsillar hypertrophy or lymphadenopathy. Consider steroids if stridor, severe odynophagia, or (threatened) airway compromise

**Circulation:** monitor for signs of hypotension, tachycardia, aLOC for suspicion of a splenic rupture (rare, but life-threatening)

**Disability:** Rule out CNS infection (meningitis, encephalitis) if altered LOC or photophobia present

### 2. Treatment approaches

#### Supportive Care:

Rest, hydration with water, electrolyte-containing fluids (e.g., oral rehydration solutions, broths, diluted juices) if tolerating PO intake.

#### Analgesia/antipyretics:

**Acetaminophen** 650-1000 mg PO q6h PRN

AND/OR

**Ibuprofen** 400 mg PO q6-8h PRN (if no contraindications).

AND/OR

**Ketorolac** 10 mg IV/IM q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg IV if needed

**+/- Dexamethasone** 10 mg IV/PO x1, then 4 mg q6h PRN short course

Indications for corticosteroids are analgesia, severe tonsillar hypertrophy with (threatened) airway compromise, hemolytic anemia, and/or thrombocytopenia.



### 3. Disposition

**Discharge** if stable with supportive care and clear return precautions. Advise no contact sports or heavy lifting for  $\geq 3-4$  weeks due to risk of splenic rupture. Counsel to limit transmission by avoiding sharing drinks and utensils during their 2-4 week infectious period or as long as they are having symptoms.

**Consult** medicine for admission if (threatened) airway compromise, dehydration and unable to tolerate PO intake, hepatic or hematologic complications. Consult ENT if peritonsillar abscess.

**Consult** IR and/or general surgery STAT for splenic rupture for definitive management

+/- ICU if hemodynamically unstable, in hemorrhagic shock, requiring pressors and/or inotropes.

#### References:

Ontario Ministry of Health. (2023). *Epstein-Barr Virus (Infectious Mononucleosis) – Public Health Management Guidelines*. Retrieved from <https://www.health.gov.on.ca>

Bui, P., & Chan, K. (2021). Infectious Mononucleosis: Recognition and Management in the Emergency Department. *Canadian Journal of Emergency Medicine*, 23(4), 552–558. <https://doi.org/10.1017/cem.2021.99>

Canadian Paediatric Society. (2022). *ID Snapshot: Epstein-Barr Virus (EBV)*. Retrieved from <https://cps.ca>

UpToDate. (2024). *Clinical manifestations and treatment of Epstein-Barr virus infection*. Retrieved from <https://www.uptodate.com>



# Osteomyelitis

## 1. ABCDE pearls

**Airway, Breathing:** watch for altered level of consciousness, declining GCS, signs of septic shock, inability to protect airway +/- vomiting; intubate accordingly.

**Circulation:** assess for signs of severe sepsis or septic shock (hypotension, tachycardia, aLOC); resuscitate accordingly.

**Exposure:** inspect affected area for signs of erythema, warmth, swelling, bone involvement/visualization. Look for surgical wounds or diabetic ulcers

If ulcer is present, assess depth and “probe to bone” using a swab

## 2. Monitoring and strict I/Os in cases of sepsis, septic shock

## 3. Oxygen: if clinically unstable, O<sub>2</sub> therapy to target spO<sub>2</sub> of >94%

Escalate as necessary:

NP → standard oxygen mask → Venturi mask → non-rebreather → high-flow → BiPAP

## 4. Empiric antibiotics

**Vancomycin** 15–20 mg/kg q8–12h IV

AND (one of the following 3)

**Piperacillin-tazobactam** 4.5 g IV q6–8h.

OR

**Cefepime** 2 g IV q8–12h

OR

**Ceftazidime** 2 g IV q8h



If low risk for MRSA or Pseudomonas:

**Cefazolin** 2 g IV q8h

**5. IV fluids** (if septic, hypotensive, clinically hypovolemic, low risk of overload)

**NS** or **LR** 500 mL to 1 L bolus

**6. Analgesia**

**Acetaminophen** 975-1000 mg PO q4-6h PRN

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN

OR

**Naproxen** 500 mg PO q12h PRN

OR

**Ketorolac** 15 mg IV q6h PRN

AND/OR

**Hydromorphone** 1-2 mg PO or 0.5-1 mg IV q1h PRN

**7. Disposition**

**Consult** medicine for admission and ID involvement. Will require multiple weeks of IV (or in some cases PO) antibiotics, optimization of diabetes management etc.

**Consult** orthopedic surgery if concerned regarding severe OM, necrosis, urgent debridement requirement

**Consult** ICU STAT for hemodynamic instability requiring vasopressors and/or inotropes



References:

Berbari, E. F., Kanj, S. S., Kowalski, T. J., Darouiche, R. O., Widmer, A. F., Schmitt, S. K., ... & Infectious Diseases Society of America. (2015). 2015 Infectious Diseases Society of America (IDSA) clinical practice guidelines for the diagnosis and treatment of native vertebral osteomyelitis in adults. *Clinical Infectious Diseases*, 61(6), e26–e46.

Lew, D. P., & Waldvogel, F. A. (2004). Osteomyelitis. *Lancet*, 364(9431), 369–379.

Calhoun, J. H., & Manring, M. M. (2005). Adult osteomyelitis. *Infectious Disease Clinics of North America*, 19(4), 765–786.



## Sexually Transmitted Infections (STIs)

### 1. Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN

### 2. Treatment: treat empirically as outlined below if suspecting an STI:

For uncomplicated (non-disseminated) gonorrhea:

**Ceftriaxone** 500 mg IM once (<150 kg) or 1 g IM ( $\geq$ 150 kg)

For chlamydia:

**Doxycycline** 100 mg PO BID x 7 days (preferred for epididymitis)

OR

**Azithromycin** 1 g PO once (preferred for urethritis)

For syphilis (primary, secondary, early latent):

**Benzathine penicillin G** 2.4 million units IM once

For trichomoniasis:

Women: **Metronidazole** 500 mg PO BID x 7 days

Men: **Metronidazole** 2 g PO once



For genital herpes (first episode):

**Acyclovir** 400 mg PO TID x 7-10 days

For Pelvic Inflammatory Disease (PID): see [\*Pelvic Inflammatory Disease\*](#)

### **3. Disposition**

Outpatient management is appropriate for most uncomplicated STIs.

**Discharge** on antibiotics as above, while awaiting testing results.

Recommend follow-up with primary care provider, especially for test of cure in 7 days, and provide education and counseling regarding healthy sexual practices, use of contraception, importance of partner testing.

**Consult** medicine for admission in case of complicated UTI (disseminated gonococcal, severe PID), hemodynamic instability, unsafe discharge.

#### References:

Centers for Disease Control and Prevention. (2021). *Sexually transmitted infections treatment guidelines*. U.S. Department of Health and Human Services.

Levesque, A. (2022). Updates on recommendations for sexually transmitted infection treatments & empiric therapy. *EMDocs*.

Workowski, K. A., & Bolan, G. A. (2021). Sexually transmitted infections treatment guidelines, 2021. *Clinical Infectious Diseases*, 54(8), e72-e112.

Hilbert, S. L. M., & et al. (2018). Management of sexually transmitted infections in the emergency department. *Emergency Medicine Clinics of North America*.



## Streptococcal Pharyngitis (Strep Throat)

### 1. Supportive care

IV fluids (if clinically hypovolemic, poor intake)

**NS** or **LR** 500 mL to 1 L bolus

Otherwise encourage increased PO fluid intake

Analgesia/Antipyretics

**Acetaminophen** 975-1000 mg PO q6h PRN

AND/OR

**Ibuprofen** 400-600 mg PO q6h PRN

### 2. Antibiotics (if clinically suspicious of strep pharyngitis, positive rapid antigen test)

**Amoxicillin** 500 mg PO BID x 10 days

OR

**Penicillin V** 500 mg PO BID x 10 days

If anaphylactic to beta lactams:

**Clindamycin** 7 mg/kg/dose TID x 10 days (Max 300 mg/dose)

OR

**Azithromycin** 12 mg/kg once daily x 5 days (max 500 mg/dose)

If unable to tolerate PO intake:

**Penicillin G** 1.2 million units IM once



### 3. Steroids for symptomatic relief, severe pharyngeal soft tissue swelling and/or pain

**Dexamethasone** 8-10 mg IV/IM/PO x1

### 4. Disposition

**Discharge** with antibiotic prescription, conservative management recommendations as outlined above.

Recommend rest, lozenges, warm fluids, avoiding close contacts, and primary care provider follow-up as needed.

**Consult** medicine for admission only if concerned for peritonsillar abscess, severely comorbid, hypoxic, unsafe discharge.

#### References:

Shulman, S. T., Bisno, A. L., Clegg, H. W., Gerber, M. A., Kaplan, E. L., Lee, G., ... & Van Beneden, C. (2012). Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis. *Clinical Infectious Diseases*, 55(10), e86–e102.

Centor, R. M., Witherspoon, J. M., Dalton, H. P., Brody, C. E., & Link, K. (1981). The diagnosis of strep throat in adults in the emergency room. *Medical Decision Making*, 1(3), 239–246.

Infectious Diseases Society of America. (2012). Group A streptococcal pharyngitis: Clinical guidelines. *Clinical Infectious Diseases*, 55(10), e86–e102.



## Temporal (Giant Cell) Arteritis

### 1. ABCDE pearls

**Circulation:** Palpate temporal artery for tenderness, thickening, decreased pulsation, assess for asymmetric pulses/BP (would suggest large vessel involvement (such as subclavian artery), assess for features of dissection (large vessel vasculitis).

**Disability:** Assess for visual changes/loss, headache, scalp tenderness, and jaw claudication. Assess for stroke signs as GCA can involve cerebral arteries.

### 2. Treatment approaches

Note: Consult rheumatology to dictate treatment below

#### Steroids:

**Prednisone** 1mg/kg PO (typically 50-60 mg) if no visual symptoms

OR

**Methylprednisolone** 500-1000 mg IV daily for vision loss or worsening visual acuity

#### Analgesia:

**Acetaminophen** 650-1000 mg PO q6h PRN (max 4g/day)

AND/OR

**Ibuprofen** 400-600 mg q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg PO/IV q4-6h PRN



### **Antiemetics:**

**Ondansetron** 4-8 mg PO or IV q8h PRN

### **3. Disposition**

**Discharge** considered only if no visual symptoms, stable vitals, diagnosis confirmed, outpatient ophthalmology follow-up arranged within 48-72 hrs and oral steroids prescribed (40-60 mg PO daily until follow-up with ophthalmology/rheumatology)

**Consult** medicine or ophthalmology if: visual symptoms, systemic symptoms (fatigue, fever, weight loss, anemia), or high-risk features (e.g. fever, polymyalgia rheumatica, ESR  $\geq 50$  mm/hr or CRP level  $\geq 10$  mg/L)

**Post discharge instructions:** Highlight importance of compliance to steroids as prescribed; Educate on vision loss, need for compliance with treatment, and close follow-up with primary care provider/other specialists.

#### References:

Temporal Arteritis; Canadian Rheumatology Association. (2020). *Giant Cell Arteritis: Clinical Practice Guidelines and Recommendations*. Canadian Journal of Rheumatology



# Viral Upper Respiratory Tract Infection

## 1. Oxygen: target spO<sub>2</sub> of >92%

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP → intubation

## 2. Supportive care

IV fluids (if clinically hypovolemic, poor intake)

**NS** or **LR** 500 mL to 1 L bolus

Otherwise encourage increased PO fluid intake

Analgesia/Antipyretics

**Acetaminophen** 650–1000 mg PO q4–6h PRN

AND/OR

**Ibuprofen** 400–600 mg PO q6h PRN

+/- **Nasal saline sprays/rinses** (OTC) BID–QID.

## 3. Disposition

**Discharge** with medication recommendations as outlined above.

Educate on self-limiting nature, avoiding close contact, masking etc.  
Recommend primary care provider follow-up as needed.

**Consult** medicine for admission only if severely comorbid, hypoxic, unsafe discharge.



**References:**

Centers for Disease Control and Prevention. (2021). *Common cold: Clinical guidance for healthcare professionals*. U.S. Department of Health and Human Services.

Fashner, J., Ericson, K., & Werner, S. (2012). Treatment of the common cold in children and adults. *American Family Physician*, 86(2), 153–159.

Kenealy, T., & Arroll, B. (2013). Antibiotics for the common cold and acute purulent rhinitis. *Cochrane Database of Systematic Reviews*, 2013(6), CD000247.

Worrall, G. (2011). Common cold. *Canadian Family Physician*, 57(11), 1289–1290.



# Metabolic

Acute Hypercalcemia	148
Acute Hypokalemia	150
Chronic Pain Exacerbation	152
Diabetic Ketoacidosis (DKA) & Hyperosmolar Hyperglycemic Syndrome (HHS)	154
Hyperkalemic Emergency	157
Hyperthermia	159
Hypoglycemia	161
Hypothermia	163
Sepsis	165



## Acute Hypercalcemia

### 1. ABCDE pearls

**Airway, Breathing:** monitor for severely altered mental status and aspiration risk in severe cases; intubate accordingly (rare).

**Circulation:** monitor for volume depletion secondary to losses, hypotension, or arrhythmias (obtain ECG and keep on telemetry).

**Disability:** assess mental status (can range from mild confusion to coma in severe hypercalcemia).

### 2. Rehydration

**NS** 1-2 L IV bolus, then maintenance at 200-300 mL/h for calciuresis (adjust for cardiac or renal status).

Continue to monitor other electrolytes (q2-4 hr) during rehydration.

### 3. Diuretics

**Furosemide** 20-40 mg IV PRN for volume overload secondary to IV rehydration, but does not reduce hypercalcemia.

### 4. Long-acting antiresorptive

if severe (>15 mg/dL) or CNS depression

**Zoledronic acid** (if malignancy-related) 4 mg IV over 15 min

OR

**Denosumab** (second line) 120 mg SC (especially in renal failure)

### 5. Hemodialysis

Rarely considered, only for hyperCa with life-threatening arrhythmia/heart block.



## 6. Treat underlying causes: hyperparathyroidism, sarcoidosis, TB

## 7. Supportive care

### Analgesia

**Acetaminophen** 500-1000 mg PO/IV q6h PRN to max 4g/day

### Antiemetics

**Ondansetron** 4-8mg PO or IV q6-8h PRN

## 8. Disposition

**Consult** medicine for assessment and/or admission if calcium >3.5 mmol/L, neurological symptoms (e.g., confusion, lethargy), renal impairment, ECG changes (short QT, arrhythmias), underlying malignancy or unclear etiology.

**Discharge** if mild ( $\text{Ca} < 3.0 \text{ mmol/L}$ ), asymptomatic, stable, and reversible cause identified with reliable follow-up.

**Post discharge instructions:** Maintain hydration; avoid thiazides, lithium, calcium/vitamin D supplements. Follow up with primary care provider for further work-up and long-term management.

### References:

Canadian Family Physician (CFP). (2017). *Approach to hypercalcemia in the emergency department*.

Pfennig, C. L., Slovis, C. M. Electrolyte disorders. In R. M. Walls, R. S. Hockberger, M. Gausche-Hill, T. B. Erickson, & S. R. Wilcox (Eds.). (2023). Rosen's emergency medicine: Concepts and clinical practice (10th ed., Vol. 2, pp. 1534–1536). Elsevier.



## Acute Hypokalemia

### 1. ABCDE pearls

**Airway, Breathing:** monitor for severely altered mental status and aspiration risk in severe cases; intubate accordingly (rare).

**Circulation:** monitor for volume depletion secondary to losses, hypotension, or arrhythmias (obtain ECG).

**Disability:** assess mental status (can range from mild confusion to coma in severe hypokalemia).

**2. Monitoring:** place patient on telemetry if symptomatic/ $K<2.5$ , ECG changes (U waves, flat/inverted T waves, ST depressions, QT elongation), significant drop and/or iatrogenic hypokalemia (e.g. insulin).

**3. Treat underlying cause** (GI/renal losses, medications (e.g. thiazide > loop diuretics), intracellular shifting, poor PO intake, endocrine etc.).

Treat concurrently for **hypomagnesemia** to shift the K intracellularly once administered. Assume hypomagnesemia in moderate/severe hypokalemia.

#### Clinical Pearl: Thyrotoxic Periodic Paralysis

- acute hypokalemia and painless muscle weakness in hyperthyroidism
- order TSH and treat hyperthyroidism as appropriate

### 4. K<sup>+</sup> replacement

Non emergent hypokalemia (mild): target K >3.5

Start oral **KCl** titrated to desired increase, then reassess lytes

(10 mEq = 0.1 mmol/L increase, but may need more as potassium is predominantly intracellular)

e.g. 40mEq to increase serum K by 0.4 mmol/L



Serum potassium 2.5 to 3 mEq/L (moderate):

Oral **KCl** titrated to desired increase (40-60 mEq), then reassess lytes

OR

Start **KCl** 10 mEq/hour IV; adjust based on repeat serum potassium

Serum potassium <2.5 mEq/L or life-threatening hypokalemia (severe):

Start **KCl** 10 to 20 mEq/hour IV; adjust based on repeat serum potassium

Note: if replacing at >10 mEq/hour, central access is required

## 5. Disposition

**Discharge** if K<sup>+</sup> has normalized and the patient is stable with normal ECG, with outpatient follow up (ie repeat bloodwork with PCP in 1 week).

**Consult** medicine for assessment +/- admission for workup or management of underlying etiology, symptomatic or hypokalemia refractory to ED management.

### References:

Pfennig, C. L., Slovis, C. M. Electrolyte disorders. In R. M. Walls, R. S. Hockberger, M. Gausche-Hill, T. B. Erickson, & S. R. Wilcox (Eds.). (2023). *Rosen's emergency medicine: Concepts and clinical practice* (10th ed., Vol. 2, pp. 1528–1530). Elsevier.



## Chronic Pain Exacerbation

### 1. ABCDE pearls

**Disability:** In those presenting with back pain, screen for red flags for cauda equina including saddle anesthesia, urine retention, fecal incontinence, limb weakness, or loss of reflexes.

**Exposure:** Identify possible sources of pain. Look for signs of trauma, infection, or pathology inconsistent with patterns of chronic pain.

### 2. Analgesia

Tailor to pre-existing outpatient regimen.

Escalate as needed:

**Ibuprofen** 400 mg PO q6h

OR

**Ketorolac** 10 mg IV/IM q6h

AND/OR

**Hydromorphone** 1-2 mg PO or 0.5-1 mg IV

OR

**Morphine** 5-10 mg PO q2-4h PRN or 2.5-5 mg IV q30-60min PRN

AND/OR

**Gabapentin** 300 to 600 mg PO (one-time dose in ED if patient missed)

AND/OR

**Nerve block(s)** for localized pain to the discretion of ED provider



### 3. Disposition

**Refer** to outpatient pain clinic.

Some patients may require admission for a pain crisis.

Follow up with primary care physician to titrate medications and explore alternative analgesic options.

#### References:

BC Provincial Academic Detailing Service, 2013. *Opioids in chronic non-cancer pain: the basics*. British Columbia Ministry of Health

Cisewski, D. and Friedman, B.W., 2020. Back pain. In: R. Zeller, ed. *EMRA pain management guide*. Dallas, TX: Emergency Medicine Residents' Association (EMRA)

Toward Optimized Practice (TOP) Program, 2011. *Low back pain: towards optimized practice clinical practice guideline*. 2nd ed. Edmonton, AB: Alberta Health Services.

Queremel Milani, D.A. and Davis, D.D., 2025. Pain management medications. In: *StatPearls* [Internet]. Treasure Island, FL: StatPearls Publishing



# Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycemic Syndrome (HHS)

## 1. ABCDE pearls

**Airway and Breathing:** monitor for severely altered LOC, declining GCS, inability to protect airway +/- vomiting. Suction secretions

Intubation should ALWAYS be a last resort in DKA as it may exacerbate the acidosis - reserve for peri-arrest or arrest

**Circulation:** watch for hypotension, tachycardia for signs of hypovolemia/hypovolemic shock; resuscitate accordingly.

## 2. Monitoring: monitor vitals closely, strict I/Os, place patient on telemetry.

Blood glucose q1-2h + electrolytes q2-4h (potassium replacement may be needed).

## 3. Oxygen: O<sub>2</sub> supplementation as necessary

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

## 4. IV fluids

If hypovolemic:

**LR** 1-2 L bolus, may need 3-4 L total. Avoid NS as it may worsen acidosis with additional hyperchloremic metabolic acidosis due to large volumes.

(Adjust based on hemodynamics, urine output. Decrease if CHF, ESRD)



Once volume deficit corrected:

If glucose > 15:

**LR** 150-200 cc/hr

If glucose < 15:

**LR** 100 cc/hr + **D10W** 100cc/hr

\*Note: glucose checks q1-2h, if starting with LR 150-200 cc/hr and glucose <15 on repeat CBG, then addition of **D10W** as a second infusion allows you to titrate glucose as needed.

## 5. Potassium

If serum potassium between 3.5-5 mEq/L: **KCl** 10-20 mEq/L of IVF

If serum potassium > 5 mEq/L: no KCl, but monitor potassium level q1-2h

## 6. Insulin (target 3-4 mmol/L drop in glucose per hour)

If initial serum potassium is <3.3 mEq/L: delay insulin and give IV KCl until potassium normalizes.

**Insulin** at 0.1 units/kg/hour IV **until anion gap closes**

Serial VBGs q1-2h (if severe) or q2-4h (if mild to moderate) until anion gap closes (for DKA)

## 7. Glucose

Add **D5W** or **D10W** when glucose < 15 mmol/L secondary to insulin

\*Note: D10W is safe to run through a peripheral line, if higher concentration needed, will need a central line\*



## 8. Manage underlying cause

5 I's:

- **Infection** (see *Infectious and Inflammatory*)
- **Infarction** (see *STEMI, NSTEMI, Stroke, Mesenteric ischemia*)
- **Infant** (pregnancy)
- **Indiscretion** (dietary non-adherence)
- **Insulin deficiency** (non-adherence or pump malfunction)

## 9. Disposition

**Consult** medicine for assessment +/- admission for complications like cerebral edema, hyperchloremic acidosis, iatrogenic overload requiring further diuresis, unsafe discharge, expected non-compliance with diabetes medications.

**Consult** ICU if severe acidosis despite resuscitation ( $\text{pH} < 7.1$ ) complications related to hypokalemia, hemodynamically unstable refractory to fluid resuscitation, requiring pressors, inotropes

**Discharge** if resolution of DKA/HHS: glucose  $< 11-14$ , bicarbonate  $>$  mmol/L,  $\text{pH} > 7.3$  and tolerating PO intake. Ensure the underlying cause of DKA is identified and treated.

DKA may be triggered by an underlying infectious or inflammatory process. Recommend follow-up with primary care provider vs GIMRAC follow-up to review diabetes management.

### References:

Diabetic ketoacidosis in adults: Treatment. UpToDate [Internet].

Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN. Hyperglycemic crises in adult patients with diabetes. In: De Groot LJ, Chrousos G, Dungan K, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.

Treatment of severe hypovolemia or hypovolemic shock in adults. UpToDate [Internet]



# Hyperkalemic Emergency

## 1. ABCDE pearls

**Airway:** watch for signs of muscle weakness and/or paralysis, severely altered LOC, cardiac arrest. Intubate accordingly.

**Circulation:** if cardiac arrest, initiate ACLS algorithm. Consider hyperkalemia as a reversible cause.

## 2. Monitoring: monitor vitals closely. All patients should be on telemetry and monitored for arrhythmias.

## 3. Cardiac protection

**Calcium gluconate** 10 mL IV 10% solution (1000mg) over 2-3 minutes

## 4. Intracellular shift

**Insulin** 10-20 units IV

AND

**Dextrose** 50% 50 mL IV

AND (as necessary)

Nebulized **Albuterol** 10-20 mg

AND (if concurrent metabolic acidosis, as necessary)

**Sodium bicarbonate** 1-3 amps IV over 15-30 minutes



## 5. Enhance K<sup>+</sup> removal

**Furosemide** 40 mg IV

OR

If renal function is impaired, can use an osmotic laxative such as  
**lactulose** 30 mL PO

OR

If hypovolemic, **NS** 500 to 1000 mL bolus

## 6. Monitoring

Serum K<sup>+</sup> level q1-2h after initiation of treatment.

Repeat VBG if acidotic and required sodium bicarbonate q1-2h after initiation of treatment.

Repeat ECG 1-2 hours after initiation of treatment.

## 7. Disposition

**Consult** nephrology for consideration of dialysis if refractory hyperkalemia or renal failure.

**Consult** medicine for admission if underlying cause to be worked up/managed, or persistent hyperkalemia.

If K has normalized and the underlying cause is treated/stable, can discharge with primary care physician follow up and clear instructions to return to ED (chest pain, palpitations, syncope, pre-syncope).

### References:

- Rafique, Z., Peacock, F., Armstead, T., Bischof, J. J., Hudson, J., Weir, M. R., & Neuenschwander, J. (2021). Hyperkalemia management in the emergency department: An expert panel consensus. *Journal of the American College of Emergency Physicians Open*, 2(5).



# Hyperthermia

## 1. ABCDE pearls

**Airway and Breathing:** Ensure airway patency. Assess for tachypnea or respiratory distress. Prepare for intubation if LOC is significantly impaired, unable to protect airway or if ventilatory support needed (e.g., for severe heat stroke with CNS depression). Supplemental O<sub>2</sub> as needed. (Use warmed, humidified oxygen if available) Aim for SpO<sub>2</sub> >94%.

**Circulation:** assess for hypotension or signs of shock. Monitor for arrhythmias or myocardial strain in elderly/comorbid patients.

## 2. Monitoring:

Place patient on telemetry and monitor ETCO<sub>2</sub> during cooling.

Continuous core temperature monitoring (esophageal, bladder, rectal probe) until normal temperature achieved. Avoid oral temperature checks.

## 3. Cooling Measures

### Mild to Moderate Hyperthermia (e.g. heat exhaustion):

Passive cooling: remove excess clothing

Active cooling: apply cool compresses to forehead/neck or use fans

### Severe Hyperthermia (core temp >40°C or altered LOC):

Active cooling required:

- Ice packs to groin, axillae, and neck
- Cooling blankets
- Evaporative cooling: spray with lukewarm water + fan
- Submersion in ice water

**Goal:** Lower core temperature to <38.5°C within 30–60 minutes.



## 4. IV Fluids

Oral rehydration if the patient is alert and not obtunded or vomiting.

**NS** or **LR** boluses (cooled to 4°C if tolerated), 250–500 mL at a time.

- Rehydrate slowly to avoid pulmonary edema
- Titrate to blood pressure and urine output
- Avoid fluid overload, especially in elderly or HF patients

## 5. Prevent heat generation/ reduce shivering

Treat seizures or stimulant toxicity (benzodiazepines).

Some cooling modalities may lead to shivering, use **benzos** or **fentanyl** to reduce.

## 6. Disposition

**Consult** medicine +/- ICU if altered LOC, seizures, hypotensive, signs of organ failure, or core temp >40°C or if evidence of rhabdomyolysis, renal injury, or coagulopathy.

Consider poison control consult if substance-related hyperthermia suspected.

**Discharge** if fully recovered, normal temperature, stable vitals, no evidence of organ dysfunction, and underlying cause addressed (if present).

Ensure safe discharge conditions (fixed address, adequate access to hydration, shelter, and cooling). Counsel on heat illness prevention (hydration, breaks, avoid peak sun exposure).

Follow up with primary care provider.

### References:

- Epstein, Y., & Yanovich, R. (2019). Heatstroke. *New England Journal of Medicine*, 380(25), 2449–2459.
- Jung, Y. S., Kim, H.-H., Yang, H. W., & Choi, S. (2020). Targeted temperature management in patients with severe heatstroke. *Medicine*, 99(45).
- Marsden, J., & Chiu, I. (2024). *Point-of-care emergency clinical summary*. Heat-Related Illness : Emergency Care BC.
- Platt, M. A., & LoVecchio, F. (2025). *Nonexertional (classic) heat stroke in adults*. UpToDate.
- Platt, M. A.; Price, T. G. Heat Illness. In R. M. Walls, R. S. Hockberger, M. Gausche-Hill, T. B. Erickson, & S. R. Wilcox (Eds.). (2023). Rosen's emergency medicine: Concepts and clinical practice (10th ed., Vol. 2, pp. 1771–1780). Elsevier.



# Hypoglycemia

## 1. ABCDE pearls

**Airway and Breathing:** assess for severely altered mental status, declining GCS, inability to protect airway +/- vomiting; intubate accordingly if refractory to glucose correction

**Circulation:** Monitor for bradycardia, tachycardia, hypotension; consider mimics such as stroke, sepsis, intoxication.

**Disability:** perform a full neurological exam. Focal deficits may improve after glucose; do not label as stroke until hypoglycemia is excluded.

## 2. Medications

If patient is alert & able to swallow safely:

3-4 **glucose tablets**, sublingual

300 g (1200 cal) of **carbohydrate** (soda, juice, sandwich, snacks) – target 15 grams of carbohydrate q15mins

If patient is altered/NPO:

**D50W** 50-100 mL (1-2 ampules) IV

OR

**D10W** 100-200 mL IV

If patient NPO and no IV access:

**Glucagon** 1 mg IM (less effective in malnourished or alcohol-induced hypoglycemia as limited glycogen stores)

Note: Should be used as last resort as given glucagon's many side effects



If secondary to sulfonylurea:

**Octreotide** 100 mcg IV, then maintenance dose of 50 mcg SC q6h

(Monitor patients within 24h of stopping octreotide for rebound hypoglycemia)

Repeat CBG q15-30 min post-glucose administration for 1-2 hours until normoglycemia attained.

### 3. Disposition

**Discharge** if full neurological recovery, tolerating PO, glucose stable after  $\geq 1-2$  hrs observation and patient reliable

Discharge instructions:

- Eat a balanced meal before leaving (protein, fats, complex carbs)
- Avoid driving for 24 hrs if the episode was severe or caused aLOC. Can consider reporting to MTO if poor adherence to medications, poorly controlled diabetes
- Educate on prevention strategies (meal timing, medication adjustment)

Outpatient endocrinology or primary care follow-up for medication review +/- recommend diabetes educator referral if recurrent events.

#### References:

Diabetes Canada (2023), *Chapter 14: Hypoglycemia in adults*, in *Clinical Practice Guidelines*, Diabetes Canada.

Farkas, J. (2023), *Hypoglycemia*, in *Internet Book of Critical Care (IBCC)*, EMCrit.

Banh, K. & Acosta, J. (2019), *Hypoglycemia*, in *M4 Curriculum: Endocrine & Electrolytes*, CDEM, SAEM.



# Hypothermia

## 1. ABCDE pearls

**Airway and Breathing:** Ensure airway protection. Prepare to intubate if core body temperature <28 C and/or if severely altered LOC or respiratory failure.

**Circulation:** handle gently – risk of precipitating ventricular fibrillation below 30 C. Start with warmed IV fluids (see below).

**Exposure:** look for frost bites. Rid the body of cold or wet clothes.

## 2. Monitoring: Monitor vitals closely. ECG q30-60min during rewarming.

Patient should be on continuous core temperature monitoring (esophageal, bladder, rectal probe) until normal temperature achieved. Avoid oral temps.

Supplemental O<sub>2</sub> as needed. (Use warmed, humidified oxygen if available)  
Aim for SpO<sub>2</sub> >94%.

Monitor electrolytes, specifically potassium and pH with serial VBG.

## 3. Rewarming

### Mild hypothermia (32-35 C)

Passive external rewarming: remove wet clothing, cover with warm blankets, increase ambient temperature, use reflective blankets.

### Moderate hypothermia (28-32 C)

Active external rewarming: forced air warming systems (e.g., Bair Hugger), heating pads, warm water bottles (handle carefully to avoid burns).



### **Severe hypothermia (<28 C)**

Warmed IV fluids (NS or RL warmed to 40-42 C)

Warmed humidified oxygen

Bladder and gastric lavage with warm saline

In case of cardiac arrest or hemodynamic instability consider extracorporeal rewarming (ECMO or cardiopulmonary bypass) if available. Consider use of HOPE score for decision of ECMO.

## **4. Disposition**

**Consult** ICU cardiac instability or arrest, or if persistent need for internal rewarming or ECMO required.

**Consult** medicine if moderate/severe hypothermia, altered LOC, hypotensive, or significant comorbidities, unsafe discharge, unhoused etc.

**Discharge** if fully rewarmed, asymptomatic with no underlying conditions requiring admission.

Ensure safe discharge conditions (fixed address, adequate heating, clothing, food, and support system), consider social work involvement if unhoused individual.

Recommend early follow-up with primary care provider.

### References:

Headdon, W., Wilson, P., & Dalton, H. (2009). The management of accidental hypothermia. *BMJ*, 338.

Jolly, B. T., & Ghezzi, K. T. (1992). Accidental hypothermia. *Emergency Medicine Clinics of North America*, 10(2), 311–327

Paal, P., Pasquier, M., et. al.. (2022). Accidental hypothermia: 2021 update. *International Journal of Environmental Research and Public Health*, 19(1), 501

Zafren, K. (2025). *Accidental hypothermia in adults: Management*. UpToDate.



## Sepsis

### 1. ABCDE pearls

**Airway:** monitor for severely altered LOC, declining GCS, inability to protect airway +/- vomiting; suction secretions and intubate accordingly.

**Circulation:** monitor for hypotension, tachycardia, warm extremities for signs of shock; resuscitate accordingly.

### 2. Monitoring: monitor GCS and vitals closely (HR, BP, O<sub>2</sub> saturation). Strict I/Os.

### 3. Oxygen: O<sub>2</sub> supplementation as necessary

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

### 4. Resuscitation titrated to target MAP of >65mmHg

**LR or NS** 1–2 L over 30-60 minutes

AND/OR

**Vasopressors:** **Norepinephrine** 0.05-0.1 mcg/kg/min if refractory to fluid resuscitation

### 5. Antibiotics: broad spectrum therapy

**Piperacillin-tazobactam** 3.375 g to 4.5 g IV

+/-

**Vancomycin** 1-1.5g IV

Note: look for previous cultures and/or sensitivities in order to guide management, particularly for MRSA or ESBL.



## 6. Disposition

**Consult** ICU for admission if persistent requirements for pressors and/or inotropes.

**Consult** medicine for admission for all other cases of sepsis pending blood culture results and appropriate antibiotic treatment.

**Consult** appropriate service, if applicable, for source control (general surgery for intra-abdominal infection or abscess, urology for septic stone).

### References:

Yealy, Donald M., et al. "Early care of adults with suspected sepsis in the emergency department and out-of-hospital environment: A consensus-based Task Force report." *Annals of Emergency Medicine*, vol. 78, no. 1, July 2021, pp. 1–19.



# Nephrology & Urology

Acute Kidney Injury (AKI)	168
Kidney/Ureteric Stone	170
Pyelonephritis	172
Testicular Torsion	175
Urinary Tract Infection (UTI)	176



# Acute Kidney Injury (AKI)

## 1. ABCDE pearls

**Airway, Breathing:** usually not compromised unless due to significant fluid overload. Consider intubation if pulmonary edema with respiratory failure.

**Circulation:** assess for signs of hypovolemia, including hypotension, tachycardia, aLOC, flat JVP, cold and clammy skin; resuscitate accordingly. Beware of electrolyte derangements (e.g. hyperkalemia) that may lead to life-threatening arrhythmias.

## 2. Address reversible causes

Hold offending/nephrotoxic medications, if suspected (e.g. NSAIDs, ACEi/ARBs, aminoglycosides, metformin, DOACs, lithium)

See [kidney/ureteric stone](#) if suspecting a post-renal cause

## 3. Fluids (for pre-renal AKI)

If hypovolemic:

**NS or LR** 250-1000 mL bolus, then 75-150 mL IV infusion, as necessary

Avoid fluid overload in suspected renal or post-renal AKI, or in CHF, ESRD patients.

## 4. Diuretics

If fluid overload:

**Furosemide** 20-40 mg IV (or home PO dose x2); some patients with severe renal dysfunction may require higher doses for adequate diuresis.

Do not “force” diuresis in oliguric patients without other signs of overload.



## 5. Disposition

**Consult** nephrology and/or medicine if hyperkalemia refractory to medical treatment, volume overload unresponsive to diuretics, uremic symptoms (encephalopathy, pericarditis), rapidly rising creatinine or AKI of unclear cause, suspicion for glomerulonephritis or intrinsic renal disease

**Consult** urology if surgical cause (i.e., obstructing stones or other obstructive uropathy - e.g. tumour) is identified

**Discharge** if all the following are met: mild AKI with clear reversible cause (e.g. hypovolemia, offending medication), improving creatinine following ED management, normal K<sup>+</sup>, no uremic symptoms. Recommend follow-up with primary care physician.

### References:

Grams, M. E., et. al. (2011). Fluid balance, diuretic use, and mortality in acute kidney injury. *Clinical Journal of the American Society of Nephrology*, 6(5), 966–973.

Okusa, M. D., & Rosner, M. H. (2025). *Overview of the management of acute kidney injury (AKI) in adults*. UpToDate.

Piracha, K. (2023). Acute kidney injury: An algorithmic approach. *Acute Kidney Injury*

Silver, S. A., et. al. (2023). Association of an acute kidney injury follow-up clinic with patient outcomes and Care Processes: A cohort study. *American Journal of Kidney Diseases*, 81(5).



## Kidney/Ureteric Stone

### 1. ABCDE pearls

Circulation: watch for signs of fever, hypotension, and associated infectious symptoms for sepsis or shock secondary to septic stone and/or pyelonephritis.

**2. Monitoring:** monitor vitals (HR, BP, temperature) if suspicious of septic stone, or in uncontrollable pain.

**3. Analgesia** (escalate as necessary)

**Ketorolac** 10 mg IV q6h PRN (max 120 mg/day)

AND/OR

**Hydromorphone** 0.5 to 2 mg IV q2-4h PRN (or more often based on symptoms)

OR

**Morphine** 1 to 4 mg IV q1-4h PRN , max 10 mg q4h (or more often based on symptoms)

### 4. Antiemetics

**Ondansetron** 8 mg IV q4-8h PRN

**5. Alpha blockers** to aid in stone passage (debated)

**Tamsulosin** 0.4 mg PO for distal stones 5-10 mm



## 6. Disposition

**Consult** urology for patients with a septic stone, stone with a solitary kidney, intractable pain, inability to tolerate PO intake

(see [Urinary Tract Infection](#) for management of UTI complicated by stone)

**Discharge** patients if stone has passed or if <5 mm, pain controlled, stable vitals, and reliable follow up. Arrange outpatient urology follow up in 1 week

Note: may discharge patients with larger stones, but give clear instructions to RTED, given higher risk for operative management.

Plan for outpatient analgesia:

- **Ibuprofen** 400 to 800 mg PO q 6-8h PRN
- **Acetaminophen** 1,000 mg PO q6h PRN
- Consider **Hydromorphone** 1-2 mg PO q4-6h PRN (10-15 tablets max)

Plan for outpatient nausea:

- Consider **Ondansetron** 8 mg PO q4-8h PRN (2-3 days max)

Instruct the patient to return to the ED if they develop a fever, uncontrolled pain, anuria.

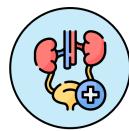
### References:

Curhan, G, Aronson, M, Preminger, G. Kidney stones in adults: Diagnosis and acute management of suspected nephrolithiasis. O'Leary, M, Baumgarten, D, ed. UpToDate. Waltham, MA: UpToDate Inc.

Hydromorphone: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.

Ketorolac (systemic): Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.

Morphine: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.



# Pyelonephritis

## 1. ABCDE pearls

**Airway, Breathing:** assess for severely altered LOC, declining GCS, inability to protect airway +/- vomiting for signs of sepsis/septic shock; intubate accordingly.

**Circulation:** monitor for signs of sepsis or septic shock such as hypotension, tachycardia, fever, aLOC, warm, flushed skin.

**2. Monitoring:** monitor vitals closely (HR, BP) for sepsis/septic shock. Strict I/Os. Elderly patients may present without fever.

**3. Oxygen:** O<sub>2</sub> supplementation as necessary

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

## 4. Resuscitate

**NS or LR** 1–2 L IV bolus if hypovolemic and/or septic

+/-

Vasopressors (as needed): **norepinephrine** 0.05–0.1 mcg/kg/min if refractory to fluid resuscitation



## 5. Antibiotics:

broad spectrum coverage – start early if patient appears septic/sick , do not delay until imaging.

Mild cases (outpatient):

**Ciprofloxacin** 500 mg PO BID x 7 days

**Cephalexin** 1000 mg PO BID 10 days

Moderate-severe (inpatient):

**Ceftriaxone** 1g IV q24h (preferred in pregnancy)

OR

**Cefepime** 1-2g IV q12h

OR

**Piperacillin-tazobactam** 3.375 g to 4.5 g IV q6-8h

## 6. Supportive care

Analgesia:

**Hydromorphone** 0.5-2 mg PO or IV q4-6h PRN for pain

(avoid NSAIDS for nephrotoxicity)

Antipyretics:

**Acetaminophen** 650-1000 mg PO/IV q6h PRN (max 4 g/day)

Antiemetics:

**Ondansetron** 4-8 mg PO or IV q8h PRN



## 7. Disposition

**Discharge** patient on oral antibiotics with close outpatient follow-up if the patient is young, healthy, reliable for follow-up, with adequate supports and no red flags (sepsis or shock).

**Consult** medicine/urology for assessment and admission for continued monitoring, resuscitation and antibiotic treatment.

Admission required if elderly >60, renal calculi, obstruction, recent hospitalization, DM, septic, solitary kidney, pregnant, immunocompromised or unable to tolerate per oral.

### References:

Hooton, T. M., Gupta, K., & Wagenlehner, F. M. E. (2022). International clinical practice guidelines for the treatment of acute uncomplicated pyelonephritis and complicated urinary tract infections. Infectious Diseases Society of America (IDSA).



## Testicular Torsion

### 1. ABCDE pearls

Circulation: monitor for tachycardia, hypotension – advanced torsion may lead to systemic symptoms.

Exposure: expose and inspect genitalia with patient supine.

Assess for high-riding testis, horizontal lie, negative Prehn's sign (pain refractory to elevation), cremasteric reflex.

### 2. Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg IV q4h PRN

AND

Ice pack PRN for swelling

(avoid NSAIDs until surgical decision is made, given bleeding risk)

### 3. Disposition

Consult **urology** STAT for assessment, surgical detorsion.

Do NOT discharge a suspected torsion.

If urology not available: manual detorsion indicated ( $180^\circ$  lateral rotation of testis – “open the book” manoeuvre).

#### References:

Ringdahl, E. and Teague, L., 2006. Testicular torsion. American Family Physician, 74(10), pp.1739–1743.

UpToDate, 2024. Evaluation and management of testicular torsion

Kapoor, S., 2008. Testicular torsion: a race against time. International Journal of Clinical Practice, 62(5), pp.821–827

Cummings, J.M. et al., 2002. Adult testicular torsion. The Journal of Urology, 167(5), pp.2109–2110



## Urinary Tract Infection (UTI)

### 1. ABCDE pearls

**Circulation:** assess for signs of sepsis such as hypotension, tachycardia, fever, altered LOC; resuscitate as needed

**Disability:** monitor for signs of delirium such as disorientation, lethargy, confusion, abnormal speech, delusions, behavior off baseline

### 2. Monitor vitals and LOC closely if concerned for sepsis. Strict I/Os.

### 3. Supportive care

#### If febrile

**Acetaminophen** 650-1000 mg PO q6h PRN to max 4g/day

AND/OR

**Ibuprofen** 200-400mg PO q6h PRN

OR

**Ketorolac** 10 mg IV q6h PRN

(Use caution with NSAIDs in patients with UTIs as may also have decreased renal function)

### 4. Insert Foley catheter in case of urinary retention, can consider in altered LOC (see [Foley catheter insertion](#))



## 5. Antibiotics

**Uncomplicated UTI** (otherwise healthy patients, normal vitals, no signs of pyelonephritis, not pregnant):

**Nitrofurantoin** 100 mg PO BID x 5 day

OR

**Sulfamethoxazole/trimethoprim** 160MG/800MG PO BID X 3 days

OR

**Fosfomycin** 3mg PO single dose

**Complicated UTI** (immunocompromised, male, pregnancy, febrile, septic, associated stone, obstruction, pyelonephritis):

**Amoxicillin-Clavulanate** 875/125 mg PO BID x 7 days

OR

**Cephalexin** 500 mg po QID x 7 days

OR

**Ciprofloxacin** 500-750mg PO BID OR 400 mg IV q12 h x 5-7 days

OR

**Ceftriaxone** 1-2 g IV q24 h x 5-7 days

OR

**Piperacillin-tazobactam** 4.5 g IV q8hrs x 5-7 days

Considerations:

- Ceftriaxone are often first line antibiotics given in Emergency Department as broad spectrum and we typically do not have susceptibilities back yet
- Tazocin should only be used in immunocompromised or transplant patients, sepsis or hemodynamic instability



- Ciprofloxacin can prolong QT as well as can worsen confusion and cause seizures, tendon rupture
- Macrobid causes delirium in older patients
- Septra causes hyperkalemia in elderly and/or concurrent ACEi use
- Fosfomycin is great for lower UTI, has no renal coverage for pyelo

### Pregnancy:

First Line: **Amoxicillin** 500mg PO q8h x 7 days

Second Line: **Nitrofurantoin** 100mg PO BID x 5-7 days

(typically avoided in first trimester and at term)

OR

**Cephalexin** 500mg PO QID x 7 days

If concerned for pyelonephritis, see [Pyelonephritis](#)

## 6. Disposition

**Consult** medicine for admission for altered LOC, delirium, sepsis (hypotensive, tachycardic), febrile; will need inpatient course of antibiotics and monitoring

**Consult** ICU for hemodynamically unstable patients requiring vasopressor support

**Discharge** if hemodynamically stable, uncomplicated UTI. Discharge on antibiotic regimen as above.

Education on prevention of UTIs at time of discharge:

- Adequate hydration
- Void regularly (avoid retention)
- Empty bladder immediately before and after intercourse

Follow up with primary care provider. If no response to antibiotics within 24-48 hours, recommend earlier follow-up.



References:

Lytvyn, Y. and Qazi, M.A. (2022). *Toronto Notes 2022*. S.L.: Toronto Med Society.

Long, B. & Koyfman, A. (2018). The emergency department diagnosis and management of Urinary Tract Infection. *Emergency Medicine Clinics of North America*, 36(4), 685–710.

Rosen's Emergency Medicine : Concepts and Clinical Practice. St. Louis :Mosby, 2002.



# Neurology

Cauda Equina	181
Concussion	183
Encephalitis	185
Headaches (Migraine, Cluster, and Tension)	188
Intracerebral Hemorrhage	190
Meningitis	194
Neuralgias	197
Radiculopathies	199
Seizures & Status Epilepticus	200
Stroke (Ischemic and Hemorrhagic)	203
Transient Ischemic Attack (TIA)	208



## Cauda Equina

### 1. ABCDE Pearls

**Disability:** assess for saddle anesthesia, urinary retention (do a post-void residual bladder scan to confirm retention > 300cc) or overflow incontinence, fecal incontinence, bilateral leg weakness or numbness, decreased rectal tone.

### 2. NPO

### 3. Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN

AND/OR

**Morphine** 2-4 mg q4h

OR

**Hydromorphone** 0.5-2 mg IV or PO PRN for severe pain.

Keep patient NPO in case urgent surgery required

### 3. Disposition

Discharge is never appropriate from ED if suspected or confirmed cauda equina.

Consult neurosurgery urgently for assessment and surgical intervention for all cauda equina cases confirmed on MRI.

#### References:

Polsky, Z., et al. (2020). *Risk stratifying non-traumatic back pain for cauda equina syndrome*. Canadian Journal of Emergency Medicine, 22(5), 652–654.



eMedicine. (2024, December 30). *Cauda Equina and Conus Medullaris Syndromes: Treatment (medication)*. eMedicine.

Emergency Care BC. (2023, May 31). *Cauda Equina and Conus Medullaris Syndromes*. Retrieved from EmergencyCareBC.ca.

Choosing Wisely Canada. (n.d.). *Emergency Medicine Recommendations—Red Flags in Low Back Pain (including cauda equina)*. Retrieved from ChoosingWiselyCanada.org.

Canadian Association of Radiologists (CAR). (2024-11). *Spine Referral Guideline: SP06. Cauda Equina Syndrome*.



# Concussion

## 1. ABCDE pearls

**Airway and Breathing:** Usually intact. Assess for vomiting or declining GCS that may threaten airway; intubate if necessary.

**Circulation:** Monitor for signs of hypotension, tachycardia, altered level of consciousness for possible hemorrhagic or neurogenic shock

**Disability:** Neurological examination

Elicit mechanism of injury and symptoms, can use tools such as the “Standard Assessment of Concussion (SAC)”

Mental status examination, can be non-standardized or can use tools such as “The Mental Status Examination in Adults”

Neurological examination with a minimum examination of CN III to VII

**Exposure:** Head-to-toe exposure for bruises and/or lacerations

## 2. Monitoring: monitor GCS, and neuro vitals q1h

## 3. Medication

Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN (avoid NSAIDs if intracranial bleed is not excluded)

Antiemetics

**Ondansetron** 4-8 mg PO or IV q8h PRN



## 4. Disposition

Consult **IM** or **Neuro** team for admission if

Glasgow Coma Scale (GCS) <15, evidence of seizure(s), abnormal bleeding parameters from underlying bleeding diathesis or oral anticoagulation, other neurologic deficit, recurrent vomiting

### Discharge

Cognitive and physical rest for 24-48 hours

Gradual return to activities as tolerated and continue to avoid activities that may result in a second head injury (no sports until cleared):

<https://parachute.ca/wp-content/uploads/2019/06/Return-to-Sport-Strategy.pdf>

<https://parachute.ca/wp-content/uploads/2019/06/Return-to-School-Strategy.pdf>

Follow-up with a primary care physician or concussion clinic if symptoms persist

### Return precautions

Worsening headache, vomiting, confusion, focal neurological deficits, seizures, or drowsiness.

### References:

Ontario Neurotrauma Foundation. (2018). *Mild traumatic brain injury (mTBI) / concussion: Evidence-based guidelines for primary care*. <https://onf.org/concussion-guidelines/>

UpToDate, 2025. Acute mild traumatic brain Injury (concussion) in adults.



## Encephalitis

### 1. ABCDE pearls

**Airway, Breathing:** Assess for severely altered level of consciousness or seizures +/- vomiting requiring airway protection. Be prepared for rapid sequence intubation and neuroprotective intubation to secure airway

**Circulation:** watch for hypotension, tachycardia, aLOC for possible sepsis. Resuscitate accordingly as necessary. Suspect ICP if Cushing's triad present (hypotension, bradycardia, irregular respiration)

**Disability:** Perform rapid neurological assessment (GCS, pupils, focal neurological deficits) and assess for seizures

### 2. Monitoring: monitor vitals closely (HR, BP, O<sub>2</sub> sat, temperature). Neuro vitals q30-60 minutes

### 3. Empiric Antiviral Therapy

Start **Acyclovir** 10 mg/kg IV q8h (adjust for renal function)

Start immediately if encephalitis suspected; do not delay for imaging or LP

### 4. Empiric Antibiotic Therapy

Start **Ceftriaxone** 2 g IV q12h

+/- **Vancomycin** 15-20 mg/kg IV q8-12h if high risk for MRSA

+/- **Ampicillin** 2 g IV q4h if >50 years or immunocompromised (for Listeria coverage)



## 5. Seizure Management

**Lorazepam** 0.1 mg/kg IV (max 4 mg/dose), may repeat in 5-10 min

- If persistent: Levetiracetam 40–60 mg/kg IV loading dose (max 4.5 g)
- Alternative: Phenytoin 20 mg/kg IV loading dose (second-line)

## 6. Supportive Care

Manage raised ICP: head elevation 30°, hyperosmolar therapy (mannitol 0.25–1 g/kg IV or hypertonic saline)

IV fluids, electrolyte monitoring, glucose management

### Antipyretics

**Acetaminophen** 650-1000 mg PO/IV q6h PRN (max 4 g/day)

AND/OR

**Ibuprofen** 400-600 mg PO/IV q6h PRN

AND/OR

**Ketorolac** 15-30 mg IV q6h PRN

## 7. Disposition

All suspected encephalitis patients require hospital admission; most should be admitted to a monitored setting (step-down) or ICU

**Consult** medicine for admission

**Consult** ICU if persistently severely altered LOC, hemodynamically unstable, requiring pressors or inotropes, or if patient remains intubated/fails extubation

**Consult** neurology for assessment +/- ENT/neurosurgery if concern for abscess



**References:**

Tunkel AR, Glaser CA, Bloch KC, et al. (2008). The management of encephalitis: Clinical practice guidelines by the IDSA. *Clin Infect Dis*, 47(3): 303-327.

Canadian Paediatric Society – Acute management of CNS infections in children.

UpToDate – Viral Encephalitis: Treatment and Prevention



# Headaches (Migraine, Cluster, and Tension)

## 1. ABCDE pearls

**Disability:** functional impairment common in migraine and cluster headaches; monitor GCS. Perform neurological examination to rule out FNDs and central etiologies.

## 2. Special considerations

Place patient in dark room, dim lights if photophobic

## 3. Treatment approaches

### Migraine

Migraine cocktail:

**Ketorolac** 10 mg IV/IM

AND

**Metoclopramide** (Maxeran) 10 mg IV

+/- **Sumatriptan** 6 mg SC

+/- **Dexamethasone** 10 mg IV (to avoid recurrence)

+/- **NS** or **LR** 500-1,000 mL bolus (for severe migraines)

### Cluster headache

**Sumatriptan** 6mg SC

AND

**Ketorolac** 30-60 mg IM/IV

OR



**Ibuprofen** 400-600 mg PO and **Acetaminophen** 1000mg PO

AND

**O<sub>2</sub>** through non-rebreather mask 12-15 L for 10-15 minutes

### **Tension headache**

**Ibuprofen** 400-600 mg PO and **Acetaminophen** 975 mg PO

## **4. Disposition**

**Discharge** if symptoms are well controlled, no red flag features

**Consult neurology or medicine** for admission and/or observation if secondary causes are suspected, persistent vomiting and dehydration with inability to tolerate PO.

Prescribe NSAID +/- Triptan +/- antiemetic PRN for migraine

Prescribe SC Triptan for cluster

Recommend NSAIDs PRN for tension. Avoid using more than 8 days per month to avoid rebound headache

Follow-up with primary care physician for prevention and ongoing management

### References

Becker WJ; Findlay T; Moga C; Scott NA; Harstall C; Taenzer P; (n.d.). *Guideline for primary care management of headache in adults*. Canadian family physician Medecin de famille canadien.



## Intracerebral Hemorrhage

### 1. ABCDE pearls

**Airway, Breathing:** ensure airway protection, watch for altered and/or worsening LOC, GCS <8, vomiting or seizures (risk of aspiration), impending herniation and perform neuroprotective intubation accordingly, if indicated.

**Circulation:** assess for signs of shock (hypotension, tachycardia, altered LOC), or signs of Cushing's triad (bradycardia, hypertension, Cheyne-Stokes respirations).

**Disability:** continually reassess GCS for signs of progression of bleed or raised ICP. Assess for focal neurological deficits, pupillary changes. Neuro vitals hourly.

**Exposure:** assess for signs of trauma.

### 2. Monitoring: closely monitor BP and O<sub>2</sub> saturation, strict I/Os

### 3. Oxygen: O<sub>2</sub> therapy to target spO<sub>2</sub> of >94% to avoid hypoxic injury

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

### 4. Neuroprotection

- Head of the bed at 30-45 degrees
- Maintain normoglycemia – consider empiric amp of D50W for hypoglycemia, or insulin sliding scale for hyperglycemia
- Maintain normoxia
- Maintain cerebral perfusion pressure by preventing hypotension (see below)
- Avoid hyperthermia and fever by using antipyretics, cooling strategies



## 5. Blood pressure control (target SBP <160 mmHg or MAP < 110 mmHg)

**IV Labetalol** 10-20 mg over 1-2 minutes (bolus, repeat q5-10 minutes as needed) or 0.5-2 mg/min infusion

OR

**IV Nicardipine** infusion 5 mg/hour (titrate up by 2.5 mg/hour q5-15 min)

OR

**IV Hydralazine** (second line) 10-20 mg q4-6h PRN

Note: careful titration to AVOID HYPOTENSION (sBP <120, MAP < 60) and maintain CCP

## 6. Manage raised ICP (if clinically indicated. Can defer to NT-ICU team unless impending herniation, clinical deterioration)

**3% NaCl** 3mL/kg IV

AND/OR

**Mannitol** at 1g/kg IV

## 7. Reverse anticoagulation

### For warfarin reversal

**Vitamin K** 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

**PCC** 25 units/kg (INR 2-4)

OR

35 units/kg (INR 4-6)

OR

50 units/kg (INR >6)



### For dabigatran reversal

**Idarucizumab** 2 x 2.5 mg within 15 minutes from one another

### For apixaban, rivaroxaban reversal

**Andexanet alfa**

4 mg/min infusion for 2 hours

(apixaban <5 mg or rivaroxaban <10 mg, last dose >7 hrs ago)

OR

8 mg/min infusion for 2 hours

(apixaban >5 mg or rivaroxaban >10 mg, last dose <7 hrs ago)

OR

**PCC** 25 units/kg, then repeat INR

### For heparin

**Protamine sulfate** 1-1.5 mg IV per 100 USP units of heparin

Administer platelets (as necessary)

## 8. Seizure prophylaxis (if indicated: documented seizure)

**Levetiracetam** (Keppra) loading dose 20-60 mg/kg, over 5-15 minutes  
(usually 1,000-1,500 mg IV load)



## 9. Other medications

**Ondansetron** 4 mg IV q6-8h PRN for nausea

**Acetaminophen** 650-1000 mg PO q4-6h PRN for analgesia

OR

Low dose **morphine** 1-2 mg IV q1-2h PRN for analgesia

(avoid NSAIDs due to bleeding risk)

## 10. Disposition

Establish goals of care, DNR status with SDM/LOA

Consult (**neurotrauma**) ICU or **stroke step-down** – for all intracerebral hemorrhages. If not available, consult neurosurgery

### References:

American Heart Association/American Stroke Association, 2015. Guidelines for the management of spontaneous intracerebral hemorrhage. *Stroke*, 46(7), pp.2032–2060

Intercollegiate Expert Stroke and Traumatic Brain Injury Committees, 2024-25. Early blood pressure management in acute ICH. *Current Neurology and Neuroscience Reports*

Peng X et al., 2023. Critical care management of acute intracerebral hemorrhage. *PMC Neurology Review*

European Stroke Organisation and AHA/ASA, 2025. Care bundle protocols (INTERACT-3, etc.) for ICH management. *Stroke Manual Guidelines*

Kumar N et al., 2019. Surgical management of spontaneous ICH: systematic review and algorithm. *Neurosurgery Journal*

emDocs.net, 2024. Intracerebral hemorrhage: diagnosis, emergency management and prognosis



# Meningitis

## 1. ABCDE pearls

**Airway:** Consider neuroprotective intubation if unable to protect airway, severely altered LOC +/- vomiting, severe respiratory distress.

**Breathing:** Supplement oxygen as needed.

**Circulation:** Consider aggressive fluid resuscitation and/or vasopressors if signs of sepsis (hypotension, tachycardia, altered mental status).

**Disability:** Regular neuro vitals (q1h)

**2. Monitoring:** monitor vitals and neurological status closely for sepsis.

**3. Positioning:** Elevate head of bed to 30 degrees.

## 4. Early empiric therapy

### Bacterial Meningitis

**Ceftriaxone** 2 g IV q12h

AND

**Vancomycin** 15-20 mg/kg IV q8-12h

AND

**Ampicillin** 2 g IV q4h (if >50 years old or immunocompromised)

### Concern for HSV meningitis

**Acyclovir** 10 mg/kg q8h



## 5. Steroids

**Dexamethasone** 10 mg IV q6h

## 6. Supportive Care

Analgesia

**Acetaminophen** 650-1000 mg PO

AND/OR

**Ketorolac** 10-30 mg IV

AND/OR

**Hydromorphone** 0.5-2 mg IV

Antiemetics

**Ondansetron** 4 mg IV

Fluids (if requiring resuscitation or patient is unable to tolerate PO intake)

Start with 1L LR or NS IV bolus

## 7. Disposition

**Consult** medicine for admission.

**Consult** ICU for admission if persistently decreased level of consciousness, need for mechanical ventilation/failed extubation, shock requiring inotropes/vasopressors and/or seizures.



References:

Asemota, J., Stoian, I., Amaze, G., Olayinka, S., Uchenna, N., & Marathe, M. (2024). Management of adults with bacterial meningitis in the emergency department. *Cureus*. <https://doi.org/10.7759/cureus.62767>

Prudhomme, N. & Hoang, R(2018, April 19). *Meningitis in the ED patient*. EM Ottawa.

Emergency Care BC. (n.d.). *Meningitis management – Clinical summary*.



## Neuralgias

### 1. Medications

#### Trigeminal Neuralgia

**Carbamazepine** 200 mg daily starting dose (first-line for trigeminal neuralgia)

OR

**Gabapentin** 300 mg daily starting dose (second-line for trigeminal neuralgia)

OR

**Lidocaine** PO or intranasal as 2.4% aerosol, or 5mg/kg IV over one hour (rescue therapy for trigeminal neuralgia; attempt other therapies first)

#### Postherpetic Neuralgia

**Gabapentin** 300mg daily starting dose (first-line for neuralgic-predominant postherpetic neuralgia)

OR

**Amitriptyline** or **Nortriptyline** (TCA) 10mg daily at bedtime (first-line for neuropathic-predominant postherpetic neuralgia)

AND/OR

Adjunctive therapies:

**Capsaicin** topical high-concentration 8% (refractory post-herpetic neuralgia)

**Lidocaine** patches (refractory postherpetic neuralgia pain)



## 2. Procedures

Nerve blocks may be offered to patients with the following indications should the ED provider be comfortable performing the block:

- to minimize opioid use (due to risk of respiratory depression, opioid intolerance, or chronic opioid use)
- acute and severe pain
- pain poorly managed with systemic medication

Contraindications include:

- acute infection at potential site of injection
- coagulopathy
- on antithrombotics
- pre-existing neural deficits in the region of the block

## 3. Disposition

**Outpatient referral** to anesthesia or pain clinic for pain management.

**Discharge** with follow-up with primary care provider.

### References:

- Celedon, M. and Yu, C. Dermatologic manifestations of herpes zoster virus. In: S. Swadron, S. Nordt, A. Mattu & W. Johnson, eds. *CorePendum*. 5th ed. Burbank, CA: CorePendum, LLC.
- Chang, A. and Dua, A., 2025. Peripheral nerve blocks. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK459210/> [Accessed 27 August 2025].
- Kissoon, N.R., 2025. Postherpetic neuralgia. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer.
- Khoujah, D. and Chang, W., 2024. Cranial neuropathies. In: S. Swadron, S. Nordt, A. Mattu & W. Johnson, eds. *CorePendum*. 5th ed. Burbank, CA: CorePendum, LLC.
- Ho, C.C., Khan, S.A. and Whealy, M.A., 2025. Trigeminal neuralgia. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer.



# Radiculopathies

## 1. ABCDE pearls

**Disability:** monitor for bowel or bladder incontinence, urinary retention, lower extremity weakness, and saddle anesthesia for concerns re: cauda equina

## 2. Medications

### Analgesia

**Ibuprofen** 400-600 mg PO q6-8h PRN (first line)

AND/OR

**Acetaminophen** 975 mg PO q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg PO q4-6h PRN

## 3. Disposition

**Discharge** if pain controllable and no red flag symptoms

Return precautions if new onset weakness, loss of bowel/bladder control, saddle anesthesia, persistent or worsening pain

Follow-up with primary care physician, and instructions for ensuring light activity (walking, stretching) while avoiding sedentary lifestyle

Recommend NSAIDs +/- Acetaminophen around the clock and follow up with primary care physician to review pain management strategies

### References:

Davis, D., Taqi, M. & Vasudevan, A., 2025. Sciatica. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing.



## Seizures & Status Epilepticus

### 1. ABCDE pearls

**Airway and Breathing:** ensure airway protection, place patient in lateral decubitus to prevent aspiration, suction oral secretions; prepare to intubate if status epilepticus and/or ongoing seizure, hypoventilation, desaturation, declining GCS.

**Disability:** Assess pupillary responses/deviation, signs of posturing, and GCS after seizure aborts. A thorough post-ictal neurological examination may help elucidate underlying cause (metabolic derangements, head injury, stroke, CNS infections).

**Exposure:** look for signs of tongue biting or other injuries sustained during ictal event; otherwise look for signs of trauma or infection for possible underlying cause (intracranial bleed, CNS infection, rash(es))

**DEFG: Don't Ever Forget Glucose** in seizing patients! (check a capillary blood sugar ASAP)

### 2. Monitoring: monitor temperature, BP periodically; HR, O<sub>2</sub> saturation continuously during ictal event and post-ictally.

### 3. Oxygen: O<sub>2</sub> therapy (as needed) if protecting airway during ictal event

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

\*All NIPPV should be avoided in seizing/post-ictal patients as this increases aspiration risk.

Note: seizures lasting <5 minutes should be observed for self-resolution. Monitor ABCs and vitals as above, establish IV access and investigate for underlying cause.



**4. Abortive therapy** for status epilepticus (i.e. >5 min seizure or at least 2 recurrent seizures without recovery).

If seizure persists first line treatment → benzodiazepine

**Lorazepam** 0.1 mg/kg IV (max 4 mg) over 2 min, up to 2 doses

OR

**Midazolam** 10 mg IM once if > 40 kg, 5 mg IM once if 13-40 kg

OR

**Diazepam** 0.2 mg/kg/dose IV (max 10 mg), up to 2 doses

If failed two trials of benzodiazepines or seizure ongoing >5 min (i.e. status) → intubate (see Intubation) and give anti-epileptic drug

**Levetiracetam** 60 mg/kg IV (max 4,500 mg)

OR

**Valproic acid** 40 mg/kg IV (max 3,000 mg)

OR

**Fosphenytoin** 20 mg PE/kg IV (max 1,500 mg PE)

If seizure persists 20-40 minutes → propofol or midazolam

**Propofol** infusion 1–2 mg/kg bolus then 2–10 mg/kg/h

OR

**Midazolam** infusion 0.2 mg/kg bolus then 0.05–2 mg/kg/h

**5. Treat underlying etiology**

See Hypoglycemia, Stroke, Subdural Hemorrhage, Intracranial Hemorrhage, Meningitis, Encephalitis, Hepatic Encephalopathy, Hyponatremia, Pre-Eclampsia, Isoniazid Toxicity, and Toxicological Causes.



## 6. Disposition

**Transfer** to ICU if in status, ongoing propofol or midazolam infusion, refractory seizures, and/or intubated

**Discharge** only in select cases of self-limiting seizures with full recovery to neurological baseline, known seizure disorder (with similar semiology of presenting episode as previous), clear reversible causes addressed, with reliable follow-up. Refer to outpatient neurology and recommend prompt follow-up with primary care physician

**Consult** neurology and/or medicine for admission if first, unprovoked seizure, underlying cause requiring treatment (metabolic, infectious or toxic cause), escalating seizure frequency in context of known disorder

Reporting incident to relevant the **Ministry of Transportation** should be considered in seizure patients (particularly in epileptic disorders).

Counseling around safe practices (avoiding swimming, unsupervised baths, mountain climbing, operating heavy machinery, etc.) should be discussed.

### References:

Glauser, T., Shinnar, S., Gloss, D., Alldredge, B., Arya, R., Bainbridge, J., ... & Treiman, D. M. (2016). Evidence-based guideline: Treatment of convulsive status epilepticus in children and adults. *Epilepsy Currents*, 16(1), 48–61.

Trinka, E., Cock, H., Hesdorffer, D., Rossetti, A. O., Scheffer, I. E., Shinnar, S., ... & Lowenstein, D. H. (2015). A definition and classification of status epilepticus – Report of the ILAE Task Force on Classification of Status Epilepticus. *Epilepsia*, 56(10), 1515–1523.

American Heart Association. (2020). 2020 American Heart Association guidelines for CPR and ECC. *Circulation*, 142(16\_suppl\_2), S366–S468.



# Stroke (Ischemic and Hemorrhagic)

## 1. ABCDE pearls

Airway and Breathing: intubate if declining GCS, vomiting, impaired airway reflexes, or if increased ICP or signs of impending deterioration.

*Note: obtain goals of care from patient or advanced directives from SDM/POA prior to deciding on intubation and level of intervention.*

## 2. Initial Assessment

Brief neuro examination – NIHSS ([Mdcalc](#))

To rule out stroke mimickers:

- Glucose levels (r/o hypoglycemia)
- Post-ictal epilepsy
- Hypotension causing malperfusion – elevate BP then reassess
- Electrolyte disturbance

## 3. O<sub>2</sub> therapy: target spO<sub>2</sub> of >94% to avoid hypoxic injury

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

## 4. Call Code Stroke: Follow hospital's stroke activation protocol.

Usually if within 24hrs of symptoms onset (last seen normal)

## 5. Monitoring

Monitor vital signs (BP, HR, SpO<sub>2</sub>) and perform neuro vitals q15min in first hour. Obtain ECG to rule out Afib



## Ischemic stroke management (note: manage with stroke team input)

### I. Blood pressure management

Allow permissive hypertension <220/<120 for the first 24-48hours

(if receiving tPA BP parameters <180/<110)

If BP reduction is required – aim for 15% reduction for the first 24hours unless there are signs of end organ damage due to hypertensive emergency

May start with nicardipine infusion and labetolol as PRNs

**Nicardipine** infusion 5mg/hr IV, titrate 2.5 mg/hr q5-15min (max 15 mg/hr)

AND/OR

**Labetalol** 10-20 mg IV over 1-2 min, may repeat or double q10 min to max 300 mg

### II. Thrombolysis

#### Alteplase (tPA)

ONLY given within 4.5 hours window of symptom onset (or longer window as determined by stroke team)

0.9 mg/kg IV (max 90 mg): 10% as IV bolus over 1 min, remaining 90% as infusion over 60 minutes

Contraindications:

- Absolute: Active bleeding, INR >1.7, platelets <100,000, recent surgery, BP > 185/110 mmHg, current use of oral anti-coagulants with INR of > 1.7
- Relative: platelet count between 100,000 and 150,000/mm<sup>3</sup>, pregnancy, current use of anticoagulants (with a low INR)
- Post thrombolysis BP parameters <180/<105

### III. Outside tPA Window:

Determine if patient is a candidate for **mechanical thrombectomy**



Early **ASA** 160-325 mg PO

Admit to Neurology

Note: Management usually done by stroke team at bedside

## **Hemorrhagic stroke management** (note: manage with stroke team input)

### **I. BP control**

Parameters: Aim for sBP between 130-140mmHg

Caution: should lower BP moderately if sBP >220mmHg, aim for around 160mm Hg sBP

**Nicardipine** infusion 5mg/hr IV, titrate 2.5 mg/hr q5-15min (max 15 mg/hr)

AND/OR

**Labetalol** 10-20 mg IV over 1-2 min, may repeat or double q10 min to max 300 mg

### **II. Reverse anticoagulation**

#### **For Warfarin reversal:**

**Vitamin K** 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

**PCC** 25 units/kg (INR 2-4)

OR

35 units/kg (INR 4-6)

OR

50 units/kg (INR >6)



### For Dabigatran reversal:

**Idarucizumab** 2 x 2.5 mg within 15 minutes from one another

### For Apixaban, Rivaroxaban reversal:

#### **Andexanet alfa**

4 mg/min infusion for 2 hours

(Apixaban <5 mg or Rivaroxaban <10 mg, last dose >7 hrs ago)

OR

8 mg/min infusion for 2 hours

(Apixaban >5 mg or Rivaroxaban >10 mg, last dose <7 hrs ago)

OR

**PCC** 25 units/kg, then repeat INR

### For heparin:

**Protamine sulfate** 1-1.5 mg IV per 100 USP units of heparin

Administer platelets (as necessary)

## III. Elevated ICP management

Elevate HoB to 30 degrees

Consider **Mannitol** 0.25-1 g/kg IV over 15-30 min or **Hypertonic saline** (3% NaCl) 250ml IV bolus if signs of herniation

Allowing Permissive hypernatraemia in hyperosmolar therapies

145-155 mmol/L

Emergency Neurosurgery consult

**Note:** Management usually done by stroke team at bedside



## 6. Disposition

**Consult** stroke team for ANY suspected stroke.

**Consult** Neurosurgery for confirmed hemorrhage stroke.

**Consult** IR for mechanical thrombectomy if indicated (acute ischemic stroke due to large vessel occlusion within 24-hour window).

### References:

Campbell, B. C. V., Mitchell, P. J., Yan, B., Farago, G., Wang, X., Liu, G., ... & Davis, S. M. (2015). *Endovascular therapy for ischemic stroke with perfusion-imaging selection*. New England Journal of Medicine, 372(11), 1009–1018. <https://doi.org/10.1056/NEJMoa1414792>

Tadi P, Lui F. Acute Stroke. [Updated 2023 Aug 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK535369/>

UpToDate, 2025. Initial assessment and management of acute stroke

Wells, D. L., Swanson, J. M., Wood, G. C., et al. (2012). *The relationship between serum sodium and intracranial pressure when using hypertonic saline to target mild hypernatremia in patients with head trauma*. Critical Care (London, England), 16(5), R193. <https://doi.org/10.1186/cc11678>



## Transient Ischemic Attack (TIA)

### 1. ABCDE pearls

**Airway:** assess for aspiration risk if deficits are present (dysphagia, facial droop).

**Circulation:** look for evidence of systemic illness (fever, hypotension, murmur) or abnormal rhythm suggesting possible embolic source (endocarditis, Afib).

**Disability:** assess GCS, perform full neurological assessment including NIHSS, neuro exam. Assess for resolving vs. persistent neurological deficits. Monitor for recurrence or worsening of deficits.

**Exposure:** look for signs of trauma if for possible fall during TIA event.

### 2. Monitoring if fluctuating symptoms or cardioembolic cause suspected.

### 3. Neurovitals q1-2h

### 4. Blood pressure control (target BP <180/105 mmHg)

No indication for aggressive BP control unless sBP > 220 mmHg

Consider:

**IV Labetalol** 10-20 mg q10-20min PRN

OR

**IV Nicardipine** infusion 2.5-15 mg/hr



## 5. Medications

**Cardioembolic etiology:** see [Afib](#) or [Endocarditis](#)

**Non-cardioembolic etiology:**

If patient is not on antiplatelets, anticoagulation:

**ASA** 160-325 mg PO (then 81 mg daily)

AND

**Clopidogrel** 300 mg PO (then 75 mg daily)

If patient is on ASA:

Switch to **Clopidogrel** 75 mg daily (monotherapy)

OR

Add **Clopidogrel** 75 mg daily (DAPT) if high risk features or recurrent TIA

If patient is on DOAC:

Do NOT add antiplatelet

Ensure compliance with medication

Review with thrombosis or neurology prior to discharge

Assess for possible breakthrough event – can consider switching DOAC and/or referring to cardiology for thrombosis

If newly diagnosed Afib: start **Apixaban** 5 mg BID (consider adjusting dose if age >80, weight <60 kg, Cr >133)



## 6. Disposition

Consult **stroke** or **medicine** for admission if symptoms not fully resolved or recurring, high ABCD2 score ( $\geq 4$ ), new Afib with rapid rate or risk of embolic source or no safe discharge plan/poor compliance expected

**Discharge** home if symptoms have fully resolved, ABCD2 <4, no high risk features, reliable access to follow-up, compliance expected

Prescribe **Dual Anti-Platelet Therapy (DAPT)** for 21 days if non-cardioembolic, or DOAC if new Afib.

+ referral to **stroke prevention clinic** (and outpatient cardiology if new Afib OR neurology if complex presentation, unclear etiology)

+ high-dose **statin** (typically done by stroke prevention clinic)

+ 21 days DAPT is followed by anti-platelet monotherapy indefinitely.

### References:

Johnston, S.C. et al., 2007. Validation and refinement of scores to predict very early stroke risk after transient ischaemic attack. *Lancet*, 369(9558), pp.283–292

Johnston, S.C. et al., 2018. Clopidogrel and aspirin in acute ischemic stroke and high-risk TIA. *New England Journal of Medicine*, 379(3), pp.215–225.

Wang, Y. et al., 2013. Clopidogrel with aspirin in acute minor stroke or TIA. *NEJM*, 369(1), pp.11–19

Kernan, W.N. et al., 2014. Guidelines for the prevention of stroke in patients with stroke and TIA. *Stroke*, 45(7), pp.2160–2236

UpToDate, 2024. *Initial evaluation and management of transient ischemic attack and minor ischemic stroke*.



# Obstetrics & Gynecology

Ectopic Pregnancy	212
Spontaneous Abortion	214
Ovarian Torsion	217
Pelvic Inflammatory Disease (PID)	218
Post-Partum Hemorrhage	221



# Ectopic Pregnancy

## 1. ABCDE pearls

**Airway and Breathing:** assess for severely altered mental status, declining GCS, inability to protect airway; intubate accordingly.

**Circulation:** monitor for signs of hemorrhagic shock secondary to rupture (hypotension, tachycardia, pallor, cold, clammy extremities); resuscitate accordingly.

**Exposure:** monitor for abdominal distension, peritonitic signs secondary to rupture.

## 2. Monitoring: monitor vitals closely if concerned re (possible) rupture (HR, BP).

If hemorrhagic shock is suspected secondary to rupture, begin transfusing immediately +/- massive transfusion protocol (use O negative blood).

Look for free fluid suggestive of rupture on POCUS.

Give **TXA** 1 g over 10 minutes within 3 hours of bleeding onset, followed by 1 g infusion over the next 8 hours or until managed by ob/gyn.

## 3. Supportive care

### Analgesia

**Morphine** 1-4 mg IV q1-4h PRN, max 10 mg q4h

OR

**Hydromorphone** 0.5-2 mg PO or IV q2-4h PRN

### Antiemetics

**Ondansetron** 4-8 mg IV q 4 to 8 hours PRN.



#### 4. Anti-D immune globulin (if Rh-negative)

**RhoGAM (WinRho):** 50 mcg IM if GA <12 wks, 300 mcg IM if GA >=12 wks, but the higher dose is routinely used.

#### 5. Disposition

**Consult** ob/gyn for ectopic pregnancies for definitive management (i.e. methotrexate vs. surgical). STAT consult if rupture is suspected/confirmed for immediate surgical intervention.

**Consult** ICU if ruptured, hemodynamically unstable, requiring MTP, vasopressors and/or inotropes.

##### References:

Hydromorphone: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc.

Morphine: Drug information. In: Lexi-Drugs. Waltham, MA: UpToDate Inc

Tulandi, T. Ectopic pregnancy: Clinical manifestations and diagnosis. Schreiber, C, ed. UpToDate. Waltham, MA: UpToDate Inc.

Qureshi, H., et al. "BCSH guideline for the use of anti-D immunoglobulin for the prevention of haemolytic disease of the fetus and newborn." *Transfus Med* 24.1 (2014): 8-20.



# Spontaneous Abortion

## 1. ABCDE pearls

Circulation: monitor for hypotension, tachycardia, severely aLOC, cold, clammy extremities for signs of hemorrhagic shock; resuscitate accordingly

## 2. Monitoring: closely monitor vitals (BP, HR) and LOC for signs of hemorrhagic shock

## 3. Medications

If **inevitable** (bleeding, cramping, ROM, cervical dilation), **incomplete** (bleeding, cramping, partial expulsion of POC) or **missed** (fetal demise without expulsion of POC, no bleeding, closed cervix):

Watch and wait, monitor hemodynamics (for most patients)

AND (if ongoing bleeding)

**Misoprostol** 800 ug PV

If **complete** (bleeding with passage of sac/placental tissue):

No management required

If concomitant infection (infected retained POC):

**Clindamycin** 900 mg IV q8h

AND

**Misoprostol** 800 ug PV 24h later

Ensure D&C 24h after starting antibiotics.



If hemodynamically unstable, septic

Broaden to **Piperacillin-tazobactam** 4.5 g IV q6-8h

**4. Transfuse** if hemodynamically unstable, massive hemorrhage/active bleeding, Hb <70 or <80 and symptomatic

1-2 units **pRBC**, then reassess

+/- activate massive transfusion protocol for massive bleeding (>1500 mL suspected loss, >4 units pRBC)

**5. Supportive care**

**Analgesia**

**Morphine** 1 to 4 mg IV q1-4h PRN, max 10 mg q4h

OR

**Hydromorphone** 0.5 to 2 mg PO or IV q2-4h PRN

**Antiemetics**

**Ondansetron** 4 to 8 mg IV q4-8h PRN.

**6. Anti-D immune globulin** (if Rh negative)

**RhoGAM (WinRho)** if >8 weeks GA

- 120 mcg if 8-12 weeks
- 300 ug if 12 weeks or over

**7. Disposition**

Consult **obstetrics & gynecology** if the patient has profuse bleeding, hemodynamic instability, concerns for retained products of conception, or concerns for infection (possible need for D&C within 24 hours).

**Discharge** if hemodynamically stable, safe disposition. Give reassurance and education re: expected bleeding post-miscarriage.



Depending on time of presentation, ultrasound may not be available overnight. Arrange for next day ultrasound in the emergency department to assess for completion of miscarriage.

Recommend follow-up with primary care provider. If recurrent miscarriage or complications consider outpatient referral to OB/GYN.

Clear instructions to return to ED include worsened bleeding (saturating 2 sanitary pads/hr x 2 consecutive hours), presyncope, syncope, signs of infection (fever, chills, purulent vaginal discharge), or severe abdominal pain.

References:

Emergency Medicine Cases, 2012. *EMC 023: Summary*. [pdf]

Mehra, V.M., Farooqi, S., Sriram, P. and Tunde-Byass, M., 2024. Diagnosis and management of early pregnancy loss. *CMAJ*, 196(34), pp.E1162-E1168.

*Toronto notes 2022*. (2022). TORONTO MED SOCIETY.



# Ovarian Torsion

## 1. ABCDE

**Circulation:** monitor for hypotension, tachycardia, or LOC indicating signs of shock secondary to tissue necrosis, rupture or intra-abdominal bleeding; resuscitate accordingly.

**Exposure:** Unilateral tender abdomen with peritoneal signs (pain worse with movement, rigidity, rebound tenderness) is a classical finding in ovarian torsion.

## 2. Medications

### Analgesia

**Ibuprofen** 400-600 mg PO q6-8h PRN (first line)

AND/OR

**Acetaminophen** 975 mg PO q6h PRN (adjunctive analgesia)

AND/OR

**Hydromorphone** 0.5-2 mg IV or PO q4-6h PRN

### Antiemetics

**Ondansetron** 4-8 mg PO or IV q6-8h PRN

## 3. Disposition

**Consult** ob/gyn STAT for surgical detorsion/untwisting. Ovarian torsion is a gynecological emergency. Although no time cutoff exists, ovarian salvage rates decrease with increasing ischemic time – early intervention is required to save the ovaries.

### References:

Ashmore, A.A., Blackstock, S., Kenny, C. and Ismail, A. (2023) 'Recognition and initial management of ovarian torsion', BMJ, 381, e074514. doi:10.1136/bmj-2022-074514



# Pelvic Inflammatory Disease (PID)

## 1. ABCDE pearls

Circulation: monitor for signs of sepsis (hypotension, tachycardia, aLOC, fever); resuscitate accordingly (see *Sepsis*)

## 2. Antibiotic therapy

**Severe infection: inpatient therapy:**

**Ceftriaxone** 1g IV q24h

AND

**Doxycycline** 100mg PO or IV q12h

AND

**Metronidazole** 500 mg PO or IV q12h

**Mild-moderate infection: outpatient therapy:**

**Ceftriaxone** 500 mg IM x 1 dose

AND

**Doxycycline** 100 PO BID x 14 days

AND

**Metronidazole** 500 mg PO (or IV if admitted) q12h x 14 days

**If allergic to penicillins and cannot tolerate cephalosporins:**

**Levofloxacin** 500 mg PO once a day x 14 days

AND

**Metronidazole** 500 mg PO or IV q12h x14 days



### 3. Supportive care

#### Analgesia

**Acetaminophen** 1 g PO q6h PRN

AND/OR

**Ibuprofen** 400-800 mg PO q6h PRN

OR

**Ketorolac** 10-30 mg IM or IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg IV

#### Antiemetics

**Ondansetron** 4-8 mg IV q6-8h PRN

### 4. Disposition

**Discharge** home if the patient is clinically stable, tolerating PO antibiotics. Follow up with a primary care provider as soon as possible.

Instructions to return to ED if

- Vomiting, not able to tolerate antibiotics
- Worsening fevers, pain,
- There is no clinical improvement within 2-3 days

**Consult** gynecology for assessment and/or admission if

- Surgical emergencies such as ectopic pregnancy or tubo-ovarian abscess cannot be ruled out
- Pregnancy
- Severe pain refractory to ED management



- Inability to follow and/or tolerate oral regimen
- Precarious social situation, anticipated difficulties with follow-up
- Peritonitic, septic, severe PID requiring inpatient IV antibiotics
- Failure of outpatient treatment
- Immunocompromised

References:

Canada, P. H. A. of. (2021, December 9). *Government of Canada*. Canada.ca.  
<https://www.canada.ca/en/public-health/services/infectious-diseases/sexual-health-sexually-transmitted-infections/canadian-guidelines/sti-associated-syndromes/pelvic-inflammatory-disease.html>

Pelvic inflammatory disease treatment in adults and adolescents, Wiesenfeld, H. (2025.). UpToDate.



## Post-Partum Hemorrhage

### 1. ABCDE pearls

Circulation: monitor for hypotension, tachycardia, severely aLOC, cold, clammy extremities for signs of hemorrhagic shock; resuscitate accordingly

**2. Monitoring:** monitor vitals closely (BP, HR) and LOC for risk of hemorrhagic shock. Consider non-invasive ETCO<sub>2</sub> monitoring

**3. Transfuse** if hemodynamically unstable, massive hemorrhage/active bleeding, Hb < 70 or < 80 and symptomatic

1-2 units **pRBC**, then reassess

+/- activate massive transfusion protocol for massive bleeding (>1,500 mL suspected loss, >4 units pRBC)

### 4. Medications

Provide medications in the order outlined below until bleeding subsides:

**Oxytocin** 20-40 units in 1 L of crystalloid initially at 200-500 mL/hour, then titrated to sustain uterine contractions

AND/OR

**Tranexamic acid (TXA)** 1 g IV over 10 min; may repeat after 30 min-24 hrs if bleeding persists

AND/OR

**Methylergonovine** 0.2 mg IM q2-4h (contraindicated in hypertension/preeclampsia)

AND/OR



**Carboprost tromethamine** 0.25 mg IM q15min until uterine hemorrhage controlled (max 8 doses)

AND/OR

**Misoprostol** 800-1000 mcg or 600-800 mcg SL/PO

## 5. Reverse anticoagulation (rare)

### ***For warfarin reversal***

**Vitamin K** 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

**PCC** 25 units/kg (INR 2-4) OR 35 units/kg (INR 4-6) OR 50 units/kg (INR >6)

### ***For dabigatran reversal***

Idarucizumab 2 x 2.5 mg within 15 minutes from one another

### ***For apixaban, rivaroxaban reversal***

#### **Andexanet alfa**

**4 mg/min infusion** for 2 hours

(apixaban <5 mg or rivaroxaban <10 mg, last dose >7 hrs ago)

OR

**8 mg/min infusion** for 2 hours

(apixaban >5 mg or rivaroxaban >10 mg, last dose <7 hrs ago)

OR

**PCC** 25 units/kg, then repeat INR



### **For heparin reversal**

**Protamine sulfate 1-1.5 mg IV per 100 USP units of heparin**

Administer platelets (as necessary)

Involve hematology, thrombosis or obstetrical medicine in case of anticoagulation

## **6. Procedures**

1. Uterine massage (through abdominal wall)
2. Bimanual compression (external hand compresses and massages uterus, internal hand in fist to massage anterior aspect of uterus)
3. Bakri balloon or other tamponade device if medical therapy fails.

## **7. Dispo**

**Consult** OB/GYN STAT for assessment, admission, observation and definitive management.

**Consult** ICU if in hemorrhagic shock, hemodynamically unstable requiring pressors and/or inotropes.

### References:

Emergency Medicine Cases, 2012. *EMC 023: Summary*. [pdf]

Mehra, V.M., Farooqi, S., Sriram, P. and Tunde-Byass, M., 2024. Diagnosis and management of early pregnancy loss. *CMAJ*, 196(34), pp.E1162-E1168.

*Toronto notes 2022*. (2022). TORONTO MED SOCIETY.



# Ophthalmology

Acute Angle Closure Glaucoma	225
Conjunctivitis	227
Foreign Body – Eye	229



## Acute Angle Closure Glaucoma

### 1. ABCDE Pearls

**Disability:** Assess visual acuity and for visual changes/loss, severe eye pain, halos around lights, corneal clouding, photophobia, red eye, nausea, and vomiting – measure IOP (see [Tonometry](#)).

### 2. Supportive care

#### Analgesia

**Acetaminophen** 650-1000 mg PO q6h PRN for mild pain

AND/OR

**Ketorolac** 15-30 mg IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg PO or IV q4-6h PRN

#### Antiemetics

**Ondansteron** 4 mg IV q6-8h

### 3. Medications

(Keep escalating in the order outlined below until IOP normalizes)

**Timolol** 0.5% 1 drop q15min for x 2-3 times in affected eye

THEN

**Brimonidine** 0.1-0.2% 1 drop q15min x 2-3 times in affected eye

THEN

**Apraclonidine** 0.5% 1 drop q15min x 2-3 times in affected eye.

THEN



**Acetazolamide** 500mg PO/IV then 250mg PO/IV q6h.

THEN

**Pilocarpine** 2% 1 drop to affected eye.

THEN

**Mannitol** 0.5-2g/kg IV over 20 minutes

(if no response to other medications)

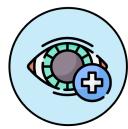
Measure IOP every 60 minutes. See [Tonometry](#).

#### 4. Disposition

Ocular emergency: **Consult** ophthalmology STAT for laser peripheral iridotomy.

##### References:

Scobie, J. & MacPherson, A., 2022. *Acute angle-closure glaucoma – Diagnosis and Treatment*. Emergency Care BC, 27 December



# Conjunctivitis

## 1. Medications

### Viral

Supportive care: warm/cool compresses, OTC preservative-free artificial tears x1-2 drops

### Bacterial

**Moxifloxacin** 0.5% ophthalmic drops, 1 drop in the affected eye(s) BID for 7 days (especially for contact lens wearers)

AND/OR

**Erythromycin** 0.5% ophthalmic ointment,  $\frac{1}{2}$  inch ribbon to affected eye QID for 7 days

OR

**Polymyxin B/Trimethoprim** 10000U/1mg/mL ophthalmic drops, 1-2 drops QID for 7 days

OR

**Ciprofloxacin** 0.3% ophthalmic drops 1-2 drops QID for 7 days (preferred in contact lens users for pseudomonas coverage)

### Allergic

**OTC artificial tears** 1-2 drops QID PRN for up to 4 weeks

AND/OR

**OTC antihistamine** eye drops 1-2 drops QID PRN for up to 4 weeks

AND/OR

**Cetirizine** 10 mg PO daily



## 2. Disposition

Discharge with following instructions:

- Avoid suspected allergen
- Hand hygiene: avoid touching eyes, sharing towels etc.
- No contacts until resolved for 24–48 hours

Discharge with clear instructions to return to ED if red flags present, including: worsening pain, worsening vision, or no improvement in 2-3 days

+/- **ophthalmology consult** in case of photophobia, vision loss, corneal ulcer, concern for epidermic keratoconjunctivitis, pain with eye movement, poor response to ongoing treatment, history of foreign body/trauma prior to presentation

### References:

Shi, K. & Kang, M., 2023. *Conjunctivitis – Diagnosis and Treatment*. Emergency Care BC.



## Foreign Body – Eye

### 1. ABCDE pearls

**Disability:** assess for conjunctival lacerations, chemosis, hyphema, subconjunctival hemorrhage.

Look for vision loss and/or decreased acuity relative to unaffected eye.

Assess cornea under slit lamp for abrasion or rust ring.

Evert eyelid to assess for subtarsal foreign body.

### 2. Removal

IF superficial: irrigation with saline or anesthetic drops (**Proparacaine** 0.5% or **Tetracaine** 0.5% x1-2 drops) then remove using cotton tip.

IF embedded: 25-gauge needle or spud with slit lamp to remove foreign object. Burr or alger brush may be used for small embedded foreign bodies, for example metallic shards.

Re-examine with fluorescein post-procedure to assess for extent of corneal abrasion extent and ensure negative seidel sign

### 3. Prophylactic antibiotics (IF contact lens wearers)

All patients should receive prophylactic antibiotics. Contact lens wearers are at risk for Pseudomonas and should be counselled to avoid contact lenses x 2 weeks.

Standard: **Erythromycin** ointment QID or **Moxifloxacin** drops QID

If patient wears contact lenses:

**Ciprofloxacin** 0.3% 1–2 drops q6h for 3–5 days

OR

**Gentamicin** 0.3% 1–2 drops q6h for 3–5 days

OR



**Ofloxacin** 0.3% 1–2 drops q6h for 3–5 days

#### 4. Analgesia

**Acetaminophen** 500–1000 mg PO q6h PRN

AND/OR

**Ibuprofen** 400 mg PO q4–6h PRN

\*Note: If associated with corneal abrasion, consider providing tetracaine eye drops at discharge (some theoretical concern for chemical ulcer associated with this, however likely safe if used sparingly)

#### 5. Preservative-free artificial tears for symptomatic relief

#### 6. Disposition

**Consult** ophthalmology if deeply embedded foreign bodies, penetrating injury or suspicion of injury to the globe, persistence or worsening of visual symptoms, difficult foreign body removal, corneal abrasions, hyphema, hypopyon or substantial changes in visual acuity.

**Discharge** with ophthalmology referral PRN if resolution of symptoms post-removal.

#### References:

Ambikkumar A, Arthurs B, El-Hadad C. Corneal foreign bodies. CMAJ. 2022 Mar 21;194(11):E419. doi: 10.1503/cmaj.211624. PMID: 35314442; PMCID: PMC9053958.

Camodeca AJ, Anderson EP. Corneal Foreign Body. [Updated 2025 Jan 22]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan



# Orthopedics & Musculoskeletal

Compartment Syndrome	232
Fractures – Approach	234
Hip Dislocation	240
Mechanical Back Pain	243
Necrotizing Fasciitis	245
Septic Joint	247
Shoulder Dislocation	249



# Compartment Syndrome

## 1. ABCDE pearls

**Circulation:** always assess pulse(s) distal to the fracture prior to and after reduction

**Disability:** assess motor function and sensation distal to the fracture

**Exposure:** expose the body and assess for other fractures and/or injuries

Assess for the 6 P's (Pain, Poikilothermia (cold extremity), Paresthesia, Paralysis, Pulselessness, and Pallor)

Pain out of proportion, especially with passive stretch of the compartment, in addition to a palpable, tight/tender compartment, is enough to suspect the diagnosis.

## 2. Supportive care

### Remove Restriction

Restrictive rings, clothing, and compressive casts must be removed

### Analgesia

**Morphine** 2 to 4 mg IV q1-2h PRN (start low if opioid naive)

OR

**Hydromorphone** 0.5 to 2 mg q2-4h PRN

### Perfusion

**IV NS or LR** 500-1000mL to maintain perfusion to limb. Keep the limb at heart level or just below to ensure adequate arterial perfusion.

### **3. Disposition**

If clinical suspicion of compartment syndrome, initiate **immediate consult** to general or orthopedic surgery for urgent fasciotomy. If etiology is due to burns and surgery is unavailable fasciotomy/ escharotomy should be performed in ED.



## Fractures – Approach

### 1. ABCDE pearls:

**Breathing:** monitor for pleuritic chest pain – rib or clavicle fracture can impact breathing.

**Circulation:** long bone fractures may lead to significant blood loss. Monitor for hypotension, tachycardia (despite analgesia), altered LOC, and pallor.

Always assess pulse(s) distal to the fracture prior to and after reduction.

**Disability:** assess motor function and sensation distal to the fracture. Certain nerves are affected by certain fractures. For example, the radial nerve is most commonly affected in mid shaft humerus fractures. Know their distribution and supply.

**Exposure:** expose the body and assess for other fractures and/or injuries. Signs to look for include pallor, ecchymosis, obvious deformities and open wounds.

Assess for signs of compartment syndrome (pain out of proportion, pallor, paresthesia, paralysis, pulsenessness). See [Compartment syndrome](#).

When ordering X-rays, always take more than one view of the same joint, as single views are usually deceiving.

### 2. Supportive care

#### Analgesia

**Acetaminophen** 1 g PO q6h PRN, max 4 g/day

AND

**Ketorolac** 15-30 mg IV q6h pRN

OR

**Hydromorphone** 0.2 to 1 mg IV q2-4h PRN



### 3. Prophylaxis

For open fractures:

Tetanus vaccine (if last dose >5 years ago)

AND

<1 cm – Start **Cefazolin** 2g IV q8h

>1 cm – Start **Cefazolin** 2g IV q8h AND Gentamicin 5mg/kg IV

### 4. Reduction

See [Procedural sedation](#).

Common approach to fracture reduction in the ED:

- 1) Ensure adequate analgesia/sedation.
- 2) Apply gentle, sustained, longitudinal traction (will often require 1-2 minutes to relax surrounding the fracture), thereby accentuating the fracture.
- 3) Reverse the mechanism of the deformity/fracture, correcting angulation as necessary, while maintaining distraction.
- 4) Assess pulses distal to the fracture.
- 5) Hold in place until immobilization (splint or cast) is applied.
- 6) Post-reduction X-ray.



Click the name of each fracture below to view their respective reduction technique

[Clavicular Fracture](#)



[Distal Radius  
Fracture \(Colles\)](#)



[Femur Fracture](#)



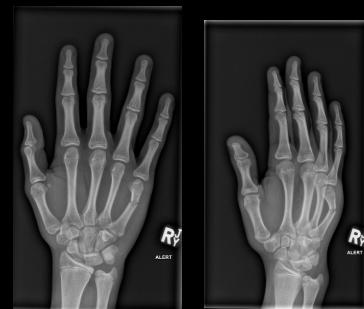
[Humerus Fracture](#)



[Lateral Malleolus  
Fracture](#)



[Metacarpal Fracture  
“Boxer’s Fracture”](#)



[Reduction & Splinting](#)

[Metatarsal Fracture  
“Jones Fracture”](#)



[Phalangeal fracture](#)



[Rib Fracture](#)





## 5. Immobilization

See [Casting](#) for technique

### Upper extremity

Sling	Clavicle #, Scapula #, Proximal Humerus #, Greater Tuberosity Proximal Humerus #, Proximal Humerus Dislocation, Radial Head #
Cuff and Collar	Proximal humerus #
Sarmiento Brace	Midshaft Humerus # (combined with Cuff and Collar)
Coaptation	Midshaft Humerus # (combined with Cuff and Collar)
Posterior Long Arm Cast	Distal Humerus # (combined with Cuff and Collar), Radial Head #, Proximal Ulna Elbow Dislocation, Olecranon #, Coronoid Process
Sugartong	Proximal Radius DRUJ, Radius Shaft #, Distal Radius #, Proximal Ulnar #, Midshaft Radius and/ or Ulnar #
Short Arm	Distal Radius #, Pisiform #
Radial Gutter	Styloid #
Volar	Distal Radius - Buckle #, Triquetrum #, Pisiform #, Hamate #
Thumb Spica	Scaphoid #, Lunate #, Capitate #, Trapezoid #, Trapezium #, 1st Metacarpal #
Ulnar Gutter	For 4th and 5th Metacarpal #, Hamate #
Radial Gutter	For 2nd and 3rd Metacarpal #



## Lower extremity

Posterior Long Leg	Midshaft Femur #, Distal Femur #
Hare or Kendrick Traction Splint	<u>Midshaft Femur #</u>
Hinged Knee Brace	Distal Femur #, Medial Distal Femur Avulsion #, Proximal Tibia Segond #
Knee Immobilizer	Patella #, Patella Sleeve, Patellar Tendon Rupture, Proximal Tibia #
Posterior Long Leg with Stirrup	Tibial Shaft #, Tib-Fib #, Proximal Fibula
Posterior Short Leg with Stirrup	Medial Malleolus #, Bimalleolar #, Trimalleolar #, Tillaux #, Pilon #, Fibula Shaft #, Weber B #, Weber C #, Talus #, Cuboid #, Navicular #, Cuboid #, Lateral Cuneiform #
Walking Boot	Fibula Shaft #, Weber A #, Weber B #, Anterior Process Calcaneus #, Sustentaculum Calcaneus #, Navicular #
Posterior Short Leg	Calcaneus #

## 6. Disposition

**Consult** orthopedics for assessment and admission/definitive management for hip fractures, displaced, open, and/or intra-articular fractures

**Consult** trauma team for polytrauma

Involve social workers or child abuse services if malicious and non-accidental injuries are suspected. For example, in the child with fractures at different stages of healing or a lower limb fracture in an infant who is still unable to walk.



Otherwise, discharge patient if proper analgesia and reduction achieved. Recommend icing, elevation, non-weight bearing and around the clock analgesia.

Refer to outpatient fracture clinic.

Recommend follow-up with primary care physician.

References:

- Harrison, M., & Mohammed, A. (2023). *Algorithms for Emergency Medicine*. Oxford University Press, Incorporated.
- Bloom, J. (2012). Overview of metacarpal fractures. *UpTo-Date, Waltham, MA* (Accessed on June 6, 2025).
- R. Derby, A. Beutler. General principles of acute fracture management. *M. Gammons, C. Asplund, ed. UpToDate. Waltham, MA: UpToDate Inc. http://www.uptodate.com.* (Accessed June 15, 2025).



## Hip Dislocation

### 1. ABCDE pearls

If traumatic cause, complete a trauma survey.

**Circulation:** Check the distal pulses, especially the dorsalis pedis and posterior tibial, if compromised – immediate reduction.

**Disability:** assess neurovascular status throughout lower extremity for nerve injury. The sciatic nerve – peroneal branch is most commonly affected in posterior dislocations, causing foot drop.

**Exposure:** expose body to assess for other injuries/fractures

In a posterior dislocation, the limb is adducted, internally rotated and shortened (PADI).

In an anterior dislocation, the limb is abducted, externally rotated and shortened (ABEx).

### 2. Analgesia: titrate as necessary

**Acetaminophen** 1 g PO q6h PRN, max 4 g/day

AND/OR

**Ibuprofen** 400-800 mg PO q4-6h PRN

OR

**Ketorolac** 10-30 mg IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg PO or IV q 2-4h PRN



### 3. Reduction

Closed reduction indicated only if patient is hemodynamically stable, there are no associated femoral neck fractures, ipsilateral displacement, or intra articular fragments

Emergent closed reduction ideally within 6 hours, to minimize risk of avascular necrosis of the femoral head

See [Procedural sedation](#)

Choice of [reduction technique](#) depends on provider experience and patient factors

Examples include:

- [Allis technique](#) (patient supine, knees and hip flexed to 90 degrees, upward traction while stabilizing pelvis)
- [Captain Morgan technique](#) (patient supine, provider's hip underneath femur as fulcrum, traction on affected leg with thigh lifting)
- [Whistler technique](#) (similar as Allis technique, with lateral rotation)

If closed reduction fails or is contraindicated (e.g., irreducible dislocation, associated fracture), open reduction is indicated.

### 4. Post-reduction care

Reassess neurovascular status immediately after reduction.

Obtain post-reduction radiographs and, if indicated, CT to confirm concentric reduction and exclude intra-articular fragments or associated fractures.

Test for stability and ensure the hip has its full range of motion without dislocating.



## 5. Disposition

**Consult** orthopedic surgery for admission if surgical management is necessary, associated fracture, or dislocation of a prosthetic hip.

**Discharge** home if otherwise healthy, successful reduction, pain controlled, with normal post-reduction imaging, no neurovascular compromise, able to ambulate and reliable follow-up.

Refer to outpatient orthopedic surgery.

### References:

*How to reduce a posterior hip dislocation - injuries; poisoning.* Merck Manual Professional Edition. (n.d.)



# Mechanical Back Pain

## 1. ABCDE pearls

**Circulation:** Watch for signs of shock (hypotension, tachycardia, poor perfusion), which may indicate red flag causes of back pain such as AAA, ruptured ectopic pregnancy, or severe infection associated with epidural abscesses

**Disability:** Assess for red flag symptoms of cauda equina syndrome such as urinary retention, bowel incontinence, saddle anesthesia, and lower extremity motor weakness. Assess for midline tenderness of spinous processes. Also assess for weakness, as well as risk factors such as osteoporosis, corticosteroid use, IV drug use etc.

**Exposure:** Assess for signs of bruising, trauma to the back

## 2. Analgesia

**Acetaminophen** 650-1000mg q4-6h, maximum daily dose 4000mg

AND

**NSAIDs**

**Ibuprofen** 400mg-800mg PO q6h (first-line), maximum daily dose 3200mg

OR

**Naproxen** 250-500mg q12h, maximum daily dose 1250mg

AND/OR

**Duloxetine** 30mg PO daily

OR

**TCA** (amitriptyline/nortriptyline) 25-75mg PO daily

AND/OR (if needed for optimal pain relief)



**Opioids** (restricted-use); should not be used routinely for long-term management of back pain, but may have been prescribed for selected patients with persistent, disabling, and refractory symptoms.

**Hydromorphone** 0.5-2 mg PO or IV q4-6h PRN (first-line for opioids)

See [Chronic Pain Exacerbation](#) for escalation of opioid treatment

### 3. Disposition

**Discharge** patients who are ambulatory and have no red flag findings or neurological deficits (if red flags present, see [Cauda Equina](#) to determine dispo).

**Discharge** with follow up with primary care physician in 7-14 days to consider escalation of pain management. Non-opioid medications may be continued until follow-up with primary care physician. Consider topical voltaren and organize physiotherapy referral at discharge.

#### References:

Chou, R., 2025. Subacute and chronic low back pain: management. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer

Miller, D. and Barrett, B., 2023. Approach to back pain. In: S. Swadron, S. Nordt, A. Mattu & W. Johnson, eds. CorePendum. 5th ed. Burbank, CA: *CorePendum*, LLC.



# Necrotizing Fasciitis

## 1. ABCDE pearls

**Airway and Breathing:** endotracheal intubation if

severely altered LOC, low GCS

neck/fascial necrotizing fasciitis

severe respiratory distress (tachypnea, hypoxia, stridor)

**Circulation:** check for signs of shock such as hypotension, tachycardia and altered level of consciousness

**Exposure:** head-to-toe physical exam (note: don PPE given high risk for possible exposure)

Examine for other areas of fasciitis, particularly genitourinary infections concerning for Fournier's gangrene

## 2. Monitoring:

monitor vitals (BP, HR) and LOC closely for sepsis.

Non-invasive ETCO<sub>2</sub> monitoring

## 3. Antibiotics

**Piperacillin-Tazobactam** 4.5g IV q8h

AND

**Clindamycin** 900mg IV q8h

AND

**Vancomycin** 15mg/kg IV q12h



## 4. Fluid resuscitation

**LR** bolus at 30 mL/kg IV over 3hr

+/- vasopressors if refractory: start with **Norepinephrine** (Levophed) at 0.05-0.1 mcg/kg/min

Goal: restore perfusion, MAP  $\geq$  65 mmHg, adequate urine output (>0.5 mL/kg/hr), improve mentation

## 5. Pain management

IV opioids

**Hydromorphone:** 0.5-2 mg IV q4h PRN

**Morphine:** 5-10 mg IV q4h PRN (titrate to effect)

## 6. Disposition

**ICU** transfer STAT if patient is hemodynamically unstable requiring vasopressors and/or inotropes

**Consult** appropriate surgical service (general surgery, urology, gynecology, orthopedics, plastics etc.) STAT for surgical management

**Consult** urology STAT for any Fournier's gangrene for surgical management

### References:

Rhodes, A., Evans, L. E., Alhazzani, W., Levy, M. M., Antonelli, M., Ferrer, R., ... & Dellinger, R. P. (2017). *Surviving Sepsis Campaign: International guidelines for management of sepsis and septic shock: 2016*. Intensive Care Medicine, 43, 304–377

UpToDate, 2025. Necrotizing soft tissue infections

Wallace HA, Perera TB. Necrotizing Fasciitis. [Updated 2023 Feb 21]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430756/>



## Septic Joint

### 1. ABCDE pearls

**Breathing:** Can present with tachypnea if sepsis is present (see [Sepsis](#)). Consider intubation if septic severely altered LOC, and/or otherwise unable to protect airway.

**Circulation:** Watch for hemodynamic instability including hypotension and tachycardia which may be signs of sepsis (see [Sepsis](#)).

**Disability:** Evaluate neurovascular integrity of affected limb (motor, sensory, distal pulses, capillary refill). Assess GCS for altered mental status.

**Exposure:** Examine for focus of infection. Assess joint for erythema, warmth, swelling, decreased ROM, pain with **passive** motion.

### 2. Analgesia

**Acetaminophen** 1 g PO/IV q6h PRN

AND/OR

**Ibuprofen** 400-600 mg PO q6h

AND/OR

**Hydromorphone** 0.5-2 mg IV q2-4h PRN for moderate/severe pain

### 3. Investigations

**Aspirate joint** to dryness as many times as necessary (to drain/clear infection, manage pain, and send for cultures). See [Joint aspiration](#).

**Blood work** (CBC, CRP)



#### 4. Empiric antibiotic treatment (as soon as possible after sending aspirate for culture)

**Vancomycin** 15-20 mg/kg IV q8-12h

AND

**Ceftriaxone** 1-2 g IV q24h

If *Pseudomonas* suspected (elderly, immunosuppressed, IV drug use, or nosocomial risk), consider substitution of Ceftriaxone with

**Cefepime** 2 g IV q8h

#### 5. Disposition

**Consult** orthopedic surgery for all cases of suspected septic joint.

**Consult** medicine for admission if showing signs of systemic illness such as fever, signs of sepsis (tachycardia and hypotension), and persistent resuscitation requirements.

**Consult** ICU admission if hemodynamically unstable, requiring pressors, inotropes, in septic shock.

#### References:

DynaMed, 2025. Septic arthritis in adults. *EBSCO Information Services*

Coakley, G. and Mathews, C.J., 2014. Septic arthritis. *BMJ Best Practice*



# Shoulder Dislocation

## 1. ABCDE pearls

**If traumatic cause, complete a trauma survey**

**Circulation:** Assess distal pulses (radial, brachial). Rarely but potentially fatally, the axillary artery gets injured, especially in elderly patients or high energy mechanism trauma.

**Disability:** assess neurovascular status throughout upper extremity for possible brachial plexus injury – especially axillary nerve injury leading to lateral deltoid loss of sensation “regimental badge patch” and deltoid contraction (arm abduction)

**Exposure:** Inspect both shoulders for their overall contour, anterior shoulder dislocation (95%) → squared-off shoulder, arm abducted and externally rotated. Posterior dislocation (5%) → arm adducted and internally rotated.

Expose body to assess for other injuries/fractures.

## 2. Analgesia: titrate as needed

**Acetaminophen** 1 g PO q6h PRN, max 4 g/day

AND/OR

**Ibuprofen** 400-800 mg PO q4-6h PRN

OR

**Ketorolac** 10-30 mg IV q6h PRN

AND/OR

**Hydromorphone** 0.5-2 mg PO or IV q2-4h PRN

## 3. Reduction

Contraindications: Subthoracic or intrathoracic dislocation (requires OR), accompanying femoral neck fracture, injury to major artery, subacute dislocation.



Start with procedural sedation for reduction (see [\*Procedural Sedation\*](#)).

Pre-reduction x-rays should be taken especially if there is a high-index suspicion of an accompanying fracture.

### **Ten Ways to Reduce a Shoulder:**

<https://www.youtube.com/watch?v=HtOnreM7heg>

The **Stimson technique** (patient prone, arm hanging with weights providing gentle traction)

[https://www.youtube.com/watch?v=HMXZyYqsS\\_E](https://www.youtube.com/watch?v=HMXZyYqsS_E)

The **Cunningham technique** utilizes massage and gentle patient adduction (requires patient participation)

<https://www.youtube.com/watch?v=MBcMoVzhdTl>

The **Milch technique** (arm overhead, gentle external rotation, gentle pressure to the humeral head)

<https://www.youtube.com/watch?v=C37uTDaqI2Q>

The **Spaso technique** can be used for patients that are unable to sit up:

<https://www.youtube.com/watch?v=ZtwQvBotAoc>

If one technique fails, try another!

Reassess neurovascular status in all patients post-reduction.

Confirm the correct position with post-reduction x-rays.

Immobilize in a sling and arrange urgent orthopedic follow-up.



## 4. Disposition

**Consult** orthopedic surgery if neurovascular compromise, delayed presentation (>48h), associated fracture of humeral neck, posterior dislocation, initial reduction attempts fail.

Otherwise, **discharge** home with outpatient referral to orthopedics.

Immobilize shoulder in sling for 3-4 weeks.

### References:

Anand, A., & Park, B. (2015). Acute management of shoulder dislocations. Journal of the American Academy of Orthopaedic Surgeons, 23(4), 209

Shoulder Dislocation : Emergency Care BC. (2024)



# Respirology

Asthma Exacerbation	253
CO Poisoning	256
COPD Exacerbation	258
Pneumonia	261
Pulmonary Embolism (PE)	265
Simple and Tension Pneumothorax	268



## Asthma Exacerbation

### 1. ABCDE pearls

**Airway, Breathing:** monitor for stridor, hoarseness, respiratory distress, dropping saturations. Assess for widespread wheeze. Intubation in patients with severe asthma is high risk due to bronchospasm and should be avoided unless life-threatening (rapidly declining GCS, severe hypoxia refractory to medical management, hemodynamic instability)

Caution: a silent chest in asthma exacerbations is a medical emergency.

### 2. Monitoring: monitor vitals closely, particularly O<sub>2</sub> saturation.

### 3. Call RT to bedside for severe exacerbations, threatened airway, elevated O<sub>2</sub> requirements.

### 4. Oxygen: O<sub>2</sub> therapy to target spO<sub>2</sub> >95%

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

### 5. Bronchodilators:

**Salbutamol** 8 puffs

AND

**Ipratropium bromide** 8 puffs (MDI with spacer)

“back-to-back” q15-20 minutes x3 PRN, then q1-4h PRN

(other options include 2.5 mg nebulized Salbutamol + 500 mcg nebulized Atrovent)



If unresponsive to inhaled  $\beta_2$ -agonist, can give **epinephrine** 0.3–0.5 mg IM (1:1000 concentration)

### **For moderate to severe asthma:**

Consider adding **magnesium sulfate** 2g IV for bronchodilation

6. **Corticosteroids:** for severe exacerbation, likely to use IV but can consider PO if patient can tolerate oral

**Methylprednisolone** 125mg IV

OR

**Prednisone** 40–60 mg PO

OR

**Dexamethasone** 10-16 mg IV

### **7. Disposition**

**Consult** internal medicine for elevated O<sub>2</sub> requirements, hemodynamically unstable, expected non-compliance with home medications, unsafe discharge

**Consult** ICU if hemodynamically unstable requiring pressors and/or inotropes, suspected anoxic/hypoxic brain injury

**Discharge:** if off oxygen and hemodynamically stable, reliable to return as needed.

Follow up with primary care provider or asthma specialist to review management.

For moderate/severe attack, discharge on prednisone for 5 days.

**Patient education:** features of the disease, goals of treatment, self-management asthma action plan, addition of inhaled corticosteroid, inhaler technique and compliance.



References:

Lytvyn, Y. and Qazi, M.A. (2022). *Toronto Notes 2022*. S.L.: Toronto Med Society.

Nickson, C. (2024) 'Rapid sequence intubation (RSI)', *Life in the Fast Lane • LITFL*, 1 July. Available at: <https://litfl.com/rapid-sequence-intubation-rsi/> (Accessed: 15 July 2025).



# CO Poisoning

## 1. ABCDE pearls

**Airway, Breathing:** Intubate if severely altered LOC and/or respiratory failure, vomiting and unable to protect airway, facial/airway edema secondary to burn with threatened airway compromise (see [Burns](#)).

**Circulation:** monitor for dysrhythmias.

**Disability:** Assess GCS and mental status.

**Environment:** Consider others affected in shared environment (e.g. home, workplace). Consider concurrent traumatic injuries from fire/ blast.

## 2. Monitoring: monitor vitals and GCS closely. Place patient on telemetry and monitor for arrhythmias.

## 3. Oxygen therapy

**100% oxygen** via non-rebreather mask until carboxyhemoglobin <5% and symptoms resolved.

**Hyperbaric oxygen therapy** if: LOC, neurological deficits, carboxyhemoglobin level >25% (>15% in pregnancy), severe metabolic acidosis (pH <7.1), myocardial ischemia or dysrhythmia.

## 4. Antiemetics

**Ondansetron** 4-8 mg PO or IV q8h PRN

## 5. Disposition

**Consult** medicine and/or hyperbaric unit if: criteria for HBO met (including loss of consciousness, neurologic symptoms, COHb >25% (or >15% if pregnant)), or pregnancy, cardiac ischemia, persistent symptoms, metabolic acidosis.



**Discharge** if asymptomatic with carboxyhemoglobin <5% after 4-6 hours of high-flow oxygen, close monitoring, no loss of consciousness and no concurrent traumatic injuries or burns.

**Post discharge instructions:** avoid re-exposure; advise home carbon monoxide detector installation, follow up with primary care provider.

Symptoms may recur (delayed neuropsychiatric syndrome). Return to the ED if you experience worsening headache, dizziness, confusion, trouble speaking, walking, or thinking, fainting, chest pain, difficulty breathing, seizures, unusual movements, ongoing nausea or vomiting, new weakness, or vision changes.

References:

Canadian Medical Association Journal (CMAJ). (2011). Diagnosis and management of carbon monoxide poisoning. CMAJ, 183(12), 1585–1592

Lindell, K. O., Jenkins, J. L., & Odell, J. M. (2014). Hyperbaric oxygen therapy in the management of carbon monoxide poisoning. Canadian Journal of Emergency Medicine, 16(2), 178–179



## COPD Exacerbation

### 1. ABCDE pearls

**Airway and Breathing:** ensure airway protection, suction oral secretions, intubate if indicated (hypoxemia, hypoventilation, expected clinical course, unable to protect airway/severely aLOC, silent chest).

**Circulation:** watch for hypotension, tachycardia, altered LOC for signs of sepsis/septic shock.

### 2. Monitoring: monitor vitals closely, particularly O<sub>2</sub> saturation.

### 3. Call RT to bedside

### 4. Oxygen: O<sub>2</sub> therapy to target spO<sub>2</sub> of 88-92% in COPD patients with chronic CO<sub>2</sub> retention

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

### 5. Bronchodilators

**Salbutamol** 8 puffs

AND

**Ipratropium bromide** 8 puffs (MDI with spacer)

“back-to-back” q15-20min x3 PRN, then q1-4h PRN

(other options include 2.5 mg nebulized Salbutamol + 500 mcg nebulized Atrovent)



## 6. Corticosteroids

**Methylprednisolone** 40 mg IV

OR

**Prednisone** 40-60 mg PO

## 7. Antibiotics (in case of Winnipeg Criteria 2 or more [increased dyspnea, increased cough, increased sputum purulence or volume] OR if requiring mechanical ventilation)

**Mild to moderate exacerbation** (non-life threatening, FEV1 >35%):

**Amoxicillin-clavulanate** 875-125 mg PO

OR

**Doxycycline** 100 mg PO

OR

**Trimethoprim-sulfamethoxazole** 160-800 mg

OR

**Azithromycin** 500 mg PO (for atypical coverage)

**Severe exacerbation** (life threatening, FEV1 <35%, mechanical ventilation):

**Ceftriaxone** 1-2 g IV q24h

OR

**Levofloxacin** 750 mg PO or IV q24h (for beta-lactam allergies)

OR

**Cefepime** 1 gram IV (for Pseudomonas coverage)

OR

**Azithromycin** 500 mg IV



## 8. IV fluids (if hypotensive, clinically hypovolemic, no risk of overload)

250 to 500 mL bolus of LR or NS

## 9. Disposition

**Consult** medicine for admission

**Consult** ICU if persistent requirements for ventilatory support, particularly if unable to be weaned off BiPAP, failed extubation, hemodynamically unstable requiring pressors, inotropes

### References:

Global Initiative for Chronic Obstructive Lung Disease. (2024). *Global strategy for the prevention, diagnosis and management of chronic obstructive pulmonary disease: 2024 report (Pocket guide)*.

Putcha, N., & Wise, R. A. (2018). Medication regimens for managing COPD exacerbations. *Respiratory Care*, 63(6), 773–782.

Leuppi, J. D., Schuetz, P., Bingisser, R., et al. (2013). Short-term vs conventional glucocorticoid therapy in acute exacerbations of chronic obstructive pulmonary disease: The REDUCE randomized clinical trial. *JAMA*, 309(21), 2223–2231.

van Geffen, W. H., Douma, W. R., Slebos, D. J., & Kerstjens, H. A. M. (2016). Bronchodilators delivered by nebuliser versus pMDI with spacer or DPI for exacerbations of COPD. *Cochrane Database of Systematic Reviews*, 2016(8), CD011826.

Rochwerg, B., Brochard, L., Elliott, M. W., et al. (2017). Official ERS/ATS clinical practice guidelines: Noninvasive ventilation for acute respiratory failure. *European Respiratory Journal*, 50(2), 1602426.

National Institute for Health and Care Excellence. (2018). *Chronic obstructive pulmonary disease (acute exacerbation): Antimicrobial prescribing* (NICE guideline NG114).

National Institute for Health and Care Excellence. (2018). *Chronic obstructive pulmonary disease in over 16s: Diagnosis and management* (NICE guideline NG115).

Canadian Thoracic Society. (2023). *Canadian Thoracic Society guideline: Pharmacotherapy in patients with COPD (2023 update)*.



# Pneumonia

## 1. ABCDE pearls

**Airway, Breathing:** suction oral secretions, monitor for severely altered LOC, vomiting, inability to ventilate or protect airway and intubate as necessary.

**Circulation:** Consider fluid resuscitation (ex: 1L LR) if there are clinical signs of hypoperfusion, hypotension, sepsis, or if the patient is unable to maintain adequate oral intake due to illness severity.

## 2. Call RT to bedside for severe desaturations, threatened airway

## 3. Oxygen supplementation

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow → BiPAP

## 4. Empiric antimicrobial therapy

**If patient is stable enough for discharge:**

**Amoxicillin-Clavulanate 875mg BID**

OR

**Amoxicillin 1 g TID** (if young patient with no comorbidities)

AND/OR

**Azithromycin 500mg PO daily** if suspicious for atypical organisms

**If being admitted:**

**Ceftriaxone 1-2g IV**

AND

**Azithromycin 500mg IV or PO**



### Special considerations:

- Allergies to penicillins: **Levofloxacin** 750mg IV
- MRSA risk factors (prior MRSA infection or colonization, recent intravenous antibiotic use, recent hospitalization, recurrent hospitalizations): add **Vancomycin** 15mg/kg IV q8-12h
- Pseudomonas risk factors: **Piperacillin-tazobactam** 4.5g IV q6h

## 5. Consideration for steroids

The role of steroids in treating pneumonia is controversial. Consider steroids in a patient with severe CAP:

**Dexamethasone** 10mg IV

OR

**Methylprednisolone** 150 mg IV

OR

**Hydrocortisone** 50mg IV



## 6. Disposition

**Consult** medicine for admission if elevated oxygen requirements, severely comorbid and/or frail, severe CAP on radiographic or laboratory findings, lack of proper supports.

The CURB65 tool and/or the Pneumonia Severity Index can help guide your decision on whether or not to admit the patient.

### CURB 65

Confusion (+1)

Elevated BUN (>7mmol/L) (+1)

Respiratory rate >30 (+1)

Blood pressure systolic < 90 mmHg or diastolic ≤ 60 mmHg (+1)

Age ≥ 65 years (+1)

PSI Score (+1)

<b>CURB-65 score</b>	<b>30-day mortality</b>	<b>Recommendation</b>
0	0.6 %	Outpatient treatment possible
1	2.7 %	
2	6.8 %	Admission recommended
3	14 %	Admission with intensive medical care recommended
4-5	27.8 %	



The [Pneumonia Severity Index](#) is another clinical prediction rule that can be used to calculate the probability of morbidity and mortality among patients with community acquired pneumonia

**Consult** ICU if hemodynamically unstable, requiring pressors/inotropes

**Discharge** if hemodynamically stable, lack of increased oxygen requirements, available supports at home, expected compliance with antibiotic regimen. Discharge on 5-7 day course of empiric antibiotics as detailed above, and recommend follow up with primary care physician

**References:**

Rider, A. C., & Frazee, B. W. (2018). Community-acquired pneumonia. *Emergency Medicine Clinics of North America*, 36(4), 665–683. <https://doi.org/10.1016/j.emc.2018.07.001>

Hellmann, J. (n.d.). *Emergency management of community-acquired pneumonia*. *Emergency Medicine Cases*

Long, B, Long, D, Kofyman, A. (2018). *Diagnosis and therapy of community-acquired pneumonia in the emergency department: A retrospective observational study and medical audit*. *Journal of Clinical Medicine*, 13(2), 574

Radermacher, P. (2016). Severe community-acquired pneumonia: Timely management measures in the first 24 hours. *Critical Care*, 20, 99

Poe, D. E. (2020, February). Pneumonia: Getting in-sync with the guidelines. *EMOttawa Blog*



# Pulmonary Embolism (PE)

## 1. ABCDE pearls

**Airway and Breathing:** intubate only if respiratory failure, profound hypoxia, declining GCS, or aLOC.

**Circulation:** Monitor for hypotension and tachycardia (suggests massive PE).

Can POCUS to look for right heart strain.

Initiate fluid/pressor resuscitation if signs of shock are present (hypotension, tachycardia, aLOC, cor pulmonale symptoms).

## 2. CCM

RT for O<sub>2</sub> support if necessary.

Place on cardiac monitor.

O<sub>2</sub> via nasal prongs → NRB → high-flow or BiPAP if respiratory distress or hypoxic to maintain SpO<sub>2</sub> > 92%.

## 3. Anticoagulation and/or Thrombolysis

**High risk patients** (massive PE: sBP < 90 mmHg or drop of >40 mmHg or signs of systemic hypoperfusion):

**Alteplase** 100mg IV bolus over 2 hours

OR

**Tenectaplase** 30-50mg IV bolus

*Common contraindications – active internal bleeding, recent major surgery or trauma, history of hemorrhagic stroke, severe uncontrolled hypertension (SBP >180 mmHg)*

AND

**Heparin** 12-15 units/kg/hour IV after thrombolysis. Do not bolus!



**Intermediate risk** (right heart strain, increasing oxygen requirements):

**Dalteparin** 200 IU/kg SC daily x 30 days, then 150 IU/kg SC daily

OR

**Enoxaparin** 1 mg/kg SC q12h

**Low risk patients:**

**Apixaban** 10 mg PO BID x 7 days, then 5 mg PO daily

OR

**Rivaroxaban** 15 mg PO BID x 21 days, then 20 mg PO daily

If DOAC contraindicated or pregnant patient:

**Warfarin** 5 mg daily

(overlap with LMWH x 5 days and until INR >2.0 for 2 days)

AND

**Dalteparin** 200 IU/kg SC daily x 30 days, then 150 IU/kg SC daily

OR

**Enoxaparin** 1.5 mg/kg SC daily

#### 4. Disposition

**Consult** interventional radiology for catheter-directed thrombolysis for clinically unstable submassive PEs, or if evidence of right heart strain is present (preferred over systemic thrombolysis due to lower bleeding risk)

**Consult** medicine for admission of intermediate risk pulmonary embolisms.

**Consult** ICU for high risk pulmonary embolisms, hemodynamic instability requiring inotropes, pressors +/- thrombolysis, cardiac arrest, intubated.

**Discharge** low-risk patients (hemodynamically stable, expected treatment compliance, otherwise healthy) – use Hestia Score and/or Simplified PESI scores.



<https://www.mdcalc.com/calc/3918/hestia-criteria-outpatient-pulmonary-embolism-treatment>

<https://www.mdcalc.com/calc/1304/pulmonary-embolism-severity-index-pesi>

Discharge on 3 months of medication of your choice (as outlined above) and outpatient thrombosis or primary care follow-up within 7-14 days.

**References:**

American College of Chest Physicians. (2012). *Antithrombotic therapy and prevention of thrombosis, 9th ed: CHEST Guideline. Chest*, 141



## Simple and Tension Pneumothorax

### 1. ABCDE pearls

**Airway:** prepare to intubate if the patient is severely altered and unable to protect their airway.

**Breathing:** observe the patient for tracheal deviation, severe respiratory distress and decreased or absent lung sounds; if present prepare for needle thoracostomy. Treat oxygen demands as required

**Circulation:** monitor for hypotension and tachycardia.

**Exposure:** look for signs of blunt chest wall trauma such as ecchymosis, edema, and paradoxical chest wall movement. Always suspect a traumatic cause, look for signs of trauma elsewhere on the patient's body.

### 2. Monitoring:

 closely monitor HR and BP for signs of obstructive shock.

Tension pneumothorax is a clinical diagnosis and medical emergency requiring immediate needle decompression. Consult the ICU or nearest trauma team depending on the cause.

### 3. Special room considerations/positioning of patient

Keep the patient in an upright position to optimize oxygenation. Patients with tension pneumothorax should be in a resuscitation room.

### 4. Call specific people to bedside

Respiratory therapy if O<sub>2</sub> requirements are high



## 5. Oxygen: O<sub>2</sub> therapy to target spO<sub>2</sub> of >92%

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

**Note:** NIPPV contraindicated in pneumothorax unless adequately treated with chest tube.

## 6. Analgesia

### Analgesia

**Acetaminophen** 1 g PO q6h PRN, max 4 g/day.

AND

**Morphine** 1 to 4 mg IV q1-4h, max 10 mg every 4 hours.

OR

**Hydromorphone** 0.2 to 1 mg IV q 2 to 4 hours PRN.

### Fluids

LR/NS 500-1000 mL bolus

## 7. Procedure

Needle decompression (if tension pneumothorax)

See [Needle Thoracostomy](#)

AND

Chest tube

See [Pigtail Chest Tube Insertion](#)

AND

Repeat chest X-ray



Patients with a **small** primary pneumothorax (<3cm from lung apex to cupola) and who are asymptomatic can be treated with supplemental oxygen and observation only, repeat chest x-ray in 4-6 hours and if no progression a 24 hour recheck.

Patients with a **very small** secondary pneumothorax (<1cm interpleural distance) and who are asymptomatic can be treated with supplemental oxygen and observation only, with follow-up for repeat chest x-ray in 12-24 hours

## 8. Disposition

Patients with tension pneumothorax require admission to hospital. The admitting service will depend on the stability of the patient. Services that may be involved include the intensive care unit and thoracic surgery.

For patients with simple pneumothorax consult medicine or surgery depending on your institution for admission if clinically unstable, fail observation, or are treated with the placement of a chest tube.

Clinically stable patients with minimal symptoms showing no signs of progression on a repeat chest X-ray 4-6 hours into observation without supplemental oxygen can safely be discharged home. Inform patients that they should not be taking a commercial flight until 7 days after x-ray resolution. Instruct patients to return to the emergency department if they are experiencing worsening chest pain or shortness of breath. Follow up with a primary care physician in 7-14 days.

### References:

G. Lee. Treatment of primary spontaneous pneumothorax in adults. *C. Broaddus, ed. UpToDate. Waltham, MA: UpToDate Inc.* <http://www.uptodate.com>. Accessed June 15, 2025.

G. Lee. Clinical presentation and diagnosis of pneumothorax. *C. Broaddus, ed. UpToDate. Waltham, MA: UpToDate Inc.* <http://www.uptodate.com>. Accessed June 15, 2025.

Acetaminophen (paracetamol): Drug information. In: Lexi-Drugs. *Waltham, MA: UpToDate Inc.* <http://www.uptodate.com>. Accessed June 16, 2025.

Morphine: Drug information. In: Lexi-Drugs. *Waltham, MA: UpToDate Inc.* <http://www.uptodate.com>. Accessed June 16, 2025.

Hydromorphone: Drug information. In: Lexi-Drugs. *Waltham, MA: UpToDate Inc.* <http://www.uptodate.com>. Accessed June 16, 2025.



# Toxicology & Psychiatry

Acute Psychosis	272
Anticholinergic Overdose	275
Cholinergic Overdose	278
Opioid Overdose	281
Sedative/Hypnotic Exposure	284
Suicidal and Homicidal Ideation	286
Sympathomimetic Overdose	289



## Acute Psychosis

### 1. ABCDE pearls

**Airway:** Patients that have received any sedating medications should be monitored to ensure that they are maintaining their airway.

**Breathing:** Support ventilation in patients that have received sedating medications resulting in decreased respiratory effort. Monitor for decreased respiratory drive if opioid use is suspected.

**Exposure:** Look for signs of trauma, IV drug use. Assess level of agitation and risk to self or others

Consider Neuroleptic Malignant Syndrome in patients on dopamine receptor antagonist medication. Symptoms include fever, encephalopathy, tachycardia, elevated CK & WBC, muscle rigidity

Consider Serotonin Syndrome in patients on SSRIs or SNRIs. Symptoms include agitation, hyperreflexia, clonus, autonomic instability, fever, and gastrointestinal upset

*Note:*

In younger individuals, acute psychosis may often represent primary psychosis or substance-induced psychosis.

In older individuals, rule out delirium, which affects a patient's disposition

### 2. Monitoring: severe agitation is a psychiatric emergency. Ensure continuous monitoring if the patient is sedated.



### 3. Special considerations

- Use the least restrictive environment possible that still maintains safety. **Attempt verbal de-escalation first.** Minimize prolonged use of physical restraints without sedation to prevent physical injury
- Plan to de-escalate physical restraints once chemical restraint is in place
- Remove all potential means of self-harm or harm to others (sharps, cords, belts, weapons).
- Maintain close observation line of sight or video monitoring if available.

### 4. Medications

Psychosis (seizures or agitation) secondary to stimulant use:

**Lorazepam** 2 to 4 mg IV q10min, max 20 mg in 30 minutes

Sedation for mild to moderate agitation:

**Haloperidol** 2 to 5 mg PO or IM (can escalate to 10 mg)

OR

**Lorazepam** 1 to 2 mg PO or IM

OR

**Olanzapine** 5 to 10 mg PO or IM

Sedation for severe agitation:

**Haloperidol** 5 to 10 mg IM

AND

**Lorazepam** 1 to 2 mg IM

AND/OR

**Ketamine** 5 mg/kg IM



5. **ECG:** baseline ECG, repeat PRN. Monitor for QTc prolongation secondary to medications used (antipsychotics).

## 6. Disposition

Treat reversible causes of agitation (hypoglycemia, hypoxia, drug intoxication).

**Consult** psychiatry if expected poor adherence to treatment plan, severe, ongoing or refractory acute psychosis, unsafe discharge, suicidal or homicidal ideation.

**Consult** substance use service if concerned for drug use.

**Discharge** if no longer experiencing psychosis, otherwise hemodynamically stable, reliable follow-up and safe discharge. Refer to outpatient psychiatry.

Provide the patient with the local mental health crisis line, as well as other mental health, substance use resources as appropriate.

### References:

S. Marder. Psychosis in adults: Initial management. *M. Stein, ed. UpToDate. Waltham, MA: UpToDate Inc.*



# Anticholinergic Overdose

## 1. ABCDE pearls

**Airway, Breathing:** If respiratory drive is impaired, consider coingestants. Intubate if severely altered LOC with vomiting, and/or otherwise unable to protect airway.

**Circulation:** watch for tachycardia as a common early sign.

**Disability:** watch for CNS symptoms such as anticholinergic delirium which present with agitation, confusion, disorientation, impaired attention and speech, and/or psychosis. Mydriasis is prominent.

**Exposure:** Assess for flushed skin, hyperthermia, and anhidrosis which are common signs of anticholinergic overdose. Monitor temperature for hyperthermia; see [Hyperthermia](#) for management of hyperthermia. Skin examination may also reveal transdermal medication patches which may be the causative agent. Assess for signs of trauma during intoxication.

## 2. Special room considerations

Involve friends/family in care and provide a low stimulus environment to help manage anticholinergic delirium, if present.

## 3. Oxygen

If respiratory depression noted, administer 100% oxygen by non-rebreather mask at 15L/minute.

## 4. Symptomatic/supportive treatment

If ingested: **Activated charcoal** 1g/kg for oral decontamination if <1 hour post-exposure and awake/cooperative.



**Cholinesterase inhibitor** for refractory anticholinergic delirium; not advised for suspected TCA overdose, wide QRS, or seizures during the current ingestion.

**Physostigmine** 0.5mg IV push over 3-5 minutes, maximum cumulative dose 2mg

**Sodium Bicarbonate** if TCA poisoning (QRS prolongation >100ms, hemodynamic instability, ventricular arrhythmias)

1mEq/kg IV bolus; specialist guidance recommended

## 5. Benzodiazepines 2<sup>nd</sup> line to physostigmine for delirium/agitation or if seizures present

**Diazepam** 2.5-10mg IV/IM q5-10min as needed

OR

**Lorazepam** 2-4mg IV/IM q10-15min as needed

OR

**Midazolam** 5-10mg IV/IM q5-10min as needed

## 6. Disposition

**Consult** toxicology or poison control for all anticholinergic toxidromes. (consider consulting early, before decontamination and antidotes)

**Consult** psychiatry for assessment and/or admission if intentional overdose suspected.

**Admit** to medicine if patient does not have normalization of vitals or mentation within 6 hours of ingestion or requires prolonged monitoring.

**ICU admission** for those presenting with severe anticholinergic toxicity and/or require treatment with physostigmine, or in case of intubation, hemodynamic instability, requiring pressors/inotropes.



**Discharge** if a patient is asymptomatic for 6 hours following ingestion and has no ECG or co-ingestion issues, particularly if reliable in follow-up and has a safe discharge environment, with no suspicion of self-harm (or if cleared by psychiatry). Ensure primary care physician follow-up.

#### References

DynaMed. *Anticholinergic Poisoning*. EBSCO Information Services. [accessed 27 June 2025].

Kwai, K. (2025). Anticholinergic Toxicity and Poisoning. In: Swadron S, Nordt S, Mattu A, and Johnson W, eds. *CorePendum*. 5th ed. Burbank, CA: CorePendum, LLC.

Newton, A. *Tricyclic antidepressant overdose*. BMJ Best Practice. [accessed 27 June 2025].

Su, M. and Goldman, M. Anticholinergic poisoning. In: *UpToDate*, Connor RF (Ed), Wolters Kluwer.



# Cholinergic Overdose

## 1. ABCDE Pearls

\*Ensure full PPE is worn. Patient will require decontamination prior to evaluation\*

**Airway, Breathing:** Patients will require suctioning of excessive secretions to maintain airway. Monitor closely for the killer Bs (bronchospasms, bronchorrhea, bradycardia), respiratory depression, and neuromuscular weakness.

Intubate if severely altered LOC with vomiting/excessive secretions, unable to maintain airway, failing to oxygenate or ventilate, worsening predicted clinical course.

**Circulation:** watch for signs of arrhythmia, bradycardia, and hypotension. Also watch for signs of hypotension and tachycardia due to volume depletion secondary to secretions; resuscitate with fluids and/or pressors as necessary.

**Disability:** Altered mental status, coma, seizures common. May present with pinpoint pupils and fasciculations, muscle weakness on neurologic exam.

**Exposure:** Remove all contaminated clothing, and wash skin with soap and water. Assess for signs of trauma secondary to intoxication.

## 2. Monitoring: telemetry and close reassessment of all patients

## 3. Oxygen supplementation

Maintain oxygen saturation >92%

Up-titrate as needed:

NP > non-rebreather mask > Intubation



## 4. Medications

**Atropine** (antidote) 1-2 mg IV

Double dose q5 minutes until secretions cleared (note: for (anticipated) severe cholinergic exposure, or multiple presentations, start preparing atropine early with pharmacy)

After secretions are controlled, continue **atropine infusion** at 10-20%/hour of dose previously administered

e.g., If 25mg atropine needed to control secretion, establish infusion of 2.5-5mg/hr

AND (only for certain cholinergics, under advice of Poison Control)

**Pralidoxime** 30-50mg/kg (1-2g in adults) IV loading dose, repeat dose in 1h, then q10-12 hours until resolution of muscle weakness (and/or when atropine no longer required)

## 5. Fluids

**IV NS or LR** 500-1000mL to maintain euvoolemia. Add vasopressors PRN to maintain MAP >65mmHg. The amount of fluids administered should be guided by the patient's ongoing losses and hemodynamic status.

## 6. Benzodiazepine

**Diazepam** 5-10mg IV, q10-15 PRN

Followed by 5-10mg q2-4h PRN

(for treatment of seizures, anxiolysis, and reduction of fasciculations)



## 7. Disposition

### Consult

Toxicology or regional poison control centre

Consider psychiatry consult if deliberate ingestion, chronic use, ongoing agitation, safety concerns complicating discharge, other mental health concerns.

**Admit** all patients with cholinergic overdoses to ICU or step down with more than minimal symptoms (i.e. more than only miosis).

Patients treated with atropine and pralidoxime should be monitored for 24 hours after therapy is stopped and asymptomatic.

### References:

Bird, S., 2025. Organophosphate and carbamate poisoning. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer.

Buckey, N., 2024. Organophosphate poisoning. *BMJ Best Practice*.

DynaMed, 2025. Cholinergic toxicity – emergency management. *EBSCO Information Services*

Frey, A. and Deutsch, A., 2025. Pesticides and cholinergic toxicity and poisoning. In: S. Swadron, S. Nordt, A. Mattu & W. Johnson, eds. *CorePendium*. 5th ed. Burbank, CA: CorePendium, LLC

Moritz, M.L. and Ayus, J.C., 2015. Maintenance intravenous fluids in acutely ill patients. *New England Journal of Medicine*, 373(14), pp.1350–1360. <https://doi.org/10.1056/NEJMra1412877>



# Opioid Overdose

## 1. ABCDE Pearls

**Airway, Breathing:** watch for life-threatening respiratory depression.

Intubate if severely altered LOC with vomiting/excessive secretions, inadequate respiratory drive with desaturation, otherwise unable to protect airway, or if expected worsening of clinical course.

However, in most cases BVM with narcan reversal is preferable to early intubation; exceptions are prolonged hypoventilation with hypoxic brain injury, contaminated drug supply, extra-potent opioids, or benzodiazepines.

**Disability:** Assess GCS as CNS depression is characteristic of opioid overdose. Miosis is also a common presentation.

**Exposure:** Fully examine patients to exclude transdermal opioid patches as possible sources of exposure. Skin examination may also identify signs of intravenous drug use (needle/track marks). Assess for signs of trauma during intoxication.

## 2. Monitoring:

Continuous cardiopulmonary and capnography monitoring. Monitor etCO<sub>2</sub> and RR as early signs of failure to ventilate.

## 3. Call respiratory therapy to bedside

For airway/ventilation support if needed

## 4. Oxygen

Provide supplemental oxygen needed to maintain oxygen saturation of >92%. Avoid mechanical PPV in opioid toxicity due to potential for somnolence and aspiration.



## 5. Medications

### Naloxone

If apneic: 0.04-2mg IV initial dose (start low for patients with OUD, high for incidental intoxication/opioid naive)

If cardiorespiratory arrest: 2mg IV initial dose

If spontaneously breathing with adequate ventilation and oxygenation: Monitor

Naloxone continuous infusion for long-acting opioids and if persistent or recurrent symptoms are present ( $\frac{2}{3}$  of total dose required to stimulate breathing)

## 6. Disposition

### Consults and referrals

Consult psychiatry for intentional overdose, and toxicology if available.

Consult substance use service or refer to outpatient substance use treatment services.

### Admit to medicine if

Patients with persistently altered mental status and physical exams 1 hour post-naloxone administration or persistent after 4-6 hours of observation.

Severe or prolonged opioid toxicity: patients who require naloxone infusion or repeated doses of naloxone, overdose with long-acting opioid, atypical route of exposure (e.g., ingesting fentanyl patches).

**Admit to ICU** for significant toxicity, ongoing naloxone requirement, high IV naloxone demands, failure to extubate, and persistently inadequate respiratory drive.



## Discharge

Patients who respond to naloxone may be discharged after normalization of mental status and vitals and 2-3 hours of observation post-naloxone dose.

Patients not requiring naloxone may be discharged after return to baseline and 4-6 hours of observation.

All patients should be discharged with naloxone kits and/or prescription. Exercise caution with discharge if unsafe living situation suspected.

Recommend self-referral substance use programs, should patient be agreeable.

### References:

DynaMed, 2024. Anticholinergic poisoning. *EBSCO Information Services*

Kwai, K., 2025. Anticholinergic toxicity and poisoning. In: S. Swadron, S. Nordt, A. Mattu & W. Johnson, eds. *CorePendium*. 5th ed. Burbank, CA: CorePendium, LLC.

Newton, A., 2025. Tricyclic antidepressant overdose. *BMJ Best Practice*

Su, M. and Goldman, M., 2024. Anticholinergic poisoning. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer



# Sedative/Hypnotic Exposure

## 1. ABCDE Pearls

**Airway, Breathing:** watch for respiratory depression. Intubate if severely altered LOC with vomiting/excessive secretions, inadequate respiratory drive and/or otherwise unable to protect airway.

**Circulation:** watch for hypotension. Resuscitate with IV crystalloids or vasopressors as necessary.

**Disability:** CNS depression can lead to coma. Certain medications such as benzodiazepine toxicity may cause symptoms similar to ethanol intoxication (i.e., slurred speech and coordination). Watch for signs of lateralization to rule out stroke.

**Exposure:** Extreme overdoses may result in hypothermia. Rule out co-ingestants. Assess for signs of trauma during intoxication.

## 2. Monitoring:

All patients with sedative/hypnotic toxicity require continuous capnography and cardiopulmonary monitoring.

In most patients, simply monitoring until symptom resolution is appropriate.

## 3. Oxygen

Titrate oxygen to target SpO<sub>2</sub> ≥92%. Escalate as needed:

**Airway:** Jaw thrust/head tilt-chin lift → NPA/OPA → LMA/ETT

**Oxygenation:** nasal prongs → Venturi mask → non-rebreather mask → ETT



## 4. Medications

**Flumazenil** (Rarely indicated; typically for children or iatrogenic causes. ONLY in incidental exposure. DO NOT provide in chronic benzodiazepine users, as can cause deadly withdrawal seizure).

Flumazenil 0.2mg IV over 30 seconds; repeated PRN for maximum dose of 1mg

## 5. Disposition

### Consult

Consider psychiatry consult if deliberate ingestion, chronic use, safety concerns, other mental health concerns.

Consult toxicology if available, or the regional poison control centre.

**Consult** medicine for admission for patients requiring step-down bed for telemetry and prolonged monitoring in the context of long-acting sedative/hypnotic ingestion.

**Consult** ICU for those with persistent hemodynamic instability, CNS/respiratory depression, or those presenting with coingestion and mixed overdoses.

**Discharge** patients who remain asymptomatic following 4-6 hours of observation, if no mental health or safety concerns.

**Discharge** with follow up with primary care physician; consider tapered discontinuation of offending medications and/or self-referral to substance use programs, should patient be agreeable.

### References:

DynaMed. Sedative-hypnotic Toxicity - Emergency Management. EBSCO Information Services.

Greller, H. and Gupta, A. Benzodiazepine poisoning. In: UpToDate, Connor RF (Ed), Wolters Kluwer

Minns, A. Sedatives/Hypnotic Toxicity and Poisoning. In: Swadron S, Nordt S, Mattu A, and Johnson W, eds. CorePendium. 5th ed. Burbank, CA: CorePendium, LLC



## Suicidal and Homicidal Ideation

### 1. Special considerations

Place patient in safe, low-stimulation environment.

Remove all potential means of self-harm or harm to others (sharps, cords, belts, weapons).

Offer privacy during sensitive discussions. Adopt calm, non-confrontational tone. Do not shy away from using words such as “suicide,” “self-harm,” “death” etc.

Maintain close observation line of sight or video monitoring if available.

Avoid use of restraints if possible, as they can be traumatic to the patient and impair rapport.

When speaking to patients, it is ALWAYS important to ensure your own safety. Have help with you (i.e. security) when speaking to patients and position yourself between the patient and the door for exit strategy if escalation occurs.

Assess for those patients at high risk (SAD PERSONS mnemonic):

- Sex (male)
- Age (<19 or >45)
- Depression diagnosis
- Previous attempt
- Excessive alcohol or substance use
- Rational thinking loss
- Separated or single
- Organized plan
- No social support
- Sickness (chronic medical condition or debilitating illness)



## 2. Call specific people to bedside

Engage social work, crisis services, or a mental health liaison early, if available

## 3. Medications

Psychosis secondary to stimulant use:

**Lorazepam** 2 to 4 mg IV q10min, max 20 mg in 30 minutes

Sedation for mild to moderate agitation:

**Olanzapine** 5 to 10 mg PO or IM

OR

**Haloperidol** 2 to 10 mg PO or IM

Sedation for severe agitation:

**Haloperidol** 5 mg IM (monitor QTc)

AND

**Lorazepam** 2 mg IM

## 4. Disposition

Patients with low imminent suicide risk, no longer active ideation:

**Discharge** if supportive, stable environment available, and patient contracts to a safety plan.

Schedule outpatient psychiatry or primary care physician follow-up before discharge, within 24-72 hours

Provide written suicide prevention materials and explain them verbally to ensure comprehension. Include crisis hotline numbers and local support resources.

Always involve family or supports in discharge planning, if and when available, with the patient's consent, to strengthen follow-through.

Clear instructions for returning to care if suicidal thoughts recur.



Patients with moderate to high suicide risk:

Voluntary hospitalization (if possible)

OR

Involuntary hospitalization – issue appropriate form(s).

**Consult** psychiatry for admission.

References:

- Betz, M. E., & Boudreault, E. D. (2016). Managing Suicidal Patients in the Emergency Department. *Annals of emergency medicine*, 67(2), 276–282. <https://doi.org/10.1016/j.annemergmed.2015.09.001>



# Sympathomimetic Overdose

## 1. ABCDE Pearls

**Airway:** Airway support may be needed in the context of MDMA-associated hyponatremia obtundation, and loss of protective airway reflexes in severe intoxication. Intubate if unable to protect airway, severely aLOC, vomiting.

**Circulation:** Watch for signs of tachycardia, dysrhythmias, hypertensive emergency, which may lead to end organ damage.

**Disability:** Perform neurological exam; look for aLOC, agitation, seizures, and delirium. Assess for serotonin syndrome (tremor, hyperreflexia, clonus, Babinski sign, and ocular clonus).

**Exposure:** Flushed, diaphoretic skin may indicate hyperthermia. Check for possible track marks and injection sites. Assess for signs of trauma which may have occurred during intoxication.

## 2. Monitoring: monitor vitals closely (BP, HR, temperature)

If hyperthermic, should have a continuous temperature probe.

If euthermia, ~q1h temperatures are appropriate.

## 3. Cooling (see *Hyperthermia*)

Initiate aggressive cooling through ice baths, cooling blankets, and ice packs.

Reduce core body temperature to <41C. Hyperthermia must be managed through both eliminating excessive muscle activity and active cooling.

Consider paralysis + mechanical ventilation in hyperthermia >40.5 C only if failed passive and active external cooling. See below for benzodiazepine dosing.



## 4. Special Room Considerations

Due to risk of agitation and psychosis, consider a secure room with close access to security. Consider physical restraints PRN. Remove restraints as soon as chemical restraint is adequate.

## 5. Medications

**Activated charcoal** if patient presents within 1 hour of drug ingestion and cooperative

Activated charcoal: 1g/kg up to 50g orally

**Benzodiazepines** to address agitation, seizures, hyperthermia, and/or autonomic excitation (hypertension/tachycardia)

Note: Patients may have different responses to benzodiazepine subtypes; be prepared to trial a second benzo.

**Diazepam** 10 mg IV initial dose, then 5-10mg IV q3-5 minutes, until symptom control achieved

AND/OR

**Lorazepam** 2-4 mg IV/IM q10 minutes until symptom control achieved

AND/OR

**Midazolam** 5 mg IV/IM initial q10 minutes until symptom control achieved

Note: Treat severe hypertension (>180/120 AFTER benzodiazepines) or signs of end-organ dysfunction. Do not use beta blockers unless there is alpha blockade already.



## 6. Disposition

**Consult** poison centre for ongoing support and recommendations for specific antidotes (i.e. sodium channel blockade with cocaine, serotonin syndrome, hypertensive emergency)

**Consult** psychiatry or substance use service if chronic methamphetamine use (can lead to irreversible psychosis), ongoing psychosis, agitation, or other mental health or safety concern making discharge unsafe.

**Admit** patients to medicine with persistently abnormal vitals, altered mental status, acidosis, evidence of end-organ dysfunction (rhabdomyolysis, renal/liver dysfunction), and/or required high doses of benzodiazepines.

**Consider ICU admission** in cases of hyperthermia  $>39.5^{\circ}\text{C}$  and severe hemodynamic instability, status epilepticus etc.

**Discharge** if stable, no longer in overdose and/or no signs of psychosis, robust social supports, residing at fixed address, and low/no risk of repeat presentation. Follow up with primary care provider and/or psychiatry/substance use referral.

### References:

Armenian, P., 2022. Sympathomimetic toxicity and poisoning. In: S. Swadron, S. Nordt, A. Mattu & W. Johnson, eds. *CorePendum*. 5th ed. Burbank, CA: CorePendum, LLC.

Bowyer, E. and Hernon, C., 2025. Methamphetamine: acute intoxication. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer.

Hoffman, R., 2025. MDMA (ecstasy) intoxication. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer.

Nelson, L. & Odujebe, O., 2025. Cocaine: acute intoxication. In: R.F. Connor, ed. *UpToDate*. Wolters Kluwer.



# Trauma

Epidural Hematoma	293
Facial Trauma, Skull Fracture	297
Subarachnoid Hemorrhage	300
Subdural Hematoma	305



# Epidural Hematoma

## 1. ABCDE pearls

**Airway, Breathing:** ensure airway protection, watch for altered level of consciousness, declining GCS, and intubate accordingly

Consider neuroprotective intubation – avoid Propofol to avoid hypotension. Consider topical Lidocaine to prevent laryngeal reflexes and BP spikes.

**Circulation:** assess for signs of shock (hypotension, tachycardia), or signs of Cushing's triad (bradycardia, hypertension, Cheyne-Stokes respirations) – prepare vasopressors at bedside.

**Disability:** continually reassess GCS for signs of progression of bleed or raised ICP as EDH can cause rapid deterioration of neurologic status. Assess for focal neurological deficits, lateralizing signs, pupillary changes. POCUS: measure optic nerve sheath diameter (for raised ICP).

**Exposure:** look for signs of trauma, scalp fractures or hematomas.

## 2. Monitoring: closely monitor BP and O<sub>2</sub> saturation, strict I/Os, neuro vitals hourly.

## 3. Neuroprotection

- Head of the bed at 30 degrees
- Maintain normoglycemia and normoxia
- Pain control (multimodal pain management)
- Maintain normothermia
- Prevent anemia – higher threshold for transfusion in brain bleeds (no clear consensus but aim >80mg/dL)
- Prevent hypoxia – balance between vasoconstriction and vasodilatation
- Maintain cerebral perfusion pressure by preventing hypotension (see below)



#### 4. Blood pressure control (target SBP <140-160 mmHg)

**IV Labetalol** 10-20 mg over 1-2 minutes (bolus, repeat q5-10min as needed) or 0.5-2 mg/min infusion

OR

**IV Nicardipine** infusion 5 mg/hr (titrate up by 2.5 mg/hour q5-15min)

Note: IV infusion indicated if sBP >220 – aim for ~20% BP reduction first hour (avoid large BP fluctuations) careful titration to AVOID HYPOTENSION and maintain CCP.

If hypotensive → give **3% NaCl** 100 mL over 10 minutes, or transfuse if hemorrhage suspected to be causing hypotension

#### 5. Manage raised ICP (if clinically indicated)

**3% NaCl** 250 mL IV bolus over 10-15 min

AND/OR

**Mannitol** at 1g/kg IV bolus over 15 minutes

- Allowing permissive hypernatraemia in hyperosmolar therapies 145-155 mmol/L.
- Neurosurgery for external ventricular device.

#### 6. Reverse anticoagulation (aim for INR <1.5)

**For warfarin reversal**

**Vitamin K** 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

**PCC** 25 units/kg (INR 2-4)

OR

35 units/kg (INR 4-6)

OR

50 units/kg (INR >6)



***For dabigatran reversal***

**Idarucizumab** 2.5 mg x 2 within 15 minutes

***For apixaban, rivaroxaban reversal***

**Andexanet alfa**

4 mg/min infusion for 2 hours

(apixaban <5 mg or rivaroxaban <10 mg, last dose >7 hrs ago)

OR

8 mg/min infusion for 2 hours

(apixaban >5 mg or rivaroxaban >10 mg, last dose <7 hrs ago)

OR

**PCC** 25 units/kg, then repeat INR

***For heparin reversal***

**Protamine sulfate** 1-1.5 mg IV per 100 USP units of heparin

Administer platelets (as necessary)

- 7. Seizure prophylaxis** (if indicated: high risk, ongoing bleeding, GCS<10, intubated, recurrent, delayed or recent seizure) + trauma patients

**Levetiracetam** (Keppra) loading dose 20-60 mg/kg, over 5-15 minutes



## 8. Other medications

**Ondansetron** 4 mg IV q6-8h PRN for nausea

**Acetaminophen** 650-1000 mg PO q4-6h PRN for analgesia

OR

Low dose **morphine** 2-5 mg IV q1-2h PRN for analgesia

(avoid NSAIDs due to bleeding risk)

Consider **TXA** if early injury in trauma patients

## 9. Disposition

Consult **neurosurgery +/- ICU** – for close monitoring and serial imaging OR definitive management including surgical evacuation of the hematoma if indicated, especially large epidural hematomas with midline shift

Alternatively, perform Burr hole IF GCS <8, imaging suggestive of epidural hematoma causing large midline shift, evidence of unequal, fixed pupils AND if timely neurosurgical intervention is not available.

(see <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3352313/>)

For small epidurals managed conservatively, admit for observation and repeat imaging.

### References:

Bullock MR et al. Surgical Management of Traumatic Brain Injury: Guidelines. *Neurosurgery*. 2006.

UpToDate (2024). "Epidural hematoma in adults: Clinical features and management."

Brain Trauma Foundation Guidelines for Severe TBI (4th ed.), 2016

Bullock et al., 2006. *Surgical management of acute epidural hematomas*. *Neurosurgery*, 58(Supplement\_3), pp.S7-S15

Wells, D. L., Swanson, J. M., Wood, G. C., et al. (2012). *The relationship between serum sodium and intracranial pressure when using hypertonic saline to target mild hypernatremia in patients with head trauma*. *Critical Care* (London, England), 16(5), R193. <https://doi.org/10.1186/cc11678>



# Facial Trauma, Skull Fracture

## 1. ABCDE pearls

**Airway, Breathing:** monitor for severe bleeding and oral debris compromising airway. Remove debris as necessary. Monitor for expanding neck hematoma, air bubbling through wounds, or brisk bleeding, and consider intubation and cricothyrotomy as necessary.

**Circulation:** Monitor for hypotension secondary to hemorrhage/hemorrhagic shock. Direct pressure to any suspected arterial bleeds. Resuscitate as needed.

**Disability:** Assess GCS, perform neurological examination for FNDs secondary to head injury.

**Exposure:** expose the rest of the body for other signs of trauma, bleeding.

## 2. Positioning

Elevate head of bed to reduce facial swelling.

## 3. Wounds assessment

Assess wounds for damage to underlying structures (eg. tendons, nerves). Clean, debride, and close simple wounds (see 6. Disposition).

## 4. Fracture assessment

**Orbit:** consult ophthalmology for assessment.

**Nose:**

1. Drain septal hematoma if present to prevent infection and necrosis
2. Ice and head elevation to reduce swelling prior to reduction
3. Discuss with plastic surgery optimal timing of reduction of nasal bone fractures presenting within 2 hours of injury
4. Consult plastic surgery for all other nasal bone fractures



Midface/LeFort fractures: Consult plastic surgery.

## 5. Infection prophylaxis

Administer tetanus vaccine for open wounds if tetanus status unknown.

Antibiotics are not required for simple facial wounds, except for:

- Bite wounds (see *Bites*) or grossly contaminated wounds
- Wounds with any evidence of compromised perfusion
- Buccal mucosa penetration
- Exposed ear or nose cartilage
- Sinus involvement
- Mandibular involvement
- CSF leak
- Open facial fractures

Open fractures involving skin only:

**Cefazolin 1 g PO q12h**

Otherwise:

**Amoxicillin-clavulonate 875-125 mg BID**

## 6. Disposition

**Consult** interventional radiology for arterial embolization for cases of heavy uncontrollable facial bleeding.

**Consult** plastic surgery for facial fractures if surgical repair needed.

**Consult** ENT and plastic surgery for nose fracture.

**Consult** ophthalmology for orbital fractures.

**Consult** trauma surgery and/or maxillofacial surgery and/or neurosurgery and/or ENT for high risk facial fractures (nasoethmoid fractures, zygomatic arch fractures associated with trismus, LeFort-type fractures of the midface and facial fractures with multiple significant injuries).



References:

Goormans F, Coropciuc R, Vercruyse M, Spriet I, Willaert R, Politis C. Systemic Antibiotic Prophylaxis in Maxillofacial Trauma: A Scoping Review and Critical Appraisal. *Antibiotics (Basel)*. 2022 Apr 5;11(4):483. doi: 10.3390/antibiotics11040483. PMID: 35453234; PMCID: PMC9027173.

Mayersak RJ. Initial evaluation and management of facial trauma in adults. UpToDate [Internet]

Skin laceration repair with sutures – Role of prophylactic antibiotics. UpToDate [Internet]



# Subarachnoid Hemorrhage

## 1. ABCDE pearls

**Airway, Breathing:** ensure airway protection, watch for altered level of consciousness, GCS <8, vomiting or seizures (risk of aspiration) and perform neuroprotective intubation accordingly, if indicated.

Watch out for neurogenic pulmonary edema.

**Circulation:** assess for signs of shock (hypotension, tachycardia), or signs of Cushing's triad (bradycardia, hypertension, Cheyne-Stokes respirations).

**Disability:** continually reassess GCS for signs of re-bleed or raised ICP. Assess for focal neurological deficits, pupillary changes. Can use POCUS to visualize the optic nerve sheath diameter to look for signs of elevated ICP. Watch out for hyponatraemia (cerebral salt wasting/ SIADH).

**Exposure:** assess for toxidromes (cocaine-induced SAH). Look for signs of trauma, scalp fractures or hematomas (SAH mimicker).

## 2. Monitoring:

closely monitor BP and O<sub>2</sub> saturation, strict I/Os, neuro vitals hourly, continuous EEG.

## 3. Oxygen:

O<sub>2</sub> therapy to target spO<sub>2</sub> of >94% to avoid hypoxic injury

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

## 4. Neuroprotection

- Head of the bed at 30 degrees
- Maintain normoglycemia and normoxia
- Pain control
- Maintain normothermia



- Prevent anemia: higher threshold for transfusion in brain bleeds (No clear consensus but aim >80mg/dL)
- Prevent hypoxia: balance between vasoconstriction and vasodilatation

## 5. Avoid vasospasm and DCI (for aneurysmal SAH)

**Nimodipine** 60 mg PO q4h (30 mg q2h if hypotensive) for up to 21 days

## 6. Blood pressure control (target SBP <160 mmHg or MAP <110 mmHg)

**Aneurysmal SAH** (aggressive BP control indicated)

**IV labetalol** 10-20 mg over 1-2 minutes (bolus, repeat q5-10min as needed) or 0.5-2 mg/min infusion

OR

**IV nicardipine** infusion 5 mg/hour (titrate up by 2.5 mg/hour q5-15min)

Note: careful titration to AVOID HYPOTENSION and maintain CCP

**Non-aneurysmal SAH** (less aggressive BP control indicated)

Avoid BP >180 mmHg, but permissive hypertension often acceptable

If hypotensive → give **LR/NS** 500-1,000 mL bolus

## 7. Manage raised ICP (if clinically indicated)

**3% NaCl** 100-250 mL IV bolus over 10-15 min

AND/OR

**Mannitol** at 1g/kg IV bolus over 15 minutes

Allowing permissive hypernatraemia in hyperosmolar therapies 145-155 mmol/L



## 8. Prevent re-bleeding: reverse anticoagulation

### ***For warfarin reversal***

**Vitamin K** 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

**PCC** 25 units/kg (INR 2-4)

OR

35 units/kg (INR 4-6)

OR

50 units/kg (INR >6)

### ***For dabigatran reversal***

**Idarucizumab** 2 x 2.5 mg within 15 minutes from one another

### ***For apixaban, rivaroxaban reversal***

#### **Andexanet alfa**

4 mg/min infusion for 2 hours

(apixaban <5 mg or rivaroxaban <10 mg, last dose >7 hrs ago)

OR

8 mg/min infusion for 2 hours

(apixaban >5 mg or rivaroxaban >10 mg, last dose <7 hrs ago)

OR

**PCC** 25 units/kg, then repeat INR

### ***For heparin reversal***

**Protamine sulfate** 1-1.5 mg IV per 100 USP units of heparin



Administer platelets (as necessary)

## 9. Seizure prophylaxis (if indicated: high risk, aneurysmal SAH, ongoing bleeding, GCS<10, intubated, recurrent, delayed or recent seizure)

Seizure prophylaxis can also be started initially for 3-7 days and discontinued if patient does not develop seizures.

**Levetiracetam** (Keppra) loading dose 20-60 mg/kg, over 5-15 minutes

## 10. Supportive care

**Ondansetron** 4 mg IV q6-8h PRN for nausea

**Acetaminophen** 650-1000 mg PO q4–6h PRN for analgesia

OR

Low dose **morphine** 1-2 mg IV q1-2h PRN for analgesia

(avoid NSAIDs due to bleeding risk)

+/- **Gabapentin** has been shown to relieve meningeal irritation

Central fever is very common in SAH – treat aggressively to prevent secondary brain injury (acetaminophen + active cooling strategies. See [Hyperthermia](#)).

## 11. Disposition

Consult **neurosurgery** for definitive management (endovascular coiling or embolization, aneurysm clipping, flow diversion or resection, EVD).

+/- **ICU** for ALL aneurysmal SAH, or non-aneurysmal SAH with hemodynamic instability, raised ICP or altered patients.

### References:

Helman, A. (2024) Ep 195 Management of Subarachnoid Hemorrhage. Emergency Medicine Cases, 28 May



Connolly ES et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage: A guideline update from the American Heart Association/Stroke Association. *Stroke*. 2023;54:e89-e114.

Steiner T et al. European Stroke Organization guidelines for the management of intracranial aneurysms and SAH. *Int J Stroke*. 2023.

Wijdicks EFM. Clinical scales in SAH. *Neurocrit Care*. 2015.

NCS and Neurocritical Care Society recommendations for neuroprotection and monitoring

Wells, D. L., Swanson, J. M., Wood, G. C., et al. (2012). The relationship between serum sodium and intracranial pressure when using hypertonic saline to target mild hypernatremia in patients with head trauma. *Critical Care* (London, England), 16(5), R193. <https://doi.org/10.1186/cc11678>



## Subdural Hematoma

### 1. ABCDE pearls

**Airway, Breathing:** ensure airway protection, watch for altered level of consciousness, GCS <8, signs of herniation (FNDs, unequal pupils, abnormal respirations) and perform neuroprotective intubation accordingly, if indicated.

**Circulation:** assess for signs of shock (hypotension, tachycardia), or signs of Cushing's triad (bradycardia, hypertension, Cheyne-Stokes respirations).

**Disability:** continually reassess GCS for signs of progression of bleed or raised ICP as SDH can cause rapid deterioration of neurologic status. Assess for focal neurological deficits, lateralizing signs, pupillary changes.

**Exposure:** look for signs of trauma, scalp fractures or hematomas.

### 2. Monitoring: closely monitor BP and O<sub>2</sub> saturation, neuro vitals hourly.

### 3. Oxygen: O<sub>2</sub> therapy to target spO<sub>2</sub> of >94% to avoid hypoxic injury

Escalate as necessary:

NP → Venturi mask → non-rebreather mask → high-flow

Hyperventilate **ONLY** if signs of herniation are present (target PaCO<sub>2</sub> 30-35 mmHg)

### 4. Neuroprotection

- Head of the bed at 30 degrees
- Maintain normoglycemia and normoxia
- Maintain cerebral perfusion pressure by preventing hypotension (see below)



## 5. Blood pressure control (target SBP <140 mmHg)

**IV Labetalol** 10-20 mg over 1-2 minutes (bolus, repeat q5-10 minutes as needed) or 0.5-2 mg/min infusion

OR

**IV Nicardipine** infusion 5 mg/hr (titrate up by 2.5 mg/hour q5-15 min)

Note: careful titration to AVOID HYPOTENSION and maintain CCP

If hypotensive → start with 1-1.5 mL/kg/h NS or LR infusion

## 6. Manage raised ICP (if clinically indicated)

**3% NaCl** 250 mL IV bolus over 10-15 min

AND/OR

**Mannitol** at 1g/kg IV bolus over 15 minutes

## 7. Reverse anticoagulation

### *For warfarin reversal*

**Vitamin K** 5-10 mg IV slow infusion (repeat in 12-24h based on INR)

AND

**PCC** 25 units/kg (INR 2-4)

OR

35 units/kg (INR 4-6)

OR

50 units/kg (INR >6)

### *For dabigatran reversal*

**Idarucizumab** 2 x 2.5 mg within 15 minutes from one another



### ***For apixaban, rivaroxaban reversal***

#### **Andexanet alfa**

4 mg/min infusion for 2 hours

(apixaban <5 mg or rivaroxaban <10 mg, last dose >7 hrs ago)

OR

8 mg/min infusion for 2 hours

(apixaban >5 mg or rivaroxaban >10 mg, last dose <7 hrs ago)

OR

**PCC** 25 units/kg, then repeat INR

Administer platelets (as necessary)

### ***For heparin reversal***

**Protamine sulfate** 1-1.5 mg IV per 100 USP units of heparin

Administer platelets (as necessary)

## **8. Seizure prophylaxis** (if clinical or electrographic seizures, cortical involvement, low level of consciousness, or no EEG availability)

**Levetiracetam** (Keppra) loading dose 20-60 mg/kg, over 5-15 minutes

## **9. Other medications**

**Ondansetron** 4 mg IV q6-8h PRN for nausea

**Acetaminophen** 650-1000 mg PO q4-6h PRN for analgesia

OR

Low dose **morphine** 2-5 mg IV q1-2h PRN for analgesia



(avoid NSAIDs due to bleeding risk)

## 10. Disposition

Consult **neurosurgery STAT**: can admit to floor or step down if GCS >13, stable, no high risk features on CT (midline shift, herniation etc.), not on anticoagulation, no seizures, protecting airway, non-operative management indicated

+/- **ICU** if GCS <13, midline shift > 5mm, cisternal effacement, mass effect, signs of herniation, failed extubation, suboptimal anticoagulation reversal, status/refractory seizures, or while awaiting neurosurgical intervention.

Can **discharge** patient if GCS 15, no progression of bleed on repeat CT in 6 hours, no focal neurological signs, stable gait, and reliable social situation

### References:

Greenberg, M.S., 2019. Handbook of Neurosurgery. 9th ed.

Hemphill, J.C. et al., 2015. Guidelines for the management of spontaneous intracerebral hemorrhage. *Stroke*, 46(7), pp.2032–2060.

Edlmann, E. et al., 2017. Pathophysiology of chronic subdural haematoma: inflammation, angiogenesis and implications for pharmacotherapy. *The Lancet Neurology*, 16(10), pp.846–855

UpToDate, 2024. Spontaneous subdural hematoma: Clinical features, diagnosis, and management.

Delgado Almandoz, J.E. et al., 2010. Diagnostic accuracy and yield of multidetector row CT for the emergency evaluation of acute subdural hematoma. *AJNR American Journal of Neuroradiology*, 31(3), pp.495–500

National Institute for Health and Care Excellence (NICE), 2021. *Head injury: assessment and early management*.

Naidech, A.M. et al., 2009. Anticonvulsant prophylaxis and seizure incidence following intracerebral hemorrhage. *Neurocritical Care*, 10(1), pp.27–32.



# Procedures

Abscess Drainage	310
Cardioversion (Electrical)	312
Digital Nerve Block	313
eFAST Scan	315
Foley Catheter Insertion	319
Intubation	321
Joint Aspiration	326
Laceration Repair	328
Nasogastric Tube Insertion	332
Needle Thoracostomy	334
Pigtail Chest Tube Insertion	336
Procedural Sedation	338
Splinting and Casting	340
Thoracocentesis	343
Tonometry	345



## Abscess Drainage

The most common types of abscesses are **cutaneous** arising from skin and soft tissue infections. Cutaneous abscesses can occur in the extremities, trunk, axilla, or groin. These can usually be drained in the ED:

Other types that can be managed in the ED are: superficial perianal, bartholin glad, paronychia/felon (fingers/toes), and sometimes dental.

General surgery should be consulted for deep perianal and pilonidal abscesses. ENT should be consulted for all peritonsillar abscesses and deep neck abscesses. Gynecology should be consulted for breast abscesses.

### Steps for simple cutaneous abscess I&D

Supplies: Size 11 and 15 scalpel, sterile drapes, gauze, towel, chlorhexidine swabs, 1 to 2% lidocaine in 5 mL syringe with 18-22 gauge needle, and adhesive bandage/dressing.

Brief overview video of procedure:

<https://www.youtube.com/watch?v=PtIcL7PbR18>

1. Clean the area well with chlorhexidine swabs and apply appropriate draping around the abscess
2. Infiltrate local into the skin surrounding the abscess. DO NOT inject directly into the abscess.
3. Clean the area again with either alcohol swabs or chlorhexidine, and drape with sterile drapes.
4. Make a small incision at the center of the abscess using a size 11 scalpel. Express liquid through the opening by pushing the sides of the abscess.
5. If fluid cannot be expressed, slowly expand the incision. You can initially make the incision wider using a scalpel. Additionally, if there is concern for loculations, you can introduce scissors into the incision and open-close them inside the abscess to break up the loculations.
6. If indicated, collect fluid using a syringe and place in specimen containers.



7. Once the abscess is drained, irrigate thoroughly with saline in a syringe attached to an angiocath and remove any debris.
8. Depending on the size of the abscess, it may be necessary to apply packing soaked with chlorhexidine.
9. Apply dressing

References:

- Streitz, M. J. (2025, May 2025). *How to incise and drain an abscess*. In Merck Manual Professional Version. Merck & Co., Inc.
- Pastorino, A., & Tavarez, M. M. (2020, July 24). *Incision and drainage*. In StatPearls. StatPearls Publishing.
- Dr. Geoff Butler. (2023, Jan 24). *Drainage of an arm abscess* [Video]. Youtube.



## Cardioversion (Electrical)

Electrical cardioversion delivers shocks that are synchronous to an arrhythmia. This is typically done when the arrhythmias are unstable.

Atrial fibrillation, atrial flutter, ventricular tachycardia, and paroxysmal SVT can all be cardioverted.

After preparation has been completed (i.e., monitors, 3-lead ECG, IV insertion, procedural sedation, consent):

1. Select synchronized mode on the defibrillator.
2. Select energy (120-200 joules for a-fib; 50-100 joules for a-flutter, **and** SVT and VT)
3. Verbalize intent to shock and ask all participants to “clear” from bed
4. Ensure all participants in the room repeat back “clear”
5. Press the charge button, await for the button to appear red and then hold the button down
6. Assess monitor for rhythm
7. If the first shock was unsuccessful, up to three shocks may be delivered, at higher energy.

### References:

Lozzi, L. (2020). *Squid's Little Pink e-Book: A Pocket Guide for Emergency Doctors*. Elsevier Health Sciences.

Anjum, O., Endres, K., Khorsand, S., Huebener, N., Syed, S. (Ed.). (2025, July). *Ottawa Handbook of Emergency Medicine* (6th ed.). University of Ottawa. Available at:  
[https://emottawablog.com/sdm\\_downloads/ottawa-handbook-of-emergency-medicine-6th-edition/](https://emottawablog.com/sdm_downloads/ottawa-handbook-of-emergency-medicine-6th-edition/)



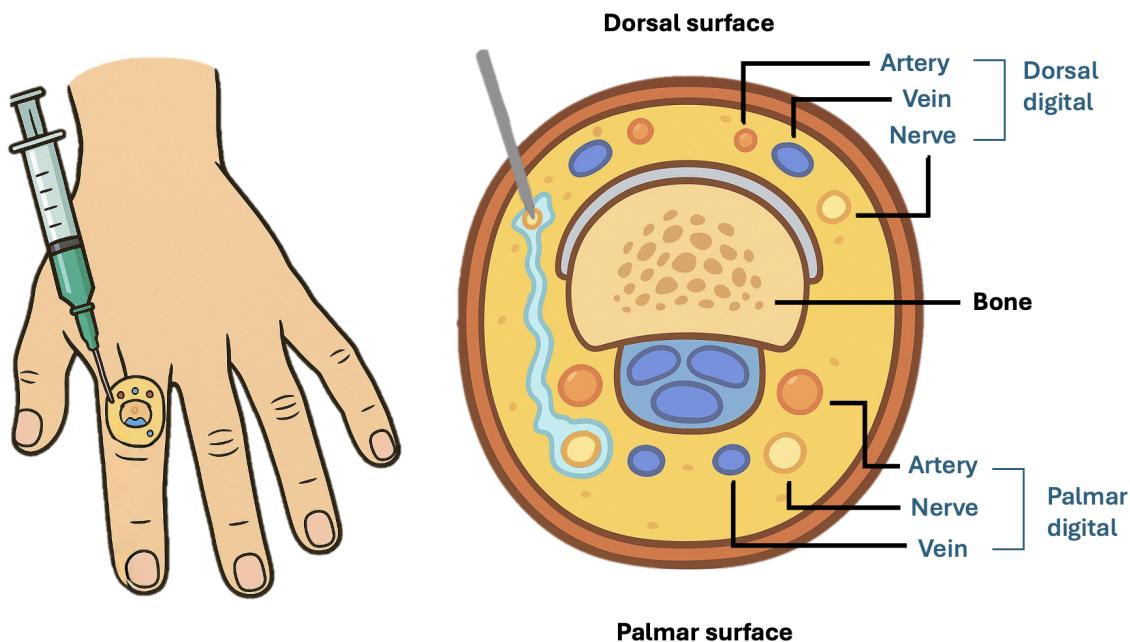
## Digital Nerve Block

### Traditional ring block (two-injection technique)

\*Note: First toe and thumb may require alternative techniques; refer to linked references

Supplies: Lidocaine in 5 mL syringe with 18 gauge needle, alcohol wipes, gauze

In this approach, anesthetic is infiltrated into the two adjacent web spaces of the finger that requires repair.



1. With the palm of the hand facing upwards, locate the MCP joints of the affected finger and of the two adjacent fingers, and identify the webspaces.
2. Insert the needle into one of the dorsal web spaces of the finger where the crease of the palm meets the hand. Slowly advance the needle, bringing it toward the palmar surface being careful to not pierce through the palmar skin.
3. Aspirate to confirm blood vessels have not been hit, then slowly inject 1-3 mL of lidocaine while withdrawing the needle.
4. Repeat steps 2-4 for the other webspace of the affected finger.



5. Gently massage the injection areas for about 30 seconds to help spread the anesthetic.

Tips: Injecting the lidocaine **slowly** is the most effective way to reduce pain patients experience during a ring block.



## eFAST Scan

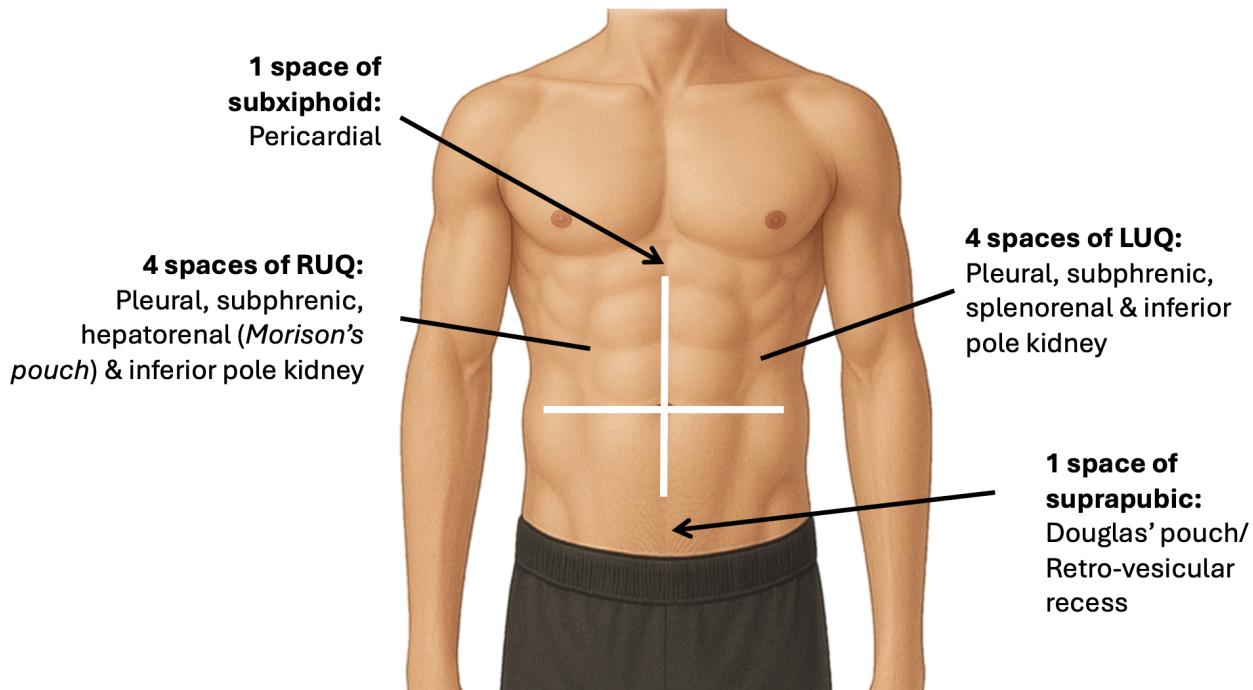
Step-by-step videos:

<https://www.youtube.com/watch?v=bsKBhAkp3fI>

<https://www.youtube.com/watch?v=LrCt0o30ygY>

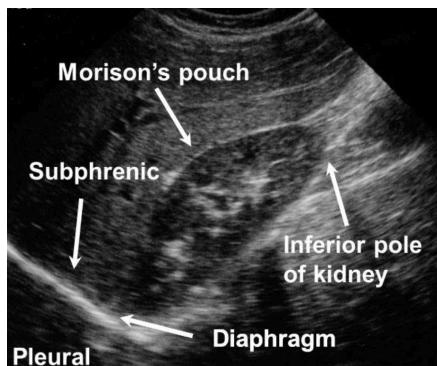
<https://www.youtube.com/watch?v=Xv0abFuo5gY>

eFAST scans are performed with the **curvilinear probe**. Five views are assessed: RUQ (Morison's pouch), LUQ (splenorenal), suprapubic, subxiphoid/parasternal, and lung views.

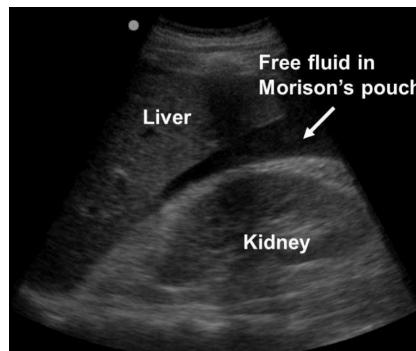




- 1. RUQ (Morrison's pouch):** Hold the probe longitudinally with probe marker towards the head and place at the mid-axillary line. Visualize the liver, kidney, and diaphragm. Sweep through the entirety of the area. Look for fluid/blood (will appear as black anechoic area) in the hepatorenal space, around the liver, and above the diaphragm.



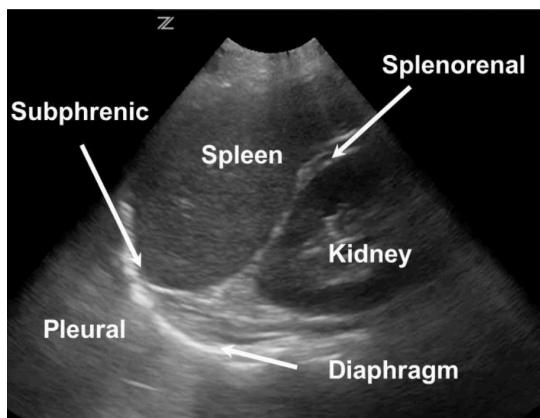
**NORMAL**



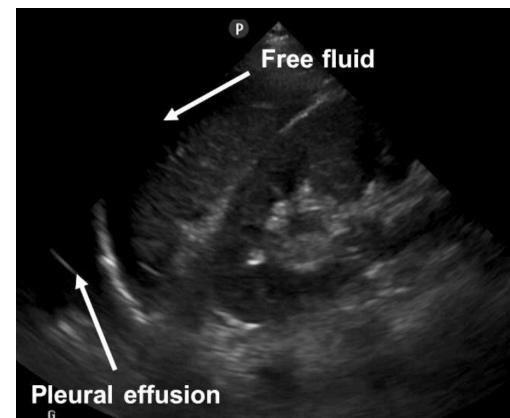
**ABNORMAL**

Hsu CH, Menaker J. Ultrasound for Trauma. Clinician.com; AHC Media. January 1 2016.

- 2. LUQ (Splenorenal):** Hold the probe longitudinally with probe marker towards the head and place at the posterior axillary line. Visualize the spleen, kidney, and diaphragm. Sweep through the entirety of the organs. Look for free fluid in the splenorenal recess or above and below the diaphragm.



**NORMAL**

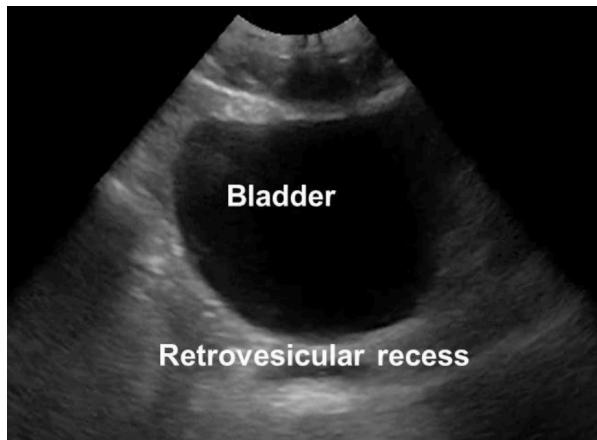


**ABNORMAL**

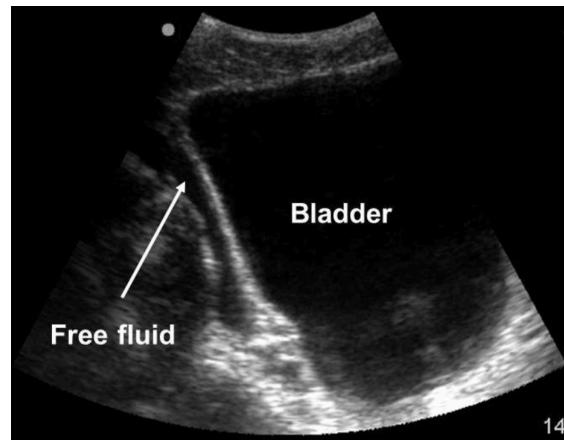
Hsu CH, Menaker J. Ultrasound for Trauma. Clinician.com; AHC Media. January 1 2016.



**3. Suprapubic:** Hold the probe marker longitudinally with probe marker towards the head and visualize the bladder. Then hold the probe marker transverse and visualize the bladder. Look for free fluid behind the bladder in pouch of Douglas (in females) and rectovesicular pouch (males).



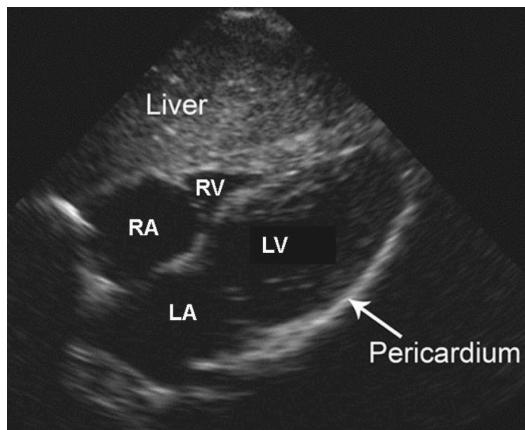
**NORMAL**



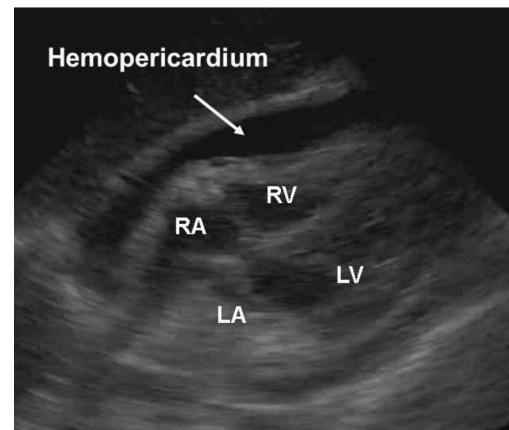
**ABNORMAL**

Hsu CH, Menaker J. Ultrasound for Trauma. *Clinician.com; AHC Media*. January 1 2016.

**4. Subxiphoid:** Hold probe below xiphoid angled towards the heart and look for a pericardial effusion. Alternative is parasternal long-axis view if heart view is difficult.



**NORMAL**



**ABNORMAL**

Hsu CH, Menaker J. Ultrasound for Trauma. *Clinician.com; AHC Media*. January 1 2016.



- 5. Lung slide:** Hold the probe longitudinally over the 2nd or 3rd intercostal space. Look for movement of pleura which will appear as “ants on a string.” Absence of lung slide suggests a pneumothorax.

References:

POCUS Geek. (2021, Jun 26). POCUS - Extended Focused Assessment with Sonography in Trauma (EFAST) - Revised 2021 [Video]. YouTube.

Radiology Nation. (2018, May 4). Ultrasound Tutorial: FAST (Focused Assessment with Sonography for Trauma) scan | Radiology Nation [Video]. YouTube.

Harvard Medical School Continuing Education. (2022, Nov 18). FAST Exam: Focused Assessment with Sonography in Trauma [Video]. YouTube.

Hsu CH, Menaker J. Ultrasound for Trauma. *Clinician.com; AHC Media*. January 1 2016.



# Foley Catheter Insertion

## Insertion in female patient

Step-by-step: <https://www.youtube.com/watch?v=fGCwMWod3BM&t=178s>

Obtain a catheter kit. It will include the following supplies: sterile drapes, cotton balls, plastic pick ups, gloves, and lubricant.

Also obtain a catheter (12-16 Fr), iodine, local anesthetic gel, water in a syringe (for inflating the catheter balloon), and sterile gloves.

1. Position the patient supine
2. Set up a sterile field around the perineal area using drapes.
3. Don PPE including sterile gloves.
4. Thoroughly clean the vulva and perineum with iodine.
5. If available, insert local anesthetic gel into urethral meatus (will take effect in 3-5 minutes).
6. Lubricate the catheter tip and keep it held in one hand. Use the other hand to part the labia and insert the catheter into the urethral meatus.
7. Once urine begins flowing out, advance the catheter 2-3 cm more.
8. Inflate the balloon with 10 mL of water and connect the catheter to the bag.
9. Secure the catheter to the leg with tape.
10. Dispose of used equipment.

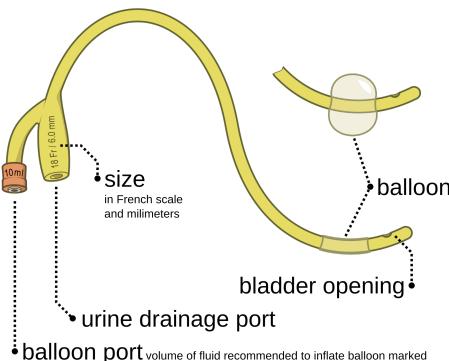


Image: *Foley catheter*. (n.d.). [Diagram]. Wikipedia.



## Insertion in male patient

Step-by-step of insertion in a male patient:

<https://www.youtube.com/watch?v=hKiakPX6AdQ>

1. Obtain a catheter kit. It will include the following supplies: sterile drapes, cotton balls, plastic pick ups, gloves, and lubricant.
2. Also obtain a catheter (12-14 Fr), iodine, local anesthetic gel, water in a syringe (for inflating the catheter balloon), and sterile gloves.
3. Position the patient supine with knees flexed.
4. Set up a sterile field around the perineal area using drapes.
5. Don PPE including sterile gloves.
6. Thoroughly clean the penis and surrounding area in the direction away from the urethral meatus
7. If available, insert local anesthetic gel into urethral meatus (will take effect in 3-5 minutes)
11. Lubricate the catheter tip and keep it held in one hand. Use the other hand to gently pull and hold the penis upwards and insert the catheter into the urethral meatus.
12. Once urine begins flowing out, advance the catheter 2-3 cm more.
13. Inflate the balloon with 10 mL of water and connect the catheter to the bag.
14. Secure the catheter to the leg with tape.
15. Dispose of used equipment.

### References:

Geeky Medics. (2025, Jan 7). *Female Catheterization* [Video]. YouTube.

Geeky Medics. (2025, Jan 7). *Male Catheterization* [Video]. YouTube.



## Intubation

Step-by-step video: <https://www.youtube.com/watch?v=zEMvu3j6yN4>

Detailed description with videos of the 7 Ps (HIGHLY RECOMMENDED):  
<https://iem-student.org/rapid-sequence-intubation-rsi/>

**Supplies:** Can be remembered by **SOAPME**:

**Suction:** at least one working suction, place in between mattress

**Oxygen:** non-rebreather and BVM attached to 15 LPM of O<sub>2</sub>

(Optional additional passive oxygenation with nasal cannula at maximum flush throughout laryngoscopy from additional oxygen source (tank))

**Airway equipment:** ETT size 7.5 with stylet fits for most adults, 7.0 for smaller females, 8.0 for larger males. Test balloon by inflating 10 mL of air with syringe

- **Stylet:** place inside of ETT for rigidity. Ensure that it stops before the eyelet. Curve the end of the tube starting at the proximal end of the cuff in the shape of a hockey stick
- **Blade:** Mac 3 or 4 for adults (curved)
- **Handle:** attach blade to handle and ensure light works, turn it off until you are ready to intubate
- **Backup:** ensure difficulty airway cart is nearby if necessary

**Pre-oxygenation:** 15 LPM NRB to obtain as high as possible O<sub>2</sub> saturation

- minimum 5 VC breaths or 2 min normal RR)

**Monitoring:** cardiac monitors, continuous SpO<sub>2</sub>, BP on opposite arm to IV

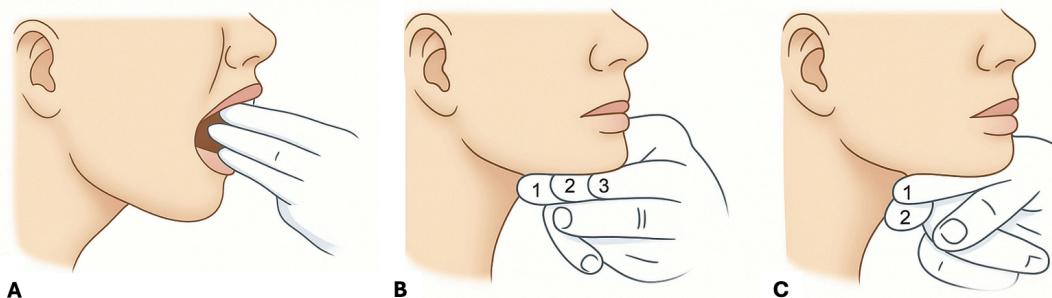
**End tidal CO<sub>2</sub>:** out of the package, keep sticker on until patient is intubated



## The 7 Ps

### 1. Preparation: assess for anatomically difficult airway using “LEMON”

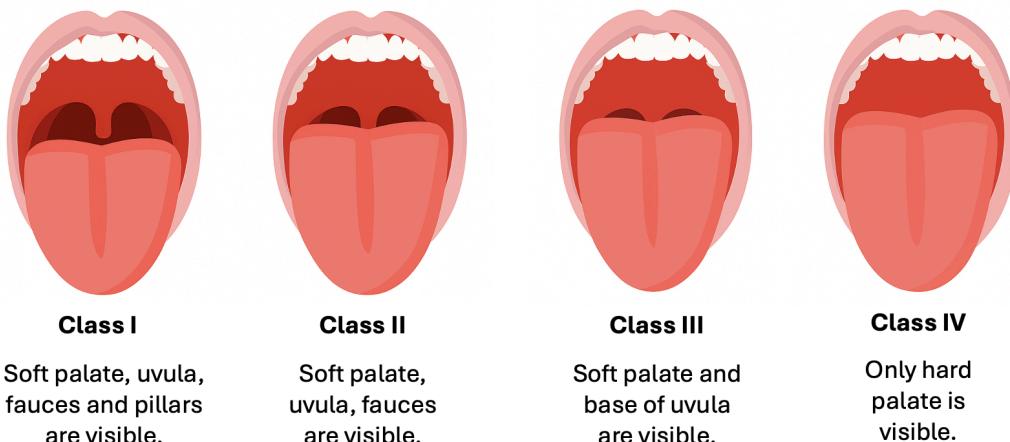
- Look: obese, incisors, beard, short neck, overbite, underbite
- Evaluate 3-3-2 rule: using 3 finger breadths to open mouth, 2 finger breadths from mandible to neck, and 2 finger breadths from neck to thyroid notch.



- Mallampati score: look inside mouth.

### MALLAMPTI SCORE

Assessment is done with the patient sitting in Fowler's position, mouth open and tongue fully protruded, while remaining silent (not saying “ahh”).



- Obstruction: loose teeth, stridor, masses, epiglottitis
- Neck mobility: neck/jaw surgeries or injuries (e.g., spinal fusion), medical conditions (e.g., alkylosing spondylitis), C-collar in situ



**2. Preoxygenation:** As time allows, provide 100% O<sub>2</sub> for 3 minutes via 15LPM NRB. Consider that certain populations may require a longer preoxygenation time and/or may be quicker to desat during apnea (e.g., pregnancy, obese, extremes of age).

**3. Pre-treatment:** In certain scenarios, medications can be used to reduce adverse response to laryngoscopy.

**Atropine** – Children <10 years old to prevent reflex bradycardia (0.02 kg/mg IV)

**4. Induction & paralytic:** Induce rapid loss of consciousness and paralysis

Options for **induction** agents are:

- **Etomidate:** Ultra short active sedative
  - Dose: 0.3 mg/kg IV
  - Onset: 30-45 seconds
  - Duration: 10 minutes
  - Considerations: contraindicated in sepsis
- **Ketamine:** PCP derivative for both analgesia and sedation-dissociative agent
  - Dose: 1-2 mg/kg IV or 3-4 mg/kg IM
  - Onset: 30-45 seconds
- **Propofol:** Ultra short-acting hypnotic with no analgesic properties
  - Dose: 2 mg/kg IV rapid push
  - Onset: 30-45 seconds
  - Considerations: May cause hypotension, not considered “hemodynamically safe,” contraindicated if vasodilated

\*For more details, refer to the [Procedural Sedation](#) section



Options for **paralytic** agents are:

- **Succinylcholine (“sux”)**

- Dose: 1.5-2 mg/kg IV, 3-4mg/kg IM
- Considerations: Causes transient rise in potassium, avoid in dialysis patients, crush injuries, history of malignant hyperthermia, or neuromuscular disorders.

- **Rocuronium**

- Dose: 1.2 -1.5mg/kg IV
- Considerations: Causes long paralysis

**5. Protection and positioning:** Elevate the head of the bed and extend the neck of the patient to the “sniffing position.” If the patient is under C-spine precaution, must perform with in-line stabilization. Essentially, remove the C-collar and have a second person holding the cervical spine stable with two hands. May need to use a cushion/blanket under the occiput in adults, or shoulders in kids, to achieve the forward neck position of the sniffing position.

**6. Placement of tube:** Hold the blade in your left hand always. Vocalize your view, ask your assistant for the ETT and for removal of the stylet once you visualize your ETT through the vocal cords. Ensure that the tube is placed at least 3 times the tube length at the level of the lips. Secure the tube with face tape or ETT holder. Ensure tube placement with capnography or alternatively with colometric capnographic device (yellow = yes), listen for equal breath sounds bilaterally, assess for equal chest rise and fall, and order a post-intubation X-ray.

**7. Post-intubation:** Have your sedation and analgesic medications prepared prior to intubation

- **Propofol:** Give bolus at 0.5 to 1 mg/kg IV then 20 mcg/kg/min and titrate upwards
- **Fentanyl:** Titrate 50-100 mcg IV (1 mcg/kg)



References:

Clinical Advisor. (2016). *Understanding the mallampati score infographic* [Infographic]. CA.  
<https://www.clinicaladvisor.com/features/understanding-the-mallampati-score/>

Anesthesia Key. (2016). *Identification of the Difficult and Failed Airway infographic* [Infographic].  
<https://aneskey.com/identification-of-the-difficult-and-failed-airway/>

Abuagla, Q. (n.d.). *Rapid Sequence Intubation (RSI)*. International Emergency Medicine Education Project.  
<https://iem-student.org/rapid-sequence-intubation-rsi/>

The Manual of Emergency Airway Management- Dr Ron Walls, et. al.  
<https://embasic.org/wp-content/uploads/2011/12/06-airway-show-notes.pdf>



## Joint Aspiration

### Knee Aspiration

Step-by-step video: <https://www.youtube.com/watch?v=l7ZMGYHtvZs>

Supplies: 20-60 mL syringe with a 18-12 gauge needle, syringe with 1 to 2% lidocaine, specimen containers, gloves, alcohol swabs, adhesive bandage, pillow/towel to place under knee

Parapatellar Approach:

Needle will enter into joint space from lateral / anterolateral / inferolateral or medial / anteromedial /interomedial to the patella.

1. Position patient supine and place pillow/towel under the knee so that it is slightly flexed (opens the joint space and relaxes quadriceps tendon)
2. Palpate the medial or lateral (depending on which side you wish to enter) aspect of the patella.
3. Once the edge is identified, insert the needle with the lidocaine towards the direction of the intercondylar notch, using the edge of the patella as a guide, while infiltrating local.
4. After 3-5 minutes, insert the large aspiration needle in the same track as the lidocaine. Again, use the edge of the patella as a guide and drive the needle underneath the patella.
5. Aspirate. If no fluid is drawn, withdraw the needle, change the direction slightly, and re-advance the needle.
6. If no aspiration is withdrawn from one side of the patella, try the other side.
7. Withdraw the needle once an adequate amount of fluid is collected and/or the patient feels relief from decreased pressure in the joint.
8. Inject the aspirate into TWO specimen containers; one for **cell count with differential**, and the other for **gram stain and culture and sensitivity**.
9. Apply adhesive bandage.



The other method is **suprapatellar** and it is often ultrasound-guided.

<https://www.youtube.com/watch?v=uytE2N7GrBk>

References:

Merck Manual Professional Editors. (n.d.). *How to do knee arthrocentesis* [Procedure overview]. In *Merck Manual Professional Version*.

Shlamovitz, G. Z., & Schraga, E. D. (2024, March 20). *Knee arthrocentesis*. In *Medscape*.

Clarius Mobile Health. (2023, Jun 14). *Knee Effusion Aspiration* [Video]. YouTube.

SteveMoraMD. (2021, Feb 21). *MoraMD: Knee Effusion Aspiration. A Nearly Painless Technique* [Video]. YouTube.



## Laceration Repair

There are many different types of lacerations you will encounter. The majority of lacerations encountered by a junior learner can be closed with simple interrupted sutures.

Contraindications to primary closure and indications for consultation with a plastic surgeon or other surgical specialist include grossly contaminated lacerations, animal bites, large/complex lacerations, and specialized repair necessary to ensure optimal cosmetic outcomes.

Below are basic principles for suturing:

### Local anesthetics

Typically, **1% lidocaine** (or Xylocaine) is used for local anesthetics. Opt for **lidocaine with epinephrine** for lacerations that are actively bleeding, due to its vasoconstriction effect. Maximum dose of lidocaine is 5mg/kg without epinephrine and 7mg/kg with epinephrine.

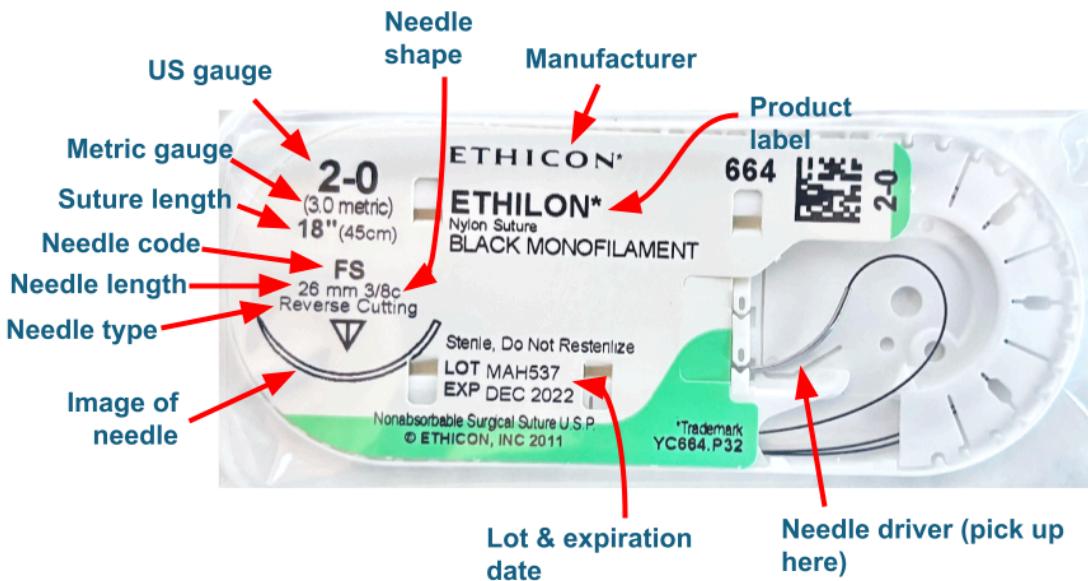
### Wound irrigation

The best way to clean a wound is to flush it thoroughly with **normal saline** and/or antiseptic fluid such as **chlorhexidine**. If there is debris in the wound, consider using a syringe filled with saline/water to shoot fluid into the wound with pressure; this may dislodge the debris.

### Suture types

Sutures can be non-absorbable or absorbable. Non-absorbable sutures such as Prolene are used for slow healing wounds. Absorbable sutures such as Vicryl and Vicryl Rapide are used for fast-healing wounds, and for buried stitches.

\*Note: the difference between Vicryl and Vicryl Rapide is the rate at which they are absorbed. Vicryl retains 75% of its strength at 14 days and 50% at 21 days whereas Vicryl Rapide retains 50% at 5 days and none at 14 days.



More information about suture types: <https://coreem.net/core/suture-materials/>

## Stitch types

The most versatile and common stitch in the ED is the simple interrupted.

Horizontal and vertical mattress should be used for areas with high tension.

Subcuticular suturing may be used for cosmetic purposes, particularly on the face.

## Steps for simple interrupted sutures

Supplies: Suture pack (non-absorbable monofilament for skin e.g. Nylon/Prolene 4-0 to 6-0 depending on site), suture tray (should include needle drivers, toothed forceps (Adson), suture scissors, sterile gauze, sterile drapes), saline for irrigation, antiseptic (chlorhexidine), local anaesthetic in syringe/needle

1. Irrigate wound copiously with normal saline and then dry with gauze. If the wound is bleeding, apply pressure for 3-5 minutes (use more pressure than you think is required).
2. Infiltrate local anaesthetic along the wound edges, entering from within the wound



3. While anesthetic sets in, open up the suture tray and create a sterile field. Suturing is a clean procedure but opt for a sterile technique when possible.
4. To load the needle, pick up the needle with the needle driver  $\frac{1}{3}$  of the way from the swaged end (where the needle meets the suture) and clamp down.
5. Starting from one end of the wound, lift one edge slightly and insert the needle through the skin 3-5 mm from the wound edge. Pass the needle in a curved arc and exit within the wound gap.
6. At this point, release your hold on the needle while holding the edge with the forceps, and reload your needle.
7. Perform the same motion on the other edge and come out of the dermis at the same depth and same distance on the opposite side. Always use wrist/forearm rotation to follow the curvature of the needle; DO NOT push the needle straight.
8. Thread the suture through until there is a 2-3 cm tail remaining outside the skin, then let go of your needle.
9. Place your needle driver (closed but not clamped) in the middle of the “V” that you have now created, and wrap the long tail (still attached to the needle), around the needle driver twice. Then grasp the short end with the pickups and pull through until snug.
10. Once your first knot is secured and tight, repeat steps 10 and 11 again, but with only one initial wrap around the needle driver.

*Note:* this should be done twice at minimum in order to secure the knot. You may opt for more “throws.”

11. Place the knot to one side of the laceration, and not directly over it.
12. Once the throws are complete, trim suture tails to ~3-5 mm.
13. Repeat the above steps until the wound is closed. Place interrupted sutures ~3-5 mm apart.
14. Apply antibiotic ointment if indicated and cover with sterile dressing.

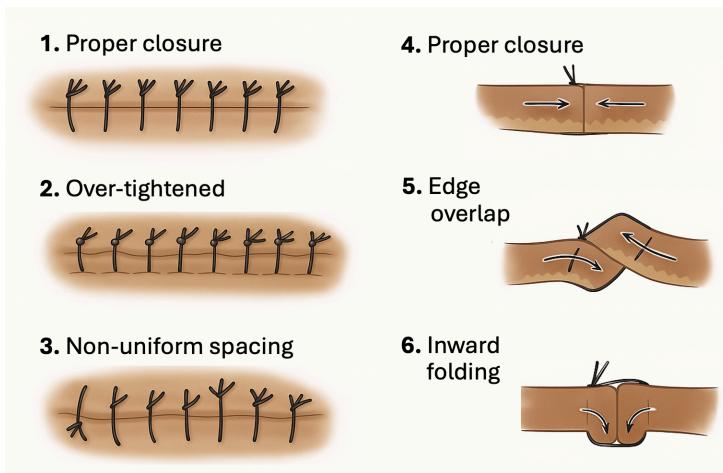


Image: *Figure 8: Achieving ideal tissue approximation requires consistent and meticulous technique.*

Correct simple suturing (1) will apply ideal tension across each stitch to avoid tissue strangulation (2) or uneven approximation (3).

The appearance of correct tissue approximation, as well as common pitfalls are demonstrated

Skin overlap (5) and inward folding (6) are some of the most common and easily avoidable errors that can seriously affect wound healing and lead to infection and other complications.

#### References:

Cohen-Gadol AA. *Suturing and Closure*. July 10, 2019. The Neurosurgical Atlas.

Forsch, R.T., Little, S.H. & Williams, C.W., 2017. Laceration Repair: A Practical Approach. American Family Physician, 95(10), pp.628–636.

Pérez-Bustillo A, González-Sixto B, Rodríguez-Prieto MA. Surgical principles for achieving a functional and cosmetically acceptable scar. *Actas Dermo-Sifiliogr (Engl Ed)*. 2013;104(1):17-28.



## Nasogastric Tube Insertion

Supplies: 14 gauge NG tube, lubricant jelly, 50-60mL syringe with catheter tip, cup of water, marker, emesis bag, tape/dressing, and towel

Demonstration video: <https://www.youtube.com/watch?v=fwvVdw3tzg0>

1. Don appropriate PPE including gloves, gown, and face shield
2. Elevate the head of the bed to 45-90 degrees.
3. Place a towel on the patient's chest.
4. Assess oropharynx and nasopharynx for possible obstruction (hematoma, deviated septum, polyps, enlarged tonsils, etc.)
5. Determine the appropriate length of the NG tube by measuring from the patient's earlobe or angle of mandible to the xiphoid process, and add 15 cm. Mark the length on the tube.
6. Apply lubricant to the end of the tube to aid in nasal passage.
7. Advance tube along the floor of the nasal cavity, aiming straight back and then down. Take note that the patient may gag once the tube reaches the oropharynx. Encourage the patient to take sips of water and swallow to aid in passage.
8. Assess proper tube placement. If there is any respiratory distress, difficulty speaking, change in voice, or violent gagging, the tube is probably in the trachea and should be removed immediately.
9. Once the stomach is suspected to have been reached, secure the tube by applying dressing/tape to nose and cheek.
10. Obtain a portable CXR to ensure correct placement (i.e., not coiled in the esophagus or down one of the bronchi). Note: cannot put anything through the tube until placement has been confirmed. Placement is correct when the tube goes straight down the esophagus, past the carina and diaphragm, and is coiled in the stomach.

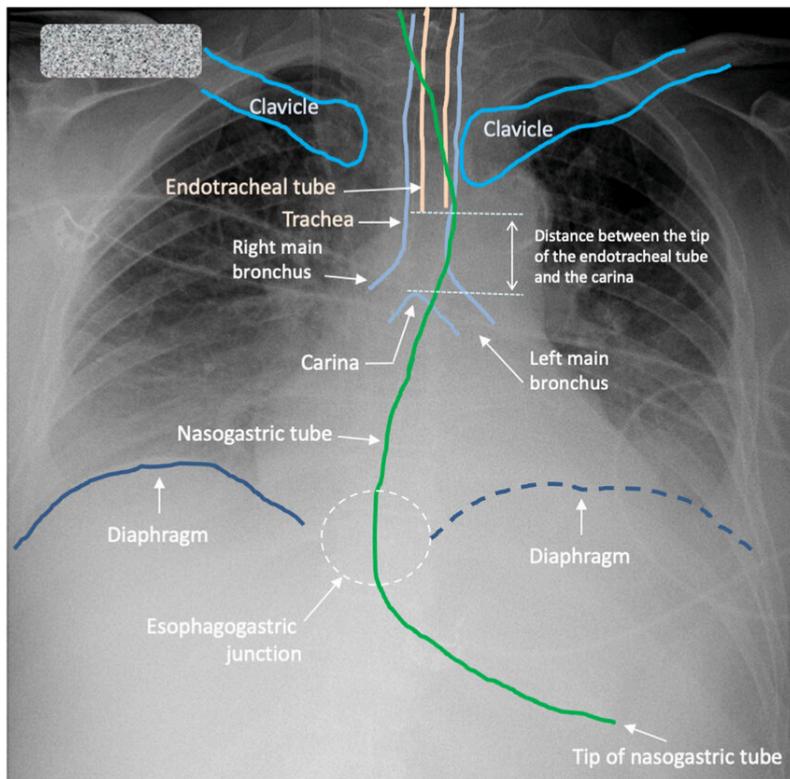


Image: *Figure 1. Endotracheal and nasogastric tube position and radiographic landmarks.* From *The accuracy of intensive care nurses' interpretation of chest radiographs to recognise misplacement of endotracheal and nasogastric tubes after a single training session and comparison with residents' interpretation* by Kamel et al., 2023, *Australian Critical Care*, 36(6), 948-954.

#### References:

Hamilton Health Sciences (2021) *How to insert your NG tube*. Hamilton Health Sciences. Available at: <https://www.hamiltonhealthsciences.ca/wp-content/uploads/2021/06/NG-Tube-How-To-Insert-1.pdf> (Accessed: 28 July 2025)

Lecturio Nursing (2021) *How to Insert an Nasogastric Tube Like a Pro: Complete Nursing Tutorial* [YouTube video], 30 November. Available at: <https://www.youtube.com/watch?v=fwvVdw3tzg0> (Accessed: 28 July 2025).

[https://www.merckmanuals.com/professional/gastrointestinal-disorders/how-to-do-gastrointestinal-procedures/how-to-insert-a-nasogastric-tube#Equipment\\_v47934087](https://www.merckmanuals.com/professional/gastrointestinal-disorders/how-to-do-gastrointestinal-procedures/how-to-insert-a-nasogastric-tube#Equipment_v47934087)

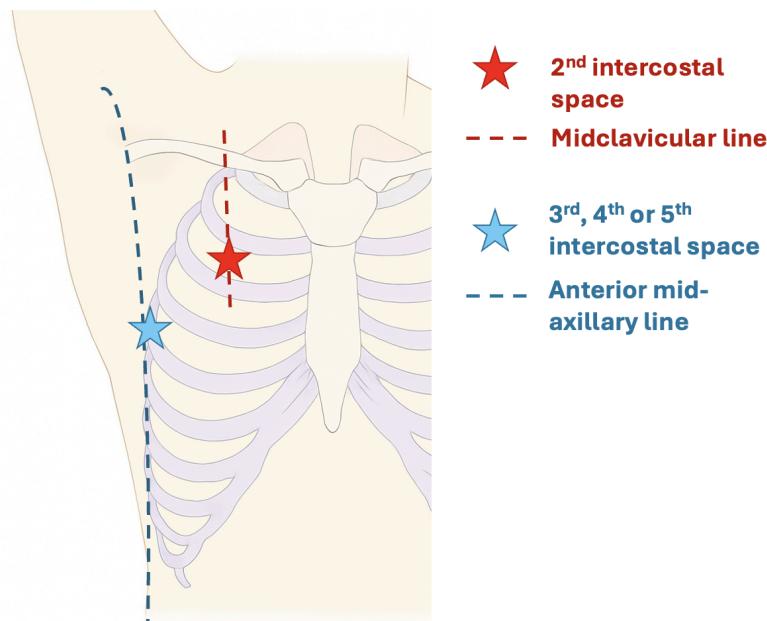


## Needle Thoracostomy

Step-by-step: <https://www.youtube.com/watch?v=2X3iGP3pIiQ>

Supplies: 14-16 gauge over-the-needle catheter, 10 mL syringe, antiseptic (chlorhexidine or iodine), sterile gloves +/- local anesthetic

1. Landmark your site of insertion, either the 2nd intercostal space at the mid-clavicular line or the 5th intercostal space at the mid-axillary line, on the affected side.



2. Prep the area by cleaning with antiseptic if time permits. Don sterile gloves and drape the area.
3. First place the needle/catheter into the insertion site for immediate decompression. Advance your needle until a “pop” is felt and/or there is loss of resistance.
4. After initial decompression, connect your needle/catheter to a 10 mL syringe and insert it along the superior margin of the 3rd rib at the mid-clavicular line or over the 5th rib at the mid-clavicular line.
5. Once in place, withdraw your needle and allow the angiocatheter to be open to air.



6. Then attach your catheter to tubing. The open end can be placed into a bottle of sterile water, which should be placed below the insertion site to avoid fluid being pulled into the pleural space, with bubbles indicating the flow of air.
7. A definitive tube for continued drainage can then be placed in a less urgent fashion.

**References:**

Dezube, R. (2025, May). *How to do needle thoracostomy (needle decompression)*. In *Merck Manual Professional Version*. Merck & Co., Inc.

Connors KM, Terndrup TE (1997). *Sites of needle depression and thoracostomy [Illustration]*. In Henretig FM, King C [eds]: *Textbook of Pediatric Emergency Procedures* (p 399). Williams & Wilkins.



## Pigtail Chest Tube Insertion

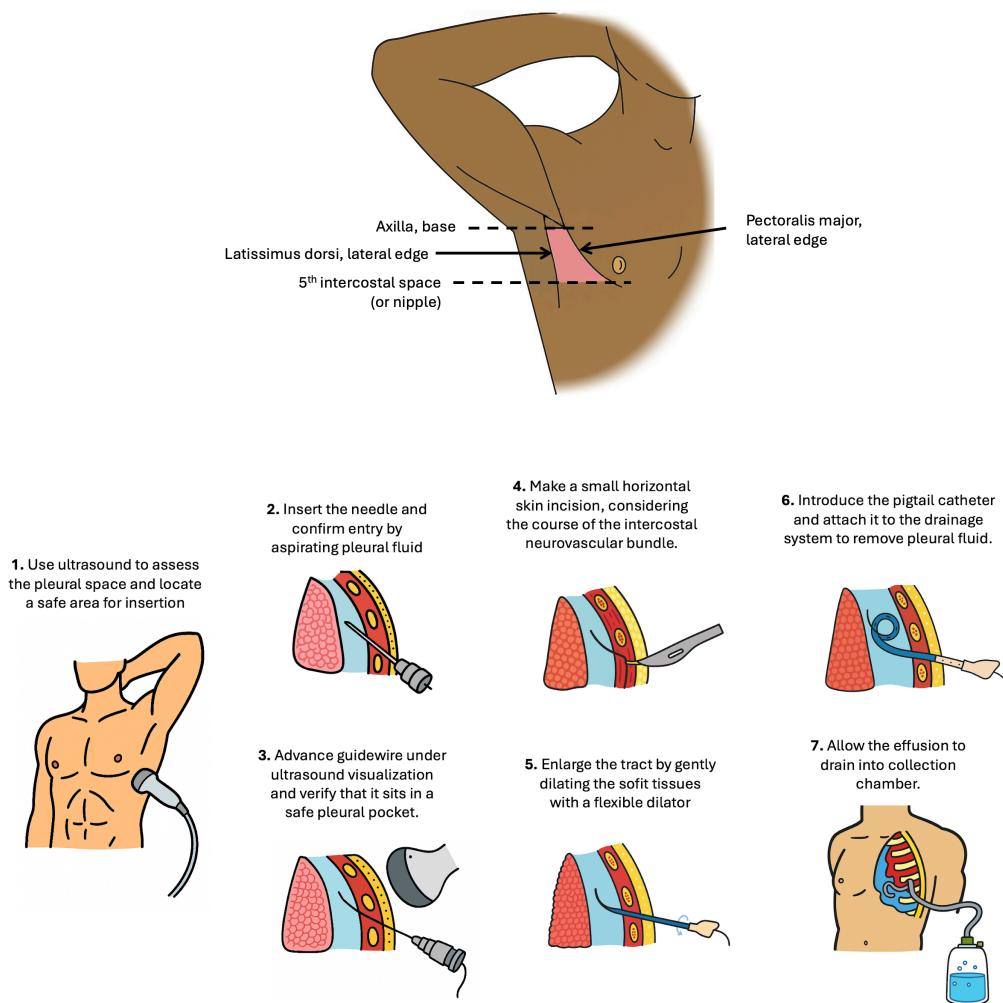
Step-by-step video: <https://www.youtube.com/watch?v=d4EOOvtqj6Y>

Supplies: chest tube kit (seeker needle and syringe, guide wire, scalpel, dilator, pigtail catheter and obturator), suture kit, 0 silk suture, sterile gloves, mask, cleaning supplies, local anesthetic.

1. Elevate patient at 45 angle with arm placed above the patient's head.
2. Landmark the insertion site, which is typically in the 4th or 5th intercostal space along the mid-axillary line.
3. Prep the area with iodine or chlorhex.
4. Inject local anesthetic at the landmark along the upper border of the 5th rib (recall: the neurovascular bundle runs underneath the ribs).
5. Note: can opt to use ultrasound for guidance and clearer visualization of anatomy (see below).
6. Insert the seeker needle into the landmarked site and advance; aspirate when advancing.
7. Once pleural space has been entered (loss of resistance with syringe, some hear or feel a “pop”), aspiration of air/fluid/blood. Remove your syringe from the needle and insert the guide wire.
8. Use a scalpel to make a small incision as the site of the wire entry.
9. Thread the dilator around the guide wire and push through the skin to enlarge the incision. **ENSURE THAT YOU DO NOT TAKE YOUR HAND OFF THE GUIDEWIRE.**
10. Remove the dilator from the guide wire and thread the pigtail catheter over the guide wire.
11. Advance the catheter to the second line, partially remove the obturator/guide wire, and continue advancing to the third line. Completely remove the obturator and guidewire.
12. Close the stopcock, connect the tubing for your chosen drainage system, and re-open the valve to allow air to escape.



13. Suture pigtail in place and apply occlusive dressing.
14. Ensure the valve is functioning by submerging into a cup of water. Ask the patient to cough. If coughing causes air bubbles to form in the water, the valve is functioning properly.
15. Order CXR to confirm placement and rule out complications.



#### References:

Lozzi, L. (2020). *Squid's Little Pink e-Book: A Pocket Guide for Emergency Doctors*. Elsevier Health Sciences.

EM Cases. (2021, Dec 13). *Pigtail catheter placement for pneumothorax* [video]. YouTube.

Hernandez, M. et al. "Figure 1 – British Thoracic Society's triangle of safety detailing anatomic borders for placement of chest tubes." *Tube Thoracostomy: Increased angle of insertion is associated with complications*, uploaded by Johnathon Aho on ResearchGate, 2016

Sedhai, Y. R. et al. "Illustration of ultrasound-guided percutaneous pigtail catheter insertion in the thoracic cavity and intrapleural fibrinolytic therapy description." *Therapeutic Advances in Respiratory Disease*, uploaded on ResearchGate.



## Procedural Sedation

1. Apply monitors, including O<sub>2</sub> saturation, cardiac monitoring, ETCO<sub>2</sub>, and BP (place cuff on the opposite side of IV line used for medication administration; cycling at least q5 mins)
2. Ensure respiratory therapy (RT) is present at bedside
3. Pre-oxygenate with supplemental oxygen
4. Choose and prepare medications. Shorter procedures (e.g. cardioversion) often require solely sedation, whereas longer procedures (e.g. fracture reduction) often require sedation with analgesia

### Sedatives

**Midazolam** 0.02-0.1 mg/kg IV

OR

**Ketamine** 0.5-1 mg/kg IV

OR

**Propofol** 0.2-0.5mg/kg IV

### Analgesics

**Fentanyl** 2-3 micrograms/kg

5. Administer your IV analgesia first. Then, administer sedatives in small aliquots to determine the patient's response and proceed accordingly. For example, younger healthy patients may require larger doses of propofol to reach adequate procedural sedation in contrast to older comorbid patients.
6. Ensure that you have adequate saline flush syringes to administer after your IV sedative medication.
7. Monitor for response to sedation, hemodynamic instability, and apnea
  - a. Have a prefilled syringe of **phenylephrine** available for push-dose pressors if needed for hypotension.



- b. Be prepared for emergency airway intervention in the event of apnea, including initiating bag-valve-mask ventilation and intubation if necessary.
- 8. After the procedure is complete, ensure ongoing respiratory stability and at least one stable blood pressure reading. Once the patient is emerging and able to follow commands, it is safe to leave the bedside.

**References:**

Smith L. *Squid's Little Pink Book: A Pocket Guide for Emergency Doctors*. 2nd ed. MedEd Press; 2021.

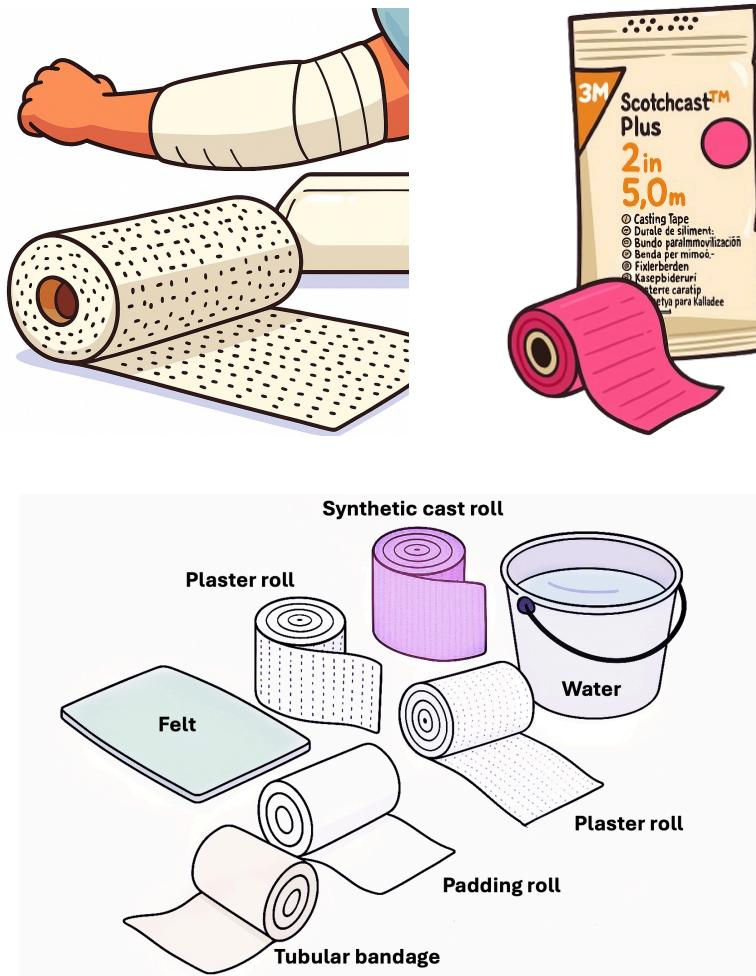


## Splinting and Casting

Supplies: fibreglass rolls or plaster sheets, stockinette, cast padding (Webril), shears, bucket with lukewarm water, pads +/- tensor bandage.

Note: do NOT apply a cast in case of an open fracture, significant swelling, neurovascular compromise or grossly contaminated wound.

See [Fracture Reduction](#)



1. Start by positioning the limb in the “position of function” (upper limb – elbow at 90°, wrist neutral or slightly extended, fingers slightly curled; lower limb – ankle at 90°, knee in slight flexion if above-knee cast)
2. Measure and cut the stockinette to the appropriate size, then apply it to the affected limb – it should be longer and extend 5 to 10 cm beyond the desired splinted/casted area in both the proximal and distal directions.



3. Wrap the Webril padding evenly, starting distally and with 50% overlap. Ensure extra layers at bony prominences (elbow, malleoli etc.).

If wrapping the hand/wrist, create a thumb-sized hole through the padding and insert thumb for proper fit.

4. Place a pad underneath the affected limb and glove up.

*If using plaster for splinting (more often):*

5. Grab 8 to 10 layers of plaster sheet and measure onto affected limb, ensuring it spans the joints/area you wish to immobilize – use shears to cut plaster.
6. Submerge the plaster into the lukewarm water and squeeze out excess, then apply the wet plaster onto the Webril padding. Ensure it does not extend beyond both ends of the padding. Ensure no contact directly with exposed skin.

*If using fibreglass roll for casting:*

7. Submerge the fiberglass roll into the lukewarm water then wrap around the limb similarly to Webril padding, ensuring it spans the joints/area you wish to immobilize.

Also ensure it does not extend beyond both ends of the padding

8. Using the palm of your hand, mold the wet plaster or fiberglass into the Webril padding using gentle pressure, and wait for cast /splint to harden in the desired alignment

Note: the warmer the water, the faster the cast hardens

9. Fold back the padding and stockinette onto the hardened material at the edges

10. If using plaster, wrap a layer of Webril padding and tensor bandage over hardened material and secure



Educate the patient on following cast care instructions:

- Keep dry and clean: do NOT submerge in water
- Elevate the limb for first 24-48 hrs to reduce swelling
- Move the exposed joints (fingers, toes) to prevent stiffness
- Do not insert objects to scratch inside the cast
- Return to ED immediately for increasing pain, tingling, numbness, cold digits, swelling, or fever

For most common splinting/casting techniques in ED, see:

Upper limb

**Ulnar gutter:** <https://www.youtube.com/watch?v=MTXMkG-TYLk>

**Radial gutter:** [https://www.youtube.com/watch?v=fCNoaVVB\\_t0](https://www.youtube.com/watch?v=fCNoaVVB_t0)

**Thumb spica:** <https://www.youtube.com/watch?v=WLjvFS9ZRs4>

**Volar short arm:** <https://www.youtube.com/watch?v=xekSpaAobAI>

**Posterior long arm splint:** <https://www.youtube.com/watch?v=kXyGIqvYWts>

Lower limb

**Ulnar gutter:** <https://www.youtube.com/watch?v=MTXMkG-TYLk>

**Radial gutter:** [https://www.youtube.com/watch?v=fCNoaVVB\\_t0](https://www.youtube.com/watch?v=fCNoaVVB_t0)

**Thumb spica:** <https://www.youtube.com/watch?v=WLjvFS9ZRs4>

**Volar short arm:** <https://www.youtube.com/watch?v=xekSpaAobAI>

**Posterior long arm splint:** <https://www.youtube.com/watch?v=kXyGIqvYWts>

#### References:

Besselaar A, Green D, Howard A; Hunter J, Monsell F, editors. Long leg cast. AO Foundation.

Krom A, Kiel J. Splinting and Casting. WikiSM. Published May 26 2023



## Thoracocentesis

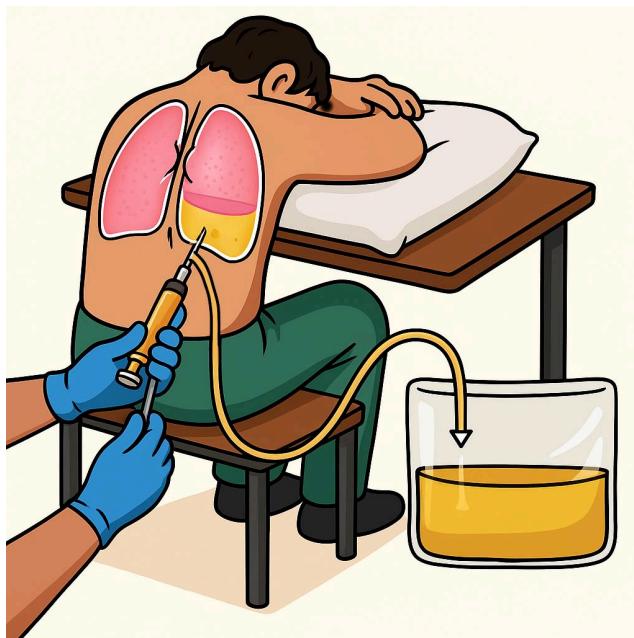
Step-by-step video: <https://www.youtube.com/watch?v=OCa113G8UJk>

Supplies: Thoracentesis kit (8 French over-the-needle catheter, an 18-gauge needle, a stopcock, 35 to 60 mL syringe, and thoracentesis drainage bag/system; 10 mL syringe with 1 to 2% lidocaine with appropriate needle, specimen containers x 2, adhesive dressing, sterile gloves, sterile drapes, chlorhexidine skin prep applicator x 3, alcohol swabs, adhesive bandage

1. Position the patient sitting upright while leaning slightly forward with their arms supported (overbed table/towel/pillow).
2. Open the thoracentesis kit, don sterile gloves, and prepare a sterile field.
3. Landmark your site of insertion with ultrasound guidance. Locate the superior aspect of the pleural effusion and target one rib space below this. Stay superior to the rib to avoid damaging the neurovascular bundle. Mark the site by making an impression with the cap of a needle.
4. After your landmarking, determine the best angle for needle insertion, which should be identical to the angle of your transducer during ultrasound. Ideally, the angle should be perpendicular to the skin surface, which is easier to duplicate with the needle/syringe assembly.
5. Once the angle is determined, the depth for needle penetration is measured from a frozen image on the screen using the machine caliper function.
6. Once you have determined your landmark site, angle of insertion, and insertion depth, clean the area with a chlorhexidine skin prep applicator and apply appropriate draping over the site.
7. Infiltrate your 1-2% lidocaine first into the skin, then advance it towards the superior rib. Pleural return indicates that the needle has entered the pleural space and additionally determines/confirms the distance from the skin to the pleural fluid collection.
8. The needle is then withdrawn slightly and additional anesthetic is injected to anesthetize parietal pleural nerve endings.
9. Once the patient is anesthetized, make a small incision through the epidermis using the No. 11 scalpel blade.



10. Insert the over-the-needle catheter in a closed stopcock position through the same tract while applying continuous negative pressure to the syringe. Await for fluid aspiration and then insert another 5 mm forward.
11. Advance the catheter forward over the needle to the desired depth or until the catheter hub is against the skin. The needle is then removed (through the stopcock) and the catheter and its attached stopcock remain in place.
12. With the stopcock open to the patient and the syringe, 50 mL of pleural fluid is withdrawn for analysis. More fluid may be removed if required for additional tests.
13. Once your analysis fluid is removed, additional fluid can be removed using gravity, syringe, or vacuum drainage.
14. Fluid is typically removed up to 1-1.5L, until flow stops, or if the patient experiences symptoms.



#### References:

Dezube, R. (2025, July). *How to do thoracentesis* [Procedure overview]. In *MSD Manual Professional Version* (Reviewed by R. K. Albert, M.D.).

Ryan Walsh. (2023, May 10). *How to Perform a Thoracentesis with the Safe-T-Centesis Kit* [Video]. YouTube.

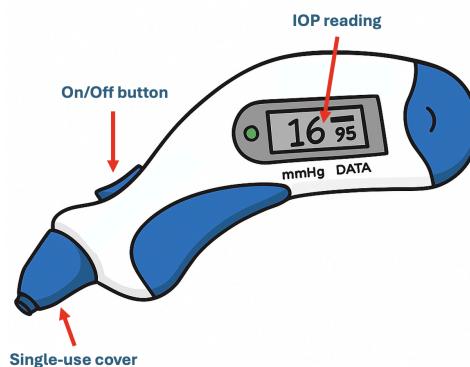


## Tonometry

Supplies: Tonometer (Tonopen), disposable Tonopen tip cover, ocular anesthetic (proparacaine 0.5% or tetracaine 0.5%), gauze

Do NOT perform tonometry if suspecting globe rupture – it can lead to extravasation of intraocular contents. In case of chemical injury, irrigate well prior to attempting tonometry.

1. Start by uncapping tetracaine or proparacaine bottle and applying one to two drops into the lower conjunctival sac created by pulling down on the lower eyelid.
2. Ask the patient to blink gently and wait 30 seconds to a minute for successful numbing.
3. Turn on the Tonopen and calibrate as per manufacturer recommendations.
4. Place a disposable tip cover on Tonopen tip.
5. Ask the patient to look at a fixed target and keep eyes open during measurement.
6. Once eye is properly anesthetized, gently retract the upper and lower eyelid with your fingers and hold the Tonopen perpendicular to the cornea.
7. Advance the Tonopen until the tip contacts the corneal surface **lightly**.
8. Repeat this movement multiple times fast. Listen for a beep which indicates sufficient pressure is applied.
9. An IOP reading should be generated after several beeps are heard. Perform twice and record the highest IOP generated.



# INDEX

<b>TABLE OF CONTENTS</b>	<b>2</b>
<b>Cardiology</b>	<b>3</b>
Acute Pericarditis	4
Aortic Dissection	6
Atrial Fibrillation, Atrial Flutter	8
Congestive Heart Failure Exacerbation	10
Infective Endocarditis	13
Hypertension/Hypertensive Emergency	15
Myocarditis	17
NSTEMI	19
Stable Angina	22
STEMI	25
Supraventricular Tachycardia (SVT)	29
Symptomatic Bradycardia, Heart Block	31
Unstable Angina	33
Vasovagal Syncope	35
Ventricular Tachycardia (VTach)	37
<b>Dermatology/Skin</b>	<b>39</b>
Abscesses	40
Burns	43
Cellulitis	46
Rashes	50
Ulcers	53
Wound Dehiscence	56
<b>ENT, Head &amp; Neck, Oral</b>	<b>59</b>
Acute Sinusitis	60
Anterior and Posterior Epistaxis	62
Benign Paroxysmal Positional Vertigo (BPPV)	65
Foreign Body – Airway	67
Gingivitis and Dental Infections	69
Mastoiditis	71
Otitis Externa	73
Acute Otitis Media	75
<b>Gastroenterology</b>	<b>76</b>
Acute Cholecystitis	77
Acute Diverticulitis	79
Acute Pancreatitis	81

Appendicitis	83
Ascites & Spontaneous Bacterial Peritonitis (SBP)	85
Bowel Perforation	87
Chronic Cholecystitis	89
Esophageal Varices	91
Foreign Body – GI Tract	94
Gastritis/Gastric Ulcer	97
Gastroenteritis	100
Hepatic Encephalopathy	102
Inflammatory Bowel Disease (IBD) Flare-Up	104
Mesenteric Ischemia	106
Small Bowel Obstruction	108
<b>Hematology &amp; Oncology</b>	<b>110</b>
Anemia	111
Deep Vein Thrombosis (DVT)	114
Febrile Neutropenia	116
Tumor Lysis Syndrome	118
<b>Infectious &amp; Inflammatory</b>	<b>120</b>
Anaphylaxis	121
Bites	124
Gout Flare	129
Herpes Zoster Virus (Shingles)	131
Mononucleosis (EBV)	134
Osteomyelitis	136
Sexually Transmitted Infections (STIs)	139
Streptococcal Pharyngitis (Strep Throat)	141
Temporal (Giant Cell) Arteritis	143
Viral Upper Respiratory Tract Infection	145
<b>Metabolic</b>	<b>147</b>
Acute Hypercalcemia	148
Acute Hypokalemia	150
Chronic Pain Exacerbation	152
Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycemic Syndrome (HHS)	154
Hyperkalemic Emergency	157
Hyperthermia	159
Hypoglycemia	161
Hypothermia	163
Sepsis	165
<b>Nephrology &amp; Urology</b>	<b>167</b>

Acute Kidney Injury (AKI)	168
Kidney/Ureteric Stone	170
Pyelonephritis	172
Testicular Torsion	175
Urinary Tract Infection (UTI)	176
<b>Neurology</b>	<b>180</b>
Cauda Equina	181
Concussion	183
Encephalitis	185
Headaches (Migraine, Cluster, and Tension)	188
Intracerebral Hemorrhage	190
Meningitis	194
Neuralgias	197
Radiculopathies	199
Seizures & Status Epilepticus	200
Stroke (Ischemic and Hemorrhagic)	203
Transient Ischemic Attack (TIA)	208
<b>Obstetrics &amp; Gynecology</b>	<b>211</b>
Ectopic Pregnancy	212
Spontaneous Abortion	214
Ovarian Torsion	217
Pelvic Inflammatory Disease (PID)	218
Post-Partum Hemorrhage	221
<b>Ophthalmology</b>	<b>224</b>
Acute Angle Closure Glaucoma	225
Conjunctivitis	227
Foreign Body - Eye	229
<b>Orthopedics &amp; Musculoskeletal</b>	<b>231</b>
Compartment Syndrome	232
Fractures - Approach	234
Hip Dislocation	240
Mechanical Back Pain	243
Necrotizing Fasciitis	245
Septic Joint	247
Shoulder Dislocation	249
<b>Respirology</b>	<b>252</b>
Asthma Exacerbation	253
CO Poisoning	256
COPD Exacerbation	258
Pneumonia	261

Pulmonary Embolism (PE)	265
Simple and Tension Pneumothorax	268
<b>Toxicology &amp; Psychiatry</b>	<b>271</b>
Acute Psychosis	272
Anticholinergic Overdose	275
Cholinergic Overdose	278
Opioid Overdose	281
Sedative/Hypnotic Exposure	284
Suicidal and Homicidal Ideation	286
Sympathomimetic Overdose	289
<b>Trauma</b>	<b>292</b>
Epidural Hematoma	293
Facial Trauma, Skull Fracture	297
Subarachnoid Hemorrhage	300
Subdural Hematoma	305
<b>Procedures</b>	<b>309</b>
Abscess Drainage	310
Cardioversion (Electrical)	312
Digital Nerve Block	313
eFAST Scan	315
Foley Catheter Insertion	319
Intubation	321
Joint Aspiration	326
Laceration Repair	328
Nasogastric Tube Insertion	332
Needle Thoracostomy	334
Pigtail Chest Tube Insertion	336
Procedural Sedation	338
Splinting and Casting	340
Thoracocentesis	343
Tonometry	345
<b>INDEX</b>	<b>346</b>