



# CanadiEM Junior Learner Primer



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## About CanadiEM Junior Learner Primer

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# Chapter 1

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## Introduction to The ED

# The Emergency Medicine Mindset

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## EM Mindset Video Summary



To view this video, go to this link

<https://www.youtube.com/watch?v=n3OKyYCsIaY>

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## Overview

The following are five key steps that you can take to start "thinking like an emergency physician". Unlike other clinical services, the emergency department is often quite chaotic and requires a different mindset for organization of time and workflow.

### Step 1: Stable vs. Unstable

Look at your patient. The emergency medicine mindset is that you should be addressing your patient's emergent needs (e.g. ABCs), using their vital signs (HR, RR, O2 sat, BP, and point-of-care glucose) to guide your thinking. It is imperative to consider who is sick and requiring immediate attention, and who is well enough to wait. The determination of stable versus unstable is of the utmost importance.

### Step 2: Commit to your Disposition

It is worth conceptualizing the ED as a corridor rather than a ward. New patients are always coming in so the ones under your care have to be diagnosed, managed, and dispositioned so as to create room for more.

**Disposition:** Decide early in the encounter if the patients are likely going home, staying or shall be decided upon after investigations and/or consults.

**High Yield Tip:** One way to think about disposition is to sort the patients into 3 groups - Red (Critically ill), Yellow (Needs testing and perhaps admission), and Green (Needs some investigations to rule out and minor treatments). Thinking about your red-green-yellow decisions will help you think ahead.

### Step 3: The Two Step Differential Diagnosis Process:

In emergency medicine, we always have to bear in mind the worst differential diagnoses (WORST CASE DDx) when we walk in the room. Until proven otherwise, all of our chest pain patients have aortic dissection, coronary artery disease, pulmonary embolism, and a pneumothorax. Although this is a bizarre way to think, it increases your sensitivity for bad things if you go in thinking about how you have to rule these out with your history and physical exam. We like to rule out the top-most deadly causes at first and work our way down to the common and likely, with highlights to red flags and documenting these on the chart.

Once you've spoken to your patient and examined them as best you can, REFINE your initial worst-case DDx to improved differential diagnoses of those conditions are still on your list - the bespoke DDx.

Within this bespoke list, consider creating a prioritization system. Some like to sort and prioritize the DDx by three levels: Critical, Emergent, and Common.

### Step 4: Managing Multiplicity:

Recent literature has found that emergency physicians manage multiple patients at once by quickly assessing and labelling each patient with temporary labels that encapsulate their story and ED trajectory (1) The figure below highlights this process.

Once you have a sense of what each patient is requiring (e.g. bloodwork, CT, admission) you get a feel for the ebb and flow of the department. You will start to develop an internal sense of how long labs will take, or whether or not you'll have a big queue for ultrasounds. This anticipatory ability will allow you to better bounce between patients. Like a master chef or an experienced barista, you'll start to be able to anticipate your workflow needs.

Until you do, here are some simple procedures you can adopt to help optimize your workflows while you're guest-starring in the ED:

1) "Round" upon (i.e. reassess) your current patients every hour or so. Review all their labs/tests, see what's back. Once the labs are back, see how they are doing clinically, and make sure you DOCUMENT that you did so.



2) Run the board with your team - with the doc in charge or the charge nurse, go through the whole list of patients on the go, and see if there are themes that arise. If everyone is having trouble getting CT results back, someone probably needs to reach out to the radiology team to see what's going on. It may be that work from the other part of the hospital is affecting some of your needs (e.g. the troponin machine is down).

3) After each resuscitation, make sure to sit down and reassess your patients. Some resuscitations (especially ones related to COVID-19) may require you to be sequestered in full PPE for a good chunk of time (e.g. 45 minutes to an hour). Upon completing that case, make sure to return your tracker board to figure out what the situation in the department is like. Things may have drastically changed since you looked at it last!

### Step 5: Playing "Tetris" with Time:

Efficiency will come after you've gotten a sense of timing - so don't worry too much if you think you aren't being efficient as a learner - it takes experience! Within increased anticipatory ability, you will slowly become able to predict which patients require a full work-up and which ones don't. You'll also most likely get more accustomed to the way that our triage nurses communicate via their initial assessment notes.

Once you get in the swing of things, you'll start spotting patterns and find ways to be more efficient. The diagram below highlights the importance of optimizing your own personal workflow.

One other pro-tip -chart as you go- especially as a learner! If you chart on paper, you won't be able to take your charts home to finish, so don't spend many extra hours in the ED writing notes - integrate note writing into your workflow. Similarly, for those charting electronically, it is a huge bummer to have to spend time at end of the shift charting when you can be studying, recovering and resting between shifts.

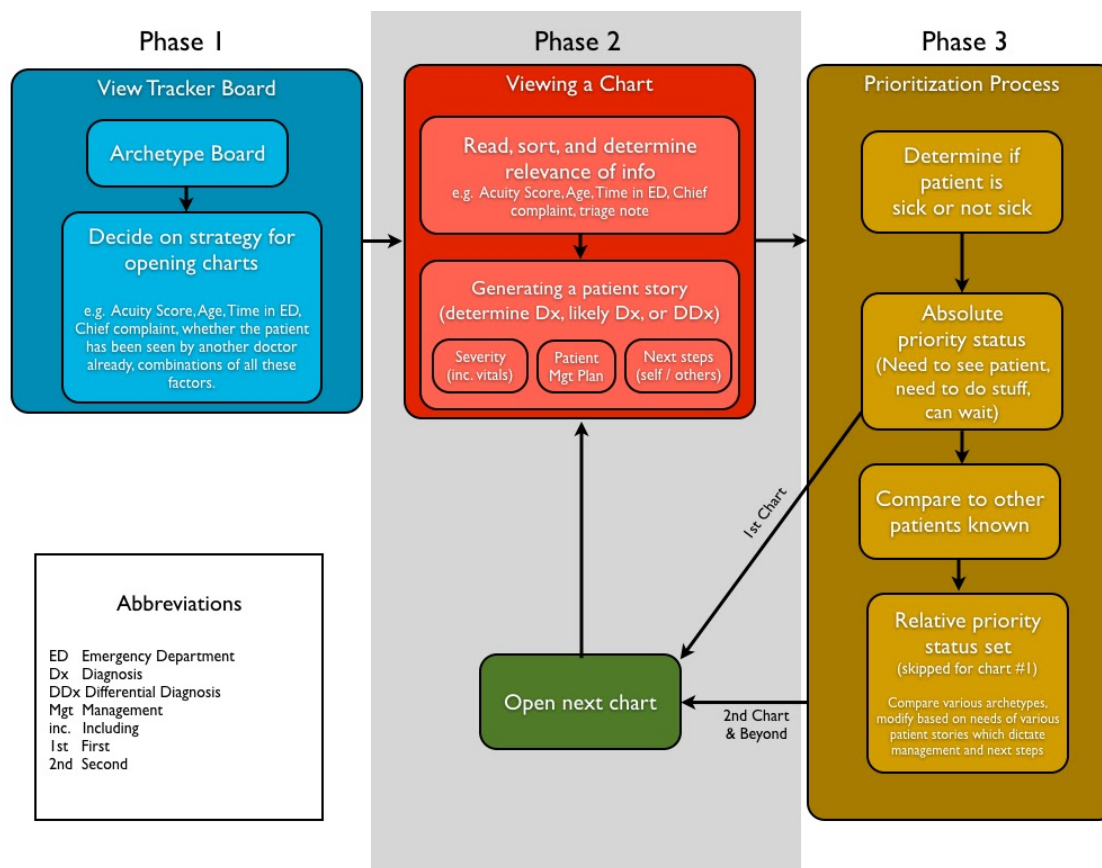


Figure from Chan et al. 2018 which explains how emergency physicians manage multiple patients.

## Most Importantly...

Stay aware and safe. Take care of your physical and emotional needs especially during this crunch time- you are precious!

### Pearls for Junior Learners:

1. Learn to identify sick vs not sick! If your patient is sick - get your supervisor/senior resident! Emergency medicine can be time sensitive so don't delay it even if you haven't finished your history/physical!
2. After step 1 - Take your time if you need it! As a junior learner you are in a unique place where you are afforded the time you need! The ED is an amazing learning experience with a diverse variety of presentations so take advantage of it!
3. Ensure your charting is up to date! You may forget the specifics if you are seeing many patients so make sure you document as you go.
4. Keep track of your patients - for example, you can take a sticker or add them to your tracker. This will help you track and keep up to date on your patients investigations, and disposition patients as efficiently as possible.

## Recommended Readings, Videos, and Podcasts:

Closler blog: The Balancing Act: Learning to Thrive in Multipatient Environments (Canadian Content on American Blog)

<https://closler.org/lifelong-learning-in-clinical-excellence/the-balancing-act-learning-to-thrive-in-multipatient-environments>

Reuben Strayer at Western University's EM Rounds - Emergency Thinking (Canadian-Trained American)

<https://youtu.be/2ZdQBjjTFGQ>

REBEL EM: The EM Mindset (CAUTION: American resource)

<https://rebelem.com/the-em-mindset/>

## References:

1. Chan TM, Mercuri M, Van Dewark K, Sherbino J, Schwartz A, Norman G, Lineberry M. Managing multiplicity: Conceptualizing physician cognition in multipatient environments. *Academic Medicine*. 2018 May 1;93(5):786-93.
2. Chan TM. What's Next? Cognitive Task Analysis of Emergency Physicians' Experience in Multi-Patient Environments. Available at: [https://indigo.uic.edu/articles/What\\_s\\_Next\\_Cognitive\\_Task\\_Analysis\\_of\\_Emergency\\_Physicians\\_Experience\\_in\\_Multi-Patient\\_Environments/10915484/1](https://indigo.uic.edu/articles/What_s_Next_Cognitive_Task_Analysis_of_Emergency_Physicians_Experience_in_Multi-Patient_Environments/10915484/1)

# Emergency Department Culture 101



To view this video, go to this link

<https://www.youtube.com/watch?v=rasEIDEGxKA>

## Introduction

**S**o, you have found yourself in an emergency department (ED). We are so happy you are here. Thank you for coming to lend us a hand – we won't forget it. We can imagine that this place feels different than the wards or the operating theatre or clinic. Some of that difference has to do with the types of patients we see, the decisions we make, and the care we provide but much of it has to do with something even more fundamental than that, ED culture. That culture is the culmination of the values, beliefs, and practices that make us who we are. As an anthropologist and emergency medicine resident I am going to share with you a few key facets of emergency medicine culture that will facilitate your rapid transition to our side of the consult.

## 1. Emergency Medicine is a Team Sport

This is easy to say, but what does it actually mean? It means we fundamentally believe that every single person on the team plays an integral role in providing care and keeping the machine going. How do we live that value? We learn people's names, we say please and thank you, we seek input from nurses and paramedics, and we ask the unit clerk about their kids. Staff/Residents often go by their first names. We pitch in where we can (getting a patient water, changing linens, help porter patients etc.) and we try to do all these things with a smile. We check in on each other after tough cases, we are honest with our feedback, and we ask our colleagues how we can help. There is no room for ego. We live this value because we are humans, and it makes the workplace

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more fun, and because we rely on every individual on the team to be psychologically safe (1) in critical moments when we must rely on them to speak up. We know that “teamwork makes the dreamwork”, especially in trying times>Welcome to the team.

## 2. The Charge Nurse is the Boss

There’s not much more to say about this one. It is just the truth. Embrace it. They are the ones who are there for 12-hours a day, and their only goal is to maintain situational awareness with regards to whole department and the rest of the hospital.

## 3. Perfect is the enemy of good

This reality might make you feel uncomfortable. We have strong duty to individual patients yet sometimes we are forced to come up with good, but not perfect plans for them. Good questions to ask yourself include “does this seem safe?” or “would other doctors think this is reasonable given the circumstances?” or “will I sleep tonight with this choice?” If the answer to all of those questions is, “yes!” then your plan is probably a good one. It may not be perfect, but it is good. Striving for absolute perfection in the emergency department, while admirable may impair your ability to do the most good for the most number of patients...and it will actually destroy your soul. This isn’t an excuse to cut corners, be lazy, or provide sub-standard care, rather it is a realization that we are making difficult decisions with limited information without the luxury of time. We usually do that very well, but we can’t always do it perfectly. That is okay.

## 4. We are good at being wrong.

Because we are good but not perfect (see #3 above) sometimes we are wrong. This job is humbling. The radiologist will report a fracture in the final x-ray report for that patient you sent home with an ankle sprain the night before. Internal medicine might identify a PE in that patient you referred with a COPD exacerbation. That STEMI that went to the cath lab was actually a dissection. Every time we hear about these cases our hearts sink a little bit. We think (and sometimes persevere) about what we could have done differently, what we missed, what we should have seen, and how we can move closer on the spectrum towards perfect. After getting over the initial gut punch – usually through talking to colleagues (see #1 above) - we incorporate any lessons into our practice and then see the next patient. For more on this, check out our other related resource on [the Emergency Medicine Mindset](#).

## 5. We love asking for help.

This one you probably already know. Emergency physicians excel at asking for help. In fact, it is something we are best at. You are usually on the receiving end of those phone calls. Now we are here for you, no matter what. There is no stupid question. Worried about a patient? Ask for help. Don’t know where something is? Ask for help. Don’t know what to do? Ask for help. Want an

extra set of eyes on a rash? Ask for help. You can officially call yourself an emergency physician when you ask more questions on a shift than you answer.

We hope this gives you a glimpse of the values, beliefs, and practices that are common to most emergency departments in Canada. Of course, culture is local and there will be variations and differences to these themes.

## Most Importantly...

You will be surrounded by all sorts of people that want you to succeed. Be like us, ask for help. Maybe you just need the password for the locked bathroom, or maybe you want someone to chat with about a bad case you've just had. We all support each other in the ED. You have been adopted to our family, and you are now part of our tribe. Welcome to the Emerg family.

### Junior Learner Tips

1. Don't be afraid to ask questions. Your preceptor, residents and other inter-professional team members are there for you and understand that you are there to learn.
2. There is amazing learning you can get from the various professionals working in the ED! Want to learn more of the airway? Respiratory therapists are there for you! Want to learn about pre-hospital care? EMS is there for you! Want to learn about department/doctor specific orders, specific procedures, dressings, or anything really? The nurses are there for you!
3. Try to get involved with procedures, when you feel comfortable doing so. Sometimes preceptors may not know what you feel comfortable getting involved with or they are busy dealing with sick patients, there is no harm in asking if it would be okay for you to get involved with procedures when there is a chance.
4. Bring snacks if allowed! ED shifts can be busy so you may not be able to get a lot of time for a break.
5. Get to know the nurses: they'll save you more than once! (super high yield!)

## Recommended videos, podcasts and resources

- Justin Morgenstern. First 10:EM. The EM Mindset: Not Knowing. <https://first10em.com/em-mindset-not-knowing>
- Purdy et al. (2019) Identifying and Transmitting the Culture of Emergency Medicine Through Simulation (Canadian first author): <https://onlinelibrary.wiley.com/doi/full/10.1002/aet2.10325>
- REBEL EM: The EM Mindset (American resource): <https://rebelem.com/the-em-mindset/>
- Nickisch & Edmondson (2019). Creating Psychological Safety in the Workplace. HBR Podcast. <https://hbr.org/podcast/2019/01/creating-psychological-safety-in-the-workplace>

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1. Nickisch & Edmondson. Creating Psychological Safety in the Workplace. HBR Podcast. Available at : <https://hbr.org/podcast/2019/01/creating-psychological-safety-in-the-workplace> Accessed last on April 6, 2020
2. Salim Rezaie. REBEL EM. The EM Mindset. Available at: <https://rebelem.com/the-em-mindset/> Accessed last on April 6, 2020
3. Justin Morgenstern. First 10:EM. The EM Mindset: Not Knowing. Available at: <https://first10em.com/em-mindset-not-knowing/> Accessed last on April 6, 2020.

# Chapter 2

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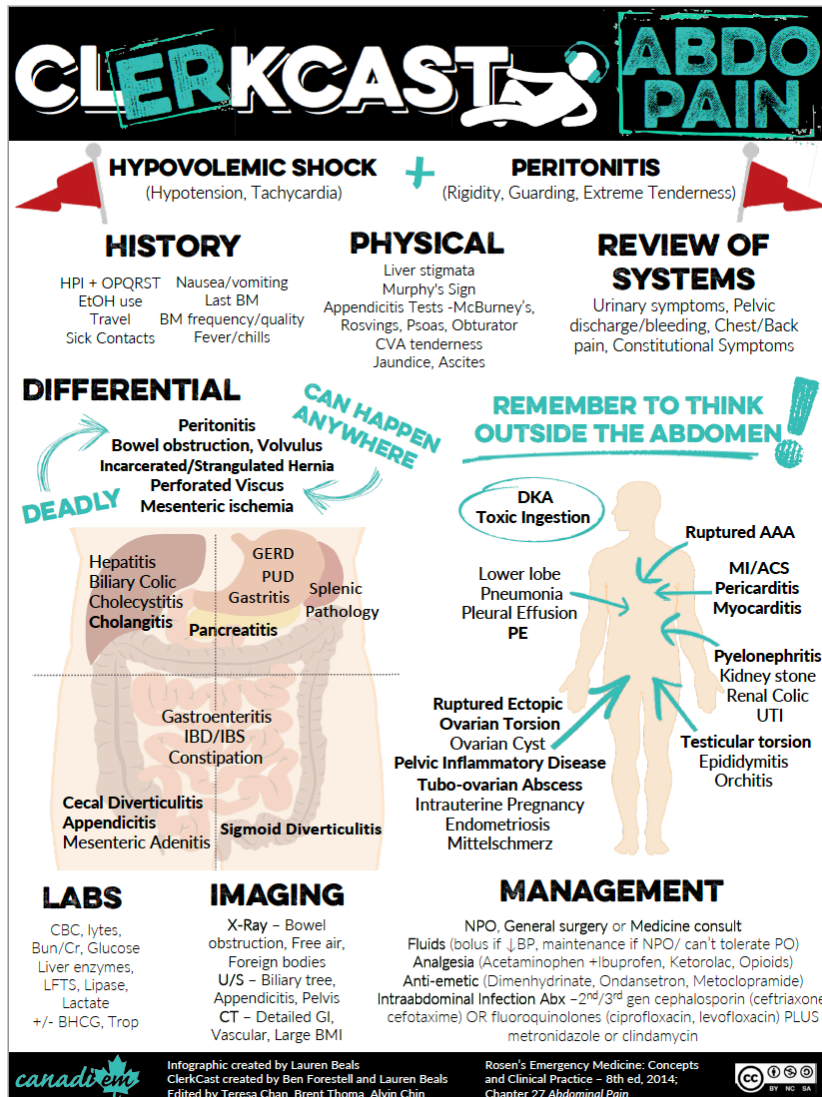
Common

Presentations



# Abdominal Pain

## Summary Infographic



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## Can't Miss Diagnoses

- Acute MI or ACS
- Aortic dissection
- Appendicitis
- Bowel obstruction, Volvulus

- Cholangitis, Cholecystitis
- Ectopic pregnancy or Ovarian Torsion/ Ovarian cyst /TOA (FAST-US, Beta)
- Ischemic bowel
- GI Bleed, Pancreatitis
- Perforated viscus
- Ruptured AAA
- Testicular torsion

## Investigations

- CBC, BUN, Cr, Lytes, Glucose, VBG/Lactate
- Serial Troponin, ECG and Chest x-ray where warranted,
- Beta-hCG where warranted
- Imaging:
  - X-ray: look for bowel obstruction, free air, foreign bodies
  - U/S: biliary tree, appendicitis
  - CT: detailed GI, vascular, large BMI
- \*Have a low threshold for imaging in the elderly, immunosuppressed, patients with past abdominal surgeries + reassess soon\*

## History, Physical and Review of Systems

### Pertinent points from history

- HPI + OPQRST
- EtOH
- Travel
- Sick contacts
- Nausea/vomiting
- BM frequency/quality
- Fever/Chills
- PEARL: history of surgeries, past STIs, cancer can lead you to r/o obstruction

### Pertinent physical exam findings

- Liver stigmata
- Murphy's sign
- Appendicitis tests: McBurney's Rosving's Psoas, Obturator
- CVA tenderness
- Jaundice, ascites

### ROS:

- Urinary sx
- Pelvic discharge/bleeding

- Chest/[back pain](#)
- Constitutional symptoms
- Red flags: hypovolemic shock + peritonitis

### PEARLS for Junior Learners

1. Remember to think outside the abdomen:
  - ECGs indicated in older patients and diabetic patients with chest or abdo pain to R/O cardiac cause
2. **In the elderly:** Aortic disease in the elderly can present with vague complaints, high level of suspicion is required
3. **In females of child-bearing age:** Always R/O Ectopic, Beta hCG sent early with other baseline labs
4. **In patients with recent antibiotic use:** If presenting with diarrhea, fever - consider C-diff toxin in stool

### Additional Graphic Reference

<b>RUQ</b> Gallstones Cholangitis Hepatitis Liver Abscess/Trauma (Cardiopulmonary) (Pancreatitis)	<b>EPIGASTRIC</b> Pancreatitis Acute Coronary Syndrome Esophagitis Peptic Ulcer Duodenal Ulcer Gastritis Aortic Dissection	<b>LUQ</b> Splenic Abscess Splenic Trauma Splenic Engorgement (Cardiopulmonary)
<b>RIGHT SIDE / FLANK</b> Crohn's Disease Ulcerative Colitis Pyelonephritis Renal / Ureteric Colic AAA rupture	<b>UMBILICAL</b> AAA rupture Appendicitis (early) Mesenteric adenitis Meckel's diverticulitis Constipation	<b>LEFT SIDE / FLANK</b> Crohn's Disease Ulcerative Colitis Pyelonephritis Renal / Ureteric Colic AAA rupture
<b>RLQ</b> Appendicitis Diverticulitis of R colon Crohn's Disease Ulcerative colitis Constipation Ovarian Cyst (Female) (Incarcerated) Hernias	<b>SUPRAPUBIC</b> Testicular Torsion Urinary Retention UTI / Cystitis (Pregnancy-related)	<b>LLQ</b> Diverticulitis Ulcerative colitis Constipation Ovarian Cyst (Female) (Incarcerated) Hernias

## Recommended Readings, Videos and Podcasts

- ClerkCast: Episode 3: Abdominal Pain -<https://canadiem.org/clerkcast-episode-3-abdominal-pain/>
- Emergency medicine cases Abdo pain & MI Podcast -<https://emergencymedicinescases.com/best-case-ever-34-inferior-mi-presenting-with-abdominal-pain/>
- Abdominal Pain – Thinking Outside the Box Podcast -<https://emergencymedicinescases.com/best-case-ever-21-abdominal-pain-thinking-outside-box/>
- CRACKCast E027 – Abdominal Pain -Podcast -<https://canadiem.org/crackcast-e027-abdominal-pain/>
- CRACKCast E093 – Appendicitis-Podcast -<https://canadiem.org/crackcast-e093-appendicitis/>
- CRACKCast E086 – Abdominal Aortic Aneurysm -Podcast -<https://canadiem.org/crackcast-e086-abdominal-aortic-aneurysm/>

# Chest Pain

## Infographic Summary

**CLERKCAST CHEST PAIN**

**P.E.T.M.A.C. DEADLY** concerning stories for causes of chest pain

	<b>PULMONARY EMBOLISM</b>	<b>ESOPHAGEAL RUPTURE</b>	<b>TENSION PNEUMOTHORAX</b>
<b>History &amp; Physical</b>	Dyspnea, Fatigue, Tachycardia, Unilateral leg swelling	Vomiting/retching followed by sudden onset chest pain (Boerhaave syndrome)	Sudden onset chest pain and worsening respiratory distress
<b>Risk Factors</b>	PERC to rule out, Wells Criteria for PE to stratify risk	Recent endoscopy or surgical procedure, Internal erosion (severe GERD or caustic ingestion)	Penetrating trauma, Bullae and blebs, Connective tissue disease

	<b>MYOCARDIAL INFARCTION</b>	<b>AORTIC DISSECTION</b>	<b>CARDIAC TAMPONADE</b>
<b>History</b>	Exertional, centralized or left-sided, chest pressure or tightness, radiating up neck/down arms	Sudden onset, ripping or tearing, chest or back pain	Penetrating trauma, Gradual onset chest pain and respiratory distress
<b>Associated Symptoms</b>	Diaphoresis, Shortness of breath, Nausea, Palpitations	Syncope, New neurological deficit, Abdominal symptoms	Beck's triad, distant heart sounds, distended neck veins, decrease in blood pressure
<b>Risk Factors</b>	Smoking, Diabetes, HTN, Family Hx of early CVD, Cocaine	Male: Female 3:1, HTN, Previous aneurysm, Connective tissue disorder	Malignancy, Renal failure, Recent myocardial infarction

<b>STABLE ANGINA</b>	<b>VS</b>	<b>ACUTE CORONARY SYNDROME</b>	
<b>Stable Angina</b> Demand ischemia Previous history of angina	<b>Unstable Angina</b> Supply ischemia New or atypical angina	<b>NSTEMI</b> Subendocardial Infarct Partial vessel occlusion	<b>STEMI</b> Transmural Infarct Complete vessel occlusion
Trop EKG Normal	Normal, T wave inversion, ST Depressions	+	+
		Hyper-acute T waves, ST elevation Reciprocal changes	

canadiEM  
Infographic created by Lauren Beals  
ClerkCast created by Ben Forestell and Lauren Beals  
Edited by Teresa Chan, Brent Thoma, Alvin Chin

Rosen's Emergency Medicine: Concepts and Clinical Practice - 9th ed, 2017; Chapter 25 Chest Pain  
HTN = Hypertension, CVD = Coronary Vascular Disease

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MHPE

ClerkCast Infographic describing concerning stories for deadly causes of chest pain. The mnemonic to remember is PETMAC which stands for **pulmonary embolism**, esophageal rupture, tension pneumothorax, myocardial infarction, aortic dissection, cardiac tamponade. PE - A history of dyspnea, fatigue, tachycardia, and unilateral leg swelling is suggestive of a **pulmonary embolism**. Use PERC to rule out and Wells criteria for PE to stratify the risk. A history of vomiting, retching, following by sudden onset chest pain (Boerhaave syndrome) is suggestive of esophageal rupture. Risk factors for esophageal rupture include: recent endoscopy or surgical procedure and/or internal erosion (severe GERD or caustic ingestion). A history of sudden onset chest pain and worsening respiratory distress may indicate tension pneumothorax.

Risk factors include penetrating trauma, bullae and blebs, and connective tissue disease. A history of exertional, centralized or left-sided chest pressure or tightness which radiates up the neck and down the arms is suggestive of a myocardial infarction. Associated symptoms may include diaphoresis, shortness of breath, nausea, and palpitations. Risk factors include smoking, diabetes, hypertension, family history of early cardiovascular disease, and cocaine use. A history of sudden onset, ripping or tearing chest or **back pain** is suggestive of an aortic dissection. Associated symptoms may include syncope, new neurological deficit, and abdominal symptoms. Risk factors include hypertension, previous aneurysm, connective tissue disorder, and being male. A history of penetrating trauma, gradual onset chest pain and respiratory distress are suggestive of cardiac tamponade. Associated symptoms may include Beck's triad (distant heart sounds, distended neck veins, and decreased blood pressure). Risk factors include malignancy, renal failure, and recent myocardial infarction. Now let's review stable angina versus acute coronary syndrome and some of the ECG findings. Stable angina is caused by demand ischemia and will have a normal troponin and normal ECG. Unstable angina is caused by supply ischemia and will have a normal troponin, and either a normal ECG or T wave inversion and ST depression. An NSTEMI is caused by subendocardial infarct or partial vessel occlusion. An NSTEMI will have an elevated troponin and ST depression. A STEMI is caused by a transmural infarct or complete vessel occlusion, and will have an elevated troponin, hyper-acute T waves, ST elevation, and reciprocal changes on ECG.

## Differential Diagnosis

The differential diagnosis for chest pain can be categorized into emergent and non-emergent causes. For cardiac causes of chest pain, emergent etiologies include acute coronary syndrome, unstable angina, aortic dissection, ischemia, coronary spasm, and cardiac tamponade. Non-emergent causes include valvular heart disease, aortic stenosis, mitral valve prolapse, and hypertrophic cardiomyopathy. For pulmonary causes, emergent etiologies include **pulmonary embolism**, tension pneumothorax, pneumothorax, and mediastinitis. Non-emergent causes include pneumonia, pleuritis, tumor, and pneumomediastinum. For gastrointestinal causes, emergent etiologies include esophageal rupture, esophageal tear, cholecystitis, and pancreatitis. Non-emergent causes include esophageal spasm, reflux, peptic ulcer, and biliary colic. For CNS causes, etiologies include spinal root compression and thoracic outlet. Non-emergent causes include herpes zoster and post herpetic neuralgia. For musculoskeletal causes, etiologies include muscle strain, rib fracture, tumor, costochondritis, and nonspecific chest wall pain. Other causes of chest pain include hyperventilation and psychological causes.

## DDx for Chest Pain



**Emergent:** ACS, unstable angina, aortic dissection, ischemia, coronary spasm, cardiac tamponade

**Non-Emergent:** Valvular heart disease, aortic stenosis, MVP, HCM



**Emergent:** PE, tension pneumothorax, pneumothorax, mediastinitis

**Non-Emergent:** pneumonia, pleuritis, tumor, pneumomediastinum



**Emergent:** Esophageal rupture, esophageal tear, Cholecystitis, pancreatitis

**Non-Emergent:** Esophageal spasm, reflux, peptic ulcer, biliary colic



**Emergent:** spinal root compression, thoracic outlet

**Non-Emergent:** herpes zoster, postherpetic neuralgia



**MSK:** muscle strain, rib fracture, tumor, costochondritis, nonspecific chest wall pain



**Other:** psychological, hyperventilation

Infographic by Alysha Laviolette

## General History

1. Infectious symptoms (fever/chills/URTI/cough/sputum)
2. CHF symptoms and dyspnea (orthpnea, PND, SOBOE, leg swelling)
3. PE risk factors
4. GI sx, N/V, GER (reflux, biliary disease, or other abdominal causes)
5. Palpitations or syncope
6. Ask about cocaine or other stimulants
7. Sx suggestive of ACS and dissection

## Investigations

- CBC, BUN, Cr, Lytes, Glucose, bilateral arm BP's
- Serial Troponin (usually 2-3 hours apart)
- Chest CXR where warranted
- Consider D-Dimer where appropriate (use PERC to rule out)
- ECG - Remember to compare an old ECG; Consider 15-lead ECG if pain refers to back.
- Consider telemetry
- Consider bedside abdominal U/S
- Liver enzymes, lipase, VBG
- B-HCG
- CT angiogram if suspecting a PE

### Tips on Tests:

- For hs-troponin T, the 2h delta to rule-out is  $< 4$  ng/L and the delta to rule-in is  $\geq 10$  ng/L. (EM CASES)
- CXR - looking for alternative diagnoses (Pneumothorax, pneumonia) or incidental findings (ground-glass opacities, suggestive of COVID-19)

## Clinical Decision Tools of Relevance (found on [mdcalc.com](http://mdcalc.com))

### Cardiac

- HEART Score (predicts 6-week risk of major adverse cardiac event)
- HEART Pathway (identifies ED patients with acute chest pain for early discharge)
- GRACE Score (estimates admission-6 month mortality for patients with ACS)
- TIMI for STEMI (estimates mortality in patients with STEMI)
- TIMI for Unstable Angina & NSTEMIs (estimates mortality for patients with unstable angina and non-ST elevation MI)
- TIMI Risk Index (provides mortality estimate in patients with ACS using only BP, HR, and age)

### PE

- PERC Rule (rules out PE if no criteria are present and pre-test probability is less than or equal to 15%)
- Well's Criteria for PE (objectifies risk of PE)
- YEARS algorithm (helps rule out PE; also validated in pregnant patients)

### Pneumonia

- CURB-65 (estimates mortality of CAP to help determine inpatient vs. outpatient treatment)
- Pneumonia Severity Index / PORT score (estimates mortality for adult patients with CAP)



## Risk Stratification

Risk-stratify chest pain patients into low, moderate, and high-risk groups with the help of HEART SCORE for MACE ([https://www.youtube.com/watch?v=oMnhzND\\_V2s](https://www.youtube.com/watch?v=oMnhzND_V2s)).

Patients may qualify for early discharge on MD CALC here:

<https://www.mdcalc.com/heart-pathway-early-discharge-acute-chest-pain>

### Low Risk Patients

Low-risk patients with a follow-up troponin (at 3 hours) can be considered for [safe discharge](#) home with appropriate follow-up.

## Other Management Pearls

- Hypotensive patients with inferior wall ST changes may need 15 lead ECG. Review Right ventricular infarction here:  
<https://www.youtube.com/watch?v=rAvFubbdT14&feature=youtu.be>
- Assess pts with focal neuro signs for aortic dissection.
- If SpO<sub>2</sub> < 93%, consider oxygen supplementation and monitoring, and Aspirin where warranted.
- Remember, we usually do serial Troponins and ECG where warranted. Guidelines advise that these troponins should be at least 2 hours apart. Consult your institutional policy for specific guidance based on your troponin assay.

*“One ECG begets another” - Dr. Amal Mattu*

### Junior Learner Pearls

- **Remember:** chest pain can be caused by non-cardiac issues. Rule out psychiatric, abdominal, pulmonary, MSK, medication causes.
- Always compare the most recent ECG to a previous one.

## Recommended Readings, Videos and Podcasts

- First 5 min: Approach to chest pain  
<https://emin5.com/2015/08/05/approach-to-chest-pain/>
- ClerkCast E02 - Chest Pain  
<https://canadiem.org/clerkcast-episode-2-chest-pain/>
- CRACKCast E214 – Chest Pain  
<https://canadiem.org/crackcast-e214-chest-pain/>
- EMCases: Low-Risk Chest Pain and High Sensitivity Troponin  
<https://emergencymedicinecases.com/low-risk-chest-pain-high-sensitivity-troponin/>
- CRACKCast E085 – Aortic Dissection  
<https://canadiem.org/crackcast-e085-aortic-dissection/>
- CRACKCast E076 – Pneumonia  
<https://canadiem.org/crackcast-e076-pneumonia/>

# Dyspnea/SOB

## Can't Miss Diagnoses

- Viral Illnesses (including COVID-19)
- Anaphylaxis
- Pneumonia (PNA)
- Congestive Heart Failure (CHF)
- Acute Coronary Syndrome (ACS)
- Acute exacerbation of Asthma
- Acute Exacerbation of Chronic Obstructive Pulmonary Disease (COPD)
- Pulmonary Embolism (PE)
- Aortic Dissection
- Pneumothorax (PTx)
- Cardiac Tamponade

### Can't miss mimics (high respiratory rate):

- DKA
- Sepsis

### Updated and adapted for clerks by:

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### Original primer created by:

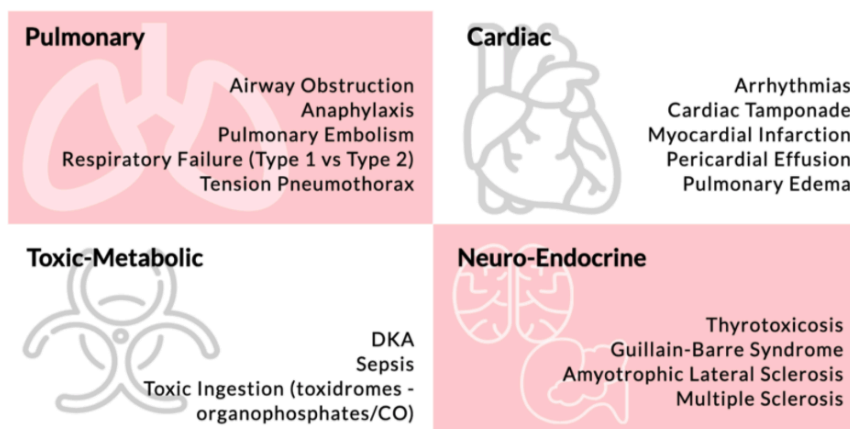
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## Differential Diagnosis

Differential diagnoses for shortness of breath categorized by pulmonary causes, cardiac causes, toxic/metabolic causes and neuro-endocrine causes. Pulmonary causes include airway obstruction, anaphylaxis, [pulmonary embolism](#), respiratory failure type 1 and 2, and tension pneumothorax. Cardiac causes include arrhythmias, cardiac tamponade, MI, Pericardial effusion and pulmonary edema. Toxic-metabolic causes include DKA, sepsis, and toxic ingestion. Neuro-endocrine causes include thyrotoxicosis, Guillain-barre syndrome, ALS, and MS.



## Points to focus upon

### History

- New Symptoms - Hemoptysis
- Previous Seasonality / Patterns - to differentiate asthma from other viral illnesses etc.
- Allergies or new allergic reaction precipitants (soaps, perfumes)
- Medication history and adherence; inhalers, diuretics
- Use of Medications - Nitro Spray effective? Adherent to anticoagulant prescriptions?
- Has the patient used their multidose inhaler (MDI) with SPACER? (This is a common reason for Salbutamol "not working")
- **Pulmonary Embolism** risk factors (use PERC and Wells Criteria)
- CAD risk factors (also compare new and old ECGs)
- Functional Status - Exercise Tolerance, Recent Decline?
- Changes in diet - especially with CHF patients (Higher salt intake?)

### Physical

- Always check for signs of DVT on your physical exam.
- LOOK FOR SIGNS OF ANAPHYLAXIS (swelling, hives, etc.)

## Investigations

1. Chest x-ray
2. CBC, BUN, Cr, Lytes, Glucose, VBG +/- Lactate
3. Serial Troponin where warranted
4. Consider ECG - Remember to compare an old ECG
5. Consider D-Dimer
6. Consider telemetry

## Management

- BE CAREFUL. ALWAYS USE APPROPRIATE PPE WITH DYSPNEIC PATIENTS!
- Always consider that your patient may have more than one diagnosis.
- Assess patient's airway as soon as you walk into the room and assess if the patient SICK vs NOT SICK
- If at anytime you feel you will need to intervene, have the interventions ready in case (ie bag mask, direct/video laryngoscope, LMA, bougie etc). Temporizing methods: Chin lift/jaw thrust, BVM, suctioning, nasal airway, oral airway, LMA
- General approach - attach monitors, give supplemental O2 if needed, ABCs (ie get IV access), assess need for intubation and prepare for it

## Possible Treatment Interventions

- Anaphylaxis: epinephrine, antihistamines, fluids
- Asthma/COPDe: oxygen, bronchodilators, corticosteroids , possibly antibiotics
- Infection: empiric antibiotics until source identified (note look up your local antibiogram for common local organisms and their susceptibility when giving empiric antibiotics)

## Airway Management

### Spontaneously Breathing Patient

1. Nasal Prongs
2. Face mask, Non-Rebreather Face Mask

### Temporizing Measures For Inadequate Ventilation

1. Bag-Valve Mask +/- Nasal Airway
2. High Flow Nasal Oxygenation (ie. Mastech)
3. CPAP/BiPAP: Acute Exacerbations of CHF, COPD, Asthma

### Definitive Measures For Inability To Maintain/Protect Airway

1. Oro-Tracheal Intubation
2. Surgical Airway

### Additional Modalities

1. Needle Thoracostomy For Tension Pneumothorax
2. Tube Thoracostomy To Drain Pleural Effusions Or Hemothoraces, And To Treat Pneumothoraces

*(Source: Ottawa's Clerkship Guide to Emergency Medicine)*

## Indications for Intubation

Infographic demonstrating indications for intubation (4 P's): patency, positive-pressure ventilation, protection and predicted deterioration.

# Indications For Intubation

**P**

### Patency

Obtain and maintain a patent airway when obstructed or impending obstruction

**P**

### Positive-Pressure Ventilation

To correct deficient oxygenation and/or ventilation

**P**

### Protection

Protect from aspiration if decreased LOC

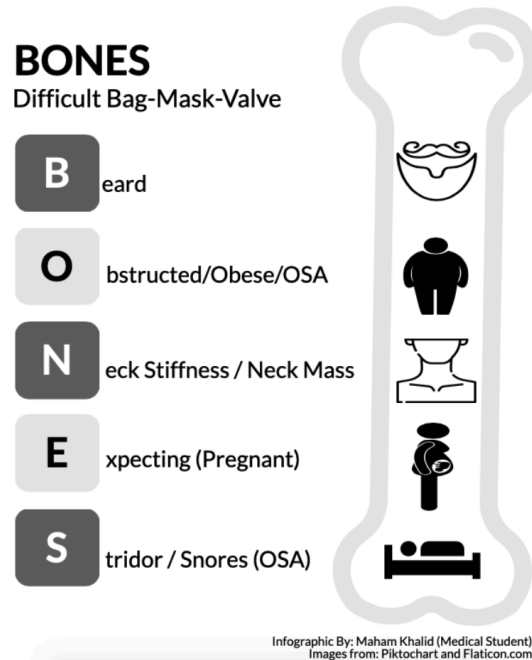
**P**

### Predicted Deterioration

Earlier intubation may be preferred to potential intubation in less favourable environment.

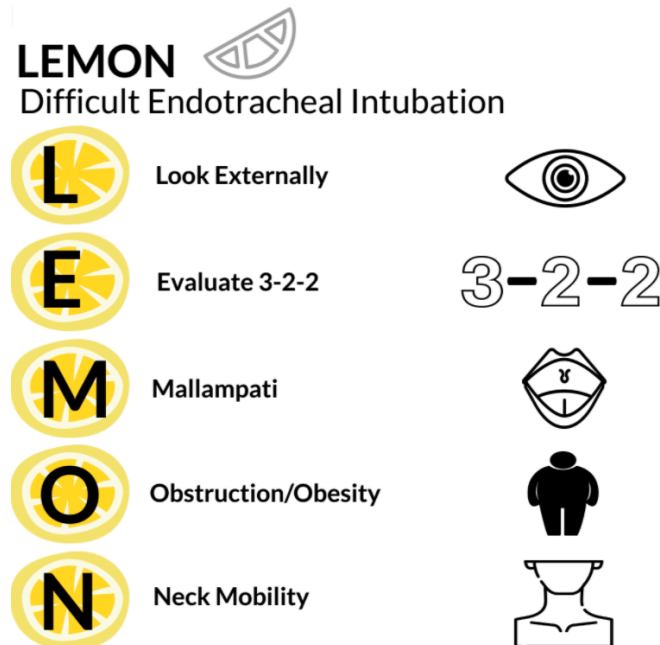
## Difficult Bag-Mask-Valve (BMV)

BONES mnemonic for difficult BMV: beard, obstructed/obese/OSA, neck stiffness/neck mass, expecting (pregnant), stridor/snores.



## Difficult Endotracheal Intubation

Lemon mnemonic for difficult endotracheal intubation: look externally, evaluate 3-2-2, Mallampati, obstruction/obesity and neck mobility



## Difficult Laryngeal Mask Airway

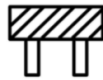
RODS mnemonic for difficult LMA: restricted mouth opening, obstruction, distorted airway anatomy, stiff lungs/neck

### RODS

Difficult Laryngeal Mask Airway



**R**estricted Mouth Opening



**O**bstruction



**D**istorted Airway Anatomy



**S**tiff Lungs / Neck

Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com

## Difficult Cricothyrotomy

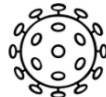
SHORT mnemonic for difficult cricothyrotomy: surgery, hematoma/have infection (abscess), obesity, radiation, tumour/trauma

### SHORT

Difficult Cricothyrotomy



**S**urgery



**H**ematoma, Have Infection (Abscess)



**O**besity



**R**adiation



**T**umor, Trauma

Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com



## Assess the S's of the Airway

(<https://canadiem.org/basic-airway-assessment-easy-1-2-3/>)

**Step 1** - Is there evidence of airway obstruction? Look for silence, see-saw chest movement as signs of complete obstruction. Stridor, secretions, snoring and smash-injuries are signs of partial obstruction.

**Step 2** - Is there a risk of anticipated obstruction? Look for singe, sputum, swelling of the neck and stab wounds.

**Step 3** - Is there risk of aspiration from failure to protect airway? Assess sleepiness (low GCS).

	<b>Step 1: Is there evidence of airway obstruction now?</b>	<b>Step 2: Is there a risk of anticipated airway obstruction?</b>	<b>Step 3: Is there a risk of Aspiration from failure to PROTECT their airway?</b>
<b>Signs &amp; Symptoms</b>	<b>Complete Obstruction</b> Silence without chest rise or See-Saw Chest movement <b>Partial Obstruction</b> Stridor – airway swelling/compression by hematoma Secretions – saliva, blood Snoring – tongue relaxation Smash – risk of teeth/blood in the airway	Singe or Sputum (carbonaceous) – risk of delayed airway swelling from inhalational burn Stab or Swelling neck – risk of delayed airway compression from expanding hematoma or neck mass	Sleepy (low GCS)

### Junior Learner Pearls

1. If the patient looks SICK or gets SICK during history/physical - call for help/let someone know before proceeding in case the patient needs immediate attention (ie resident or preceptor)
2. Know the indications for various interventions and how they can help - ie when to use supplemental oxygen/advancing to providing pressure support and eventually intubating
3. When applying clinical decision making rules - know their meaning, their indications (ie apply PERC when pre-test probability is  $\leq 15\%$ ), and their ramifications. What are you signing up to do when you apply them (ie Wells PE  $> 6$  = do CT PA, if Wells PE  $< 2$  still gets a D-Dimer)
4. GCS  $< 8$  is not an absolute indication for intubation! (ie intoxicated patients and post-ictal patients can have GCS 5 or 6 and wake up a few hours later and don't need to be intubated as they often don't aspirate)
5. Look up your local antibiogram for common local organisms and their susceptibility when giving empiric antibiotics

## Recommended Readings, Videos and Podcasts

CRACKCast E025 – Dyspnea Overview

<https://canadiem.org/crackcast-e025-dyspnea/>

COVID-19 related assessment and Recommendations

<https://canadiem.org/surviving-sepsis-campaign-covid-19-recommendations/>

CRACKCast E074 – COPD

<https://canadiem.org/crackcast-e074-copd/>

CRACKCast E073 – Asthma

<https://canadiem.org/crackcast-e073-asthma>

EMCases - Pulmonary Embolism

<https://emergencymedicinecases.com/pulmonary-embolism-diagnosis-2-imaging-pregnancy-subsegmental-pe>

<https://emergencymedicinecases.com/wp-content/uploads/2018/11/Infographic-PE-Pregnancy-Final.jpg>

Managing Airway -

<https://canadiem.org/basic-airway-assessment-easy-1-2-3/>

## KEY DECISION MAKING RULES

PERC -

<https://www.mdcalc.com/perc-rule-pulmonary-embolism>

Wells PE -

<https://www.mdcalc.com/wells-criteria-pulmonary-embolism>

Wells DVT -

<https://www.mdcalc.com/wells-criteria-dvt>

Ottawa's Clerkship Guide to Emergency Medicine - Shortness of Breath Section

<https://emottawablog.com/wp-content/uploads/2018/03/Ottawas-Clerkship-Guide-to-Emergency-Medicine-First-Edition.pdf>

# Back Pain

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## Can't Miss Diagnoses

- Unstable vertebral fracture
- Cord compression causing Cauda Equina Syndrome (CES): Epidural abscess, hematoma
- Spinal abscesses
- Transverse myelitis
- Vertebral osteomyelitis
- Discitis
- Spinal metastasis

## Killer Mimics

- Vascular: Aortic dissection, Ruptured aortic aneurysm, PE, MI
- Renal: Pyelonephritis, renal colic
- Pneumonia
- Pelvic conditions: Prostatitis, PID

## Red Flags of Back Pain

**Important to assess in:** DM, history of malignancy, anti-coagulation, osteoporosis, IVDU, steroid use, immunocompromised states, and associated alarming symptoms like fever, syncope (aortic dissection).

## BACK-PAIN Mnemonic for Red Flag Screening

Here is a nifty mnemonic that may be useful:

### Updated and adapted for clerks by:

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### Original primer created by:

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## RED FLAGS

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**B - Bowel (incontinence) or Bladder (retention) dysfunction**



**A - Anesthesia of Saddle region (saddle anesthesia)**



**C - Cancer History or Constitutional Symptoms (?abscess)**



**K - Killer Pain / Constant Pain**



**P - Parasthesias of lower limb**



**A - Age greater than 50**



**I - IV drug use, recent infection, immunocompromised**



**N - Neuromotor deficits**

Infographic by: Maroof Khalid, MD Candidate

Images from: flaticon.com

## Points to Focus Upon

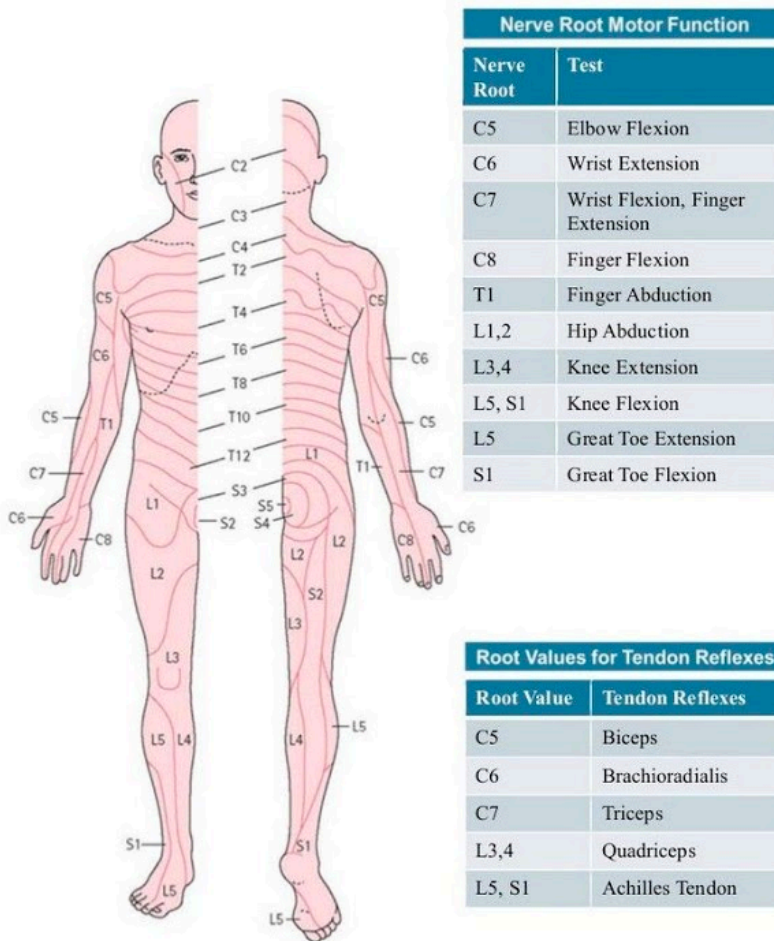
- Assess ABC, O2 need, complete neurologic exam including gait-walk and midline and paraspinal tenderness as well as reproducibility.
- All back pain examinations with neurological deficits should have routine documented assessment until care is transferred to the spine team. Worsening deficits warrant a rapid assessment by the spine team.
- Cauda Equina Syndrome (CES) - Screen for and document the presence or absence of these. You can have a PARTIAL CES. \*\*Urinary retention (but may have overflow incontinence), fecal incontinence, saddle anesthesia use.

## SCREEN FOR RED FLAGS (See above)

- Document the presence or absence of red flags
- Physical Exam (read more here: (<https://canadiem.org/how-useful-is-the-physical-examination-in-suspected-cauda-equina-syndrome/>))
- Post Void Residual (PVR) volume to assess urinary retention. Less than 50mL PVR is adequate bladder emptying. Over 200mL PVR indicates inadequate emptying.
- DO A DIGITAL RECTAL EXAM (Rectal tone).
- Repeating serial examinations is prudent, mainly to see if there has been a change in symptoms.
- Document pattern of symptoms as well (ideally with ASIA) especially where symptoms are worse (distal vs proximal, motor vs sensation). The ASIA ISCOS tool can be found here ([https://asia-spinalinjury.org/wp-content/uploads/2016/02/International\\_Std\\_Diagram\\_Worksheet.pdf](https://asia-spinalinjury.org/wp-content/uploads/2016/02/International_Std_Diagram_Worksheet.pdf))

Epidural abscess at any setting can cause symptoms of CES; MRI the entire spine if this is a consideration (fever or sepsis with unrelenting back pain).

## Dermatomes and Myotomes



## Investigations

- An X-ray the area of the spine for most individuals over 50 years of age is reasonable. Make sure you get two views on L-spine X ray (AP & Lateral).
- Tips on Tests: CXR - looking for alternative diagnoses (Pneumothorax, pneumonia) or incidental findings.

## Management

### IF MECHANICAL BACK PAIN IS YOUR MAIN SUSPECTED DIAGNOSIS:

- \*Remember, Mechanical LBP is a diagnosis of exclusion.\*
- NSAIDs where warranted, and Acetaminophen.
- Breakthrough opioids when necessary or if other medications are contraindicated (e.g. if patient on DOAC or Warfarin and cannot have NSAID).
- Patient education is imperative for adherence. The CORE back pain tool and exercises they can tolerate. See below.

**IF RENAL COLIC IS YOUR MAIN SUSPECTED DIAGNOSIS**

- Assess for sepsis, consider anti-emetic, analgesic and IVF early on

**IF SPINAL ABSCESS IS YOUR MAIN SUSPECTED DIAGNOSIS**

- Consider antibiotics early in case of fever and LBP, and/ or story consistent with spinal intervention, IVDU or immunosuppression and concern for epidural abscess- MRI

**IF AAA IS YOUR MAIN SUSPECTED DIAGNOSIS**

- Provide blood resuscitation and transfer to OR

**IF AORTIC DISSECTION IS YOUR MAIN SUSPECTED DIAGNOSIS**

- IV BP meds (Labetolol) to control HR and BP, with consult to vascular ASAP

**IF CES IS YOUR MAIN SUSPECTED DIAGNOSIS**

- Urgent MRI, spine consult, pain management, and IV dexamethasone

**Tips for Junior Learners:**

1. Make sure to document your physical and neurological exam well for back pain!
2. If the pain appears severe with a particular exam maneuver, avoid adding more pressure unless comfortable with the exam, otherwise allow senior/staff to finish that portion of the exam.
3. Ask your staff if they are comfortable with you doing more invasive tests such as the DRE on your own and if they are, have a chaperone.
4. Remember that most back pain is mechanical!

**Patient Education Materials**

- CORE BACK PAIN TOOL: <https://cep.health/tool/download/19/>
- Dr. Mike Evan's Back Pain Video: <https://www.youtube.com/watch?v=BOjTegn9RuY>

## Saskatchewan Exercise Guides for Patient Education

1. Pattern 1 - Pain is worst in the back, buttocks, upper thigh, or groin (but may radiate to the legs) <http://www.sasksurgery.ca/pdf/healthy-back-exercises1.pdf>
2. Pattern 2 - Pain is worst in the lower back (and may spread to buttocks or legs) <http://www.sasksurgery.ca/pdf/healthy-back-exercises2.pdf>
3. Pattern 3 - Pain is mainly in the legs but back pain may be present <http://www.sasksurgery.ca/pdf/healthy-back-exercises3.pdf>
4. Pattern 4 - Pain is worst in legs and can be described as heaviness or aching <http://www.sasksurgery.ca/pdf/healthy-back-exercises4.pdf>

## Recommended reading, videos, and podcasts

- Deeper Dive CanadiEM Post on Physical Exam in Back Pain: <https://canadiem.org/how-useful-is-the-physical-examination-in-suspected-cauda-equina-syndrome>
- Exam Series: Guide to the Back Exam: <https://canadiem.org/exam-series-guide-to-the-back-exam/>
- ASIA ISCOS Tool for Classifying Spinal Cord Injury: [https://asia-spinalinjury.org/wp-content/uploads/2016/02/International\\_Std\\_Diagram\\_Worksheet.pdf](https://asia-spinalinjury.org/wp-content/uploads/2016/02/International_Std_Diagram_Worksheet.pdf)
- PVR: <https://www.ncbi.nlm.nih.gov/books/NBK539839/>
- Tiny Tip: Back Pain Differential Mnemonic: <https://canadiem.org/back-pain-differential/>
- Tiny Tip: CES for Cauda Equina Syndrome: <https://canadiem.org/tiny-tips-cauda-equina-syndrome/>
- CRACKCast E035 – Back Pain: <https://canadiem.org/crackcast-e035-back-pain/>
- Low Back Pain Emergencies Emergency medicine cases: <https://emergencymedicines.com/episode-26-low-back-pain-emergencies/>
- Lumbar Disc Herniation- Orthobullets: <https://www.orthobullets.com/spine/2035/lumbar-disc-herniation>
- Back examination video - Rheumtutor: <https://www.rheumtutor.com/msk-examination/videos/>










# Headache

Also see "[Trauma - Isolated Head Injury](#)" for similar info.

## Cannot miss Diagnosis

### Headaches: Can't Miss Diagnoses: BITE ME V

	<p><b>Bleed</b> Subarachnoid hemorrhage, traumatic intracranial hemorrhage (epidural or subdural hematoma)</p>
	<p><b>Infection</b> Meningitis, encephalitis</p>
	<p><b>Thrombosis</b> Cerebral venous sinus thrombosis</p>
	<p><b>Eye</b> Acute angle closure glaucoma</p>
	<p><b>Mass/Migraine</b> Especially status migrainosus (&gt;72h)</p>
	<p><b>Environmental exposure</b> Carbon monoxide (CO) poisoning</p>
	<p><b>Vascular</b> Temporal arteritis, carotid artery dissection</p>

Infographic by Monika Bilic

### Updated and adapted for clerks by:

Monika Bilic,  
Maham Khalid,  
Maroof Khalid,  
Alysha Laviolette

### Original primer created by:

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EM),  
Teresa Chan MD FRCPC  
MHPE

## Non-emergent but common headaches

- Migraine
- Trigeminal neuralgia
- Post-traumatic (concussive)
- Sinusitis

- Cluster or Histamine
- Headaches
- Dental problems
- TMJ
- Tension Headache
- Cervical Strain
- Effort-dependent or coital headaches

## Points to focus on

### History

Red flags: sudden onset, thunderclap, exertional onset, meningismus, fever, neurologic deficit, AMS

Sx of increased ICP: persistent vomiting, headache worsening laying down or in AM  
Others: history of Trauma, Anticoagulation, Maximal intensity at onset, Fever, immunocompromised.

### Physical:

- Vitals
- Full neurological exam and reassess
- Signs of meningismus
- Temporal tenderness
- Eye exam (slit lamp, IOP)
- Signs of raised ICP (intracranial pressure)

## Investigations

Neuroimaging is used to rule out deadly causes.

- Most benign headaches do not need further investigation
- See clinical decision rules below

Lumbar puncture: used if (1) CT head negative (>6 h from onset) but suspicion of suparachnoid hemorrhage, or (2) Suspicion of meningitis

### Labs:

CBC, BUN, Cr, Lytes, Glucose

Consider INR/PTT (esp if on warfarin or DOACs)

ESR/CRP if suspect temporal arteritis

## Clinical Decision Tools

Canadian CT Head Rules: post-traumatic for patients with GCS 13-15

<https://www.mdcalc.com/canadian-ct-head-injury-trauma-rule>

PECARN rule: post-traumatic for children

<https://www.mdcalc.com/pecarn-pediatric-head-injury-trauma-algorithm>

Ottawa Subarachnoid Rule: to rule out SAH in those with headache

<https://www.mdcalc.com/ottawa-subarachnoid-hemorrhage-sah-rule-headache-evaluation>

"6-hour CT head for r/o SAH" rule - not an official rule, but mounting evidence

<https://rebelem.com/does-a-normal-head-ct-within-6-hours-of-onset-of-headache-rule-out-sah/>

## Management

### ICH

- Neurosurgery and/or admission.
- Consider reversal of oral anticoagulation using human prothrombin complex (PCC) in consultation with hematology/thrombosis/Blood bank to your institution.
- Specific reversal agents are also available

### ED MIGRAINE MANAGEMENT

- Acetaminophen
- NSAID (e.g. toradol 10mg IV x1)
- Metoclopramide (Maxeran)
- Sumatriptan

Discharge Diagnoses to Educate About:

Migraine, Tension HA, Cluster HA, ENT referred pain

### Pearls for Junior Learners

- Remember to document the presence or absence of red flags when charting
- Remember that the benign causes are a diagnosis of exclusion

## Recommended readings, videos and podcasts

Approach To: Headaches

<https://emin5.com/2017/02/22/approach-to-headaches/>

CRACKCast E020 – Headaches (General approach)

<https://canadiem.org/crackcast-e020-headaches/>

CanadiEM MVP infographic - CT Head Rules Infographic

<https://canadiem.org/canadiem-mvp-infographic-series-canadian-ct-head-rule/>

CRACKCast E103 – Headache Disorders (Deeper dive)

<https://canadiem.org/crackcast-e103-headache-disorders/>

EMCases Headache Pearls and pitfalls

[https://emergencymedicinecases.com/wp-content/uploads/filebase/pdf/EMC\\_014\\_May2011\\_Summary.pdf](https://emergencymedicinecases.com/wp-content/uploads/filebase/pdf/EMC_014_May2011_Summary.pdf)

Canadian CT Head Rule YouTube Video (featuring Dr. Stiell himself)

<https://www.youtube.com/watch?v=-qOfQQK-O24>

PECARN Education Card (by ALiEM-CanadiEM)

<https://canadiem.org/the-pecarn-pediatric-head-ct-rule-project/>

# Ischemic Stroke

---

## Differential Diagnosis

### Structural

- acute/chronic subdural or epidural hematoma
- brain tumour
- brain abscess

### Vascular

- air gas embolism
- aortic dissection
- carotid/cervical artery dissection
- migraine
- giant cell arteritis
- polyarteritis nodosa
- lupus/vasculitis
- cerebral venous sinus thrombosis

### Metabolic

- hypoglycemia
- Wernicke's encephalopathy
- post-seizure induced Todd's paralysis

### Infectious

- Bell's palsy
- Vestibular neuronitis

### Demyelination or Peripheral Neuropathy

- Peripheral nerve palsy
- Meniere's disease

## Etiology

### In situ thrombosis

- large vessels (occurs at cerebral vessel branch points - ex. internal carotid artery and caused by ulcerated atherosclerotic plaque -> platelet plugs)
- small vessels (lacunar or small vessel strokes at the small terminal vessel end points [DM, HTN])

### Updated and adapted for junior learners by:

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### Original primer created by:

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Sahlas MD FRCPC  
(Neurology)

## Embolic obstruction

- cardiac (afib, septic embolic from infective endocarditis)
- non cardiac (extracranial proximal carotid plaque, age)

## Points to Focus On

### History

1. VERY IMPORTANT --> Last known well time from patient if reliable or witness if not.
  1. Do not just go by what EMS says, may not accurate due to time constraints
2. Brief HPI on how patient was found or what lead to event/if witnessed. Listen to EMS reports. Sometimes they gathered info that cannot be found anywhere else.
3. Past medical history (pertinent + only including recent bleeding, prior ICH, known AF, metastatic ca with life expectancy <6 months, cardiovascular RF)
4. Medication list (mainly anticoagulants/anti-platelets)
5. Baseline functional status (ask for specific ADLs, walking unassisted and if patient can be left alone for a day at a time – most elderly cannot although “independent” per family)

### Physical Examination

1. ABCs – Is patient protecting airway? Stroke patient's de-saturate late and aspirate early.
2. Blood pressure (~5% of acute ischemic stroke patients have normal BP on arrival)
3. Capillary blood sugar – If <4 correct but if symptoms persist, proceed with stroke eval.
4. NIH Stroke Scale (use App. on phone to help calculation – see below)
5. If administering tPA, perform a thorough baseline airway assessment (just in case patient develops angioedema later)

### Stroke Neurological Exam

1. GCS/LOC
2. Speech
3. Inspect for signs of trauma
4. Cranial nerve assessment
5. Sensory and motor x4 limbs
6. Cerebellar function
7. Glucose

### Investigations

1. Bloodwork: CBC, INR/PTT, VBG, lytes, Creatinine, Trop
2. Imaging
3. EKG (this should wait after treatment decision has been made) – Look for Atrial Fibrillation
4. If patient presented *within 6 hours* from last known well, perform:

1. CT head + CTA carotids(multiphase)\*
  5. If patient presented *beyond 6 hours* from last known well and they are independent at baseline and have an NIHSS>6, perform:
    1. CT Head + CTA arch to vertex (multiphase) + CT Perfusion (RAPID), if available.
- \*CT head + CTA should be performed for all patients presenting with symptoms of acute ischemic stroke, as well as for patients with high-risk TIAs (symptoms of unilateral motor weakness, speech difficulties, monocular blindness, or visual field defect).

## Clinical Decision Tools

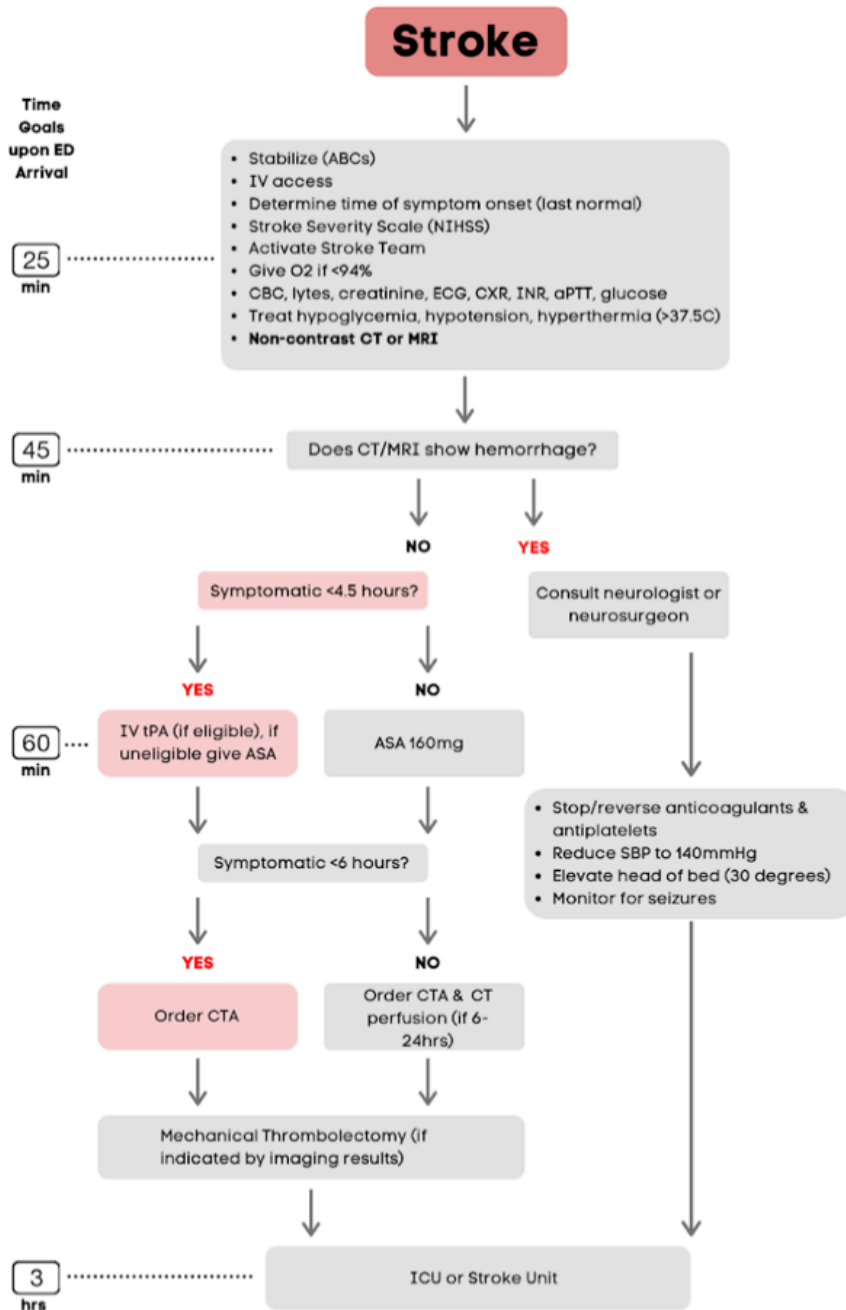
- NIH Stroke Scale (calculates stroke severity) <https://www.mdcalc.com/nih-stroke-scale-score-nihss>
- Modified NIH Stroke Scale (shortened version of the NIH stroke scale) <https://www.mdcalc.com/modified-nih-stroke-scale-score-mnihss>
- tPA Contraindications for Ischemic Stroke <https://www.mdcalc.com/tpa-contraindications-ischemic-stroke>
- Download the NeuroToolkit App on your phone to perform the NIHSS. It also has inclusion/exclusion criteria for tPA, aphasia images and other useful scales. CAUTION: This is NOT #FOAMed
  - Apple : <https://apps.apple.com/ca/app/neuro-toolkit/id350656519>
  - Android: [https://play.google.com/store/apps/details?id=com.ellington.kent.neurotoolkit&hl=en\\_CA](https://play.google.com/store/apps/details?id=com.ellington.kent.neurotoolkit&hl=en_CA)

## Stroke Algorithm

- The goal of the stroke algorithm is to ensure patients receive appropriate treatment and investigations within three hours of presenting to the emergency department.
- Upon arrival to the ED, providers should:
  - ensure the patient is stable (ABC's), ensure IV access,
  - determine time of symptoms onset (when patient was last normal),
  - perform Stroke Severity Scale (NIHSS),
  - activate Stroke Team,
  - give supplemental oxygen if SpO2 is less than 94%,
  - order CBC, electrolytes, creatinine, ECG, chest x-ray, INR, aPTT, and glucose.
  - Providers should also treat hypoglycemia, hypotension, hyperthermia, and order a non-contrast head CT or MRI.
  - These investigations should be ordered *within 25 minutes* upon arrival to the ED.
- Head CT or MRI should be assessed *within 45 minutes* upon arrival to the ED to rule out intracranial hemorrhage.
  - If there are *no signs of hemorrhage* and patient has been symptomatic for less than 4.5 hours then give IV tPA (if eligible) and order a CTA.

- If patient is not eligible for tPA or has been asymptomatic for over 4.5 hours, then give aspirin 160mg and order CTA.
    - Based on CTA, patient may be eligible for mechanical thrombolectomy.
- The final step of this algorithm is admission to the ICU or stroke unit *within three hours* upon arrival to the ED.
- If there are *signs of intracranial hemorrhage* on head CT or MRI, then consult a neurologist or neurosurgeon and stop/reverse anticoagulants and anti-platelets.
  - Patients with an intracranial hemorrhage need to have their systolic blood pressure reduce to at least 140mmHg, have the head of their bed elevated to 30 degrees, and be monitored for seizures.
  - These patients should then be admitted to ICU or stroke unit *within three hours* upon arrival to the ED.
- Medications in the stroke algorithm.
  - tPA (alteplase) should be given at 0.9mg/kg, maximum dose 90mg over 60 minutes with initial 10% of dose given as a bolus over 1 minute.
    - tPA should not be delayed for additional images.
    - Absolute Contraindications to tPA:
      1. Intracranial hemorrhage on CT
      2. Clinical presentation suggests subarachnoid hemorrhage
      3. Neurosurgery, head trauma, or stroke in the past 3 months
      4. Uncontrolled HTN (>185mmHg SBP or >110mmHg DBP)
      5. Hx of intracranial hemorrhage
      6. Known intracranial arteriovenous malformation, neoplasm, or aneurysm
      7. Active internal bleeding
      8. Suspected/confirmed endocarditis
      9. Known bleeding diathesis
      10. Low glucose (<50mg/dL)
    - **\*\*These can be found on MDCalc\*\*** <https://www.mdcalc.com/tpa-contraindications-ischemic-stroke>
    - If patient is hypertensive
      1. give Labetolol 10-20mg IV over 1-2 minutes or
      2. Nicardipine 5mg/hr IV and titrate by 2.5mg/hr every 5-15 minutes with maximum 15mg/hr, or
      3. give Clevidipine 1-2mg/hr and titrate by doubling dose every 2-5 minutes until maximum 21mg/hr.





**Doses/Drugs**

- tPA:**
- 0.9mg/kg, max dose 90mg over 60min with initial 10% of dose given as a bolus over 1 min
  - do NOT delay tPA for additional images

- For Hypertension:**
- Labetalol 10-20mg IV over 1-2min OR
  - Nicardipine 5mg/h IV, titrate by 2.5mg/h every 5-15min, max 15mg/h OR
  - Clevidipine 1-2mg/h, titrate by doubling dose every 2-5min, max 21mg/h

**Absolute Contraindications for tPA:**

1. Intracranial hemorrhage
2. Clinical presentation suggests SAH
3. Neurosurgery, head trauma, or stroke in the past 3 months
4. Uncontrolled HTN (>185mmHg SBP or >110mmHg DBP)
5. Hx of intracranial hemorrhage
6. Known intracranial arteriovenous malformation, neoplasm, or aneurysm
7. Active internal bleeding
8. Suspected/confirmed endocarditis
9. Known bleeding diathesis
10. Low glucose (<50mg/dL)

## tPA After Stroke

- A study was conducted to assess patient outcome of thrombolysis with Alteplase given 3 to 4.5 hours after an acute ischemic stroke.
- Background information: Alteplase (tPA) is used to breakdown blood clots in ischemic strokes. tPA was previously only approved until 3 hours post-stroke.
- Pooled analysis of data from randomized control trials showed a favourable outcome if treatment was given between 3 and 4.5 hours.
- The question of this study was, what is the safety and efficacy of tPA given 3 to 4.5 hours post-stroke?
- The methods of this study included: double blinded multi-site randomized control trials and a 1:1 tPA to placebo randomization.
  - Inclusion criteria was: patients 18 to 80 years old, with and acute ischemic stroke, and able to receive the study drug within 3 to 4.5 hours after symptom onset.
  - Exclusion criteria included patients with an intracranial hemorrhage and severe stroke (NIHSS score greater than 25 or on imaging techniques). 418 patients received tPA and 403 patients received the placebo.
- Of the patients who received tPA, 2.4% had a symptomatic intracranial hemorrhage, 7.7% died, and 45.2% became disabled from their stroke.
- Of the patients who received the placebo, 0.3% had a symptomatic intracranial hemorrhage, 8.4% died, and 45.2% became disabled from their stroke.
- In summary, while Alteplase treatment given at 3 to 4.5 hours after the onset of acute ischemic stroke symptoms increased the incidence of symptomatic intracranial hemorrhage, it can decrease disability in a select population of patients without changing mortality.

# THROMBOLYSIS WITH ALTEPLASE 3 to 4.5 HOURS AFTER ACUTE ISCHEMIC STROKE

ECASS Investigators

canadiem MVP INFOGRAPHIC SERIES

## Background



Alteplase (tPA) is used to **breakdown blood clots** in ischemic strokes.



3hr

tPA was previously **only approved until 3hr** post stroke



3 - 4.5 hr

Pooled analysis of data from RCTs showed a **favourable outcome** if treatment was given **between 3 - 4.5 hrs**

What is the safety and efficacy of tPA given 3 - 4.5 hrs post stroke?

## Methods



Double blinded  
Multi-site RCT



1:1 tPA to  
Placebo  
randomization

### ✓ Inclusion



18 to 80 years old



Acute ischemic  
stroke



Able to receive the  
study drug within 3-  
4.5 hours after  
symptom onset

### ✗ Exclusion



Intracranial  
hemorrhage



Severe stroke  
(NIHSS score >25 or on  
imaging techniques)

## Results



tPA (418)

0.9 mg/kg (max 90mg)



Placebo (403)

No Drug



Symptomatic  
Intracranial  
Hemorrhage

2.4%\*

0.3%



Mortality  
(at 90 days,  
no significant difference)

7.7%

8.4%



Disability  
(at 90 days,  
modified Rankin > 1)

45.2%\*

52.4%

\* = statistically significantly different

## Take Home



While **Alteplase treatment given at 3-4.5 hours** after the onset of acute stroke symptoms **INCREASES** the incidence of **symptomatic intracranial hemorrhage**, it can **DECREASE** disability in a select population of patients without changing mortality.



### REFERENCES:

ECASS Investigators. (2008). Thrombolysis with Alteplase 3 to 4.5 hours after acute Ischemic Stroke. *New England Journal of Medicine*, 359(13), 1317-1339

This infographic was created by Amy Chung and edited by Alvin Chin



## Complications of tPA

- **BLEEDING AFTER tPA:** Sometimes after administration of tPA, you can get Intracranial Hemorrhage or systemic bleeding AFTER thrombolysis.
  - If patient worsens clinically during infusion, stop IV pump, obtain stat repeat plain CT head.
  - Obtain: INR, PTT, platelets and fibrinogen levels, type and cross match.
  - Administer: Fibrinogen concentrate and Tranexamic Acid 1g IV over 10 min.
  - Can repeat if bleeding continues.
  - Neurosurgery consultation if ICH.
  - Thrombosis consultation.
- **ANGIOEDEMA:**
  - tPA induced angioedema is an idiopathic. If patient develops signs of angioedema (e.g. lip swelling, tongue swelling),
  - Stop tPA
  - Assess for intubation, if advancing quickly, CALL FOR HELP from ENT and/or Anesthesia. Sometimes it may be best for the patient to be managed in the OR, if a surgical airway is needed (due to recent administration of tPA).
  - Methylprednisolone 125mg IV x 1
  - Histamine blockade: Diphenhydramine 50mg IV x1 plus one of (ranitidine 50mg IV or famotidine 20mg IV x 1)
  - If further angioedema, consider treating as anaphylaxis, including:
    - Epinephrine 0.5 mg IM x 1

### Pearls for Junior Learners

1. Perform a neuro exam
2. Determine when patient was "last well"
3. Calculate NIH Stroke Scale on MD Calc

## Recommended Readings, Videos, and Podcasts

- NIHSS training videos <https://secure.trainingcampus.net/uas/modules/trees/windex.aspx?rx=nihss-english.trainingcampus.net>
- Catanese L, et al. Acute Ischemic Stroke Therapy overview. *Circ Res.* 2017 Feb 3;120(3):541-558 <https://www.ahajournals.org/doi/pdf/10.1161/CIRCRESAHA.116.309278>
- Thrombolysis with Alteplase Infographic: <https://canadiem.org/canadiem-mvp-infographic-series-thrombolysis-with-alteplase-3-to-4-5-hours-after-acute-ischemic-stroke/>
- CrackCast Ep101 - Stroke <https://canadiem.org/crackcast-e101-stroke/>

## References

1. Powers WJ, et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke. American Heart Association/American Stroke Association. *Stroke* 2019;50:e344-e418.
2. Boulanger JM, et al. Canadian Stroke Best Practice Recommendations. Acute Stroke Management: Prehospital, Emergency Department, and Acute Inpatient Stroke Care. Heart and Stroke Foundation. 2018
3. Identifying Stroke Mimics in the ED - <https://emottawablog.com/2019/02/identifying-stroke-mimics/>
4. Advanced Cardiovascular Life Support: Provider Manual. Ottawa, ON: Heart & Stroke Association; 2016.
5. Emergency Department Evaluation and Management of Patients with Acute Stroke and TIA. Canadian Stroke Best Practices. <https://www.strokebestpractices.ca/recommendations/acute-stroke-management/emergency-department-evaluation-and-management>

# Vertigo

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## Can't Miss Diagnoses

### Central causes

- Cerebellar hemorrhage
- Stroke (especially posterior circulation)
- Vertebrobasilar insufficiency
- Multiple sclerosis
- Trauma
- Infections

### Peripheral causes

- BPPV
- Vestibular neuritis/labyrinthitis
- Meniere's Disease
- Infection: Acute otitis media
- Foreign body in the ear canal

### Mimics of vertigo

- Syncope/Pre-syncope
- Hypoglycemia
- Dehydration

## Points to Focus On

### History

- It is key to differentiate between *peripheral* (relatively benign, but extremely annoying) and *central* vertigo (possibly insidious and dangerous).
  - See below chart for compare and contrast
- History is notoriously **UNRELIABLE** as a differentiator for patient's vertigo (see review article by Edlow for details).
- Remember, central causes of vertigo will often have very subtle findings on a neurological screening exam (e.g. subtle gait disturbance). Be **VERY CAREFUL** when doing an examination on a patient, it is very easy to miss central vertigo caused by posterior circulation strokes.
- Central or peripheral:
  - Central vertigo is classically ill-defined, constant, and associated with vertical, bi-directional (direction changing) nystagmus.

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- Peripheral vertigo is classically dramatic, sudden onset, with rotatory-vertical or horizontal nystagmus and intense paroxysmal vertigo.

## Examination/Investigations

- Beginning with ABCs, complete vitals Pulse oximeter, and finger stick glucose.
- Orthostatic vitals & cardiovascular assessment and documenting any prior history of bleed or volume loss
- COMPLETE NEURO EXAM SCREEN
  - important findings: diplopia, dysarthria, visual changes, gait, cerebellar testing (rapid alternating movements, finger-to-nose)
- DIX-HALLPIKE MANEUVER
  - Review with this video here from the BMJ: <https://www.youtube.com/watch?v=8RYB2QIO1N4>
- HINTS exam - Head Impulse, Nystagmus, Test of Skew: <https://www.youtube.com/watch?v=VwmrjYuvqtQ>

## Comparing Central and Peripheral Vertigo

Hx/Px Factor	Peripheral	Central
<b>Onset</b>	Sudden onset	Can be either gradual or sudden
<b>Duration</b>	Severe	Mild, subtle
<b>Nystagmus directionality</b>	Unidirectional Usually horizontal, sometimes rotatory	<b>Vertical Nystagmus is a RED FLAG</b> Can be multidirectional or downbeating
<b>Effect of Head Position (e.g. Dix-Hallpike Maneuver)</b>	Worsened by certain positions  (Elicited by Dix-Hallpike)	Not really better or worse with various positions.
<b>Any Associated Symptoms?</b>	Can also have tinnitus.  NO NEUROLOGICAL SYMPTOMS ASSOCIATED.	Usually associated with other neurological symptoms.

## Clinical Decision Tools

HINTS Exam: <https://www.mdcalc.com/hints-stroke-acute-vestibular-syndrome>

## Investigations

- CBC, BUN, Cr, Lytes, Glucose
- INR/PTT (especially if on warfarin or DOACs)
- CT Head (r/o ICH)
- ECG in elderly
- Consider admission or rapid follow-up for MRI of central cause suspected.

## Management

Regardless of disposition, patients with dizziness should be warned **NOT TO DRIVE WITH THEIR SYMPTOMS**, regardless of the type of vertigo they have.

1. Peripheral Vertigo
  - The Epley Maneuver is often therapeutic - but may not always work in the ED.
  - Meniere's Disease - can use betahistamines
  - Vestibular Neuritis/labyrinthitis - can use antibiotics/steroids
  - Check out the Geeky Medics video on this: <https://www.youtube.com/watch?v=D6qEdlFVxig> (Go to 1min11sec for the Epley part)
2. Central Vertigo
  - Usually will require either admission or specialist consultation.
  - For new CNS bleeds/lesions, neurosurgery or neurology may need to be involved for rapid intervention or close follow-up.

### Pearls for Junior Learners

1. Always remember to ask if there is any changes to their hearing!
2. A thorough review of systems is necessary - i.e. changes in vision, balance, headaches, etcetera and DON'T forget constitutional symptoms
3. Some maneuvers can make nausea/vomiting worse i.e. Epley's/ Dix-Hallpike - so watch out and warn the patient!
4. DON'T forget to assess gait when doing neuro exam!
5. Always determine time course - Is this chronic vs acute? Is it worsening? If it is chronic, what changed today that made the patient come in?



## Recommended Reading, Videos, and Podcasts:

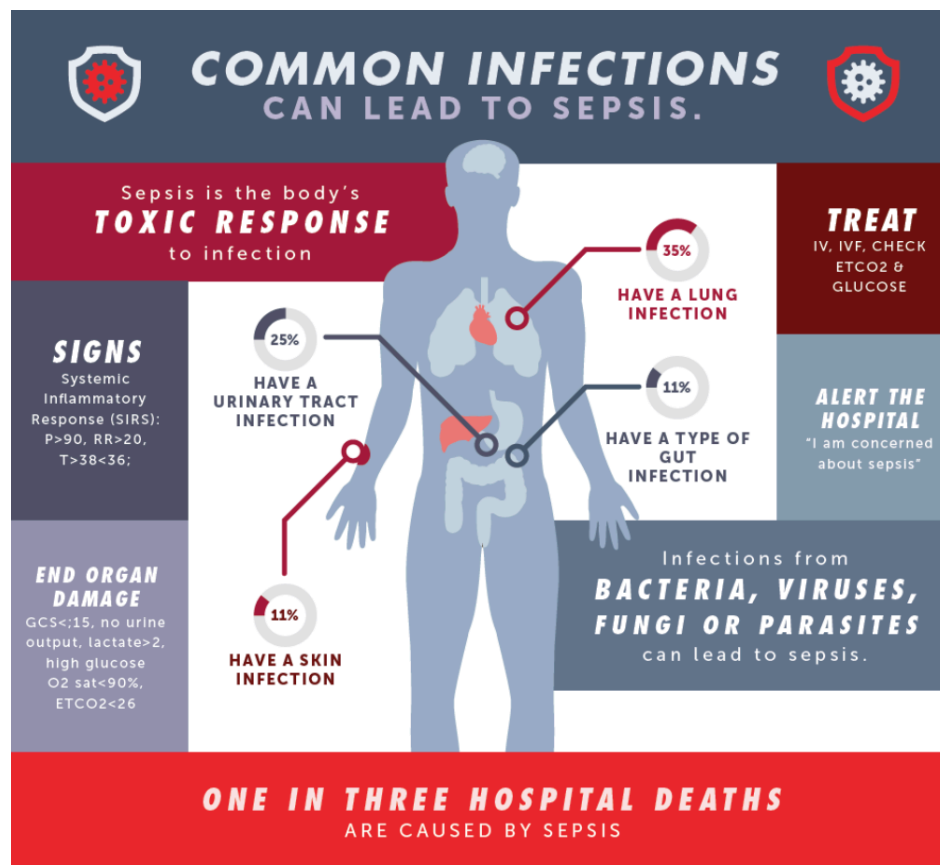
- Boring Question: Dizzy, need a few HINTS?  
<https://canadiem.org/boring-question-dizzy-need-hints/>
- Tiny Tip: HINTS exam to determine INFARCT  
<https://canadiem.org/tiny-tip-hints-determine-infarct/>
- CRACKCast E019 – Dizziness and Vertigo  
<https://canadiem.org/crackcast-e019-dizziness-vertigo/>
- MacEmerg Podcast - Dr. Jonathan Edlow from Harvard & Dizziness (Skip to 26m15s for the Dizziness Section)  
<https://soundcloud.com/mac-emerg/ep-15-residents-combat-covid-greenwald-covid-edlow-dizziness-ttc7>
- EM Basic Podcast - Dizziness  
[http://hwcdn.libsyn.com/p/8/6/7/86781ec2e50202ef/21\\_Dizziness.mp3?c\\_id=4631161&cs\\_id=4631161&expiration=1585959287&hwt=8c54a2a46ee7f6cb9ec401dd72c86c81](http://hwcdn.libsyn.com/p/8/6/7/86781ec2e50202ef/21_Dizziness.mp3?c_id=4631161&cs_id=4631161&expiration=1585959287&hwt=8c54a2a46ee7f6cb9ec401dd72c86c81)
- EM Basic Podcast Show Notes  
<http://embasic.org/wp-content/uploads/2012/06/21-dizziness.pdf>

# Fever and Sepsis

## Common infections leading to Sepsis

Permission was obtained from authors, following which infographic was taken from: <https://www.sepsis.org/education/resources/posters-and-infographics/>

### Infographic description



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Sepsis is the body's toxic response to infection. One in 3 hospital deaths are caused by sepsis. Common infections can lead to sepsis. It may be caused by bacterial, viral, fungal or parasitic infections. 35% of patients have a lung infection; 25% have a UTI; 11% have a type of gut

infection; and 11% have a skin infection. Signs of Systemic Inflammatory Response (SIRS):  $P > 90$ ,  $RR > 20$ ,  $T > 38$  or  $T < 36$ . Signs of end organ damage:  $GCS < 15$ , no urine output, lactate  $> 2$ . High glucose,  $O_2 \text{ sat} < 90\%$ ,  $ETCO_2 < 26$ . Treat: IV, IVF, check  $ETCO_2$  and glucose. Alert the hospital - "I am concerned about sepsis".

## Can't Miss Diagnoses

- Sepsis (obviously) - but critically important to find the source and control it!
- Meningitis / Encephalitis (Not to miss since may need LP for full diagnosis)
- Febrile neutropenia (especially if recent chemotherapy)
- Alcohol Withdrawal (hyperthermia, tachycardia, diaphoresis)
- Benzodiazepine Withdrawal (hyperthermia, tachycardia, diaphoresis)
- Toxic ingestions - cocaine, methamphetamines, crystal meth
- Thyroid Storm
- Serotonin Syndrome
- Neuroleptic malignant syndrome

## Points to Focus Upon

Approximately 0.5% of ED visits are related to sepsis, with the majority of cases (55-70%) occurring in patients  $> 60$ . (1,2) Most patients diagnosed with sepsis are admitted to hospital (75-90%), with up to a third of these patients admitted to ICU. Septic shock is a rare ( $< 5\%$ ) but serious complication.(2)

## Resuscitation Needs

- IV,  $O_2$ , monitoring and complete vitals.
- Recognizing the source of infection, travel, immunocompromised status and sick contact history.
- ALSO REMEMBER: Not all septic patients have a fever. Those without fever have been shown to have worse in-hospital outcomes.

## Hx

REMEMBER: Not all fever is from an infectious source. Some non-infectious causes of fever: PE, thyrotoxicosis, crystal arthropathy, toxic ingestions, withdrawal syndromes, etc.

## Approach

Often vague initial presentation with broad differential in older patients, however it is critical to initiate empiric therapy as soon as possible. Therefore having a high index of suspicion is important, particularly in vulnerable populations (e.g. advanced age, immunosuppressed, diabetes, malignancy, recent hospitalization).

## Investigations

- CBC, BUN, Cr, Lytes, Glucose, VBG
- Consider NPS, Blood Cultures
- Consider CXR, Urinalysis (+/- culture),
- Imaging based on suspected source of infection - e.g. CNS imaging (brain, spine), CT KUB for Septic urolithiasis, Ultrasound of biliary tree for cholangitis/cholecystitis, CT Abdo/Pelvis for other intraabdominal sources.

### Consider adding the following

- Troponin / ECG - depending on suspicion for end organ dysfunction
- Liver enzymes - - depending on suspicion for end organ dysfunction
- Liver function tests (Bilirubin, INR, Albumin, Glucose) - depending on suspicion for end organ dysfunction
- Lipase
- Lumbar puncture - depending on suspicion for CNS infection

### If coagulopathy suspected, may want to consider

- INR/PT
- PTT
- Fibrinogen
- D-Dimer

## Clinical Decision Tools

### Sepsis Scores

1. qSOFA Mnemonic - HAT (Hypotension, AMS, Tachypnea)  
<https://www.mdcalc.com/qsofa-quick-sofa-score-sepsis>
2. SOFA ;(Current Criteria - Surviving Sepsis 2016)  
<https://www.mdcalc.com/qsofa-quick-sofa-score-sepsis>
3. NEWS  
<https://www.mdcalc.com/national-early-warning-score-news#creator-insights>
4. NEWS2 (Most Recent Criteria - calculated at triage without bloodwork)  
<https://www.mdcalc.com/national-early-warning-score-news-2>

### Pneumonia Scores

1. PSI (Pneumonia Severity Index) score  
<https://www.mdcalc.com/psi-port-score-pneumonia-severity-index-cap>
2. CURB-65 Score  
<https://www.mdcalc.com/curb-65-score-pneumonia-severity#use-cases>

3. MuLBSTA - Mortality for Specifically Viral Pneumonia - launched during COVID-19 - yet to be externally validated  
<https://www.mdcalc.com/mulbsta-score>

## Management

The mainstay of sepsis resuscitation is:

1. supportive measures (including fluid resuscitation and intubation as needed);
2. early antibiotics and/or source control

Fluid resuscitation should be targeted to support perfusion of end-organs. And vasoactive agents (a.k.a. "pressors") can be used to help as well, and may be started peripherally (yes, even norepinephrine).

The first choice fluid is currently Ringer's Lactate for large-volume fluid resuscitation. Please see below for 10:EM summaries of the three recent IV Fluids Papers (SPLIT, SMART, and SALT-ED).

### Pearls for Junior Learners

1. Understand your early indicators of Sepsis and when to alert staff that a patient might be deteriorating - <https://www.cdc.gov/sepsis/what-is-sepsis.html>
2. Make sure to wear the proper PPE!
3. Early fluids and antibiotics are key! If you suspect sepsis let someone senior know before continuing with history and physical
4. Remember that paediatric patients may present completely different from what is commonly seen in adults! Be wary of babies who "just don't seem to be acting like themselves" - <https://canadiem.org/crackcast-e167-pediatric-fever/>

## Recommended Readings, Videos, and Podcasts

- CRACKCast E012 – Fever in the ER  
<https://canadiem.org/crackcast-e012-fever/>
- CRACKCast E138 – Sepsis Syndromes  
<https://canadiem.org/crackcast-e138-sepsis-syndromes/>
- CanadiEM COVID-19 Summary of SSC Recommendations  
<https://canadiem.org/surviving-sepsis-campaign-covid-19-recommendations/>
- Quick ICU training - Sepsis Infographics  
[https://quickicutraining.com/\\_files/200000162-5301e53022/7.%20OPS%20-%20Sepsis%20MJ%20edits\\_LB.pdf](https://quickicutraining.com/_files/200000162-5301e53022/7.%20OPS%20-%20Sepsis%20MJ%20edits_LB.pdf)
- First 10:EM IV Fluids Week Posts:  
SPLIT - <https://first10em.com/split/>  
SMART - <https://first10em.com/smart/>  
SALT-ED - <https://first10em.com/salt-ed/>
- EM Cases - Community-Acquired Pneumonia: Emergency Management  
<https://emergencymedicinecases.com/community-acquired-pneumonia/>
- EM Cases - Community-Acquired Pneumonia infographic  
<https://emergencymedicinecases.com/wp-content/uploads/2019/09/CAP-infographic-compressed.png>
- CRACKCast E023 – Sore Throat  
<https://canadiem.org/crackcast-e023-sore-throat/>
- CRACKCast E109 – CNS Infections  
<https://canadiem.org/crackcast-e109-cns-infections/>
- CRACKCast E075 – Upper Respiratory Tract Infections  
<https://canadiem.org/crackcast-e075-upper-respiratory-tract-infections/>

## References

1. Strehlow MC, Emond SD, Shapiro NI, Pelletier AJ, Camargo CA (2006) National Study of Emergency Department Visits for Sepsis, 1992 to 2001. *Annals of Emergency Medicine*. 48:3. doi:10.1016/j.annemergmed.2006.05.003
2. Wang H, Jones A, Donnelly J (2017) Revised National Estimates of Emergency Department Visits for Sepsis in the United States. *Critical Care Medicine*. 45:1443-1449.

# Skin and Soft Tissue Infections

## Can't Miss Diagnosis

- Necrotizing Fasciitis
- Toxic Shock Syndrome
- Venous Thromboembolism (e.g. DVT)
- Peripheral Arterial Occlusion
- Abscess
- Cellulitis
- Burns (including chemical)
- Lymphangitis

## Some of the Can't Miss Diagnoses

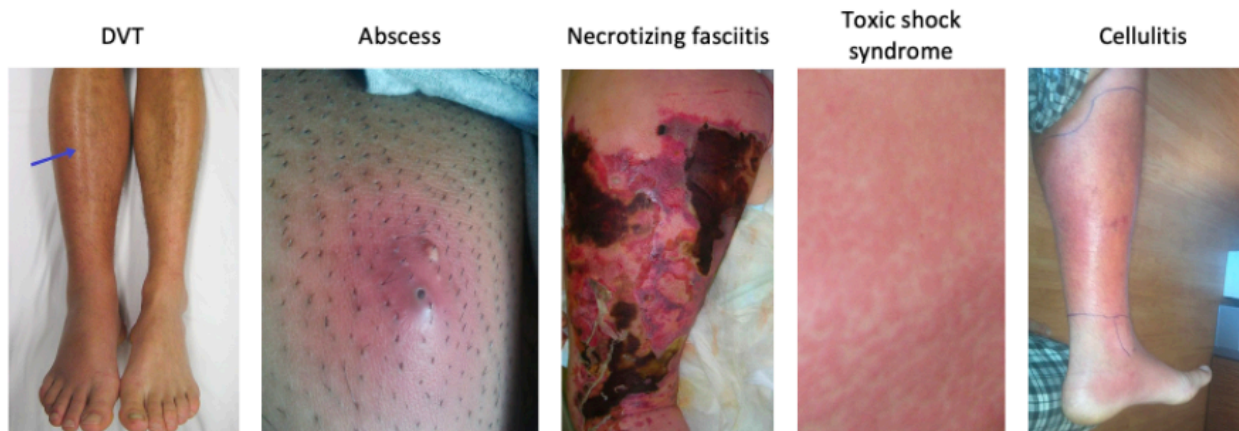
Images depicting skin changes seen in DVT, abscess, necrotizing fasciitis, toxic shock syndrome and cellulitis.

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## Points to Focus On

### History

- Tetanus status, anticoagulation, surgical manipulation if any.
- Ask about recent febrile illnesses.
- May have "pain out of proportion" (think necrotizing fasciitis) or localized hypoesthesia (numbness).

- Ask about what the rash looked like (size and distribution) initially, and how this has changed.

### Physical

- Check for peripheral pulses (they are the vital signs of the extremities!) - if absent, consider peripheral vascular disease.
- CAUTION - Absent pulses, parasthesias, pallor, pulslessness may be signs of vascular occlusion (arterial clot) or compartment syndrome (e.g. from crush injury, recent fracture reduction, etc.)

### For Infections

- Look for "portals of entry" for infection (abrasions, recent surgery)
- Check joints for any involvement
- Examine for rapidly spreading rash, purulence, bullae, blisters, crepitus.

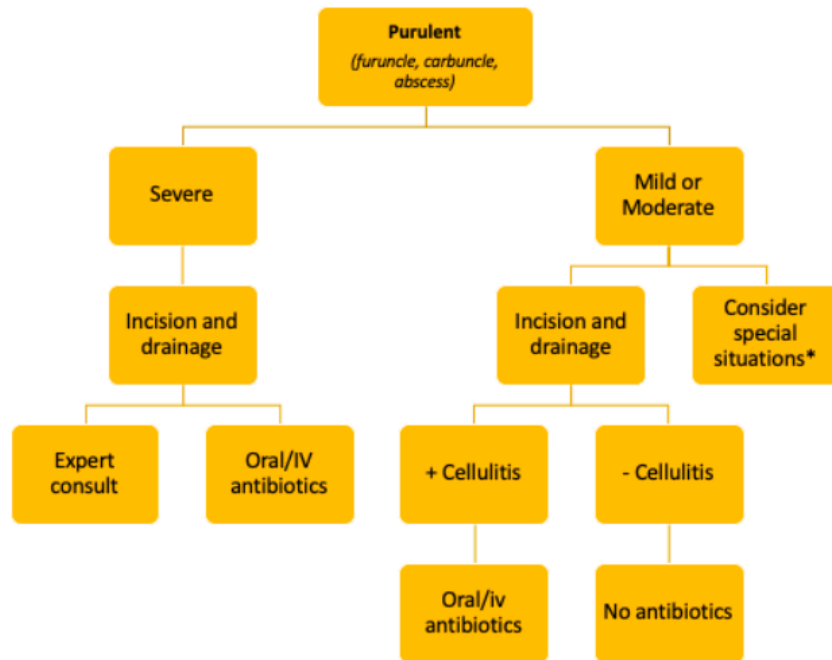
### CAUTION - necrotizing fasciitis patients break all the rules:

- They may look surprisingly well.
- They may *NOT* have any overlying cellulitis/rash.
- They may have a flat affect (known as "La Belle Indifference").
- REMEMBER: NORMAL PHYSICAL EXAM DOES NOT MEAN ABSENCE OF NEC FASC.

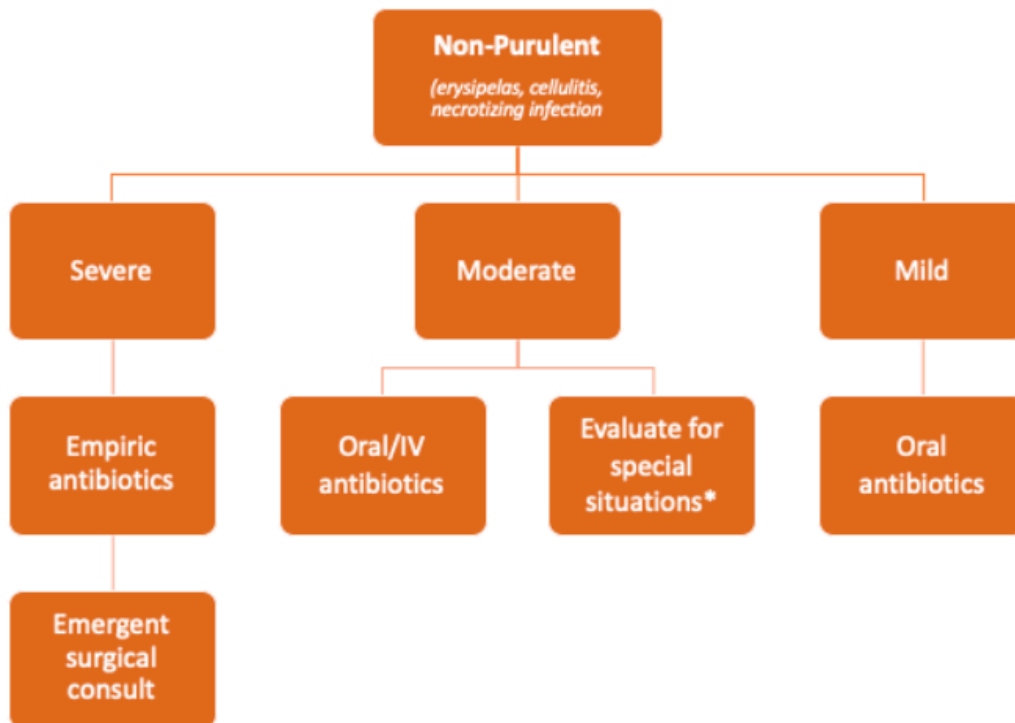
Note: point of care ultrasound can be used to diagnose smaller abscesses if drainage point not obvious.



## Approach to Purulent SSTi



## Approach to Non-purulent SSTi



## Clinical Decision Tools

- LRINEC score for necrotizing fasciitis (note: requires lab work!) <https://www.mdcalc.com/lrinec-score-necrotizing-soft-tissue-infection>

## Investigations

- DO NOT DELAY SURGICAL INTERVENTION IF SUSPECTING NEC FASC. Definitive Management is surgical debridement.
- Most diagnosed through history and physical exam, but might consider further testing/imaging in the following circumstances:
  - LOCATION: if large surface area or crossing a large joint: concern for deep extension into muscle/bone.
  - COMORBIDITIES: conditions/medications. that may affect wound healing: diabetes, peripheral vascular disease, immunosuppressant medications, etc.
  - SYSTEMIC INVOLVEMENT: look for vital sign abnormalities indicating possible sepsis.
  - RAPID PROGRESSION: rapid progression of erythema or progression of cellulitis after 48 hours of oral antibiotic therapy.
- CBC, BUN, Cr, Lytes, Glucose, VBG,
- Consider Blood Cultures PRIOR TO antibiotics
- C-reactive protein (CRP)
- Consider joint aspiration

## Management

- In general, if you are considering a biopsy or aspiration, it is best to do this before starting antibiotics for best lab results.
- Use clinical judgement: if the patient is *unstable*, immediately notify your staff: the focus will be to save the life over the limb.

## Necrotizing Fasciitis

- Surgical Debridement
- While awaiting OR to be ready, consider empiric antibiotic therapy:
  - One of Meropenem 1 g IV q8h OR Piperacillin-tazobactam 3.375 g IV q6h
  - PLUS
  - One of Vancomycin 15 mg/kg q12 h IV OR Linezolid 600 mg IV q12h
  - OR Clindamycin 600 mg IV qd
- AGAIN, DO NOT DELAY SURGICAL INTERVENTION IF SUSPECTING NEC FASC. Definitive Management is surgical debridement.

## Severe Purulent SSTI

### Choose one:

- IV Piperacillin/Tazobactam and Vancomycin; or
- Oral or IV Clindamycin (same bioavailability); or
- IV Linezolid

## Mild/Moderate Purulent SSTI

### Choose one or combination

- Oral TMP/SMX; or
- Oral or IV Clindamycin; or
- Oral Doxycycline

Of note, if no overlying cellulitis or co-morbid conditions, Choosing Wisely Canada recommends discussing the use of antibiotics with patients as the benefits conferred by antibiotics may not outweigh the risks associated with their use.

## Severe Non-Purulent SSTI

- IV Piperacillin/Tazobactam AND vancomycin
- AND IV Clindamycin (if concerned for necrotizing infection)

## Mild/Moderate Non-Purulent SSTI

- Oral Cephalexin; or
- IV Cefazolin; or
- Oral or IV Clindamycin.
- \*See notes below\*

### Notes:

- Oral antibiotics considered whenever possible. 5-7 days. Usually, first-generation cephalosporin (e.g. cephalexin) to start.
- If progressing despite antibiotics or signs of systemic infection, consider IV cephalosporins.
- If allergic (anaphylaxis) to cephalosporins, you may consider Clindamycin as an alternative therapy
  - Bonus: it has same bioavailability both PO or IV, so go ahead a treat PO - just ask patient to also start probiotics since they may get antibiotic-related diarrhea.

### Pearls for Junior Learners

- Practice explaining the lesion in all cases: the size, visual description.
- Always document the presence or absence of red flag symptoms: pain out of proportion, fever, etc.

### Recommended Readings, Videos and Podcasts

- EM Cases: Necrotizing Fasciitis: <https://emergencymedicinecases.com/necrotizing-fasciitis/>
- CRACKCast - Skin and Soft Tissue Infections: <https://canadiem.org/crackcast-e137-skin-infections/>
- EM Case: Skin and Soft Tissue Infections: <https://emergencymedicinecases.com/skin-soft-tissue-infections/>
- Life in the Fast Lane (Caution: Aussie source!): <https://litfl.com/necrotising-fasciitis/>
- EMDocs: Update on the Management of Skin Abscesses in the ED (Caution: American source!) <http://www.emdocs.net/update-on-the-management-of-skin-abscesses-in-the-emergency-department/>

### Image References

- DVT: James Heilman, MD, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>;, via Wikimedia Commons
- Abscess: Amrith Raj, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>;, via Wikimedia Commons
- Necrotizing fasciitis: Piotr Smuszkiewicz, Iwona Trojanowska and Hanna Tomczak, CC BY 2.0 <<https://creativecommons.org/licenses/by/2.0/>>;, via Wikimedia Commons
- Toxic shock syndrome: <https://www.healthline.com/health/toxic-shock-syndrome#treatment>
- Cellulitis: Pshawnoah, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>;, via Wikimedia Commons

# Musculoskeletal & Skeletal Injuries

## Can't Miss Diagnoses

1. Traumatic
2. Infectious
3. Inflammatory Causes
4. Open Joint/Open Fracture
5. Compartment Syndrome

Also, assess for soft tissue injury and /or infections which can also be very life-threatening (e.g. Necrotizing Fasciitis).

**CAUTION:** Make sure to think about abuse, especially with inconsistent stories - child abuse, domestic violence, or elder abuse.

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## Points to Focus Upon

Generally, the approach to MSK injuries will be ABCs, Look, Feel, Move:

1. Look + feel for swelling, deformity, crepitus, pallor, faint or absent peripheral pulse
2. Check neurovascular status (PMS: Pulse, Motor, Sensation)
3. Assess bleeding/open fractures
4. Active and passive ROM, if safe to do so AFTER all the above

## For Trauma

Key historical points are:

- Mechanism of injury (high vs low energy, preceding incidents)
- Associated neurological symptoms
- Blood loss + vitals
- Attend to cues for non-accidental trauma
- Associated injuries or medical conditions

## Rules of Thumb

- Examine joint above and below fracture (Investigations & radiographs as clinically indicated).
- Use decision rules for lower extremity minor trauma (ankle/foot/knee) to guide your assessment (see Joint Pain Section for details).
- All x-rays need at least 2 views (AP and Lateral), foot and ankle should have an Oblique/Mortise view.

## Pediatric Specifics

- Children don't use the same words as adults and the exam must be adjusted. When assessing them for compartment syndrome ask for pain, sleepy fingers, does it feel the same on both sides, can they be distracted from the pain by objects or videos?
- X-rays in kids are challenging due to growth plates. If you are truly confused, x-ray the contralateral side. A junior resident tip is to also flip the image of the contralateral side so now it should look identical to the injured side when looking for injuries.

## To note and document

- Tetanus status, anticoagulation, surgical manipulation if any
- Pain & Fever - suspect Septic joint in IVDU, DM, immunocompromised, elderly.
- Check for White count, CRP, Joint aspiration

### Junior Learner Tips

1. Examine the joint above and below the fracture/injury
2. Always get 2 views when ordering x-rays
3. Be suspicious and document carefully if the injury does NOT match the mechanism of injury

## Recommended Reading and Resources

- Ottawa Ankle Rule: <https://www.mdcalc.com/ottawa-ankle-rule>
- Ottawa Knee Rule: <https://www.mdcalc.com/ottawa-knee-rule>
- Subungual Hematomas and Trephination: <https://canadiem.org/subungual-hematomas-and-trephination/>

# Lower Leg Swelling

## Can't Miss Diagnoses

### Unilateral

- **Acute:** DVT (proximal, isolated distal), Arterial Occlusion, Cellulitis, MSK, Septic Joint, Bursitis, Fracture, Ruptured Baker's Cyst, Compartment Syndrome, Superficial Thrombophlebitis, Necrotizing Fasciitis, Hematoma, Myositis

### Bilateral

- **Acute:** Bilateral DVT, Cellulitis, CHF Exacerbation, Constrictive Pericarditis, AKI, Nephrotic Syndrome, IVC Thrombosis, Medication Adverse Event, Preeclampsia

### Considerations in the age of COVID-19 for your safety

Many individuals with COVID-19 can present entirely asymptotically, without cough or fever. If the rate of COVID-19 is high in your community, consider taking appropriate precautions even for this presentation. Also, consider that COVID-19 related sepsis may be a pro-thrombotic state. Early studies may show that there is an elevated D-Dimer with those with COVID-19.

### Common Chronic Manifestations

- **Chronic:** Venous Insufficiency, Peripheral Arterial Disease, Secondary Lymphedema (tumour, radiation, surgery), Venous malformation, Reflex Sympathetic Dystrophy
- **Chronic:** CHF, CKD, Venous Insufficiency, Peripheral Arterial Disease, Lymphedema, Liver Failure/Cirrhosis, Pulmonary HTN, Pregnancy, Hypothyroidism, Lipedema, Reflex Sympathetic Dystrophy, Hypoalbuminemia, Malnutrition, Medication Adverse Effect

## Points to Focus Upon

Lower extremity swelling and pain are common presentations to the ED, although many presentations are linked to an exacerbation of a systemic illness. Once a history of acute trauma has been excluded, it is important to distinguish between etiologies for unilateral and bilateral presentations. Among patients with unilateral leg swelling/pain who were worked up for DVT, the prevalence of a confirmed DVT was 19% on average.

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## History

- Chronicity of the disease process.
- History of venous thromboembolism, kidney/liver/heart failure.
- History of recent injury, immobilization, surgery/procedures.
- Associated symptoms (breathlessness, chest pain, hemoptysis, PNDs/Orthopnea).
- Medication history, recent surgical/trauma history.
- Pregnancy.

## Known Risk Factors for DVT/PE

- Venous stasis
- Vessel injury
- Hypercoagulability (inherited thrombophilia, active malignancy, estrogen, prior PE/DVT)

## Physical Exam

- Location of leg swelling
- Associated redness near or at the swelling
- Pattern of pitting edema (Does it follow a deep vein?)

## Investigations

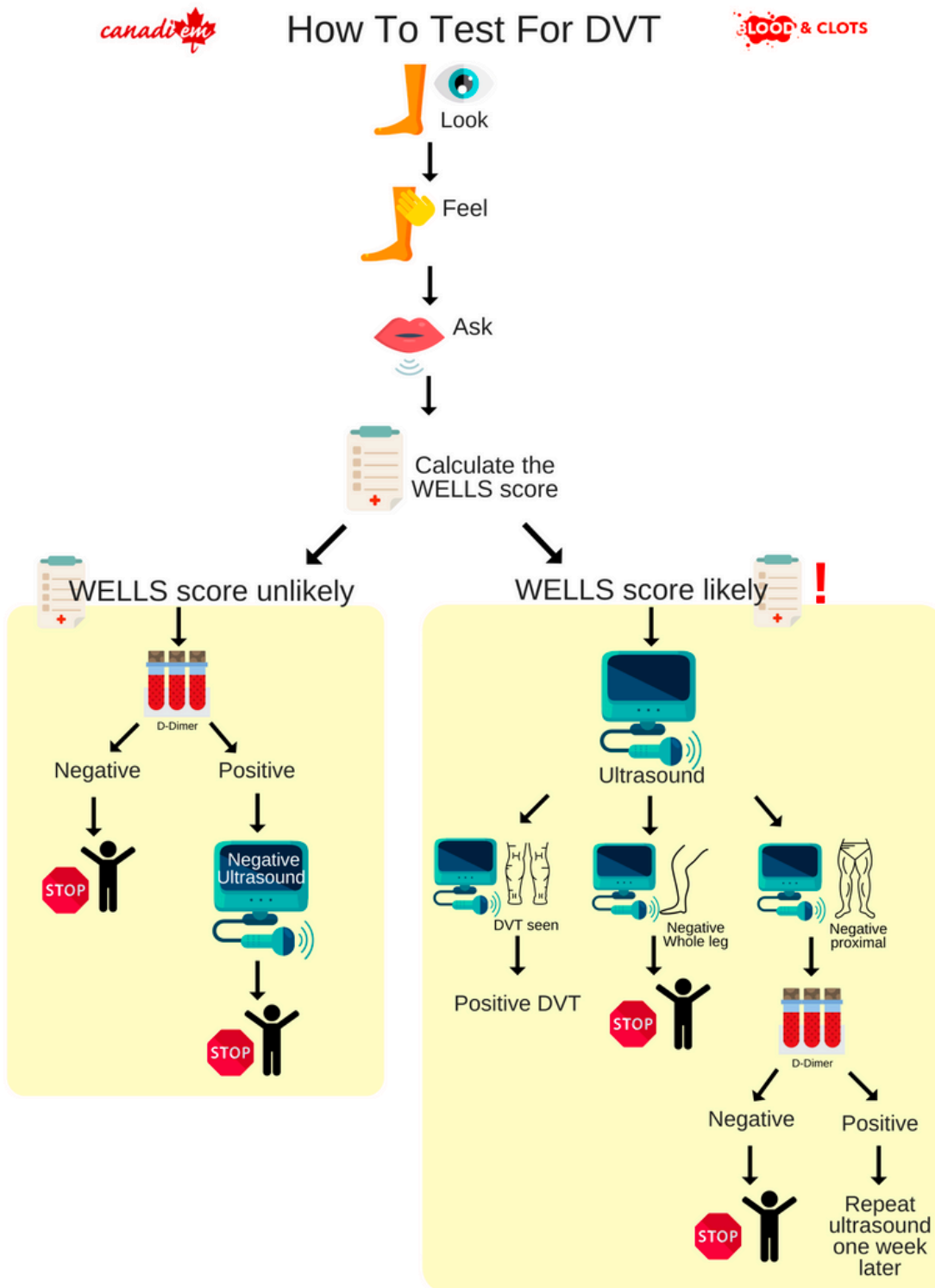
- Ultrasound
- D-Dimer (DVT)
- CXR & EKG (CHF)
- Ankle-Brachial Index (Venous Insufficiency)
- CBC (Anemia)
- Liver Enzymes (Cirrhosis, HELLP), Albumin (Nephrotic Syndrome, Hypoalbuminemia)
- Creatinine (AKI, CKD)
- Urinalysis (Protein = Nephrotic Syndrome)
- Urine  $\beta$ -hCG (Pregnancy, Preeclampsia)
- TSH +/- T3/4 (Hypothyroidism)
- Compartment Pressure (Compartment Syndrome)

## Wells' Criteria

<https://www.mdcalc.com/wells-criteria-dvt>



# Algorithm For Testing DVT



## Management

We will cover two of the more common acute leg swelling pathologies (DVT and thrombophlebitis). If there is a more systemic cause, the key will be to begin treatment of the underlying condition (e.g. diuresis for CHF).

### DVT Management

#### For stable outpatients starting anticoagulant therapy

- LMWH (with warfarin bridge) or Fondaparinux; Warfarin (bridged with 5-7 days of Low Molecular Weight Heparin subcutaneous injections)
- Heparin infusion for patients with renal impairment
- Transition to oral anticoagulation x3-12 months - Direct Oral Anticoagulant (Dabigatran, Rivaroxaban, or Apixaban)
- Pregnant patients will require other forms of treatment such as low molecular weight heparin injections

Read more at this post: <https://canadiem.org/blood-clots-series-antithrombotic-therapy-start-patient-acute-vte/>

## Thrombophlebitis

NSAIDs +/- Compression stockings

### Pearls for Junior Learners

1. Be aware of risk factors for DVT. Ask about them in your history.
2. Remember DVTs can occur in the upper and lower limbs!

### Recommended reading, videos, and podcasts:

- Blood & Clots: DVT - CanadiEM: <https://canadiem.org/blood-clots-series-can-tell-whether-patient-deep-vein-thrombosis/>
- PE & DVT - CRACKcast: <https://canadiem.org/crackcast-e088-dvt-pe/>
- Knee & Lower Leg - CRACKcast: <https://canadiem.org/crackcast-e057-knee-and-lower-leg/>
- Bilateral Lower Extremity Swelling - WikEM (American content): [https://www.wikem.org/wiki/Bilateral\\_pedal\\_edema](https://www.wikem.org/wiki/Bilateral_pedal_edema)

- Unilateral Lower Extremity Swelling - WikEM (American content): [https://www.wikem.org/wiki/Unilateral\\_leg\\_swelling](https://www.wikem.org/wiki/Unilateral_leg_swelling)
- >DVT - CoreEM (American content): <https://coreem.net/core/deep-venous-thrombosis-dvt/>
- DVT - EMDocs (American content): <http://www.emdocs.net/em3am-dvt/>
- DVT Mimics - EMDocs (American content): <http://www.emdocs.net/dvt-mimics-emergency-physician-consider/>
- Testing for Patients with Bilateral Leg Edema - EMDocs (CAUTION American content): <http://www.emdocs.net/patient-bilateral-leg-edema-tests-warranted>

# Early Pregnancy: First Trimester Bleeding

## Can't Miss Differential Diagnosis for First Trimester Bleeding:

### Can't Miss Diagnosis!



Infographic by: Maroof Khalid, MD candidate  
Images from: flaticon.com

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## Points to Focus Upon

### History

- Last Menstrual Cycle
- Determine if the patient has been on fertility treatments, which will elevate their risk of heterotopic pregnancy (a concurrent intrauterine AND ectopic pregnancies) to roughly 1:200 (much more common than normal rates which are closer to 1:10,000)
- Prenatal care & screening, prenatal vitamins
- Screen for other first trimester problems (e.g. nausea and vomiting of pregnancy)
- Social habits (pregnancy can be an important time to intervene)
- Screen for sexual and/or domestic violence (first trimester can be a high-risk time)

## Physical Exam

- Assess volume status and vitals for any suspected ectopic pregnancy, sending type and cross-match early can be life-saving
- Speculum exam to evacuate source of bleeding, presence of clots or tissue
- Cervical exam to determine if cervical os is open or closed

## Point-of-Care Ultrasound (to be done only for those with formal training and/or certification for interpretation)

- Examine for intra-uterine pregnancy
- Examine for free fluid in the abdomen/pelvis

## REMEMBER

- If you diagnose a pregnancy, do not default to giving your congratulations. You do not always know the circumstances of the pregnancy and whether this is a good thing or not. Find a way to safely ask whether this is a planned or safe situation for the patient (consider screening for domestic or sexual violence).

## Investigations

- CBC (Baseline)
- Type & Screen (If blood type NOT known, need to know if Rh negative so that they can receive Rh immunoglobulin)
- Serum Beta-HCG (Usually see gestational sac around week 5 or bHCG of 1500-2000)
- Formal Ultrasound

## Note About Beta-HCG levels in Ectopic Pregnancy

- In a normal pregnancy, the  $\beta$ -HCG level doubles every 48-72 hours until it reaches 10,000-20,000mIU/mL.
- In ectopic pregnancies,  $\beta$ -HCG levels usually increase less. Mean serum  $\beta$ -HCG levels are lower in ectopic pregnancies than in healthy pregnancies.
- The absence of an intrauterine pregnancy on a scan when the  $\beta$ -HCG level is above the discriminatory zone represents an ectopic pregnancy or a recent miscarriage.
- Read more about beta-HCG discriminatory zone and ultrasounds in suspected ectopic pregnancies here: <https://canadiem.org/%ce%b2-hcg-discriminatory-zone-suspected-ectopic-pregnancy/>

## Management

For any type of first-trimester bleeding cases, please remember to check Rh status, and provide Rh-immunoglobulin as needed. For first trimester Rh-negative individuals, low dose Rh-immunoglobulin is usually advised (50 mcg IM x 1).

### ECTOPIC PREGNANCIES

1. Unstable ectopic pregnancies should be acute resuscitations and Ob/Gyne should be contacted to provide definitive surgical care.
2. Stable ectopic pregnancies can be managed with either oral or per vaginal medicine. Contact Ob/Gyne for advice if this is outside your normal scope of care.

### INTRAUTERINE PREGNANCIES

The rate of first trimester bleeding is fairly common - around 25% (1) so it is imperative that patients know that it is common, but that it also has some slight correlation with miscarriage. Close observation of symptoms and clear return instructions for what to expect (e.g. If bleeding gets worse, please return to ED) and arranging follow-up as soon as possible. Some cities will have dedicated programs for first trimester bleeding. Consult your obstetrics and gynecology or primary care colleagues as required to figure out the best pathway to arrange follow-up for your patient.

### MISCARRIAGE

If your patient has a full pregnancy loss, it is important to consider the psychological ramifications of this for your patient (and if involved, their partner). Some key aspects of grief counselling after miscarriage are listed below for your quick reference. However, this should be performed by someone who has experience with this (if possible) to minimize secondary psychological harm to the patient.

#### **Key points to consider when grief counselling during/after a miscarriage, adapted from Deutchman et al. 2009 (1)**

- Acknowledge, but attempt to dispel guilt
- Acknowledge and validate sense of grief
- Reassure patient about future (e.g. usually most worry about future fertility)
- Provide advice/counselling on how to discuss with family/friends (speak plainly, avoid medical details, remember that others may also react emotionally, tell others what you need for support)
- Include partner (if in the picture) in psychological care

## Tips for Junior Learners

1. Be professional and respectful of the patients privacy, introducing yourself to the patient before the staff comes in to do the personal exams and asking for consent to stay in the room is important!
2. Keep an eye on the vitals for any signs of hemodynamic compromise.
3. Ask to get involved! If the patient is stable this can be a great moment to ask to learn how to use/interpret the ultrasound!

## Recommended reading, videos, and podcasts

- EM in 5 video - Vaginal Bleeding in 1st TM Pregnancy: <https://emin5.com/2015/11/09/vaginal-bleeding-in-1st-tm-pregnancy/>
- CRACKCast E034 – Vaginal Bleeding: <https://canadiem.org/crackcast-e034-vaginal-bleeding/>
- CanadiEM - How useful is the beta-HCG discriminatory zone in a suspected ectopic pregnancy: <https://canadiem.org/%ce%b2-hcg-discriminatory-zone-suspected-ectopic-pregnancy/>
- EM Cases - Ectopic Pregnancy Pitfalls in Diagnosis: <https://emergencymedicinescases.com/ectopic-pregnancy-pitfalls-diagnosis/>
- Ectopic pregnancy Ultrasound: <https://radiopaedia.org/articles/ectopic-pregnancy?lang=us>
- CRACKCast E177 – Acute Complications of Pregnancy: <https://canadiem.org/crackcast-e177-acute-complications-of-pregnancy/>
- CRACKCast E178 – Co-Morbid Medical Emergencies During Pregnancy: <https://canadiem.org/crackcast-e178-co-morbid-medical-emergencies-during-pregnancy/>
- American Family Physician Review Article (CAUTION: American Content): <https://www.aafp.org/afp/2009/0601/p985.html>
- Vaginal bleeding during early pregnancy - Merck Manual: <https://www.merckmanuals.com/professional/gynecology-and-obstetrics/symptoms-during-pregnancy/vaginal-bleeding-during-early-pregnancy>

## References

Deutchman M, Tubay AT, Turok DK. First trimester bleeding. American family physician. 2009 Jun 1;79(11):985-92. Available at: <https://www.aafp.org/afp/2009/0601/p985.html> Accessed last on April 4, 2020.

# Epistaxis

## Background

**E**pistaxis (“nose bleed”): is one of the most common ENT complaints seen in the ED. Classified as anterior or posterior, determined by the anatomic site of bleeding. Around 90% of all cases arise from the anterior nasal septum at the Kiesselbach's plexus, a confluence of terminal branches of internal and external carotid arteries. Posterior epistaxis occurs from injury to deeper structures in the nose and can be more difficult to manage due to potential arterial involvement and may present a greater risk of aspiration and challenge in achieving hemostasis. It can also involve sphenopalatine arteries.

## Causes of Epistaxis

- Nasal trauma
- Infections
- Nasal foreign bodies
- Bleeding disorders

## Points to focus on

### HISTORY

- Onset
- Location of bleeding (right or left nare)
- Duration
- Estimated quantity of bleeding
- Previous bleeding episodes and treatment
- Co-morbid conditions
- Medications (Especially anticoagulants /anti-platelets)

### PHYSICAL

- Prior to any evaluation, make sure to don proper personal protective equipment including eye shield.
- Have the patient forcefully blow out any residual clot from the nose to allow for proper visualization.
- Use a proper light sources and nasal speculum if your site has one to attempt to visualize any active bleeding

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- Be concerned for a posterior location of the bleed if you are unable to visualize an anterior source with continued epistaxis, bilateral bleeding, or significant blood in the posterior oropharynx

## LABS

- Usually unnecessary
- If concern for hemodynamic stability: CBC + coagulation panel

## Management

ABCs: resuscitate early: document vitals + use anti-platelets and anticoagulants if unstable (e.g. tachycardia, hypotension, airway compromise, respiratory distress or altered mental status)

The following is listed as a stepwise management flow. After any step, if hemostasis is maintained for 2-3 hours in the ED the patient may be discharged with appropriate follow up and return precautions.

1. Have the patient forcefully blow out any residual clot from the nose to allow for proper visualization.
2. Direct pressure, direct pressure, more direct pressure
  - Instruct the patient to pinch the nasal cartilage directly below the nasal bone for around 10 minutes
3. Direct cautery with silver nitrate sticks if the specific area of bleeding can be visualized
  - Do not perform if bleeding cannot be directly visualized
  - Avoid cautery on bilateral sides of the nasal septum to prevent septal ischemia
4. Anterior nasal packing: can apply topical vasoconstrictors + anesthesia (like lidocaine + epi)
  - Can be sent home with nasal packing with instructions to return in 48-72h.
  - Insert directly posteriorly and avoid pushing the product superiorly
  - Foam or gel based product (ex “Merocel”)
  - Balloon tamponade product (ex “Rhino-rocket”)
  - With or without TXA
5. If these interventions do not work have high clinical suspicion for a posterior location of the bleeding
  - ENT consult for potential surgical repair
6. Patients with posterior packing or those that require bilateral nasal packing should be admitted for airway and hemodynamic monitoring with ENT consult.

## Other points

### HYPERTENSION: Controversial

- Definitive evidence identifying a causal relationship between hypertension and epistaxis not been identified.

- No strong evidence has been discovered that supports acute blood pressure control in the ED management of epistaxis: routine administration of antihypertensives is not recommended.

## ANTIBIOTICS

- Historically prescribed with anterior packing due to concern for toxic shock syndrome.
- Recent evidence suggests prophylactic antibiotic use is not necessary.
- However, consider if: significant co-morbidities, immunocompromised or posterior packing.

## TXA

- Gauze or tamponade devices can be soaked in TXA (tranexamic acid) prior to application to assist with hemostatic control.

### Junior Learners Pearls

- Be Don't forget to ask about anticoagulants
- Use a light and nasal speculum to see if you can find the bleeder!

## Recommended readings, videos and podcasts

CRACKCast: Otolaryngology

<https://canadiem.org/crackcast-e072-otolaryngology/>

EM Cases: ENT Emergencies Pearls, Pitfalls, Tips and Tricks

<https://emergencymedicinecases.com/ent-emergencies/>

EMDocs: Epistaxis

<http://www.emdocs.net/em3am-epistaxis/>

# Pulmonary Embolism

## Points to focus on

**H**ow common is this: Pulmonary embolism is a relatively rare diagnosis (0.08%) in the emergency department, however, due to the potential for adverse outcomes it is important to maintain a high degree of suspicion among vulnerable populations.(1) Approximately half of patients are admitted to hospital in Canada; this proportion is much higher in the USA (90%).(2,3)

## DDx that present similarly

Highly variable presentation - DDx will depend on presenting complaint, however, the main concerns are typically:

- ACS
- Pericarditis
- Pneumonia
- Asthma/COPD Exacerbation
- Pneumothorax
- Rib Fracture
- Costochondritis
- Anxiety

It is important to assess for DVT simultaneously. Physical examination findings suggestive of a PE include: dyspnea, pleuritic **chest pain**, palpitations, hemoptysis and cough, syncope, HR >100, O2 sat <95%, and unilateral leg/arm swelling.

## Risk Factors

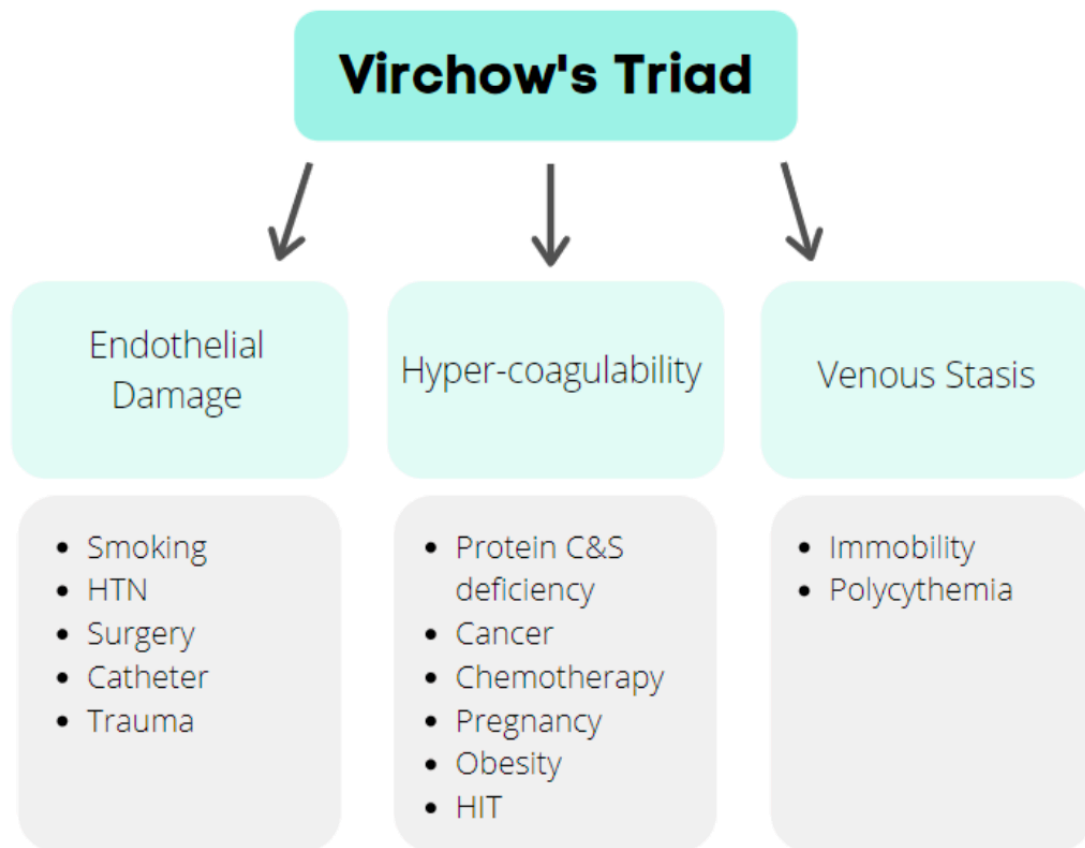
Risk factors for a pulmonary embolism can be summarized using Virchow's Triad. Virchow's Triad can be divided into three categories: endothelial damage, hypercoagulability, and venous stasis. Endothelial damage can be caused by smoking, hypertension, surgery, catheters, and/or trauma. Hypercoagulability can be caused by protein C and S deficiency, cancer, chemotherapy, pregnancy, obesity, and HIT. Venous stasis can be caused by immobility or polycythemia.

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## Signs of PE

Signs of a pulmonary embolism on ECG include: tachycardia, symmetrical T-wave inversion in leads V1 through V4, McGinn-White pattern (S1Q3T3), and incomplete or complete right bundle branch block. Signs of pulmonary embolism on a chest x-ray include: unilateral basilar atelectasis, Hampton's hump, and Westermark's sign (unilateral lung oligemia). Other physical examination signs include: dyspnea, pleuritic **chest pain**, palpitations, hemoptysis and cough, syncope, HR >100, O2 sat <95%, and unilateral leg/arm swelling.

ECG	Chest X-ray
<ol style="list-style-type: none"> <li>1. Tachycardia</li> <li>2. Symmetrical T-wave inversions (V1-V4)</li> <li>3. McGinn-White pattern: S1Q3T3</li> <li>4. Incomplete or complete RBBB</li> </ol>	<ol style="list-style-type: none"> <li>1. Unilateral basilar atelectasis</li> <li>2. Hampton's hump</li> <li>3. Westermark's sign (unilateral lung oligemia)</li> </ol>

## Investigations

- CBC, BUN/Cr, Lytes
- D-dimer
- CXR, CTPA or V/Q scan
- ECG
- Bilateral leg ultrasounds to look for DVT
- Consider troponin and POCUS where applicable

## Management

### STABLE PATIENTS

Start anticoagulant therapy with follow-up in the community setting. The PESI score can guide this decision, as will a conversation with the family physician or specialist who will be following this patient.

#### Oral Anticoagulation regimes usually include:

- Warfarin (bridged with 5-7 days of Low Molecular Weight Heparin subcutaneous injections, eg enoxaparin)
- OR
- Direct Oral Anticoagulant (Dabigatran, Rivaroxaban, or Apixaban)

Pregnant patients will require other forms of treatment such as low molecular weight heparin injections. Read more at this post: <https://canadiem.org/blood-clots-series-antithrombotic-therapy-start-patient-acute-vte/>

### Unstable Patients

- Hemodynamic stabilization via supportive resuscitation
- Admission with monitoring
- Heparinization is usually the mainstay of therapy and should be initiated in the ED. Choice of low molecular weight heparin (LMWH) vs. un-fractionated heparin depends on various factors. Please refer to these recent guidelines (section XXV) for further details: [https://journal.chestnet.org/article/S0012-3692\(15\)00335-9/fulltext](https://journal.chestnet.org/article/S0012-3692(15)00335-9/fulltext)
- May require consulting thrombosis/hematology/ICU service to discuss the role of targeted thrombolytics or other therapies.

## Clinical Decision Rules

- Wells Criteria for PE (calculates risk of DVT; not validated in pregnant patients)  
<https://www.mdcalc.com/wells-criteria-pulmonary-embolism>
- PERC Rule Out Criteria (rules out PE if no criteria are present and pre-test probability is equal to or less than 15%)  
<https://www.mdcalc.com/perc-rule-pulmonary-embolism>
- See this post for the HADCLOTS Mnemonic: <https://pamadaydotnet.files.wordpress.com/2017/07/evidence-based-approach-to-pte-20172.jpg>
- YEARS Algorithm (helps rule out PE; pregnant patients included in validation)  
<https://www.mdcalc.com/years-algorithm-pulmonary-embolism-pe>
- PESI (predicts 30-day outcome of patients with PE using 11 clinical criteria)  
<https://www.mdcalc.com/pulmonary-embolism-severity-index-pesi>
- Simplified PESI (predicts 30-day outcome of patients with PE with fewer criteria than the original PESI)  
<https://www.mdcalc.com/simplified-pesi-pulmonary-embolism-severity-index#evidence>
- HAS-BLED (estimates risk of major bleeding for patients on anticoagulation to assess risk-benefit in afib care)  
<https://www.mdcalc.com/has-bleed-score-major-bleeding-risk>

### Pearl for Junior Learners

- Every PE started as a DVT somewhere in the body - so always look for signs of a DVT!

## Recommended readings, videos and podcasts

- Antithrombotic Therapy for VTE Disease: CHEST Guideline & Expert Panel Report  
[https://journal.chestnet.org/article/S0012-3692\(15\)00335-9/fulltextAntithromboticTherapyforVTE\\_Disease](https://journal.chestnet.org/article/S0012-3692(15)00335-9/fulltextAntithromboticTherapyforVTE_Disease)
- CRACKCast Podcast: PE & DVT  
<https://canadiem.org/crackcast-e088-dvt-pe/>
- Dyspnea/PE Overview - EMCases  
[https://emergencymedicinescases.com/wp-content/uploads/filebase/pdf/EMC\\_021\\_Mar2012\\_Summary.pdf](https://emergencymedicinescases.com/wp-content/uploads/filebase/pdf/EMC_021_Mar2012_Summary.pdf)
- Diagnosing PE in Pregnancy - CanadiEM  
<https://canadiem.org/diagnosing-pulmonary-embolism-in-pregnancy/>

- Managing PE in Pregnancy - CanadiEM  
<https://canadiem.org/blood-clots-series-how-do-i-manage-acute-vte-in-pregnancy/>
- PE - LITFL (Caution, Aussie content)  
<https://litfl.com/pulmonary-embolism/>
- Outpatient PE Management - EMDocs (Caution: American content)  
<http://www.emdocs.net/outpatient-pe-management-controversies-pearls-pitfalls/>
- Thrombolysis for PE - EMDocs (Caution American content)  
<http://www.emdocs.net/pulmonary-embolus-ed-patients-require-systemic-thrombolytics/>
- Venous Thromboembolism (VTE)  
<http://www.pathophys.org/vte/>

# Trauma - General Approach

Also see [Trauma - Isolated Head Injury](#)

## Cannot Miss Diagnoses

- **Multisystem trauma**
  - **REMEMBER:** Trauma violates the Occam's Razor approach to diagnosis. Unlike multiple choice questions, multisystem trauma patients require a methodical approach from head to toe. A basic approach will be the classic Advanced Trauma Life Support (ATLS) approach.

## Trauma History (AMPLE-T)

See handover section for more info.

AMPLE-T mnemonic for taking a trauma history including allergies, medications, past medical history, last oral intake, exposures and last tetanus shot. Also get handover from paramedics/bystanders if possible (SBAR mnemonic including situation, background, assessment and recommendation).

**Updated and adapted for clerks by:**

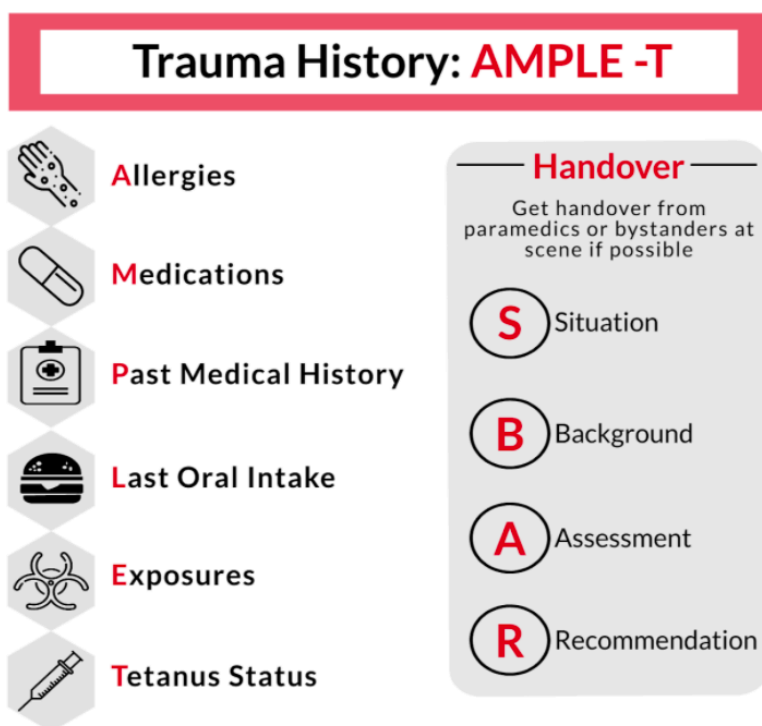
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Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com



## Trauma Primary Survey Physical (ABCDE's)

### Trauma Physical: ABCDE

#### Airway



Assess for patency, signs of obstruction  
RSI if indicated  
Tip: If the patient can talk, that is reassuring!

#### Breathing



Assess for breathing - spontaneous?  
Expose Chest  
Auscultate  
R/O Tension Pneumothorax

#### Circulation



Assess for signs of shock.  
Cycle vitals (esp BP) regularly  
Abdo soft? Consider eFAST or Surgery  
Pelvis Stable? Consider binder, foley if no blood in urethra

#### Disability



GCS, Pupillary Response?  
LOC, AMS?  
C-Collar on?  
Neurological Evaluation - sensation and motor (what is their baseline?)

#### Exposure



Assess all extremities for traumatic injuries  
LOG ROLL - spinal tenderness? posterior thoracic injuries?  
Check axilla for injuries esp penetrating  
Consider DRE to assess tone/blood if neurological deficits

Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com

### Be systematic!

ABCDEs of primary survey and trauma physical:

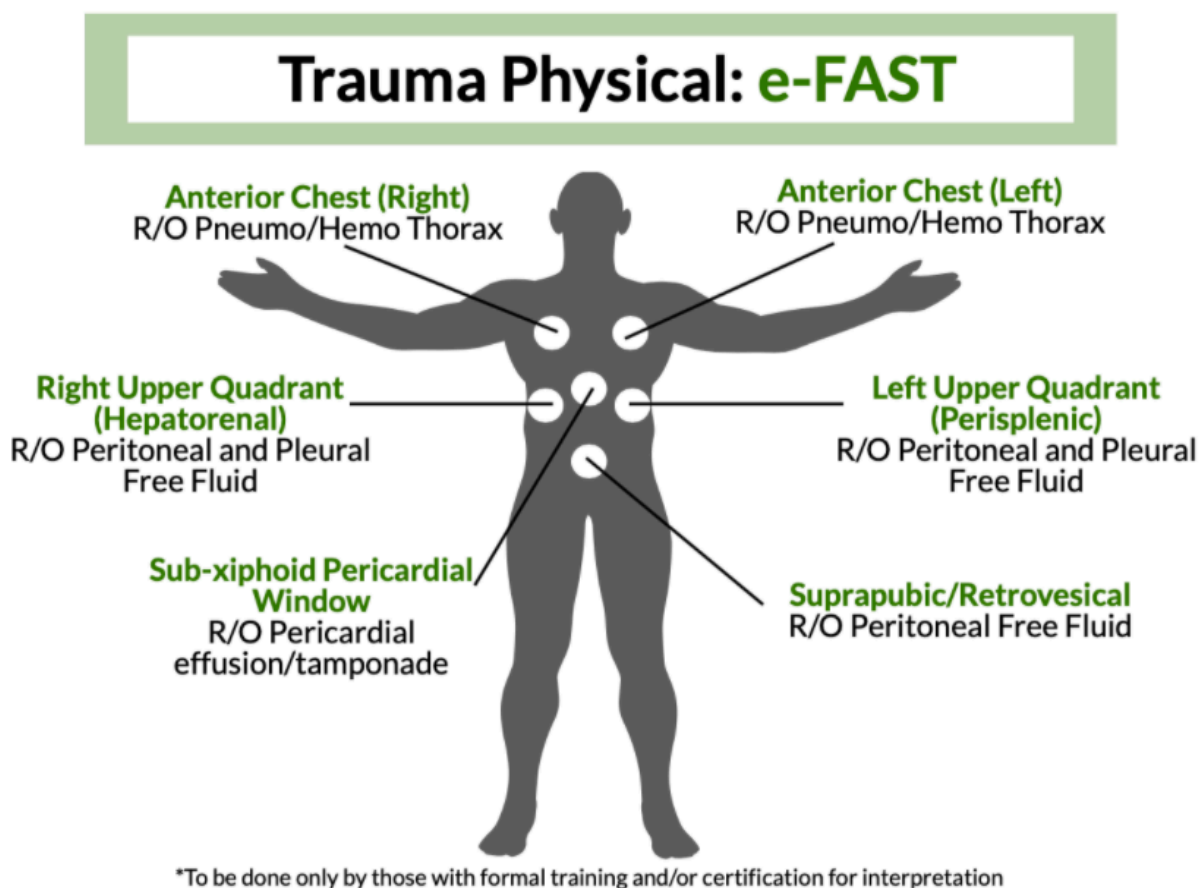
- Assess airway including assessing for patency, signs of obstruction, RSI if indicated. Tip: if the patient can talk, that is reassuring!
- Assess breathing: is it spontaneous, expose the chest, auscultate and r/o tension pneumothorax.

- Assess circulation for signs of shock, cycle vitals regularly, assess abdomen and consider eFAST or surgery, is the pelvis stable and consider binder and foley (if no blood in urethra).
- Assess disability for GCS, pupil reactivity, C-collar, neuro exam.
- Expose the patient and assess all extremities for traumatic injuries. Log roll the patient and check axilla, consider DRE if neurological deficits.

## Trauma Physical Extended (e-FAST)

Can be done in primary & secondary survey.

eFAST - U/S anterior chest on the right and left to r/o pneumo/hemo thorax. U/S RUQ and LUQ to r/o peritoneal and pleural free fluid. U/S suprapubic/retrovesical space to r/o peritoneal free fluid. U/S sub-xiphoid pericardial window to r/o pericardial effusion/tamponade.

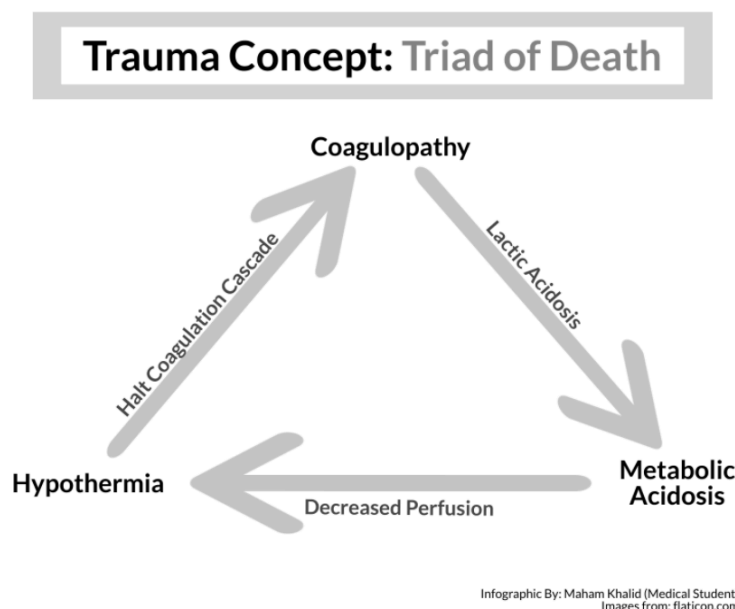


## Secondary Survey

**Do a full a physical FAST exam:** subxiphoid pericardial window, perisplenic, hepatorenal (Morison's pouch), pelvic/retrovesical.

## Trauma Triad of Death

Triad of death: hypothermia, metabolic acidosis and coagulopathy



## Investigations

All investigations should be tailored and led by the clinical acumen of the collective trauma resuscitation team's wisdom.

### Basic bloodwork for Trauma

- CBC, BUN, Cr, Lytes, Glucose, Liver enzymes (AST, ALT, GGT, ALP, Bilirubin. Lipase), Troponin (Cardiac injury)
- INR/PTT - especially if decreased LOC and do not know medication history
- Group & Screen (especially if patient is bleeding - or has potential of bleeding)
- For women, make sure to test for pregnancy (urine beta-HCG is typical, but in some circumstances it may be advisable and easier to do a serum beta-HCG than to await a urinalysis.)

### Basic initial x-rays for a primary trauma survey include

1. Chest X-ray (usually supine)

2. C-spine X-ray (usually lateral shoot through)
3. Pelvis X-ray

If you are in a smaller centre, you may well want to call your local trauma hospital for a consultation and possible transfer, before doing any further imaging.

### Other adjunctive tests at a trauma hospital

1. CT Head
2. Spinal imaging - x-rays, or if you can get a CT of that area, and add spinal reformatting
3. CT Chest/Abdo/Pelvis\*
4. \*Highly dependent on severity of trauma and suspicion for thoracic/abdominal/pelvic trauma or perioperative planning.
5. Surgical consult (not really a test, but calling a surgeon for help can be very helpful if you are questioning a surgical diagnosis).

## Management

In Trauma, often effective teams will concurrently assess and manage throughout the resuscitation and should follow the ABC priorities.

e.g. Airway interventions are completed almost immediately after a problem is noted.

Interventions beyond this primary survey will often require rapid consultation with a number of team members that may or may not be immediately present (e.g. general surgery, neurosurgery, orthopaedics), so be ready to tell this the patient's multiple times.

Do not get distracted by obvious but low priority injuries at the cost of high priority but more subtle findings.

e.g. a wheezing patient should have their airway assessed and monitored before reducing an ankle fracture.

**IF AIRWAY INTERVENTIONS ARE NEEDED:** Remember to ensure that proper airway precautions are taken.

### IV medications and blood products

Most medications or blood products should be given tailored to the needs of your patient.

One evidence-based medicine that you should consider is tranexamic acid (1g IV over 10min then 1g IV over next 8 hours for patients over 16 years of age with hemorrhage as SBP <90 mmHg or HR >110).

### Tips for Junior Learners

1. Be aware of your placement in the room - be helpful but not in the way!
2. If you are comfortable ask to be more involved ie help with CPR, bag masking etc - some preceptors (depending on your competence level) may be let you be more involved procedurally ie with intubations or arterial lines etc.
3. Never forget your PPE!
4. Depending on the patient - there may be a previous consult or history on the patient in the EMR - it may be helpful for your preceptor if you get it
5. Be mindful of when you are asking questions - it may be helpful to save your questions until the trauma is more stable

### Recommended readings, videos and podcasts

- MedSk1 Trauma Video <https://www.youtube.com/watch?v=q48PNEaa38M>
- ATLS Primary Survey Video (circa 2014):<https://www.youtube.com/watch?v=NIYt4rO1B8k>
- MacEmerg Podcast - Trauma Pearls with Dr. Jon Sherbinoh<https://www.stitcher.com/podcast/macemerg-podcast/e/62064458>
- East Guidelines (CAUTION: American Source)<https://www.east.org/education/practice-management-guidelines>
- eFAST module from U of T:[https://pie.med.utoronto.ca/POCUS/POCUS\\_content/eFast.html](https://pie.med.utoronto.ca/POCUS/POCUS_content/eFast.html)
- CrackCast Multiple Trauma (E036)<https://canadiem.org/crackcast-multiple-trauma/>
- CrackCast Abdominal Trauma (E046)<https://canadiem.org/crackcast-e046-abdominal-trauma/>
- CrackCast Thoracic Trauma (E045)<https://canadiem.org/crackcast-e045-thoracic-trauma/>
- CrackCast Pediatric Trauma (E038)<https://canadiem.org/crackcast-e038-pediatric-trauma/>
- CrackCast Neck Trauma (E044)<https://canadiem.org/crackcast-e044-neck-trauma/>
- CrackCast Trauma in Pregnancy (E037)<https://canadiem.org/crackcast-trauma-in-pregnancy/>
- CrackCast Pelvic Trauma (E055)<https://canadiem.org/crackcast-e055-pelvic-trauma/>
- CrackCast Genitourinary Trauma (E047)<https://canadiem.org/crackcast-e047-genitourinary-trauma/>
- CrackCast Peripheral Vascular Trauma (E048)<https://canadiem.org/peripheral-vascular-trauma/>

### References

Walls R, Hockberger R, Gausche-Hill M. Rosen's emergency medicine-concepts and clinical practice e-book. Elsevier Health Sciences; 2017 Mar 9. Chapter 33, Multiple Trauma.

# Trauma - Isolated Head Injury

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## Related Sections

See [Trauma - General Approach](#) or [Headache](#) for related info.

## Can't Miss Diagnoses

- Epidural hematoma
- Subdural hematoma
- Acute on Chronic Subdural Hematoma
- Other Intracranial Hemorrhage (ICH)
- Basilar Skull Fracture
- Le fort Fractures of midface (I, II, III)

\*See [Headache](#) section for more on other benign causes of headaches.\*

## Points to Focus On

### History

- Trauma history
  - SAMPLE
    - Signs/Symptoms,
    - Allergies,
    - Medications,
    - PMHx,
    - Last oral intake,
    - Exposures/Events
- Recent anticoagulant use
- Presence of any VP shunt
- Consider screening for potential violence at home with certain high risk populations (intimate partner, children, elderly)

### Presentation

- ABCDE of trauma (See "Trauma General Overview")
- Glasgow Coma Scale
- Orientation Status (Awake? Alert? Oriented to person, place, time?)




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## Glasgow Coma Scale (GCS)

Glasgow Coma Scale		
 <b>Eye Opening</b>	 <b>Verbal Response</b>	 <b>Motor Response</b>
1 - No Response	1 - No Response	1 - No Response
2 - To Pressure	2 - Sounds	2 - Abnormal Extension
3 - To Speech	3 - Inappropriate words	3 - Abnormal Flexion
4 - Spontaneous	4 - Confused	4 - Withdrawal Away From Pain
	5 - Oriented x 3	5 - Localizing To Pain
		6 - Obeying Commands

Infographic by: Maroof Khalid, MD Candidate  
 Images from: flaticon.com

## Glasgow Coma Scale - Pupil Reactivity Score

### Glasgow Coma Scale - Pupil Reactivity Score = GCS-P Score

Score derived from GCS - score for Pupil Reactivity (with un-reactive pupils leading to a higher pupil reactivity score). Helps provide better prognostic value on initial patient assessment

Pupil Reactivity Score	
<u>Pupil(s) un-reactive to light</u>	<u>Score</u>
Both Pupils	2
One Pupil	1
Neither Pupil	0

\*GCS-P, for more information on prognostic score visit: <https://emottawablog.com/2018/07/gcs-remastered-recent-updates-to-the-glasgow-coma-scale-gcs-p/>

## Investigations

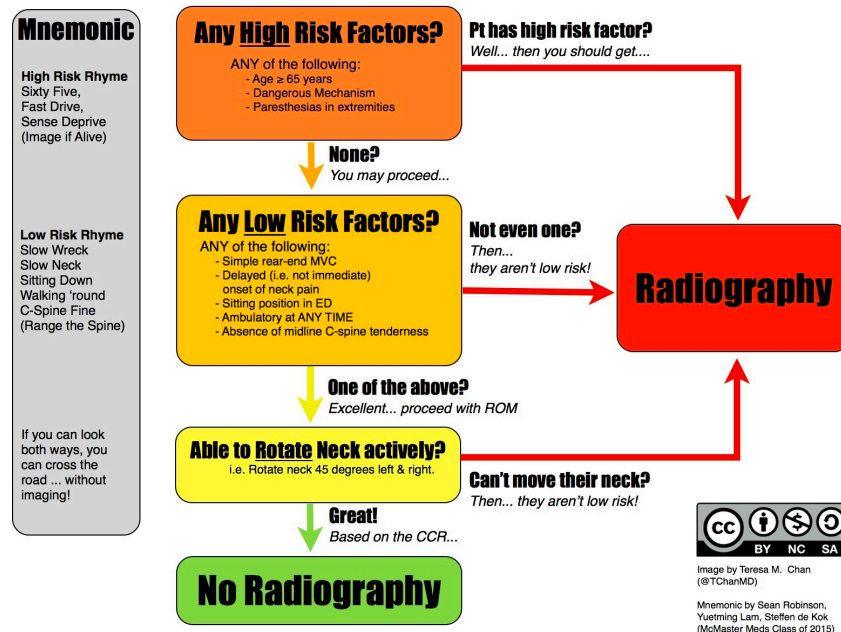
- Neuroimaging if warranted.
  - Use the relevant clinical decision tools to guide this decision. Be wary of the inclusion and exclusion criteria of these tools to ensure you are applying them correctly. (e.g. age cut offs, use of warfarin).
  - Alternatively, observation for a number of hours (usually 6 hours) can be an alternative for moderate risk patients (especially in children and young adults).
- CBC, BUN, Cr, Lytes, Glucose,
- INR/PTT - especially if decreased LOC and if you do not know medication history.
- Group & Screen (especially if patient is bleeding - or has potential of bleeding).
- \*For women, make sure to test for pregnancy (urine beta-HCG is typical, but in some circumstances it may be advisable and easier to do a serum beta-HCG rather than wait for a urinalysis).



## Clinical Decision Tools

- Canadian CT Head Rules <https://www.mdcalc.com/canadian-ct-head-injury-trauma-rule>
- PECARN head injury rule for children <https://www.mdcalc.com/pecarn-pediatric-head-injury-trauma-algorithm>

## CT Head Rule Summary Graphic from CanadiEM.org :



## Management

### For Intracranial Hemorrhage

- Management for ICH would usually involve Neurosurgery and/or admission.
- Consider reversal of oral anticoagulation using human prothrombin complex (PCC) in consultation with hematology/thrombosis/blood bank at your institution.
- Specific reversal agents are also available, but consult your hematologists or local protocols for this.

### Basic Things You Can Immediately Do at Bedside:

- Tilt head of bed up 30 degrees to prevent increased ICP. If the spine is not cleared, then use reverse Trendelenburg positioning.
- It may be worthwhile to consider hypertonic (3%) saline and/or mannitol, but you may wish to discuss with your Neurosurgeon.

- Consider phenytoin loading (17mg/kg IV over 30-60 min x 1) for patients with severe traumatic brain injury to prevent seizure.

## Patient Education Tools

- Alberta Health Services Choose Wisely Infographic: See Figure 1 in Article - <https://www.cureus.com/articles/19507-a-patient-focused-information-design-intervention-to-support-the-minor-traumatic-brain-injuries-mtbi-choosing-wisely-canada-recommendation>
- PECARN Education Card (by ALiEM-CanadiEM) - <https://canadiem.org/the-pecarn-pediatric-head-ct-rule-project/>

### Pearls for Junior Learners

- Always be careful with the spine, screening for concurrent C-spine injury! (Canadian C-Spine rule - <https://www.mdcalc.com/canadian-c-spine-rule>)
- If you suspect a significant bleed alert your staff!
- Collateral history can be super useful, especially in a patient with decreased LOC.
- If there is a trauma, get involved! This can include conducting the primary survey or helping assess c-spine, closing source of bleeding, etc./li>

## Recommended Readings, Videos, and Podcasts:

- CanadiEM MVP infographic - CT Head Rules Infographic <https://canadiem.org/canadiem-mvp-infographic-series-canadian-ct-head-rule/>
- Canadian CT Head Rule YouTube Video (featuring Dr. Stiell himself) <https://www.youtube.com/watch?v=-qOfQQK-O24>

## References:

1. Walls R, Hockberger R, Gausche-Hill M. Rosen's emergency medicine-concepts and clinical practice e-book. Elsevier Health Sciences; 2017 Mar 9. Chapter 34, Head Trauma.

## Ortho - Joint Pain

### Can't Miss Diagnoses

- Septic Arthritis
- Trauma
- Also, assess overlying soft tissues for infections that can also be very life-threatening (e.g. Necrotizing Fasciitis).
- Open Joint
- Prosthetic Joint Infection

### Mimics

- Gout
- Rheumatoid arthritis
- Osteoarthritis
- Hemarthrosis
- Dislocations

### Differential Diagnosis for Monoarticular Arthritis

**O**steoarthritis

**S**eptic arthritis

**T**umor in nearby bone / Trauma

**R**heumatic & autoimmune disease

**I**ntra-articular pathology

**C**rystal arthropathy (Gout, Pseudogout)

**H**emarthrosis

#### Updated and adapted for clerks by:

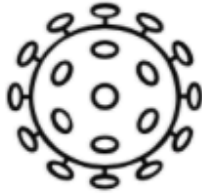
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## Differential Diagnosis for Prosthetic Joint Pain

### DDx Prosthetic Joint Pain



**Septic**  
Loosening



**Aseptic**  
Loosening



**Fracture**



**Dislocated/damaged**  
**polyethylene liner** (especially in  
Unicompartmental Knee  
Replacements)

Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com

### Points to Focus Upon

**To note and document:** Tetanus status, anticoagulation, surgical manipulation if any.

If Joint Pain & Fever are present, must suspect septic joint, especially if a patient has no history of similar pain OR has any of the following risk factors:

- Recent intravenous drug use
- Diabetes Mellitus
- Immunocompromised
- Elderly

Check for White count, CRP, Joint aspiration. Polyarticular arthritis is usually suggested of a more systemic problem. Consider a sexual history in these patients or in any young patients with joint pain.

Before you go hog-wild on tests, chat with your rheumatology colleague and/or consult this resource: <https://www.cmaj.ca/content/162/13/1833>

**Prosthetic Joints:** All joints should be aspirated with sterile technique. However, this is especially applicable to prosthetic joints. If there is an orthopaedic doctor on call, it is worth discussing with them prior to doing an aspiration. If an aspiration of a prosthetic joint is going to be done, a full drape, sterile setup, and sterile technique must be followed. When calling the orthopaedic surgeon, ideally know the date of the original surgery, surgeon, and the onset of symptoms. This is most applicable for knees. Hips should be done under image guidance.

## Clinical Decision Tools

- **Ottawa Ankle (and Foot) Rule:** Can be used in adults (100% sensitive) and in children over 12 (98.5% sensitive): <https://www.mdcalc.com/ottawa-ankle-rule>
- **Ottawa Knee Rule:** <https://www.mdcalc.com/ottawa-knee-rule>
- **Acute Gout Diagnosis Rule:** <https://www.mdcalc.com/acute-gout-diagnosis-rule#pearls-pitfalls>

## Investigations

- CBC, BUN, Cr, Lytes, Glucose, VBG
- C-reactive protein (CRP), ESR (if available at your lab)
- Consider joint aspiration
- X-rays
  - Consider weight bearing X-rays for lower extremity.
  - **REMEMBER:** All X-rays need 2 at least 2 views, for knee joint pain include a sunrise or patellar view.

## Management

Septic arthritis will require surgical wash-out. Involve your consultants early if this is a suspicion. Also, don't be a hero if you are not confident with your aspiration technique. Remember, during COVID-19 many hospitals have shut down their operating rooms and your orthopedics colleagues may be available to help - especially if you are redeployed to the ED. **NEVER ASPIRATE THROUGH A CELLULITIS, FIND CLEAN TISSUE AND AVOID MAJOR VESSELS/NERVES.**

Joint Aspiration - Medscape Article: <https://emedicine.medscape.com/article/2094114-technique#c2>

First 10:EM - Joint Aspiration Video: <https://first10em.com/videos/orthopedics-videos/joint-aspiration/>

### Tips for Junior Learners:

1. Always examine the joint above and below! Especially in elderly patients, knee pain may be masking a hip pathology i.e., fracture.
2. Palpate bones individually if possible i.e., the carpal/tarsal bones to help isolate injuries.
3. Palpate bones vs. soft tissues to see which one is more tender i.e., sprain vs boney injury.
4. Pay attention to the point of maximal tenderness and compare it with the corresponding part of the X-ray to help orient/analyze the imaging.
5. Some injuries may not be as obvious on imaging but can be dangerous if missed i.e., scaphoid fractures are at risk for avascular necrosis (AVN) if missed.
6. Past Medical History may be very important here! I.e., has this happened before, is this similar to their previous gout attacks?
7. For rheumatologic conditions: Inquire if they are followed by a rheumatologist, what is their treatment regime, what else have they previously tried, what has worked for acute attacks in the past, has anything changed recently?
8. Never forget to do a review of systems or ask about fevers and other constitutional symptoms for a systemic cause.

## Recommended Reading, Podcasts and Videos

- CanadiEM knee exam post: <https://canadiem.org/exam-series-guide-to-the-knee-exam/>
- Orthobullets -Septic Arthritis - Adult: <https://www.orthobullets.com/trauma/1058/septic-arthritis--adult>
- Orthobullets - Gout: <https://www.orthobullets.com/basic-science/9041/gout>
- Orthobullets - OsteoArthritis: <https://step1.medbullets.com/topicview?id=112032>
- Prosthetic Joint Infections: <https://www.orthobullets.com/recon/5004/prosthetic-joint-infection>
- Review of Dermatomes: [Dermatomes](#)
- Lower Limb Sensory & Motor Examination: [Lower Limb Sensory & Motor Examination](#)
- DDX for Acute Monoarthritis CanadiEM: <https://canadiem.org/differential-for-acute-monoarthritis/>

# Ortho - Common Fractures

## Common Wrist and Forearm Fractures

### Radius

1. Overview - <https://www.orthobullets.com/trauma/1027/distal-radius-fractures>
2. Colles Distal Radius Fracture - <https://radiopaedia.org/articles/colles-fracture>
3. Barton Distal Radius Fracture - <https://radiopaedia.org/articles/barton-fracture?lang=us>
4. Smith Distal Radius Fracture (a.k.a. reverse Colles) - <https://radiopaedia.org/articles/smith-fracture?lang=us>

### Ulna

1. Ulna Styloid - <https://radiopaedia.org/articles/ulnar-styloid-fracture-2?lang=us>
2. Olecranon Fracture - <https://radiopaedia.org/articles/olecranon-fracture-1?lang=us>

### Both Forearm Bones

1. Overview - <https://www.orthobullets.com/trauma/1025/radius-and-ulnar-shaft-fractures>
2. Galeazzi Fracture+Dislocation - <https://radiopaedia.org/articles/galeazzi-fracture-dislocation?lang=us>
3. Essex Lopresti Fracture + Dislocation - <https://radiopaedia.org/articles/essex-lopresti-fracture-dislocation?lang=us>
4. Radial Head Fracture - <https://radiopaedia.org/articles/radial-head-fractures?lang=us>
5. Radial Neck Fracture - <https://radiopaedia.org/articles/radial-neck-fracture-3?lang=us>
6. Monteggia ("Nightstick") Fracture + Dislocation - <https://radiopaedia.org/articles/monteggia-fracture-dislocation?lang=us>

## Common Hand Fractures

### Carpal Bones

1. Scaphoid Fracture - <https://radiopaedia.org/articles/scaphoid-fracture?lang=us>
2. Trapezium Fracture - <https://radiopaedia.org/articles/trapezium-fracture?lang=us>
3. Perilunate Fracture + Dislocation - <https://radiopaedia.org/articles/perilunate-dislocation?lang=us>

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## Metacarpal Bones

1. Bennet Fracture - Thumb - <https://radiopaedia.org/articles/bennett-fracture?lang=us>
2. Pseudo-Bennet Fracture + Dislocation - Thumb - <https://radiopaedia.org/articles/epibasal-fracture-of-the-thumb?lang=us>
3. Rolando Fracture - <https://radiopaedia.org/articles/rolando-fracture?lang=us>
4. Boxer's Fracture - 4th and 5th Metacarpal - <https://radiopaedia.org/articles/boxer-fracture-1?lang=us>

## Humerus Fractures

### Humerus

- Proximal Humerus - <https://radiopaedia.org/articles/proximal-humeral-fracture-1?lang=us>
- Mid-Humeral Fracture - <https://radiopaedia.org/articles/humeral-shaft-fracture-1?lang=us>

### Elbow

- Humeral Condyle Fracture - <https://radiopaedia.org/articles/humeral-condyle-fracture-1?lang=us>

### Pediatric Elbow

- Epicondylar Fractures - <https://radiopaedia.org/articles/epicondyle-fracture-elbow?lang=us>
- Supracondylar Fractures (THESE ARE SURGICAL - PLEASE CALL YOUR PEDIATRIC ORTHOPEDIC SURGEON)
  1. Extension Supracondylar Fracture - Pediatrics > <https://radiopaedia.org/articles/supracondylar-humeral-fracture-2?lang=us>
  2. Flexion Supracondylar Fracture - Pediatrics - <https://radiopaedia.org/articles/flexion-supracondylar-fracture?lang=us>

## Knee Fractures

- Tibial Plateau Fracture - <https://radiopaedia.org/articles/tibial-plateau-fracture?lang=us>
- Patellar Fracture - <https://radiopaedia.org/articles/patellar-fracture-2?lang=us>
- Segond Fracture (avulsion of the lateral tibial plateau, 75% cases associated with ACL tear) - <https://radiopaedia.org/articles/segond-fracture?lang=us>
- ACL Avulsion Fracture - <https://radiopaedia.org/articles/anterior-cruciate-ligament-avulsion-fracture?lang=us>
- PCL Avulsion Fracture - <https://radiopaedia.org/articles/posterior-cruciate-ligament-avulsion-fracture?lang=us>

## Ankle Fractures

- Overview - <https://www.orthobullets.com/trauma/1047/ankle-fractures>
- Bimalleolar Fracture



- Trimalleolar Fracture - <https://radiopaedia.org/articles/trimalleolar-fracture?lang=us>
- Pilon Fracture (Distal Tibia) - <https://radiopaedia.org/articles/pilon-fracture-1?lang=us>

## Pediatric & Adolescent Fracture Patterns

- Triplane Fracture - Adolescent - <https://radiopaedia.org/articles/triplane-fracture?lang=us>
- Tillaux - Peds - <https://radiopaedia.org/articles/tillaux-fracture?lang=us>

## Management

### Core Principles

1. Ensure pulses are present (and hopefully symmetric) - if absent or grossly asymmetric, may need emergent reduction.
2. Ensure sensation is present - if none, may need urgent reduction.
3. Check for compartment syndrome.
4. Splint for comfort until reduction can be completed.
5. Consider hematoma blocks if possible.
6. Recheck for compartment syndrome, pulses, and sensation following splinting and document.

### General Rules of Reduction

1. Look at contralateral anatomy for reference points.
2. Apply analgesia, sedation, or block.
3. In-line traction.
4. Exaggerate the initial injury (don't go crazy with this step please).
5. Continue inline traction, replace bones to initial location.
6. Have an assistant wrap and splint while you hold the reduction.
7. Provide a mould with your palms (not fingers) as plaster hardens.

## Splinting

Plaster is easier for the rookie to use and is preferred by most orthopaedic residents. Prefabricated fibreglass splints will not mould well and don't hold a reduction for long. When in doubt, use plaster.

## Who Needs Surgery

Here are some general rules about individuals who might require urgent or emergent surgical attention:

- Open Fractures
- Reductions that have persistent angulation
- Articular steps post-reduction greater than 2 mm

- Highly comminuted fractures
- Fractures where length, alignment, and rotation cannot be restored
- Patients who otherwise cannot go home

## Splinting Guidelines

1. EMRA Overview of Splinting Techniques can be found here: [https://www.emra.org/globalassets/emra/publications/reference-cards/emra\\_sportsmedicine\\_splint\\_guide.pdf](https://www.emra.org/globalassets/emra/publications/reference-cards/emra_sportsmedicine_splint_guide.pdf)
2. Splinting Basics from "EM in 5":
  - Part 1- Materials and process: <https://www.youtube.com/watch?v=0M3A8HknfP4>
  - Part 2- Upper and Lower Extremity Splints: <https://www.youtube.com/watch?v=SI8eu5xSf9I&t=14s>
3. Splint like a pro - FOAM content from EM:RAP team: Splint like a pro: Sugartong Splint: <https://www.youtube.com/watch?v=1yg5HWbk8pE&list=PLzdZdThzBOGbkrQVGL1I1rDLY84Z4334I>
4. Splint like a pro: Ulnar gutter splint: [https://www.youtube.com/watch?v=O11J6wc\\_6h0&list=PLzdZdThzBOGbkrQVGL1I1rDLY84Z4334I&index=2](https://www.youtube.com/watch?v=O11J6wc_6h0&list=PLzdZdThzBOGbkrQVGL1I1rDLY84Z4334I&index=2)
5. Splint like a pro: Thumb spica splint: [https://www.youtube.com/watch?v=ww2\\_e0DoUy8&list=PLzdZdThzBOGbkrQVGL1I1rDLY84Z4334I&index=3](https://www.youtube.com/watch?v=ww2_e0DoUy8&list=PLzdZdThzBOGbkrQVGL1I1rDLY84Z4334I&index=3)
6. Splint like a pro: Posterior lower leg splint: <https://www.youtube.com/watch?v=Z4jhDZ1ljlc&list=PLzdZdThzBOGbkrQVGL1I1rDLY84Z4334I&index=4>

### Tips for Junior Learners:

1. Have a good approach to describing fractures:
  - Which bone?
  - Where along the bone?
    - Epiphyseal, metaphyseal, diaphyseal
    - Intra-articular extension vs. extra-articular
    - Single # vs. segmental #(# composed of at least two # lines that together isolate a segment of bone)
    - Comminuted (multiple fragments)
  - Displacement/Translation
    - Distal fragment in relation to the proximal fragment
    - Anterior, posterior, medial, lateral
    - Apposition (% of contact between fragments)
  - Angulation
    - Describe which direction apex is facing
  - Shortening (overlap of fragments)
2. Look for subtle signs - i.e., soft tissue swelling that can help point towards potential fracture.
3. Know which fractures may not show up on an x-ray right away - for example, scaphoid fractures are not always apparent right away on x-ray. If clinically presenting as a scaphoid fracture place patient in thumb spica and arrange f/u.

### Recommended Reading, Videos, and Podcasts:

- Northwestern University Emergency Medicine Ortho Teaching Files <https://www.nuemblog.com/ortho-teaching-files>
- EM Cases Orthopedics Collection (Featuring Dr. Arun Sayal from CASTED course and others): <https://emergencymedicinescases.com/category/specialty/orthopaedics/>
- CrackCast - Orthopedic lesions section: <https://canadiem.org/crackcast/>

# Chapter 3

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## ED Skills

# Handling Personal Protective Equipment

## General Points

Provider safety while caring for patients starts with donning appropriate personal protective equipment (PPE). There will be institutional variation with regards to available or required PPE.

## General Tips for Success

1. Declutter - Remove all ID badges, lanyards, jewelry, watches, stethoscopes and unnecessary accessories prior to donning PPE.
2. Buddy up: Don and doff with a buddy. Watch each other to ensure no steps were missed, technique is safe and possible contamination is noted right away!
3. Police the process
4. Practice makes perfect - Just like any other skill, we have to practice to become proficient. Mistakes are made when we're anxious, rushed or have knowledge gaps. This can be circumvented by practicing!
5. Be flexible - As new evidence becomes available, your PPE process may change. Mentally prepare for this. Stay informed, keep up to date with national and local guidelines and be aware of your local contingency plans. If you don't have one, start working on it!

**Updated and adapted for junior learners by:**

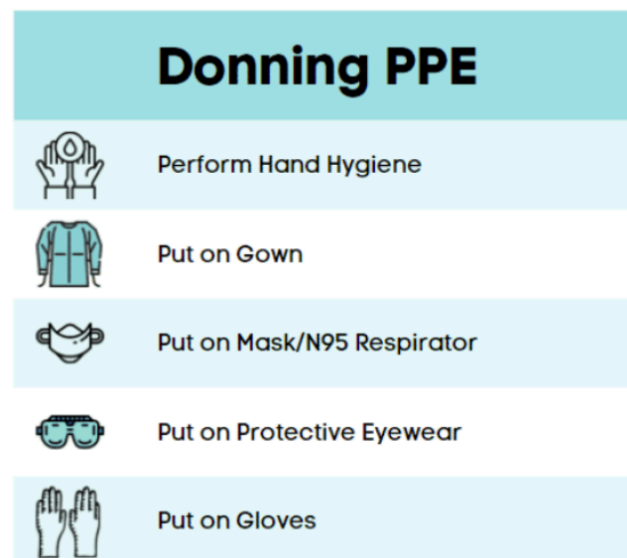
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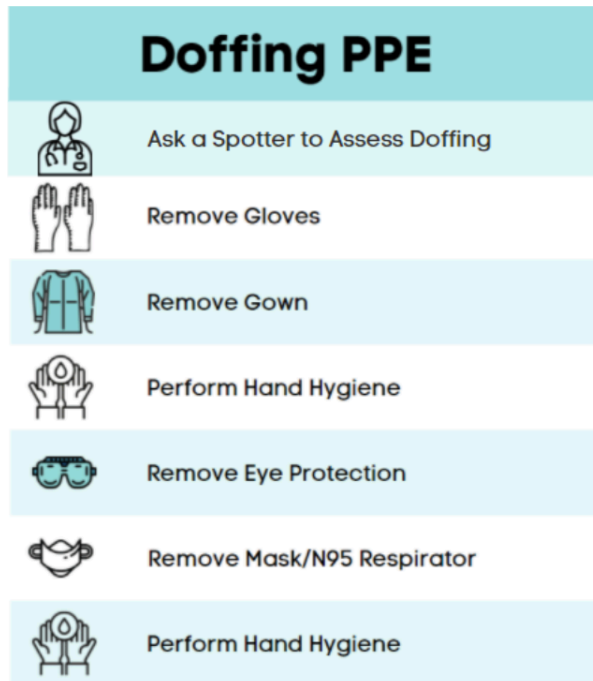
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## Donning PPE

The steps for donning personal protective equipment include: performing hand hygiene, putting on a gown, putting on a mask or N95 respirator, putting on protective eyewear, and then putting on gloves.



Infographic by Alysha Laviolette



Infographic by Alysha Laviolette

## Doffing PPE

The steps for doffing personal protective equipment include: asking a spotter to assess doffing, removing gloves, removing your gown, then performing hand hygiene, removing eye protection, removing your mask or N95 respirator, and then performing hand hygiene.

### Pearls for Junior Learners

1. Always check for droplet precaution or signs on/around the room.
2. When in doubt, wear PPE!
3. Always carry an extra pair of gloves in your pocket.

## Recommended Readings, Videos and Podcasts

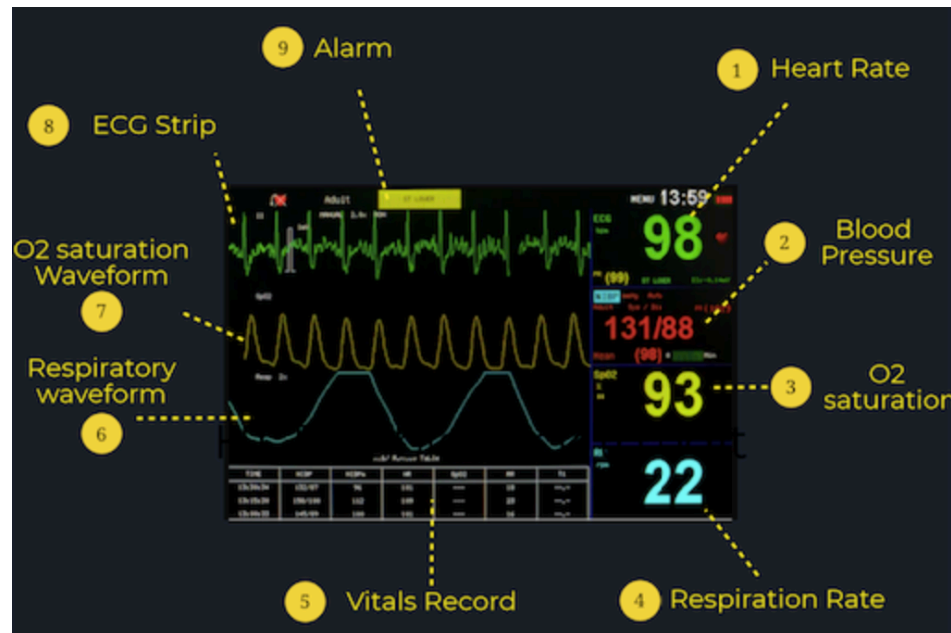
1. Just the Facts: Protecting frontline clinicians during the COVID-19 pandemic:  
<https://doi.org/10.1017/cem.2020.359>
2. CDC Resources (CAUTION - American Resource!):
  - CDC Posters - These standard donning/doffing posters are freely available on the CDC website and provide the safest approach based on the best available evidence.  
<https://www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf>
  - CDC Video - The CDC has also put together an excellent video demonstration of donning and doffing. A great refresher for all members of the healthcare team!  
<https://www.youtube.com/watch?v=t1lxq2OUy-U>

## References

1. Wang Y et al. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. 2020; [https://doi: 10.1002/jmv.25748](https://doi.org/10.1002/jmv.25748).
2. World Health Organization (WHO). Coronavirus disease (COVID-19) Situation dashboard. [www.who.int](http://www.who.int) (accessed April 10 2020).
3. Lai C et al. Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths. *Journal of Microbiology, Immunology and Infection* 2020; <https://doi.org/10.1016/j.jmii.2020.02.012>.
4. World Health Organization. Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19). [https://apps.who.int/iris/bitstream/handle/10665/331498/WHO-2019-nCoV-IPCPPE\\_use-2020.2-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/331498/WHO-2019-nCoV-IPCPPE_use-2020.2-eng.pdf). Published March 19, 2020. Accessed April 7, 2020.
5. Centres for Disease Control and Prevention. Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. Available from URL: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>
6. Centers for Disease Control and Prevention. Using Personal Protective Equipment. Available from URL: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html>.
7. Adams G and Walls R. Supporting the Health Care Workforce during the COVID-19 Global Epidemic. *JAMA* 2020; doi:10.1001/jama.2020.3972.
8. van Doremalen N, Bushmaker T, Morris D, et al. Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1. March 2020. doi:10.1101/2020.03.09.20033217
9. World Health Organization (WHO). Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care. [https://apps.who.int/iris/bitstream/handle/10665/69707/WHO\\_CDS\\_EPR\\_2007.6\\_eng.pdf?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/69707/WHO_CDS_EPR_2007.6_eng.pdf?sequence=1) Accessed April 8, 2020.
10. Public Health Agency of Canada. Interim Guidance: Infection Prevention and Control Measures for Prehospital Care. [https://ipac-canada.org/photos/custom/OldSite/pdf/PHAC\\_prehospital.pdf](https://ipac-canada.org/photos/custom/OldSite/pdf/PHAC_prehospital.pdf) Accessed April 8, 2020.
11. Public Health Ontario. Recommended Steps for Putting On and Taking Off Personal Protective Equipment. <https://www.publichealthontario.ca/-/media/documents/ncov/ipac/ppe-recommended-steps>
12. Donning and Doffing of PPE. Trillium Health Partners - Mississauga Hospital. <https://www.youtube.com/watch?v=cCzWH7d4Ags>

# Monitors and ECGs

## How to read a patient monitor, original infographic on CanadiEM



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Illustrations adapted with permission from the [LIFTL.com](http://LIFTL.com) site

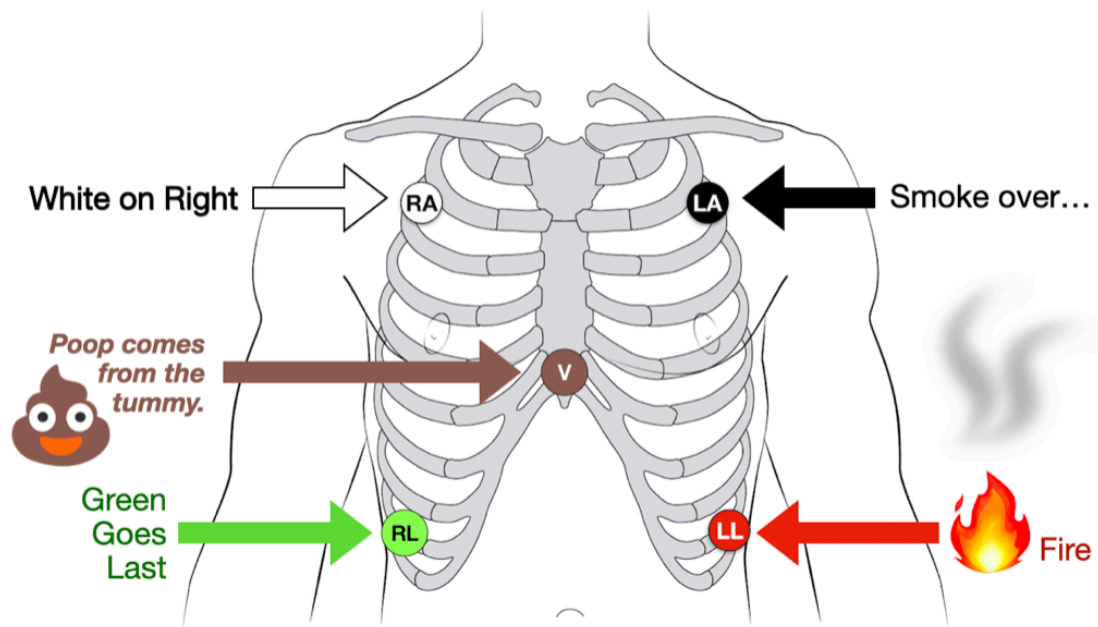
## Attaching Monitor Leads

It's probably been a while since you attached cardiac monitor leads. Here is a quick rhyme to help you remember:

1. White on right (Put the white lead on your patient's right arm [RA].)
2. Smoke over fire (On left side of the patient's body, black lead goes to left arm [LA], red lead goes below on left leg [LL].)
3. Poop comes from the tummy (Brown lead in the middle [V], closest to the abdomen)
4. Green goes last. (Green lead is placed on the limb where there isn't one yet - right leg. [RL])



## Where to attach the 5-point cardiac monitor leads.



This diagram has been adapted from Life in the Fast Lane. The original can be found here: <https://litfl.com/ecg-lead-positioning/>

## Where to Place the 12-Leads of an ECG

Remember there are only 10 electrodes required for a 12-lead ECG.

4 of these are for the limb leads (same as the monitor leads - so you can use the same rhyme, minus the V-lead part).

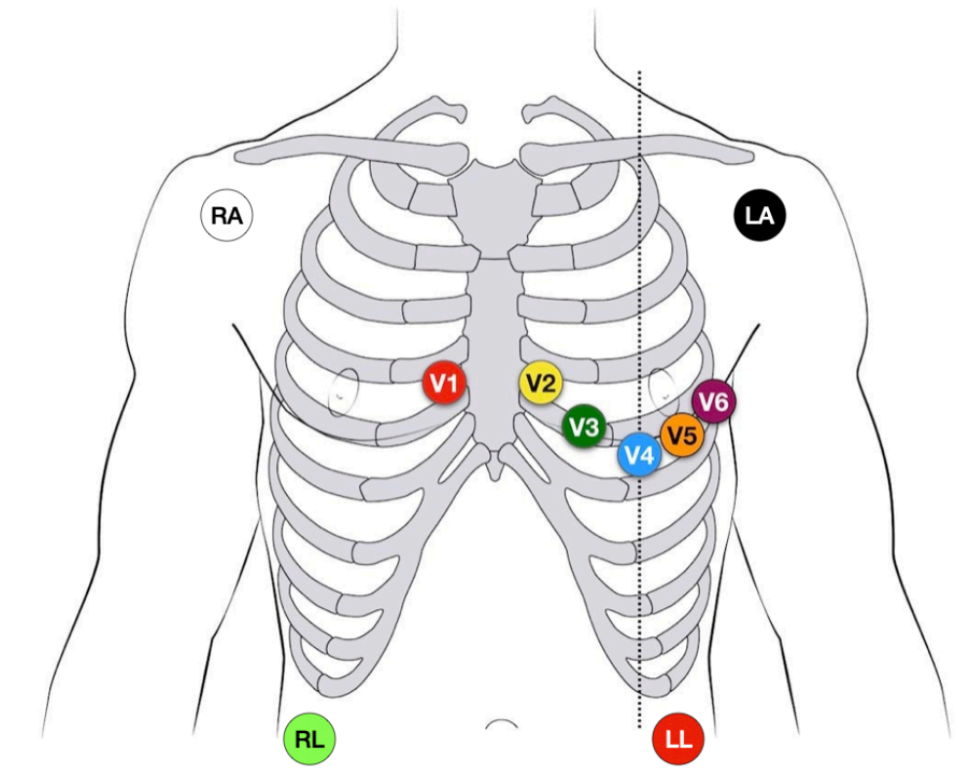
6 of these replace the V lead (brown lead) and are the precordial leads.

**\*\*WARNING\*\* PEOPLE TEND TO PLACE THE V1 & V2 LEADS WRONG A LOT.**

To review, here's where you place the precordial leads:

- V1: at the 4th intercostal space (ICS), on the right sternal border
- V2: 4th ICS, along the left sternal border
- V4: 5th ICS, at the mid-clavicular line
- V6: 5th ICS, mid-axillary line (same level as V4)
- V5: 5th ICS, at the anterior axillary line (same level as V4)
- V3: midway between V2 and V4

We have listed these OUT OF NUMERICAL ORDER as a hint for how you might best place them to space the leads out properly. Placement of 10 electrodes required for a 12-lead ECG



### Pearls for Junior Learners

- The monitor will usually show the rhythm strip (lead II) and can be unreliable, make sure to ask for the full ECG when you can!
- If you are a clerk on rotation, knowing where the leads go and asking to place them can be a good way to get involved early!

### Recommended Readings, Videos, and Podcasts

1. CanadiEM: How to Read Patient Monitors (<https://canadiem.org/how-to-read-patient-monitors/>)
2. LITFL ECG lead positioning  
<https://litfl.com/ecg-lead-positioning/>

# ECG Interpretation

## How to Use This Section

This is a quick refresher on ECGs commonly seen in the ED. We have provided one-liner introductions to each, and the answers are below the ECG. For those looking for a challenge, cover up the answer and quiz yourself.

### Pearls for Junior Learners - ECG Basics

- When evaluating an ECG, assess the following:
  1. RATE
    - Normal: 60-100
    - <60: bradycardia
    - >100: tachycardia
  2. RHYTHM
    - Looking at: R-R interval regularity; normal sinus rhythm (NSR) requires a the impulse to start at the sinus node (frequently phrased as a P wave before every QRS and a QRS after every P)
    - Regular rhythm: R-R interval the same across the tracing
    - Irregular rhythm: R-R interval varies across the tracing
    - Regularly irregular: repeating pattern of R-R intervals (i.e. Atrial flutter with variable block)
    - Irregularly irregular: R-R intervals change erratically (i.e. Afib, Vfib)
  3. AXIS
    - Direction of mean vector (frequently looking at the direction of the QRS in I, II and aVF)
    - Differential diagnosis for R axis deviation: RVH, left posterior hemiblock, PE, COPD, lateral MI, WPW, dextrocardia, septal defects, RBBB

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- Differential diagnosis for L axis deviation: left anterior hemiblock, inferior MI, WPW, RV pacing, normal variant, elevated diaphragm, lead misplacement, endocardial cushion defect, LBBB

#### 4. INTERVALS

- PR: normal: 120-200ms (3-5 small boxes)
  - High: AV block
  - Low: WPW, ectopic atrial pace maker
- QRS: normal: <120ms (<3 small boxes)
  - Wide QRS: RBBB, LBBB, V-pacemaker (i.e. V fib, V tach), hyperkalemia, ICD/pacer
- QTc: estimated by <1/2 R-R interval; or <420 for males and <440 for females
  - Short QT: <300-360: hypercalcemia
  - Long QT: "antis and hypos": antibiotics, antipsychotics, antidepressants, TCA, antihistamines, antiarrhythmics, hypo-K, hypo-Mg, congenital, MI, high ICP

#### 5. ST SEGMENT/T WAVE: see dedicated section for more

- Look for ST segment elevation + depression
- Look at reciprocal leads
- Look for hyperacute T waves

#### 6. OVERALL INTERPRETATION

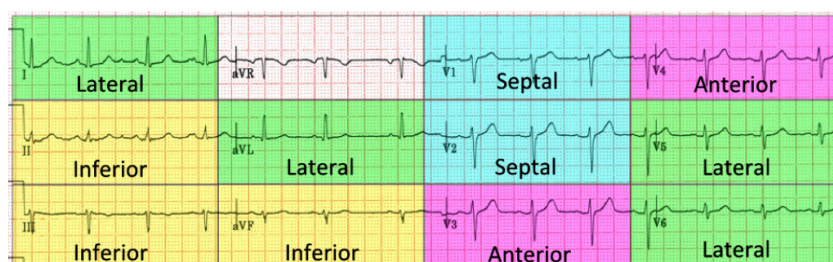
- Put it all together and asking to place them can be a good way to get involved early!

#### Resources

EM Ottawa Blog: Approach to the ECG (<https://emottawablog.com/2020/07/approach-to-the-ecg/>)

## ECG Territories

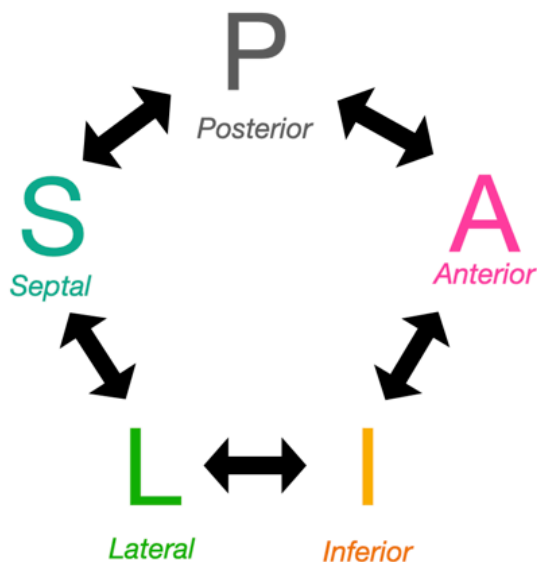
Territories of the ECG that correspond with coronary arteries



## Reciprocal Changes

So, when you identify legitimate ST elevation and you are concerned about a STEMI, where are those reciprocal changes found again? Think of PAILS - see the below diagram for the explanation. This mnemonic allows you to quickly remember where the reciprocal ST depression is anticipated to be. This is especially important since many STEMI mimics will NOT have reciprocal changes.

### PAILS mnemonic for remembering reciprocal changes



#### How this trick works

Write the word PAILS in a ring. Depending on where the ST elevation is, the reciprocal changes will be expected to appear in the adjacent zones.

That is:

**Anterior** ST elevation will have reciprocal ST depression in the posterior and **inferior** leads.

**Inferior** ST elevation will have reciprocal ST depression in the **anterior** and **lateral** leads.

**Lateral** ST elevation will have reciprocal ST depression in the **inferior** and **septal** leads.

**Septal** ST elevation will have reciprocal ST depression in the posterior and **lateral** leads.

**Posterior** ST elevation will have reciprocal changes in the **septal** and **anterior** areas.

## ECG Review - Part 1 - ST abnormalities

This review is all about spotting ST- and T-wave changes.

### PEARLS for Junior Learners - ST Segment Abnormalities

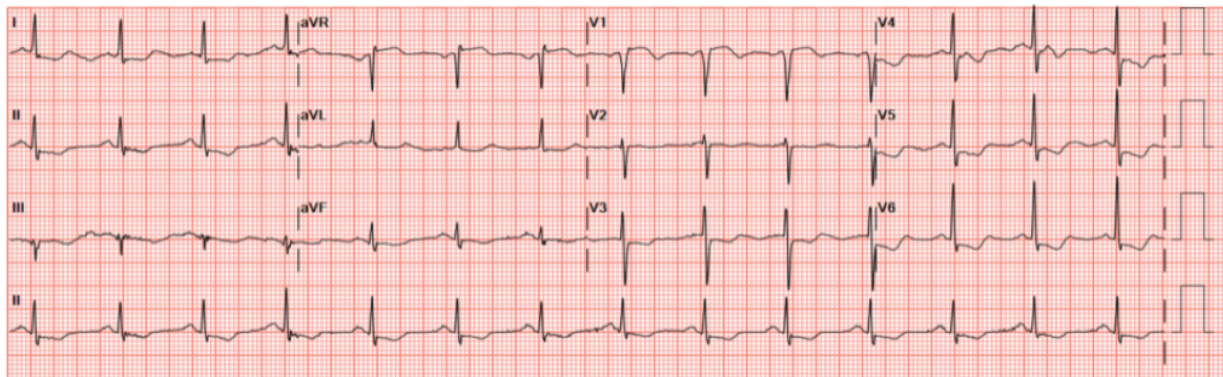
Possible causes for ST changes:

- Acute ischemia
- Myocardial injury
- Pericarditis (with global ST elevation and PR depression)
- Intraventricular conduction delays

## ST Elevation definition for a STEMI

- New ST elevation in two contiguous leads of  $>0.1$  mV in all leads other than leads V2-V3
- For leads V2-V3:  $\geq 0.2$  mV in men  $\geq 40$  yr,  $\geq 0.25$  mV in men  $<40$  yr, or  $\geq 0.15$  mV in women

47 year-old male with left sided retrosternal chest pain, which resolves a bit with nitro spray.

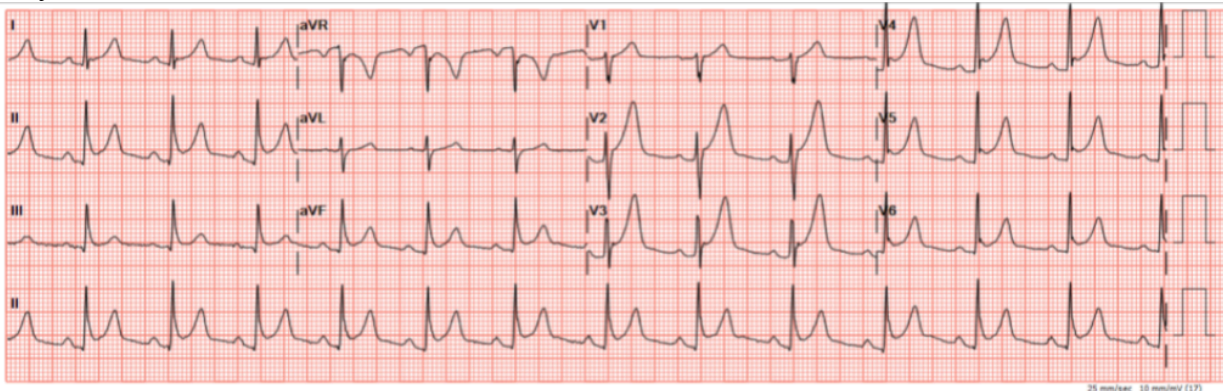


**Interpretation:** High risk NSTEMI (consider left main stenosis or triple vessel disease)

**Key Features:** Diffuse ST depression with AVR elevation

**What is your next step:** Acute coronary syndrome treatment (ASA, plavix, anticoagulation), consider nitroglycerin and beta blocker. Consult cardiology/internal medicine.

39-year-old male. Has had this before, was on Colchicine last time.

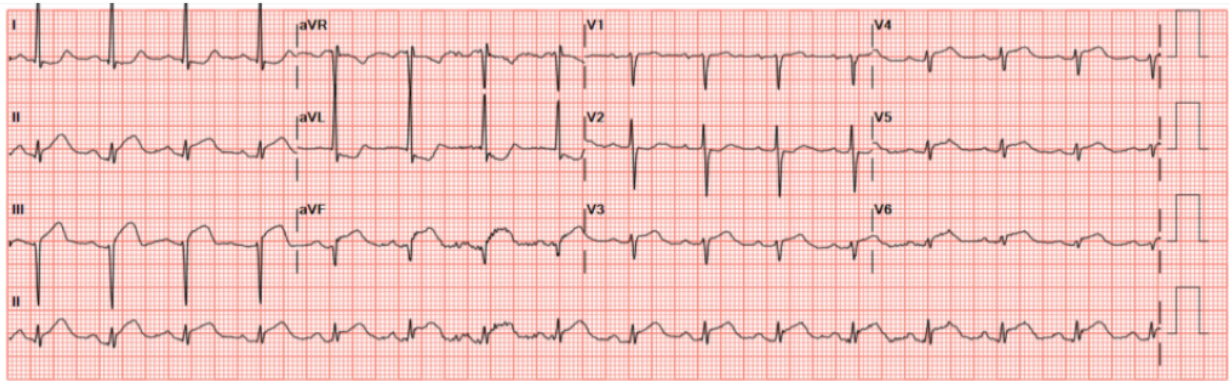


**Interpretation:** Pericarditis, a STEMI mimic

**Key Features:** Diffuse ST elevation. Diffuse PR depression.

**What is your next step:** High dose NSAIDs or ASA are first line. Colchicine x 3 months may also be warranted to prevent complications. Consider adding a proton pump inhibitor (PPI) to prevent gastrointestinal bleedibg with high dose NSAIDs. Outpatient Cardiology consult for follow-up and echocardiogram to assess for pericardial effusion.

75-year-old male. Was cutting his lawn by herself this morning. Felt some heaviness in his chest that has not been relieved by his wife's nitro spray.

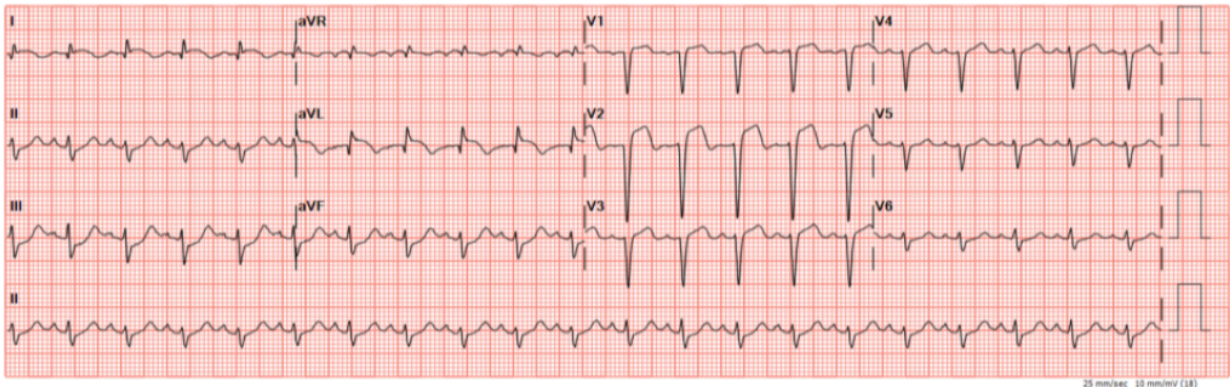


**Interpretation:** Inferolateral STEMI

**Key Features:** ST elevation in the inferior and lateral leads with reciprocal ST depressions in I and AVL.

**What is your next step:** Consult interventional cardiologist. Consider primary PCI or thrombolysis. If thrombolysis is chosen, consult local protocol and determine if patient has any contraindications to thrombolysis.

56-year-old female. Has been having indigestion all morning. Which is odd because she didn't have anything abnormal.



**Interpretation:** Anterolateral STEMI

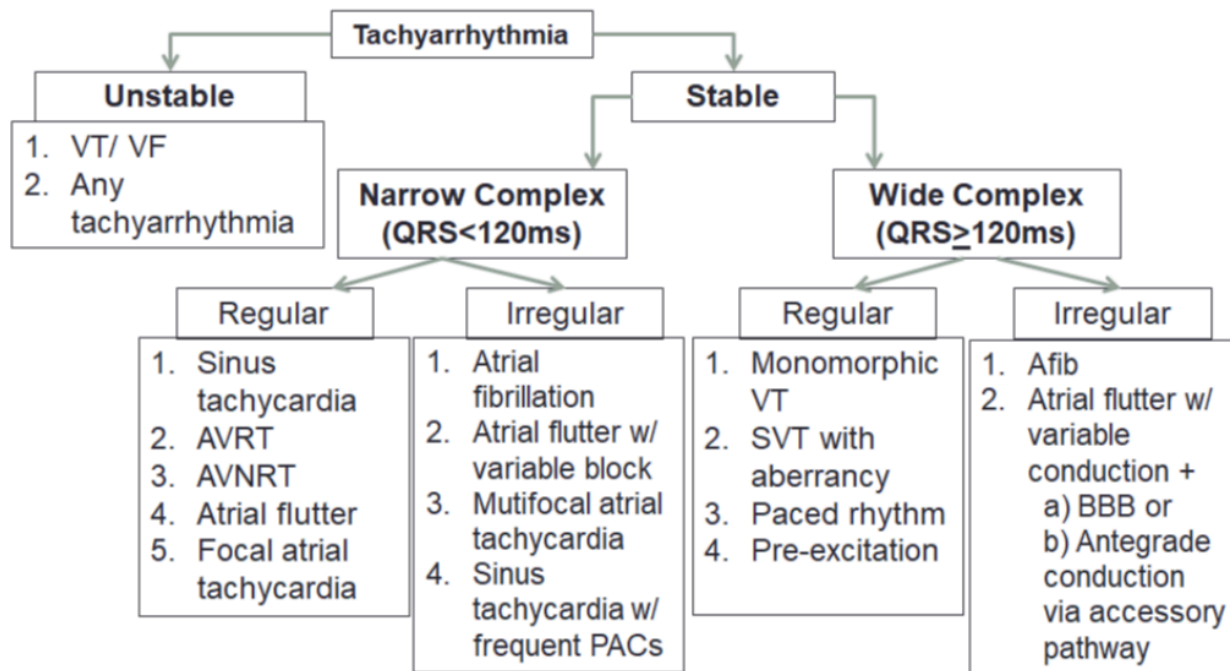
**Key Features:** ST elevation in V1-V3, I and AVL. Reciprocal ST depression in the inferior leads. Poor R wave progression. Sinus tachycardia. Left axis deviation.

**What is your next step:** Consult interventional cardiologist. Consider primary PCI or thrombolysis. If thrombolysis is chosen, consult local protocol and determine if patient has any contraindications to thrombolysis.

## ECG - Tachyarrhythmias

This review is all about differentiating really fast rhythms.

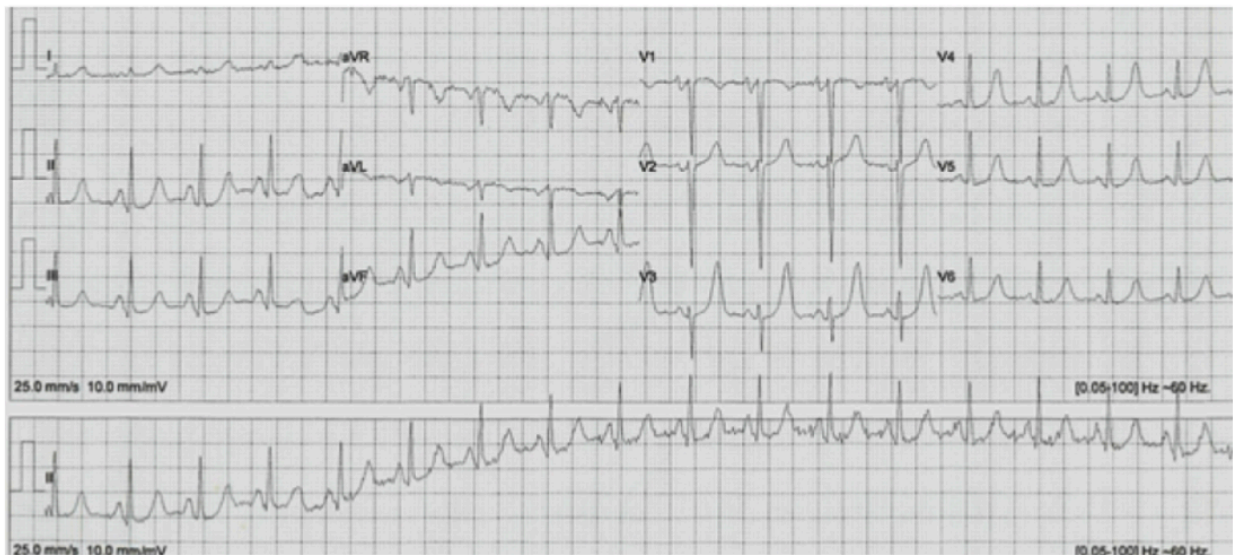
### An approach to Tachyarrhythmias





## Adult tachycardia with a pulse ACLS algorithm

25-year-old male. Feels very anxious watching the news. Very worried he is going to get COVID-19. The redeployed nurse from the pediatric ward apologizes profusely for the wandering baseline, but that is the best ECG they could get because the patient is very anxious.

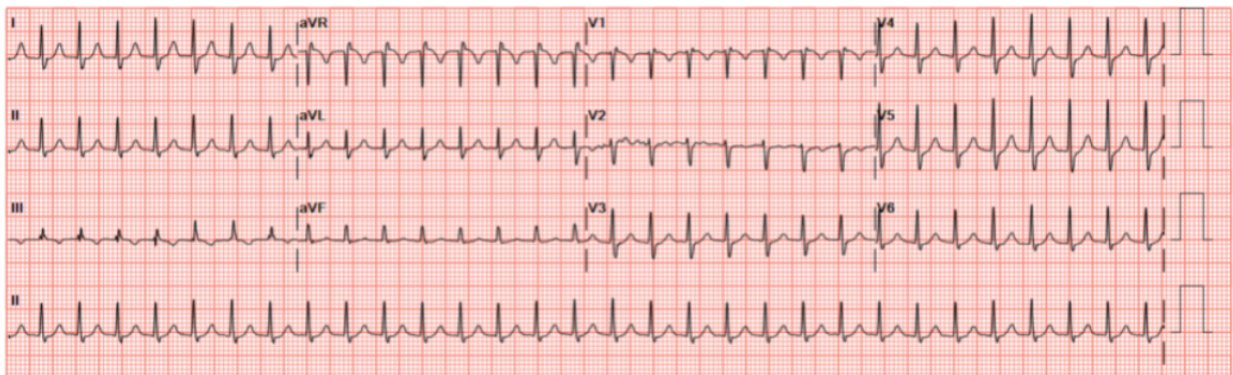


**Interpretation:** Sinus tachycardia

**Key Features:** HR > 100 BPM, Normal P wave morphology (P wave upright in I and II)

**What is your next step:** Determine underlying cause of tachycardia and treat the underlying cause.

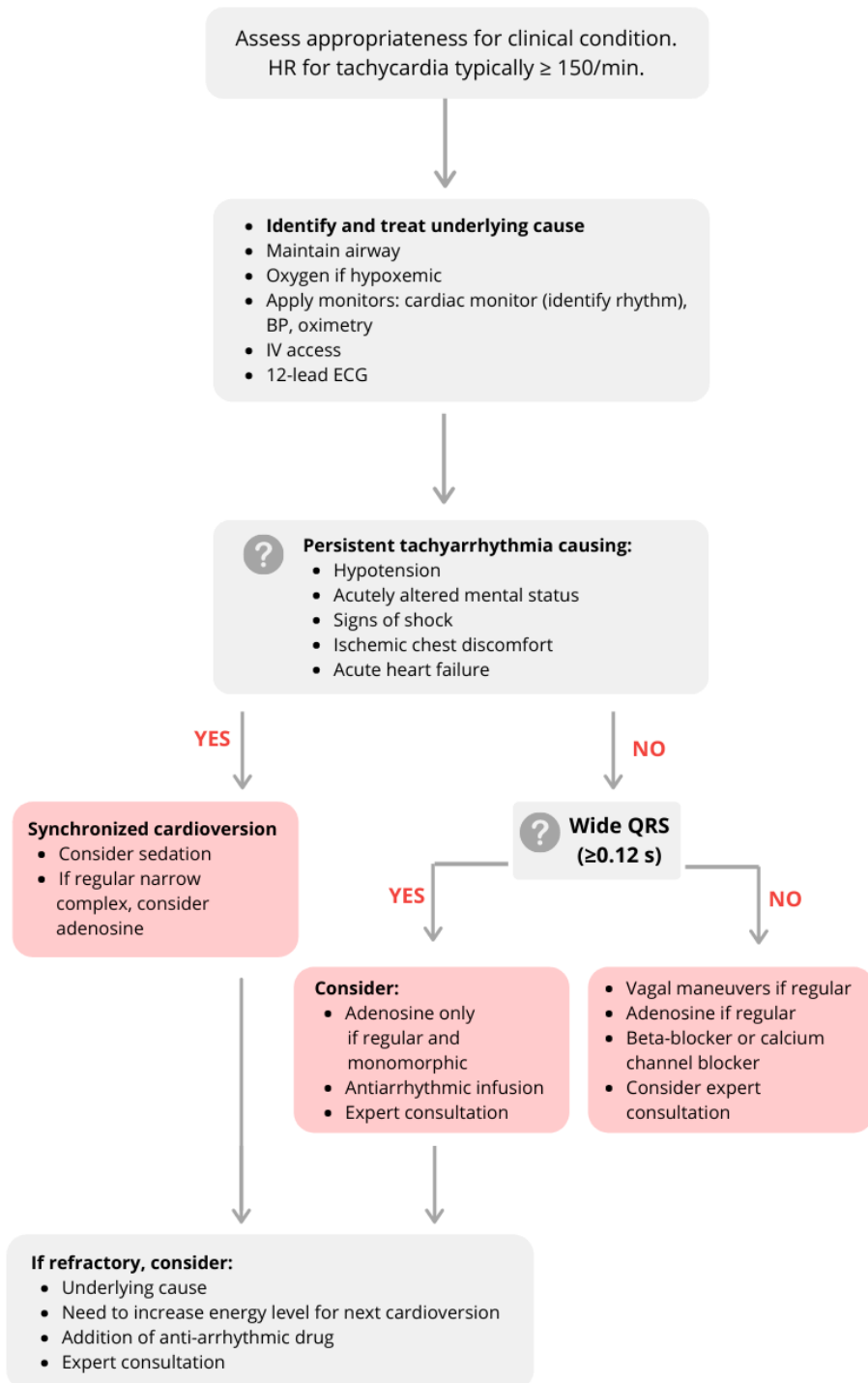
38-year-old female was out for a jog, sudden felt palpitations. Tried vagal maneuvers herself, but it didn't resolve. Continued jogging to the ED.



**Interpretation:** Supraventricular tachycardia - differential diagnosis includes AVNRT or AVRT

**Key Features:** Narrow complex, regular tachycardia - HR 180 BPM

**What is your next step:** Try a vagal maneuver (carotid sinus massage or Valsalva maneuver)  
If vagal maneuver does not work, try adenosine (6 or 12 mg IV push).



## Doses/Details

**Synchronized cardioversion:**  
refer to device's recommended energy level to maximize first shock success

**Adenosine:**  
First dose: 6mg rapid IV push, follow with NS flush  
Second dose: 12mg if required

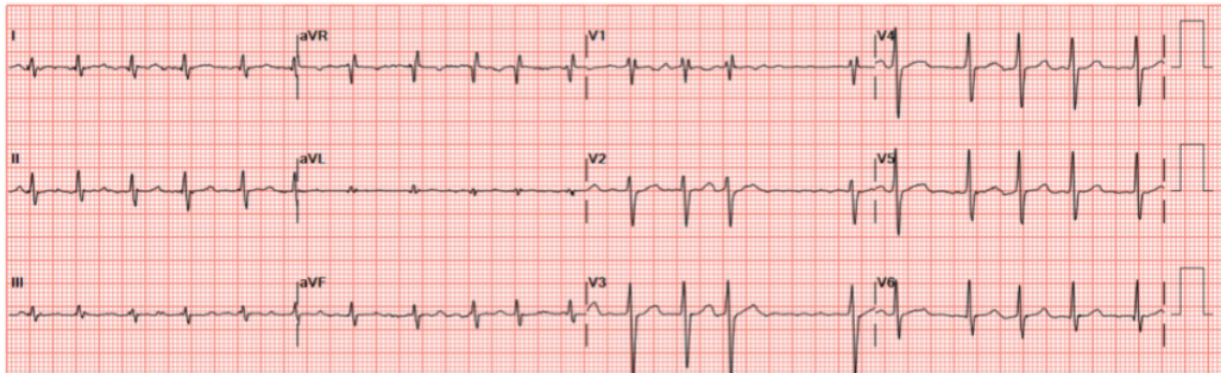
### **Antiarrhythmic infusions for stable wide-QRS tachycardia:**

**Procainamide:**  
20-50mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases  $>50\%$  or maximum dose (17mg/kg) given  
Maintenance infusion: 1-4mg/min. Avoid if prolonged QT or CHF.

**Amiodarone:**  
First dose: 150mg IV over 10 mins, repeat prn if VT recurs.  
Follow by maintenance: 1mg/min for first 6 hours.

**Sotalol:**  
100mg (1.5mg/kg) over 5 minutes.  
Avoid if prolonged QT.

87-year-old female. Here in ED with a dry cough, worried about COVID-19. Also, ran out of her warfarin recently.

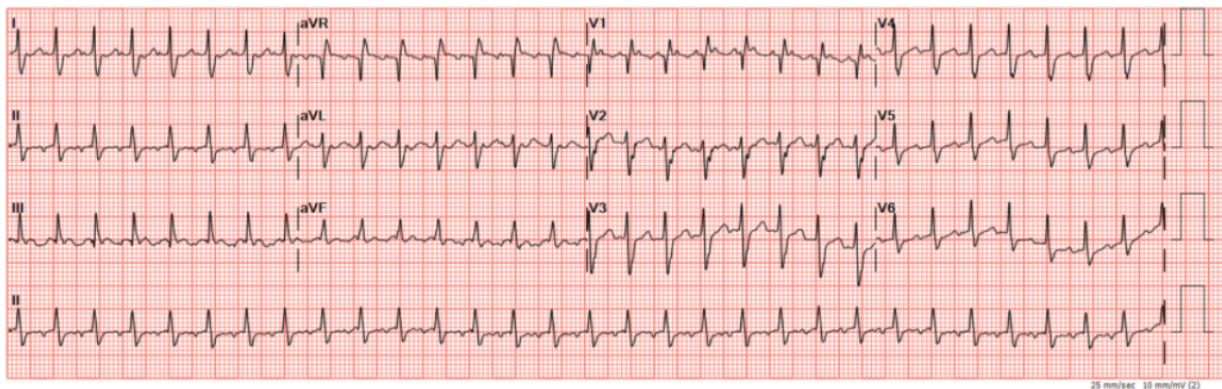


**Interpretation:** Atrial fibrillation

**Key Features:** Irregularly irregular rhythm with no P waves

**What is your next step:** Determine time of onset. Choose between rate control or cardioversion (electrical or chemical).  
Stroke prevention: Use CCS CHADS65 to determine what antithrombotic to prescribe (see next slide).

55-year-old male. Palpitations and lightheadedness.



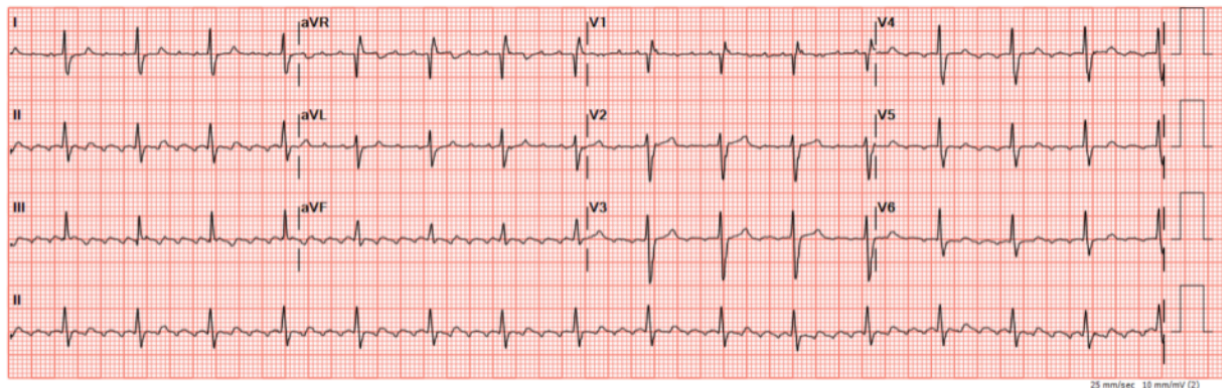
**Interpretation:** Atrial Flutter with 2:1 conduction

**Key features:** Narrow complex, regular tachycardia. F waves (flutter waves).

**What is your next step:** If unstable, cardioversion. If unsure if this is Aflutter or SVT, may trial a dose of Adenosine, which will show underlying sawtooth pattern. Otherwise, treat similarly to atrial fibrillation. Choose between rate control or cardioversion (electrical or chemical) - CCS algorithm

**Stroke prevention:** Use CCS CHADS65 to determine what antithrombotic to prescribe

Same 55-year-old male from last ECG. Recently prescribed metoprolol for his "heart condition" and now feels light headed when rising quickly.



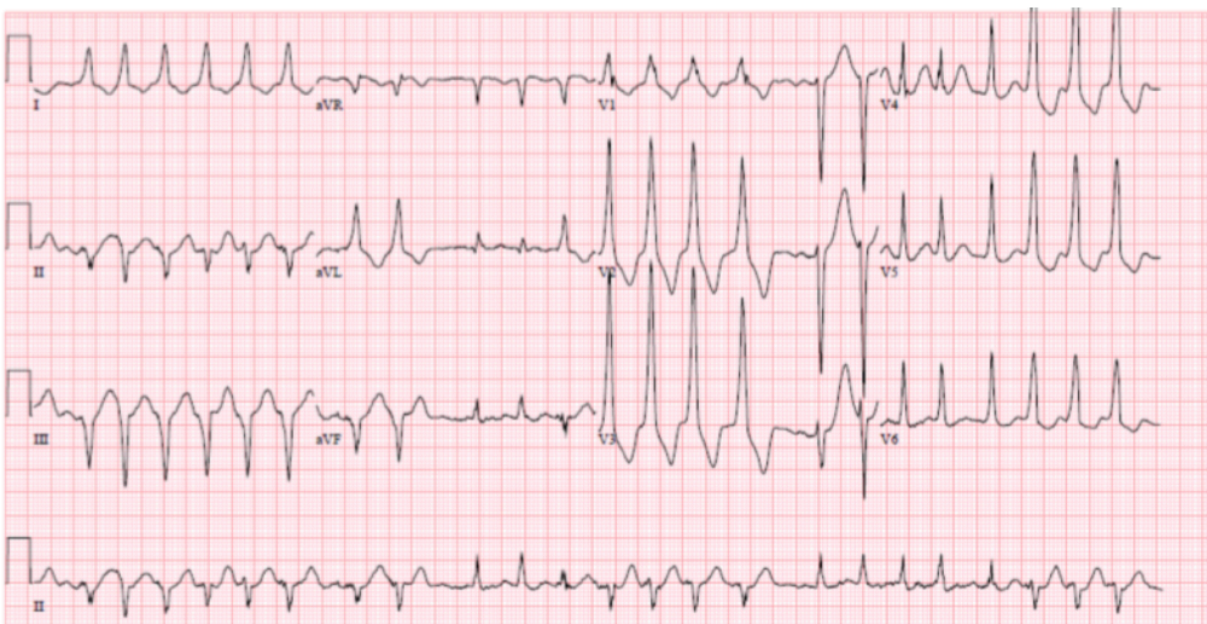
**Interpretation:** Atrial Flutter with 4:1 conduction

**Key features:** Narrow complex, regular tachycardia. F waves (flutter waves).

**What is your next step:** If unstable, cardioversion. If unsure if this is Aflutter or SVT, may trial a dose of Adenosine, which will show underlying sawtooth pattern. Otherwise, treat similarly to atrial fibrillation. Choose between rate control or cardioversion (electrical or chemical) - see CCS algorithm

**Stroke prevention:** Use CCS CHADS65 to determine what antithrombotic to prescribe

72-year-old male with extensive cardiac history. He has been feeling weird palpitations in his chest and wants it checked out.

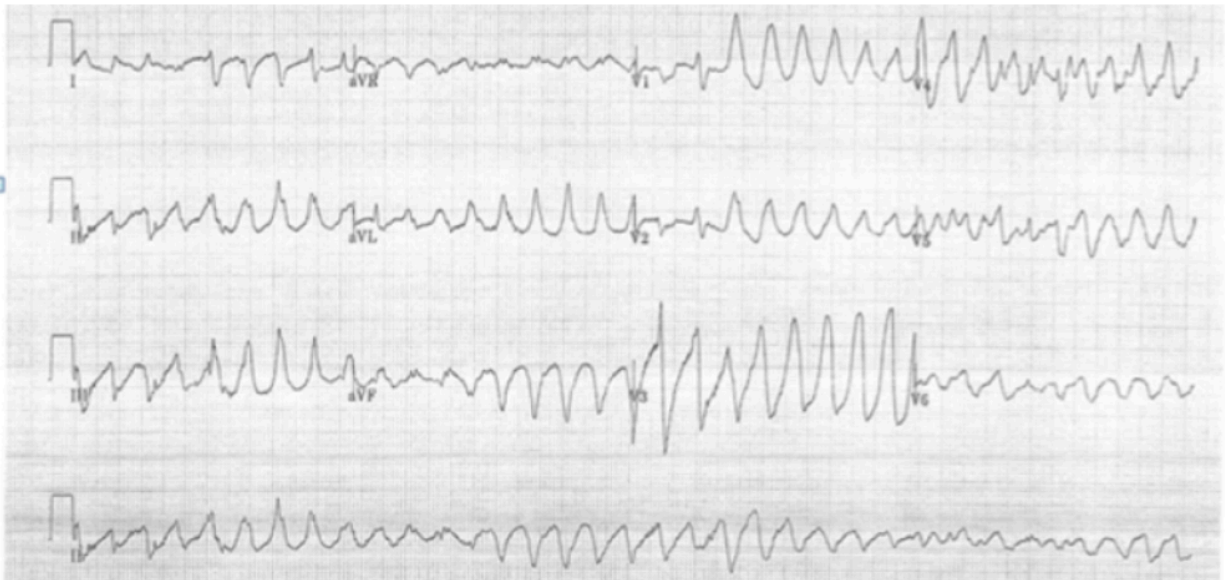


**Interpretation:** Pre-excited atrial fibrillation

**Key Features:** "wacky tachy" Irregularly irregular rhythm. QRS width varies between narrow and wide.

**What is your next step:** Unstable - cardiovert. If stable - procainamide. Perform ECG when in sinus rhythm to confirm the patient has pre-excitation (delta waves). Consult cardiology.

65-year-old male with history of psychiatric disorder was recently prescribed levofloxacin for his bacterial pneumonia. He now presents feeling worse.



**Interpretation:** Torsades de pointes

**Key Features:** Polymorphic ventricular tachycardia secondary to long QT.

**What is your next step:** Unstable - cardiovert. If stable - give Magnesium Sulphate, correct electrolyte abnormalities, stop all QT prolonging medications, consider overdrive pacing. Consult cardiology.

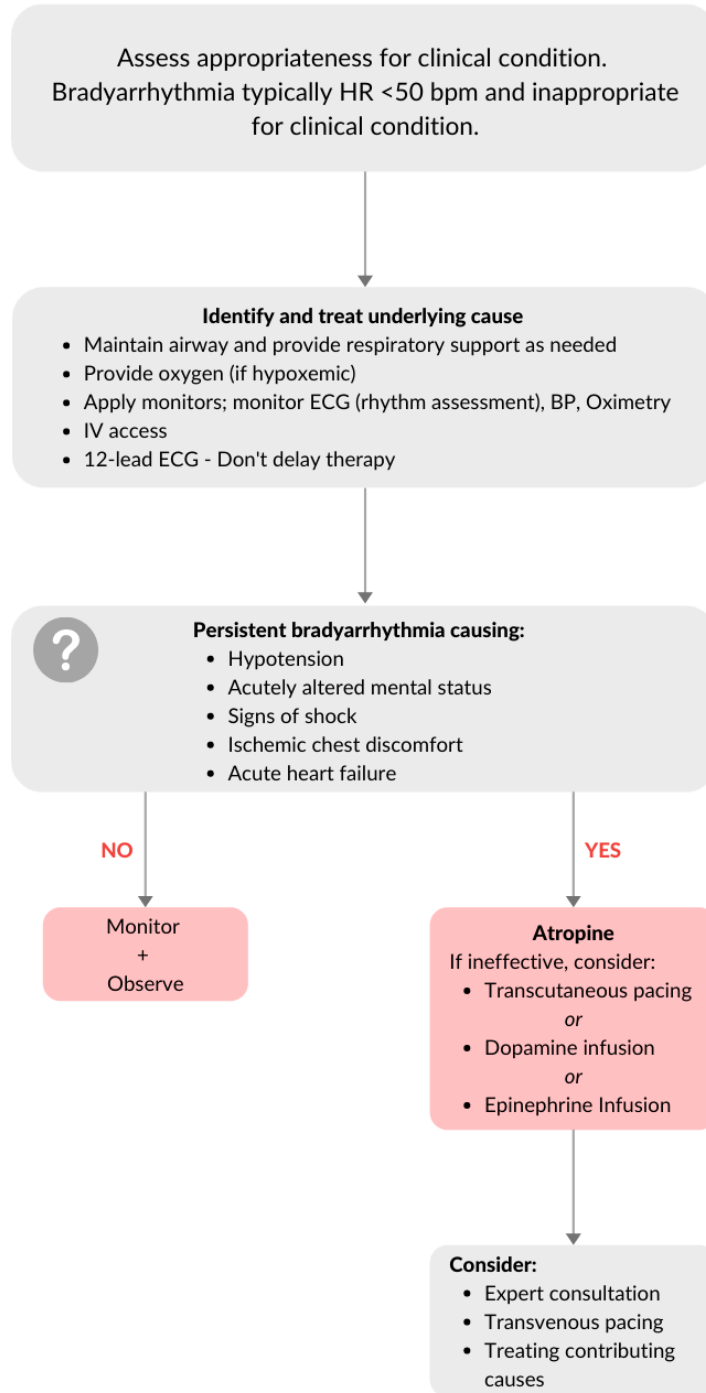
## Recommended Readings, Videos, and Podcasts

Canadian Cardiovascular Atrial Fibrillation Guidelines (2016 Update) Pocket Guide:  
[http://www.ccs.ca/images/Guidelines/PocketGuides\\_EN/Pocket\\_Guides/AF\\_Pocket\\_Guide\\_2016.pdf](http://www.ccs.ca/images/Guidelines/PocketGuides_EN/Pocket_Guides/AF_Pocket_Guide_2016.pdf)

## Bradyarrhythmias

This review is all about differentiating really slow rhythms. Remember, SOME asymptomatic bradycardias can be managed as an outpatient.

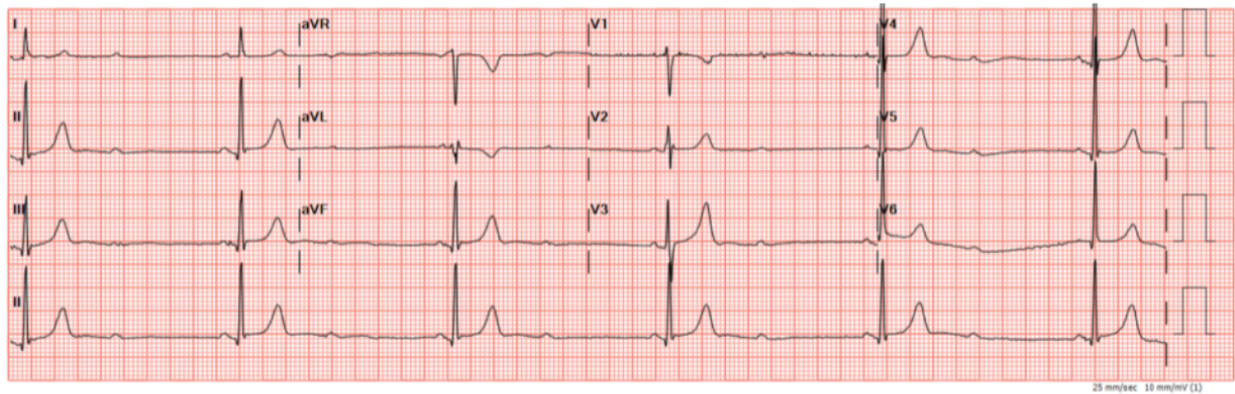
**ACLS Algorithm for SYMPTOMATIC bradycardia (on next page)**



## Doses and Details

<p><b>Atropine</b></p> <p>First Dose</p> <ul style="list-style-type: none"> <li>• 0.5 mg bolus</li> </ul> <p>Repeat</p> <ul style="list-style-type: none"> <li>• q3-5 mins</li> </ul> <p>Maximum</p> <ul style="list-style-type: none"> <li>• 3 mg</li> </ul>	<p><b>Dopamine Infusion (IV)</b></p> <p>Infusion Rate</p> <ul style="list-style-type: none"> <li>• 2-20 mcg/kg/min</li> </ul> <p>Titrate To</p> <ul style="list-style-type: none"> <li>• patient response</li> </ul> <p>Taper slowly</p>	<p><b>Epinephrine Infusion (IV)</b></p> <p>Infusion Rate</p> <ul style="list-style-type: none"> <li>• 2-10 mcg/min</li> </ul> <p>Titrate To</p> <ul style="list-style-type: none"> <li>• patient response</li> </ul>
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75-year-old from retirement home. Had syncopal event today. Has been feeling lightheaded for 2 weeks, but didn't want to cause a big scene because of all the COVID-19 stuff.

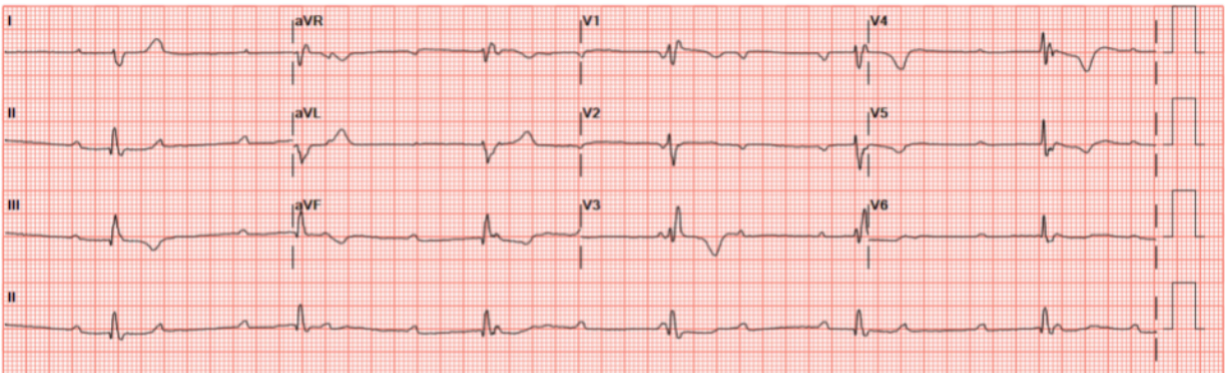


**Interpretation:** Second degree AV block (2:1 block). HR 30 BPM.

**Key Features:** Every other P wave is not conducted.

**What is your next step:** Consider isoproterenol infusion. External pacing if unstable. Consult cardiology.

63-year-old male. Has been feeling really dizzy.



**Interpretation:** Complete heart block

**Key Features:** AV dissociation (P-waves separate from the QRS complexes). Wide complex escape rhythm with right bundle branch block morphology.

**What is your next step:** Consider isoproterenol infusion. External pacing if unstable. Consult cardiology. Placement of a transcutaneous transvenous pacemaker may be warranted.

## Recommended reading, videos, and podcasts

- CanadiEM The Boring Guide to ECG's: Fascicular blocks  
<https://canadiem.org/fascicular-blocks/>
- CanadiEM Medical Concept: ECGs in Syncope  
<https://canadiem.org/medical-concept-ecgs-in-syncope/>
- CanadiEM Management of Hyperkalemia with ECG Changes  
<https://canadiem.org/management-hyperkalemia-ecg-changes/>
- CanadiEM Pacemaker Essentials: How to Interpret a Pacemaker ECG  
<https://canadiem.org/pacemaker-essentials-interpret-pacemaker-ecg/>
- Natalie's Casebook (CAUTION British Resource)  
<http://www.nataliescasebook.com/>



## Approach to Pain Management in the ED

**P**ain is one of the most common concerns of patients presenting to the ED. Achieving excellent analgesia while minimizing side effects is an important and nuanced skill to develop. The goal of emergency pain management is not to completely eradicate pain but rather, reduce pain to an acceptable level allowing for [safe discharge](#)/return to daily activities, or to bridge until inpatient care can be arranged (1)

There are a number of principles of pain management to keep in mind when choosing an analgesic agent. The WHO Analgesic Ladder has been a frequently cited reference for decades and has five main themes to guide your choices (2)

1. Oral administration is preferred whenever possible
2. Analgesics should be given regularly enough to maintain pain control
3. Agents should be chosen based on reported pain intensity
4. Dosing of agents should be adapted to the patient
5. Patients should be given clear instructions on how/when to take their medications

The type of pain that a patient is experiencing and their medical history (e.g. medical conditions, drug allergies, current medications, etc.) will influence your analgesic choice as well but a basic understanding of what your options are and when to use them is a good starting point. This post will give you an introduction to the types of analgesics you have access to in the emergency department and when to use them.

### Acetaminophen (Mild Pain)

Acetaminophen (Tylenol) is often a first line agent in the ED for mild pain. This is because of the efficacy for mild pain as well as the minimal side effects that come with it. Because Tylenol is metabolized by the liver, severe hepatic insufficiency is a contraindication but otherwise it is quite a universal analgesic (3)

### NSAIDs (Mild-Moderate Pain)

NSAIDs are an excellent choice for mild to moderate pain secondary to inflammation. This class of drugs is diverse and its uses can vary from MSK pain to renal colic. NSAIDs are often used as a first line agent either alone or in combination with acetaminophen. Despite their efficacy, NSAIDs have been associated with gastric bleeding, ulcers, platelet function inhibition, and

**Updated and adapted  
for junior learners by:**

Megan Chu,  
Julia Heighton,  
Daire Fitzpatrick  
Vincent Li

**Original primer  
created by:**

Jana Balakumaran

nephrotoxicity. These adverse effects necessitate that these agents are used for a short course and are avoided in patients with renal disease. Common NSAIDs used in the emergency department include Ibuprofen (Advil), Naproxen (Aleve), and Ketorolac (Toradol) (1,2,4).

Each drug has characteristics that define the best context to use it in:

- Ibuprofen – Oral drug – best GI side effect profile
- Naproxen – Oral drug – best cardiovascular side effect profile
- Ketorolac – IV/IM drug – best for patients who cannot tolerate PO analgesia (typically used for moderate pain) \*\*\*NOTE: A PO formulation exists but should be avoided due to higher side effect profile despite similar analgesic effect (4)

## Opiates (Moderate-Severe Pain)

Opiates are effective analgesic agents in the context of moderate to severe acute pain that cannot be adequately controlled with a non-opiate. However, this efficacy is coupled with a number of harmful side effects including: respiratory depression, sedation, tolerance, hyperalgesia, and opioid use disorder. For any outpatient script, remember that opioids are extremely constipating so always write a laxative script alongside the opioid. Great care must be taken to prescribe these drugs responsibly and under the right circumstances after appropriately educating patients about the risks and the analgesic alternatives.

The most commonly used opiates include morphine, oxycodone, and hydromorphone. Combination drugs like T3s and Percocets are often used to target moderate pain but importantly have the same addictive properties of other opiates. At equianalgesic doses, the efficacy of different opiates is the same (allowing for variance in metabolism). Oftentimes, the type of opiate used is influenced by the practitioners familiarity with dosages. Regardless when titrating opiates, “start low, go slow” is a good approach to prevent overdosing. For the elderly, it is essential to use caution as opioids can build up leading to delayed narcotic overdose (1,2,5-7)

- Combination drugs:
  - T3s (acetaminophen + codeine)
  - Percocet (acetaminophen + oxycodone) for moderate pain
- Morphine:
  - Baseline by which other opiates are measured (ME = morphine equivalents)
  - Note: metabolites hard to excrete in renal failure
- Oxycodone (1.5 ME)
- Hydromorphone (5 ME)
  - Neuro-excitatory metabolites hard to excrete so increased risk of delirium

The addictive nature of opiates is something to keep in the forefront of your mind when choosing what is best for your patient. Important questions to ask yourself include: Is my patient opioid naive? Is there a history of substance abuse? What is the risk of prescribing short-course PRN opioids on discharge for my patient? The Opioid Risk Tool (ORT) is a quick tool to take risk factors into consideration when making this difficult decision. In patients with elevated risk, you may choose agents with less addictive potential like NSAIDs, non-opioid analgesics or a brief opioid course with counseling. Remember that even a short term prescription carries with it real risks of creating opioid dependency. In high risk patients, consider dispensing or prescribing a naloxone kit. Advise patients to safely dispose of their opioids and to lock them up if there are dependents in the house who could inadvertently overdose through misadventure or error (7)

## Muscle Relaxants (Muscle Spasm)

Muscle relaxants are a class of drugs that are used to treat pain secondary to muscle spasm. Many muscle relaxants come with side effects including drowsiness and dizziness. This can keep patients from staying active and getting back to their baseline function (which are the goals of managing spasm/pain). Keeping in mind the common side effects of muscle relaxant use, it is recommended to use them in low quantities for short durations and to advise patients to avoid combining these with opioids, alcohol or benzodiazepines. Common muscle relaxants used in the emergency department include baclofen (Lioresal) and cyclobenzaprine (Flexeril) (8,9)

## Neuropathic Pain Medications (Nerve Pain)

Nerve pain is a common concern in the ED but it is often difficult to treat in this setting. The challenge stems from the slow onset of these medications (days to weeks) and necessity of titration to effect. The most common medications used to treat neuropathic pain are calcium channel blocker anticonvulsants including gabapentin and pregabalin. Both of these drugs have an unattractive side effect profile, despite their efficacy in cases of postherpetic neuralgia and diabetic neuropathy. Common adverse effects include dizziness, fatigue, ataxia, and rhabdomyolysis. They are excreted renally and should be avoided in those with renal insufficiency. When prescribing these, start at low doses before titrating up and advise patients to monitor for side effects. These should also be used in caution with patients already taking narcotics as they also have abuse potential (10)

## Summary of Common Analgesic Options

Common analgesic options with their starting doses, onset/duration, side effects, contraindications/considerations and when to use

Agent	Starting Doses	Onset/Duration	Side-effects	Contraindications/Considerations	When to Use
<b>Acetaminophen (PO or IV)</b>	PO - 1000 mg q6h IV - 1000 MG q6h	Onset <1 hr (PO); 5-10 min (IV) Duration 4-6 hr	Nausea/vomiting Hepatic injury	Severe hepatic insufficiency	Use for mild pain
<b>Ibuprofen (PO or IV)</b>	PO - 400 mg q8h IV - 400 mg q8h	Onset 30-60 min Duration 8 hr	GI irritation GI Ulceration Delayed wound healing Renal dysfunction	Active GI ulcer Active GI bleed Cerebrovascular bleeding Bleeding disorder Renal insufficiency	Use for mild inflammatory pain but for a limited course
<b>Naproxen (PO)</b>	PO - 375 mg q12h	Onset 30-60 min Duration 8-12 hr			Use for mild-moderate pain and when patients cannot tolerate PO analgesics (avoid PO formulation)
<b>Ketorolac (IV)</b>	IV/IM - 10 mg q6h	Onset ~30 min (IV) Duration: 4-6 hr			
<b>T3s - Acetaminophen + Codeine (PO)</b>	PO - 1-2 tabs q4h (325 acetaminophen -30 mg codeine - 5 mg caffeine)	Onset: 1 hr Duration: 4-6 hr	Nausea/vomiting Hepatic injury Sedation Respiratory depression Dec GI motility	Severe hepatic insufficiency Opiate Use Disorder	Use for moderate pain
<b>Percocet - Acetaminophen + Oxycodone (PO)</b>	PO - 1-2 tabs q6h (325-2.5 mg formulation)	Onset 15-20 min (PO) Duration 3-6 hr	Nausea/vomiting Hepatic injury Sedation Respiratory depression Dec GI motility	Severe hepatic insufficiency	Use for moderate pain
<b>Morphine (PO/IV)</b>	PO - 5-20 mg q4h IV - 3-5 mg q3-4h (infused over 4-5 mins)	Onset 15-30 min (PO); 5-10 min (IV) Duration 3-6 hr	CNS depression Respiratory depression Dec GI motility	Renal Insufficiency (dose adjustment) Opiate Use Disorder	Moderate to severe pain
<b>Oxycodone (PO)</b>	PO - 5-10 mg q12h	Onset 15-20 min (PO) Duration 3-6 hr		Opiate Use Disorder	
<b>Hydromorphone (PO/IV)</b>	PO - 1-2 mg q4h IV - 0.25-1 mg q4h	Onset 15-30 min (PO); 5-10 min (IV)		Delirium Opiate Use Disorder	
<b>Cyclobenzaprine (PO)</b>	PO - 5 mg q8h	Onset <1 hr Duration 12-24 hr	CNS depression Dizziness Anticholinergic effects QTc prolongation	Hyperthyroidism Heart Failure Arrhythmias	Muscle Spasm
<b>Baclofen (PO)</b>	PO - 5 mg q8h	Onset 2-3 hr Duration 8 hr	CNS depression Dizziness Weakness Insomnia	Renal Insufficiency Abrupt withdrawal - seizures, hallucination	Muscle Spasm
<b>Gabapentin</b>	PO - 300 mg TID (to be titrated by primary physician)	Onset variable Duration 24 hr	Dizziness Fatigue Ataxia Rhabdomyolysis	Renal Insufficiency	Neuropathic Pain (post-herpetic neuralgia, diabetic neuropathy)
<b>Pregabalin</b>	PO - 25 mg once daily (to be titrated by primary physician)	Onset variable Duration 12 hr	Dizziness Fatigue Ataxia Angioedema	Renal Insufficiency	Neuropathic Pain (post-herpetic neuralgia, diabetic neuropathy)

## Other Options

### Regional Blocks

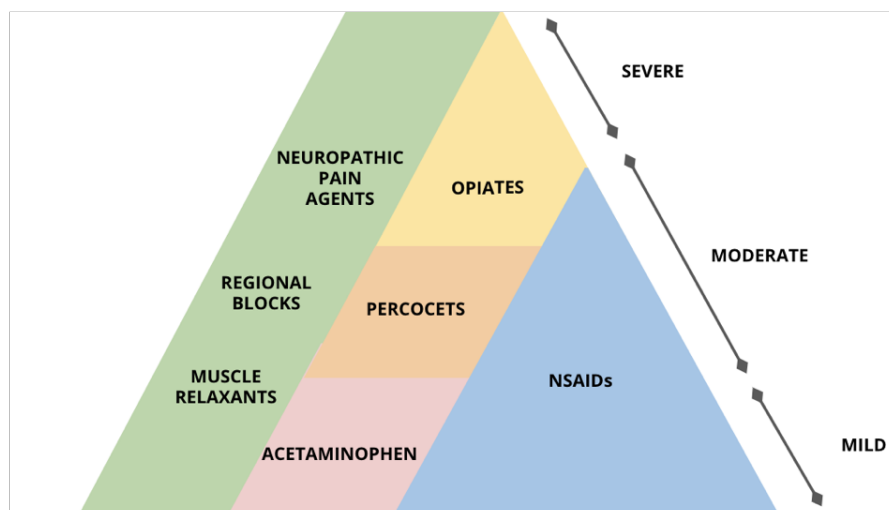
Nerve blocks are useful when pain is well localized in an area or nerve distribution (e.g. single digit, sciatica, dental). Regional blocks have the benefit of prolonged duration of pain relief but come with the cost of time needed to perform the procedure as well as risks associated with needle insertion. This is often a technique performed by more experienced or specially-trained practitioners in the department. Common agents used include lidocaine (shorter acting) and bupivacaine (longer-acting). Either agent can be combined with epinephrine to cause vasoconstriction, delaying anesthetic distribution and prolonging duration of effect. Although this is not a universally common procedure, interest has been gaining in this method of pain management in the ED (11)

### Adjuncts/Non-Pharmacologic Treatments

As adjuncts to medication don't forget that the mind plays an important role in pain. Try and ensure they have a comfortable position to sit in (where space allows). Administer ice or heat and use splints for MSK injuries. Utilize distraction (smart phones, ipads) where possible. For young children, sugar-based solutions can be used to mitigate painful procedures. Studies have shown that telling patients that their pain will be reduced can help magnify the impact of treatment (11,12)

There are a number of adjunct therapies that can be used in conjunction with the above mentioned therapies. Ice and heat therapy is a common recommendation for MSK pain. Sprains and strains have been shown to respond well to topical NSAIDs like diclofenac (Voltaren). Part of your disposition plan should always involve a plan to return to activity if this is limited by a patient's pain. Oftentimes, a multimodal approach to pain management is the most efficacious one (11)

### Analgesics for Different Levels of Pain Severity



## Takeaways

1. The goal of pain-management in the ED is not zero pain, but rather reaching an acceptable level for function.
2. When choosing route of delivery, oral is often preferred unless the patient cannot tolerate PO meds.
3. Consider a combination of non-opiates. Starting with 1000 mg Acetaminophen and 400 mg of Ibuprofen is an ED go-to for mild-moderate pain.
4. Opiates should only be used if non-opiate agents are insufficient to treat the severity of pain that the patient endorses. When using opiates, start low and go slow!
5. Treat pain before ordering your workup! Do not leave your patient suffering until you get results back.

## Final Thoughts

You will inevitably manage pain during every ED shift but luckily you have a diverse arsenal of agents at your disposal. As we continue to learn about how these agents compare, practice will shift and it is important to reassess why you are choosing one drug over another. When managing your patient's pain make sure you balance efficacy with the risks associated with each agent. Always adopt a patient-centered approach and counsel extensively on the risks and side effects of each agent.

## Resources

1. Optimizing the Treatment of Acute Pain in Emergency Department. *Annals of Emergency Medicine*. September 2017:446-448. doi [10.1016/j.annemergmed.2017.06.043](https://doi.org/10.1016/j.annemergmed.2017.06.043)
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9. Ghanavatian S, Derian A. statpearls. October 2019. <http://www.ncbi.nlm.nih.gov/books/NBK526037/>
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# Suturing and Wound Closure

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## Indications

Purpose of closing wounds:

- Minimize risk of further bleeding
- Minimize infection

As a rule, lacerations should be closed when the wound is deep enough to cause excessive or unsightly scarring. This usually occurs for lacerations that:

1. Are >5mm long
2. Are gaping
3. Extend through the dermis (which you will know because that's the layer that contains the blood vessels)
4. Can be pulled apart to reveal fat, muscle, tendons or vessels

### Junior learner primer

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## Possible Complications

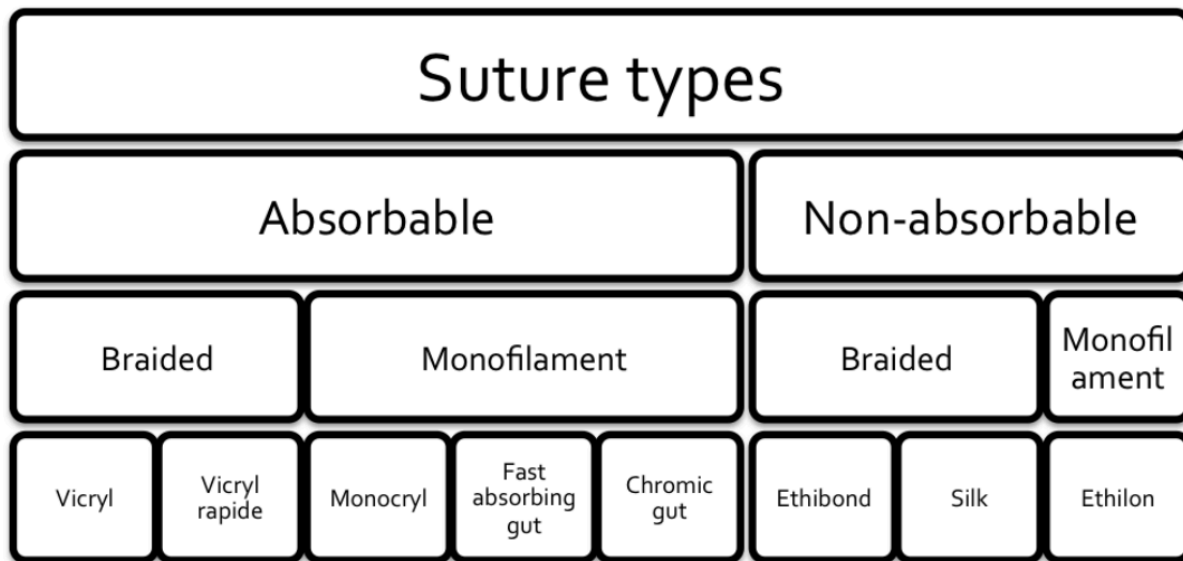
1. Infection
2. Bleeding
3. Wound dehiscence
4. Scarring

## Contraindications

1. Leave certain concave areas of face to heal by secondary intention (e.g temples, alar creases, peri-auricular area)
2. Avulsion injury and tissue loss
3. Immediate closure of human bites and certain animal bites may induce wound infections, so delayed closure may be indicated
4. Consider specialist consult prior to repairing wounds associated with fracture
5. Wounds greater than 12-24h old



## Choice of Suture Material and Sizes

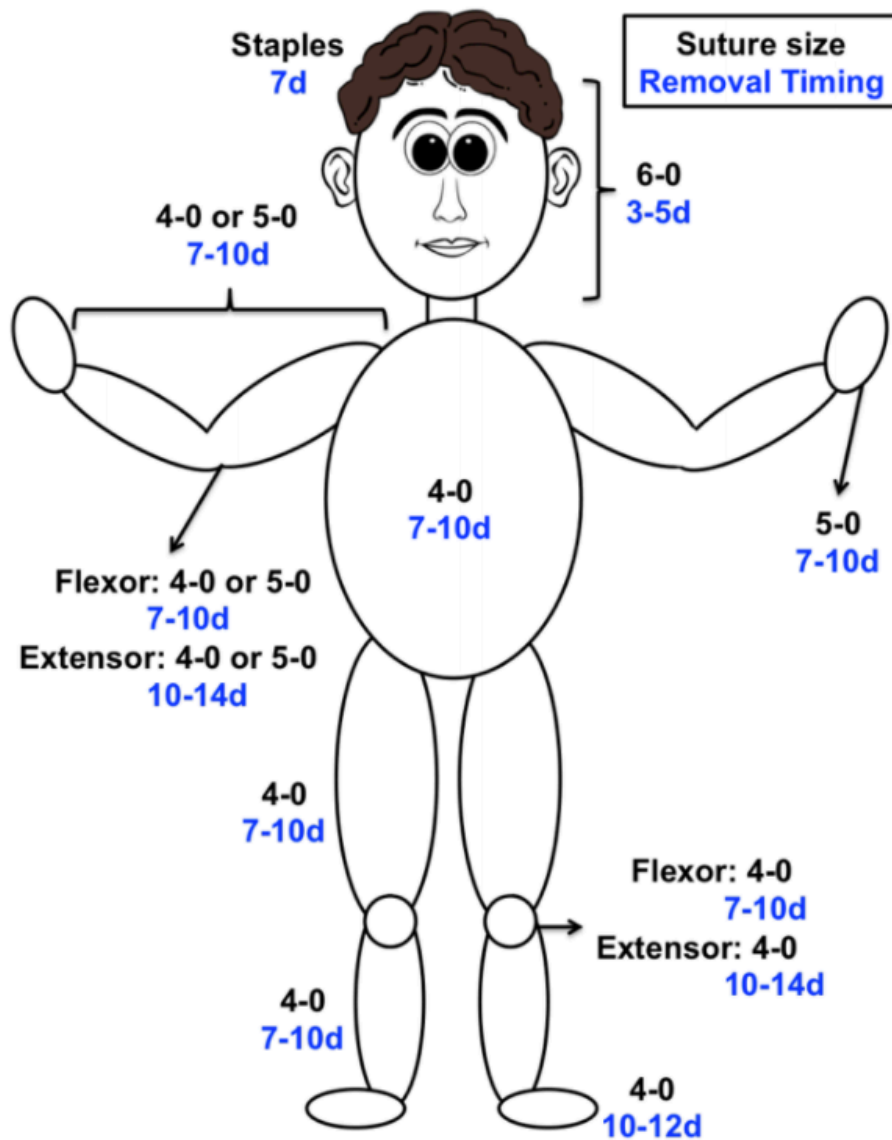


Picture from Chin, Alvin, et al. "Nice Threads: a Guide to Suture Choice in the ED." CanadiEM, 18 Dec. 2015, [canadiem.org/nice-threads-guide-suture-choice-ed/](http://canadiem.org/nice-threads-guide-suture-choice-ed/).

## Types of Sutures

1. Non Absorbable: can be used to provide longer term tissue approximation and repair most superficial lacerations in the Emergency department.  
E.g., Nylon ( Ethilon ), silk, prolene.
2. Absorbable sutures: may be broken down by body after enzymatic degradation. Half life 7-14 days. Do not need to be removed. More likely to become infected. Usually used for multilayer closure or pediatric patients to avoid removal procedure.  
E.g., Monocryl, Vicryl, PDS
3. Suture sizes: Thread size in the ED is indicated by a number followed by a "-0." A larger number indicates a smaller thread diameter. Consider repairing lacerations on extremities with 4-0 or 5-0 and the ones on the face with 6-0 owing to its thickness and smaller size of the needle. A larger diameter suture should be used in areas that may need more tensile strength including over joints, and at high wear points.
4. Needle type: Suture needles can be straight or curved, and have either a round/tapered needle or a "cutting" edge to help pass through the tissue. Most suture packs in the ED will be a "reverse cutting" curved needle.

## Laceration Repair and Sutures



Reproduced with permission from Lee, Hyunjoo, and Layla Abubshait. "PV Card: Laceration Repair and Sutures - A Cheat Sheet Guide." ALiEM, 30 Nov. 2019, [www.aliem.com/pv-laceration-repair-and-sutures/](http://www.aliem.com/pv-laceration-repair-and-sutures/).

## Environment, Material, and Equipment Checklist

### Environment

1. Adjust the light for visibility
2. Adjust bed height for ease of procedure
3. Use a side table or cart for procedural material
4. Keep a trash can nearby for proper disposal of waste

## Medications

1. Sterile solution: normal saline wash, chlorhexidine, betadine. Normal saline or sterile water can be used for irrigation. However, there is evidence that there is no statistical difference between infection rates with sterile saline wound irrigation compared to potable tap water irrigation. Potable tap water is a safe option for wound irrigation and should be considered if cost or availability of sterile saline is an issue.
2. Local anesthetic in a 5 ml syringe:
  - Lidocaine 1 with 1:100,000 epinephrine OR
  - Bupivacaine, 0.25% or 0.5%, with or without epinephrine. Bupivacaine can be used if need for longer anesthetic for large/complex wounds
  - Lidocaine/Epinephrine/Tetracaine (LET) gel - useful for open wounds in children. Apply under a tegederm bandage.
3. Note: The added epinephrine helps with additional hemostasis, and increased concentration at the injection site. However, it has been classically taught that its inclusion with local anesthetic should be avoided in use in the ears, tip of the nose, distal phalanges, and the penis, because the vasoconstrictive effect of the epinephrine may cause local tissue necrosis. While this theory has been mostly debunked in the literature, the use of local anesthetic with epinephrine in these sensitive locations is controversial.
4. Sodium Bicarbonate ( $\text{NaHCO}_3$ ): One part sodium bicarbonate to 10 parts local anesthesia with epinephrine may be added into premixed bottles of lidocaine with epinephrine to lessen the local burning during infiltration

## Materials

1. Gauze (4" bx 4"), sterile sheets, bandage & tape for dressing
2. Steri-strips where available
3. Window drape for wound, sterile gloves
4. Alternatively topical skin adhesives ( e.g Dermabond) or staples provide a fast method for wound closure and have been associated with decreased wound infection rates. Staples are composed of stainless steel & can simplify skin closure
5. Needles of various size for administration of local anesthetic

## Equipment within a Suture tray

- Needle driver : use your dominant hand to hold, with thumb and ring finger “Palming”
- Toothed forceps : hold like a pen, remember to hold the skin edge carefully and gently not to cause trauma to the viable edge
- Scissors for cutting the sutures, remember to rest the base of the blades against your index finger to maintain better control while cutting

## Points to Focus On:

### History and Physical

- Assess tetanus status
- Assess and document distal neurovascular status and vitals
- Ask about use of anticoagulants, steroids
- PMHx: immunocompromised, comorbidities that may hamper wound care
- Assess for other injuries or foreign bodies with X-ray, ultrasound or CT

### Pre-Procedure Preparation Considerations

- Attain hemostasis by pressure and elevation
- Wash hands, wear sterile gloves, prepare the sterile field and place the window drape around the wound
- Skin and wound should be irrigated thoroughly, and debride non-viable areas of skin if dirty and ragged
- Make sure the wound is explored in good light, looking for any signs of deep structural damage (e.g tendons) and ensuring no foreign body
- Approximate the wound edges to make a mental map of your suturing and how much material you would require

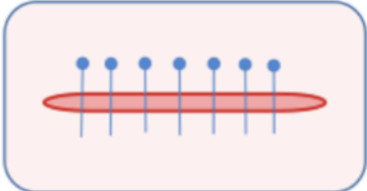

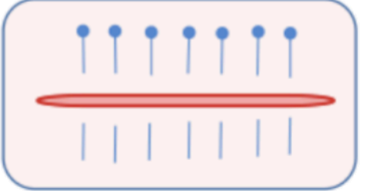
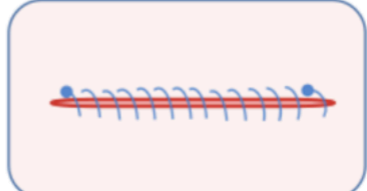
### Procedure:

#### Simple interrupted suturing

1. Infiltrate the skin edges with local anesthetic. If possible insert the needle through the lacerated edge to prevent additional areas of dermal injury. A common technique is to inject the local anesthetic subcutaneously in a circular pattern around the operative site; this administration is often referred to as field block technique. If wound is on a digit, consider a regional/digital block for anesthetic purposed.
2. Hold the skin flap with forceps and take a wider bite with the needle, pierce the skin perpendicular ( 90 degrees) to the skin.
3. Supinating at the wrist joint, rotate the curved needle through skin to dermis from out to in.
4. The needle point should be now visible within the wound. Hold this with the forcep: DO NOT use your fingers to hold the needle wherever possible to avoid needle stick injuries.
5. Grasp the needle again with the needle driver and repeat the previous action this time the needle will be seen piercing in from the dermis outward to the skin on the second flap.
6. When you have a thread coming out on both sides of the wound, approximate the wound edges to evert.
7. Tie the knot as seen in the video above. Caution: do not pull the wound too tight as this may cause tissue ischemia. 8. Remember the rules of approximation favour a good wound closure if the two flaps are everted rather than inverted.

8. Once you have knotted the suture, tie a few more knots for strength and cut the thread leaving at least 6-7 mm of thread on both sides. Caution: do not cut these too short.
9. Make sure to perform equidistant bites especially in depth to hold the viable tissue together.
10. All sutures run perpendicular to a linear wound.
11. Try to place equidistant sutures dividing the wound into equal quarters.

## Suturing Techniques

Suture Technique		
Technique	Indication	Diagram
Simple Interrupted	Go-to method of repair	
Horizontal Mattress	To repair high tension lacerations	
Vertical Mattress	To repair deep, gaping lacerations without using separate deep sutures	
Running	To quickly repair non-tensile lacerations	

From Lee, Hyunjoo, and Layla Abubshait. "PV Card: Laceration Repair and Sutures - A Cheat Sheet Guide." ALiEM, 30 Nov. 2019, [www.aliem.com/pv-laceration-repair-and-sutures/](http://www.aliem.com/pv-laceration-repair-and-sutures/).

## Post-Procedure Considerations

1. First, dispose of all the sharps in a sharps-container, and gauze in the safe bodily fluids disposal bin
2. Wash and dry the wound well, cleaning out any remaining clots or debris
3. Dress with the repaired wound with sterile gauze
4. Appropriate discharge and follow up instructions for suture removal

## Suture Care and Discharge Instructions

- S- Symptomatic: Patient may take acetaminophen for pain relief
- E- Educate: Sutures also help stop bleeding and speed healing, keep sutures clean and dry, change the dressing, and observe for discharge and foul smell
- R- Reassure the patient, remind to limit limb use till completely healed, fill out WSIB form for modified work where warranted
- F- Follow up appointment\*
- A- Alarm signs: increased soreness around wound, white or yellow discharge, any foul smelling discharge, uncontrolled bleeding, or fever over 38 degrees, redness around the wound increasing in size
- D- Document the encounter, procedure and preferably draw the wound for reference. Always document the discharge instructions given. Document tetanus status.

\*Follow up with the patient, preferably in the primary care setting for wound assessment and suture removal based on the type and location of suture placed. Arrange for wound dressing with nurse in wound clinic where available.

## Alternatives to Suturing

Technique	Ease of use	Speed	Requires anesthesia?	Advantages	Disadvantages
<i>Sutures</i>	Technically challenging	Time consuming	Yes	Most precise and least likely for the laceration to come apart before it heals	May require removal Greatest tissue reactivity Outcomes are provider-dependent Risk of needlestick injury
<i>Staples</i>	Relatively simple	Rapid	Yes	Low tissue reactivity	Requires removal Less meticulous closure Interferes with MRI/CT imaging
<i>Steri-Strips</i>	Simple	Rapid	No	Lowest infection rates No need for removal	Weak closure and the tape frequently falls off before the wound is closed. Both of these factors may cause the laceration to re-open Cannot be used around areas with hair Cannot get wet
<i>Glue</i>	Simple	Rapid	No	Resistant to bacterial growth No need for removal	Weak closure may cause the laceration to re-open Cannot get wet

### Pearls for Junior Learners:

1. Consider alternatives to suturing, where possible (i.e. staples, steristrips, glue).
2. Assess neurovascular status before anesthetizing the wound.
3. Remember the maximum doses of local anesthetic:
  - Lidocaine: 4mg/kg without epi, 7mg/kg with epi
  - Bupivacaine: 2mg/kg without epi, 3mg/kg with epi

## Patient Education Tools

- Discharge Instructions: Changing Your Dressing from Krames online: <https://dhch.kramesonline.com/3,S,86529>
- Laceration aftercare discharge Instructions: <https://lacerationrepair.com/other-topics/patient-resources/laceration-aftercare-instructions/>
- Suture Care - Krames online: <https://dhch.kramesonline.com/3,S,85117>

## Recommended Readings, Videos, and Podcasts:

- CanadiEM- Sirens to scrubs, Do you think I need stitches: <https://canadiem.org/sirens-to-scrubs-sutures/>
- CanadiEM - Nice threads: <https://canadiem.org/nice-threads-guide-suture-choice-ed/>
- CanadiEM – Wound Management Principles: <https://canadiem.org/crackcast-e059-wound-management-principles/>
- Closing the Gap (LacerationRepair.com): <https://lacerationrepair.com/techniques/basic-suturing-techniques/>
- Simple interrupted suture video-Geeky medics (4 min): <https://www.youtube.com/watch?v=z8oWv-nVO6g>
- EMin5 -Needle stick injury PEP- 5 min video: <https://www.youtube.com/watch?v=Vdqsm5K47Lk&t=185s>
- Medscape Local anesthetic infiltration: <https://emedicine.medscape.com/article/149178>
- Medscape Digital Nerve Block Technique: <https://emedicine.medscape.com/article/80887-technique#c2>
- APMC EM- Digital Block - Thumb- 1 min video: <https://www.youtube.com/watch?v=IrunA-tavMU&list=PLzdZdThzBOGbkQVGL11rDLY84Z4334l&index=7>
- Core EM-Digital Nerve Block- 3 min video: [https://www.youtube.com/watch?v=i51y6t1YRNQ&feature=emb\\_logo](https://www.youtube.com/watch?v=i51y6t1YRNQ&feature=emb_logo)
- Brian Lin ACEP Digital Block- ring block & anatomy- 2 min video: [https://www.youtube.com/watch?v=QLk\\_7gg61AM](https://www.youtube.com/watch?v=QLk_7gg61AM)

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- Procedures.” *Journal Der Deutschen Dermatologischen Gesellschaft*, vol. 3, no. 3, 2005, pp. 195–199., doi:10.1111/j.1610-0378.2005.04758.x.
4. Ilicki, Jonathan. “Safety of Epinephrine in Digital Nerve Blocks: A Literature Review.” *The Journal of Emergency Medicine*, vol. 49, no. 5, 2015, pp. 799–809., doi:10.1016/j.jemermed.2015.05.038.
  5. Kronic, Aleksandar L., et al. “Digital Anesthesia with Epinephrine: An Old Myth Revisited.” *Journal of the American Academy of Dermatology*, vol. 51, no. 5, 2004, pp. 755–759., doi:10.1016/j.jaad.2004.05.028.
  6. Lee, Hyunjoo, and Layla Abubshait. “PV Card: Laceration Repair and Sutures - A Cheat Sheet Guide.” *ALiEM*, 30 Nov. 2019, [www.aliem.com/pv-laceration-repair-and-sutures/](http://www.aliem.com/pv-laceration-repair-and-sutures/).
  7. Schnabl, Saskia Maria, et al. “Clinical Results for Use of Local Anesthesia with Epinephrine in Penile Nerve Block.” *JDDG: Journal Der Deutschen Dermatologischen Gesellschaft*, vol. 12, no. 4, 2014, pp. 332–339., doi:10.1111/ddg.12287.
  8. Weiss, Eric Alan, et al. “Water Is a Safe and Effective Alternative to Sterile Normal Saline for Wound Irrigation Prior to Suturing: a Prospective, Double-Blind, Randomised, Controlled Clinical Trial.” *BMJ Open*, vol. 3, no. 1, 2013, doi:10.1136/bmjopen-2012-001504.

# Incision & Drainage (I&D)

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## Percutaneous abscess drainage.

### Indications

- An *abscess* is an inflamed collection of pus, the area is usually tender, warm, firm, and fluctuant to palpation.
- Any abscess, however small, must be drained for complete resolution.
- Sometimes there is surrounding cellulitis or lymphangitis and, in the more serious cases, fever.

### Possible Complications

- Risk of bleeding (damage to adjacent blood vessels)
- Dissemination of infection (sepsis, bone & joints, endocarditis)
- Injury of local nerves
- The procedure may not be successful and the abscess may not be completely drained due to loculated (having, forming, or divided into loculi) collections

### Contraindications

- Pulsating mass. Do not attempt to incise a pulsating mass as it could be a hemangioma or pseudoaneurysm.
- Large, extensive, and complex abscesses, both size and depth, especially if deeper tissues are involved, such as bone (osteomyelitis) or muscles.
- Risk of neurovascular damage such as adjacent to major blood vessels and nerves.
- Anal, perirectal abscess, and pilonidal abscess due to risk for development of fistulas.
- Deep infections of the hands. These are not simple cutaneous abscesses. When significant pain and swelling exists or there is pain on range of motion of a finger, seek surgical consultation
- Packing with ribbon gauze. Do not fully “pack” an abscess cavity with ribbon gauze. This may actually trap pus within the cavity, inhibit drainage, and enlarge the eventual scar
  - The idea is to insert the gauze across all the surfaces of the cavity and provide some degree of debridement when the gauze is removed.

### Definitions

- Pustule - smaller abscess that can be opened with a scalpel/needle
- Furuncle or boil - an extension of a folliculitis infection into the subcutaneous tissue. May require I&D and warm compresses.

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- **Hidradenitis Suppurativa** - chronic inflammatory condition of the apocrine glands in the axilla and groin.
  - Secondary infection typically results in abscess formation and fistulisation requiring I&D and antibiotics.
  - Patients can have a history of self-squeezing to pop abscess.
  - It is important to assess degree of infection and systemic signs, and follow up with dermatology or surgery where required.
- **Pilonidal cyst abscess** - a relatively common finding in the sacrococcygeal region.
  - Escherichia coli is a frequent infecting organism commonly.
  - Drainage should include a search for and removal of hair and follicular tissue at the base of the abscess cavity, consider surgery consult where needed.
- **Pointing** - where the abscess is close to the skin surface , where the skin is thinned, and pus may eventually break through to drain spontaneously.
- Infected epidermoid (or sebaceous) cysts- chronic reappearing fluid collection.
  - Should be referred for complete excision of the cyst after the infection and inflammation have resolved to prevent recurrence.
- **Folliculitis** - superficial infection of the hair follicle.
  - Minor uncomplicated cases can be treated with warm compresses and gentle cleansing with antibacterial soap.
- **Carbuncle** - occurs when individual furuncles coalesce, resulting in a large painful nodule.
  - Located on the back of the neck and generally require I&D with blunt dissection using a hemostat to break up the interconnected loculations of pus.
  - Warm compresses and antibiotics are usually indicated

## Environment, Material, and Equipment

### Environment

1. Adjust the light for visibility
2. Adjust bed height for ease of procedure
3. Use a side table or cart for procedural material
4. Keep a trash can nearby for proper disposal of waste

### Medications

1. Sterile solution: normal saline wash, chlorhexidine, betadine. Normal saline or sterile water can be used for irrigation. However, there is evidence that there is no statistical difference between infection rates with sterile saline wound irrigation compared to potable tap water irrigation. Potable tap water is a safe option for wound irrigation and should be considered if cost or availability of sterile saline is an issue.
2. Local anesthetic in a 5 ml syringe:
  - Lidocaine 1% with 1:100,000 epinephrine. OR

- Bupivacaine, 0.25% or 0.5%, with or without epinephrine. Bupivacaine can be used if need for longer anesthetic for large/complex wounds\*
  - Lidocaine/Epinephrine/Tetracaine (LET) gel - useful for open wounds in children. Apply under a tegederm bandage.
3. Sodium Bicarbonate ( $\text{NaHCO}_3$ ): One part sodium bicarbonate to 10 parts local anesthesia with epinephrine may be added into premixed bottles of lidocaine with epinephrine to lessen the local burning during infiltration.

\*Note: The added epinephrine helps with additional hemostasis and increased concentration at the injection site. However, it has been classically taught that its inclusion with local anesthetic should be avoided in use in the ears, tip of the nose, distal phalanges, and the penis, because the vasoconstrictive effect of the epinephrine may cause local tissue necrosis. While this theory has been mostly debunked in the literature, the use of local anesthetic with epinephrine in these sensitive locations is controversial. (2-6)

## Materials

- Gauze (4" bx 4"), sterile sheets, bandage & tape for dressing
- Sterile ribbon gauze half or quarter inch, depending on the size of the unroofed cavity
- Window drape for wound, sterile gloves
- Needles of various size for administration of local anesthetic.

## Equipment within an I & D Tray

- Field block: large 27 G needle filled with anesthetic
- Sponge-holding forceps:
- Surgical blade, Nos. 11 and 15:
- Curved artery forceps/ hemostat:
- 60 ml syringe with Normal saline to irrigate the wound
- Toothed forceps
- Scissors

## Points to Focus On

### Pre-procedure Preparation Considerations

- Complete History and Physical.
  - Document vital signs, use of anticoagulants or steroids, immunocompromised status, and tetanus status. Assess any bony or joint involvement.
  - Remember to assess comorbidities and social determinants of health that may hamper with wound care.
  - Ask about foreign bodies or trauma.
- Immunocompromised patients or those with symptoms and signs of systemic toxicity, such as tachycardia and hypotension will require blood work and septic evaluation.

- Blood and wound cultures are recommended in such cases.
- Skin and wound should be washed with antiseptic solution.
- Wash hands, wear sterile gloves, prepare the sterile field and place the window drape around the wound.
- Consider having a suction set up and wearing visor or eye protecting equipment for large abscesses.
- Ultrasound can be used to help differentiate an abscess from complex cellulitis or phlegmon and determine maximum area of fluctuance.

## I&D Procedure

### Prepare:

1. Prepare the overlying skin for incision and drainage with povidone-iodine solution/ other antiseptic prep.
2. Small collections: Inject lidocaine superficially into the roof of the abscess along the line of the projected incision
3. Medium to large collections: Field Block
  1. Perform a field block by injecting a circumferential area of subcutaneous 1% or 2% lidocaine around the abscess, approximately 1 cm peripheral to the erythematous border.
  2. Form a wheal of lidocaine forming a ring around the abscess as you advance the needle gently and infiltrating at the same time.
  3. Avoid going through the infected areas.
  4. In addition to infiltration in a ring, anesthetize across the dome of the abscess where you plan to make the incision.

### The Incision

1. Using an 11 straight blade make an incision along the most fluctuant part of the abscess.
2. If required to culture, collect the specimen on the swab for Sensitivity.
3. Blunt dissection of the abscess (Caution: painful step, add more local anesthetic if warranted).
4. With the hemostat/artery forceps, explore & break up loculations to release pockets of collections.
5. Use 4 X 4 gauze to clean the pus.
6. Squeeze out the contents with gentle pressure and clean the pocket.

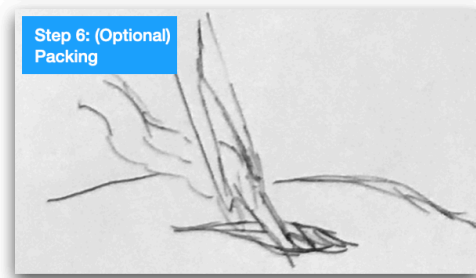
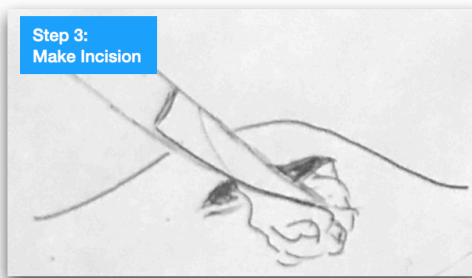
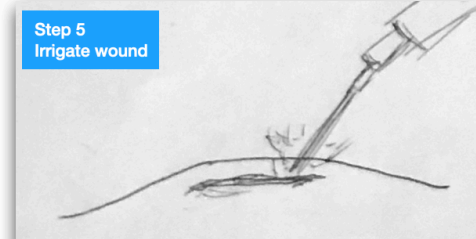
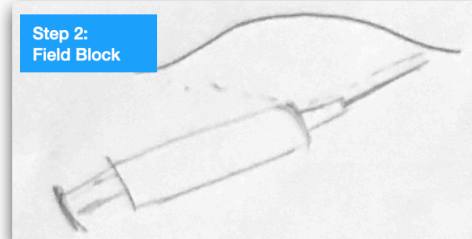
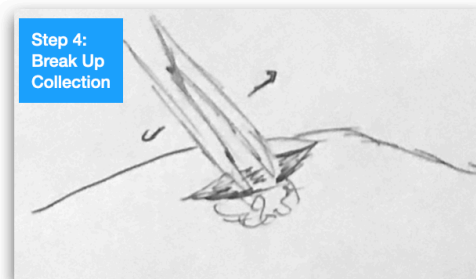
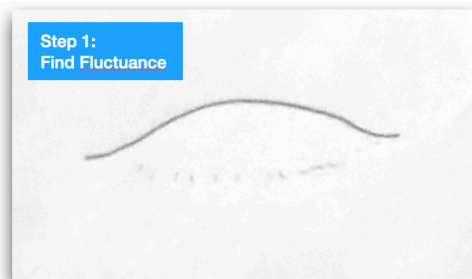
### Irrigation

- 60 cc syringe filled with normal saline and a protective cap if available.
- Flush the cavity thoroughly.

## Packing and dressing

- Packing allows to keep the wound open and drain while healing over a course of time. Not all abscess need to be packed (depending on case to case variation and clinician's discretion).
- Consider packing larger than 5cm abscesses or in immunocompromised patients.
- Remember to pack only loosely, introducing the ribbon with the help of hemostat.
- Depending on your local guidelines, the packing gauze may or may not be soaked with antiseptic solution such as saline.
- Leave a tail end of ribbon hanging outside the abscess.
- Cover with gauze, dressing, and then tape.

## I&D in 6 Steps



## Post-Procedure Considerations

1. Dispose of all the sharps in a sharps-container and gauze in the safe bodily fluids disposal bin.
2. Wash and dry the wound well, cleaning out any remaining clots or debris.
3. Cleanse the open surface with normal saline and cover with a dressing.

## Role of Antibiotics

- Uncomplicated abscesses with no symptoms or signs of systemic involvement respond well to incision and drainage and appropriate wound care.
- Check your specific hospital guidelines for specific local antibiotic resistance as well as dosing and duration.
- Severe purulent SSTI:
  - IV Piperacillin/Tazobactam and Vancomycin; or
  - Oral or IV Clindamycin (same bioavailability); or
  - IV Linezolid
- Mild/Moderate purulent SSTI: chose one or combination:
  - Oral TMP/SMX; Oral or IV Clindamycin; or
  - Oral Doxycycline
- In the setting of systemic disease or an immunocompromised host, blood and wound cultures are recommended.
  - Oral or intravenous (IV) antimicrobial therapy is then started empirically, depending on the severity of the infection.
- Of note, if no overlying cellulitis or comorbid conditions, Choosing Wisely Canada recommends discussing the use of antibiotics with patients as the benefits conferred by antibiotics may not outweigh the risks associated with their use.

\*For more information about the use of antibiotics for [skin and soft tissue infections](#), check out the related post in the primer!\*

## Suture Care & Discharge Instructions (SER FAD)

**S** - Symptomatic: Patient may take acetaminophen for pain relief.

**E** - Educate: Sutures also help stop bleeding and speed healing, keep sutures clean and dry, change the dressing and observe for discharge and foul smell.

**R** - Reassure the patient, remind to limit limb use till completely healed, fill out WSIB form for modified work where warranted.

**F** - Follow up appointment\*

**A** - Alarm signs: increased soreness around wound, white or yellow discharge, any foul smelling discharge, uncontrolled bleeding, or fever  $>38^{\circ}\text{C}$ , redness around the wound increasing in size.

**D** - Document the encounter, procedure and preferably draw the wound for reference. Always document the discharge instructions given. Document tetanus status.

\* Follow up with the patient, preferably in the primary care setting for wound assessment and suture removal based on the type and location of suture placed. Arrange for wound dressing with nurse in wound clinic where available.

## Patient Education Tools:

- Krames online- Abscess Drainage care, patient education: <https://dhch.kramesonline.com/3,S,85493>

## Recommended Reading, Videos, and Podcasts:

- CanadiEM- Skin Infections <https://canadiem.org/crackcast-e137-skin-infections/>
- Hippo Education-Soft Tissue Abscess Drainage (14 min video): <https://www.youtube.com/watch?v=iSDkvvY3SHc>(American content)
- Teach me surgery Surgical Skills - Abscess Drainage (2 min video): <https://www.youtube.com/watch?v=XnVPwvLfPpk>
- Role of Antibiotics : Medscape <https://emedicine.medscape.com/article/1830144-periprocedure#b2>
- Hippo Education: Urgent Care Bootcamp- Soft Tissue Abscess Drainage - 14 min video:& <https://www.youtube.com/watch?v=iSDkvvY3SHc>
- Anesthesia Key-Cutaneous Abscess drainage and field block: <https://aneskey.com/cutaneous-abscess-or-pustule/>
- Skilled physicians group- Incision and Drainage of Abscess (1 min video) <https://www.youtube.com/watch?v=eLWXULnzQeE>

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8. DeClerck, Matthieu et al. "Standard Incision and Drainage with Dr. Matt DeClerck" Hippoeducation, Urgent care bootcamp, Available at: [https://www.hippoed.com/urgentcare/bootcamp?utm\\_source=YouTube&utm\\_medium=social&utm\\_campaign=20200303--YouTube--social--UCB--AbscessDrainage](https://www.hippoed.com/urgentcare/bootcamp?utm_source=YouTube&utm_medium=social&utm_campaign=20200303--YouTube--social--UCB--AbscessDrainage) > Feb 28, 2020

# Screening for Intimate Partner Violence

## Statistics of Intimate Partner Violence

**I**ntimate Partner Violence (IPV) is defined by the CDC as "the threat or infliction of physical or sexual violence by a current or former adolescent or adult intimate partner or spouse." This includes hitting, slapping, strangulation, controlling access to food or medications, refusal to use condoms, or isolation from family and friends.

Current Canadian statistics on IPV are that women will have a 1 in 6 lifetime risk for IPV, and 1 in 3 for sexual assault. 24% of women and 11% of men experience IPV in their lifetime. Per the CDC, half of the patient population in urban EDs have sex assault/IPV as a PMHx. IPV is more common than aortic dissections and PEs combined. And it is very lethal, since it is highly associated with death by murder. If someone has been strangled, they are 4x more likely to be murdered in the next calendar year.

The following tools have some levels of validity evidence behind them for screening for intimate partner violence (IPV) (1). Of the two tools listed below, the PVS is most commonly used in the ED.

## Risk Factors

1. Female
2. Younger age
3. Exposure to childhood familial violence
4. Physical or mental disability
5. Use of alcohol by either party
6. Lower SES
7. Immigrants

## Concerning Presentations

1. Women with injuries to head/face/neck
2. Female patient who has attempted suicide
3. Vague/changing history
4. Injuries inconsistent with history
5. Statement that patient is "accident-prone"
6. Past history of injuries

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7. Centrally located injury (trunk, breasts)
8. Bilateral injuries
9. Defensive pattern injuries

### Partner Violence Screen (2)

1. Have you been hit, kicked, punched, or otherwise hurt by someone in the past year? If so, by whom?
2. Do you feel safe in your current relationship?
3. Is there a partner from a previous relationship who is making you feel unsafe now?

Sensitivity 65-71%

Specificity 80-84%

### Intimate Partner Violence Screening Tool (STaT) (3)

Have you ever been in a relationship where your partner has:

- ... Slapped or pushed you?
- ... Thrown, broken, or punched things?
- ... Threatened you with violence?

Sensitivity 96% (with 1 point cut off)

Specificity 75% (with a 1 point cut off)

## Management

There are four main steps of a robust management plan in these circumstances:

1. Disclosure Reaction
2. Safety
3. Injury Assessment
4. Specialist Referral

### Step 1: Disclosure Reaction

When a patient discloses IPV to us, our reaction to it has a massive impact on their morbidity. A supportive reaction has a 6-fold reduction in future PTSD, mood disorder, and substance use (6, 7). Thanking people for this disclosure is an appropriate response - something like - "thank you for telling me this today, I can't imagine how difficult that must have been and I will do my best to take care of what you need." It's simple, establishes trust, and shows empathy. People can adapt to fit their style of speech. On average, it takes 8 healthcare visits for someone to disclose IPV, so if they picked today, it is a big deal and we need to take this seriously.

## Step 2: Safety

These patients need to be in a safe area of the ED - not in the main waiting room, not in an area that is accessible by their abuser. If this patient is waiting for imaging or SW or the specialty team, they should be waiting somewhere that is inaccessible to the abuser. There are many very graphic reports of the abuser showing up at hospitals to finish the job as they are enraged about someone disclosing and seeking care. This step can literally save a life. Currently in Canada, a woman is murdered every 6 days, with greater than 90% of them by partners or ex-partners (8).

## Step 3: Injury Assessment

You should assess these patients like you would any other traumatic injury. Just because it is IPV, it doesn't mean that the usual rules of trauma don't apply. So look for and document bruising, abrasions, lacerations as you normally would. You are allowed to take photos directly into an EMR if that is your local practice - just make sure they are taken sensitively. Use the typical decision tools for things like X-rays and CT heads. A specific strangulation protocol is in development by Dr. Sampsel in Ottawa - CT angiogram of the neck is the imaging modality of choice for patients that have symptoms of vascular occlusion or neurological abnormality.

As for the question of how/what to assess, there are two major concepts here. Adult IPV is just like child abuse - the signs and symptoms are the same and follow the history. We have the historical features and patterns of injury are drilled into our heads from day one of medical school - it is the same stuff for adults who are being abused:

1. Stories that change all the time
2. History that doesn't match with the injury
3. There is a delay in seeking care

Remember that patterns of injury are the same (in concealed areas, multiple injuries at a variety of stages of healing, defensive wounds, etc).

Finally, let the history guide you - same as with any other disease entity - if someone says their foot hurts, examine their foot and the associated systems. You don't necessarily need to do a full head to toe, particularly if the patient is going to see a specialized service afterward.

Treatment is also the same, wound care, suturing, splinting, casting, tetanus, analgesia. Medical care always comes before forensic, so don't worry about "fixing" or covering something up that would be photographed later.

## Step 4: Specialist Referral

In Ontario - the Ontario Network of Sexual Assault and Domestic Violence Treatment Centers has all of the programs (and the areas they serve) listed with the contact numbers/info. They also have a ton of fantastic resources. Check out their website at: [www.sadvtreatmentcentres.ca](http://www.sadvtreatmentcentres.ca)

In BC: VictimLinkBC is a toll-free, confidential, multilingual telephone service available across BC and the Yukon 27/7 (1-800-563-0808).

For other crisis hotlines for locations across Canada, go to [www.dawncanada.net/issues/crisis-hotlines/](http://www.dawncanada.net/issues/crisis-hotlines/)

## Main Points

1. If the patient is not ready to report, always assure them that they can return to the ED!
2. Give patients resources for crisis hotlines, or tell them where they can find that information.
3. Ensure the patient has a safety plan (i.e., getting into a protected room with an escape while the abuser has an outburst, having a "go-bag", having an escape plan, having credit cards/things in their name).
4. You CANNOT report to the police if the patient does NOT want you to!
5. Document everything.

### Pearls for junior learners

- Document everything! The patient may not want to report now but they may later and your notes could help them.
- These situations may be emotional. Don't be afraid to ask for help or speak to your preceptor privately.
- If the injury does not match the MOI, be suspicious and document it.

## Recommended readings, videos, and podcasts

- Danger Assessment Tool for Domestic Abuse (4)  
<https://www.mdcalc.com/danger-assessment-tool-domestic-abuse>
- Ontario Network of Sexual Assault and Domestic Violence Treatment Centers  
[www.sadvtreatmentcentres.ca](http://www.sadvtreatmentcentres.ca)

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8. Canadian Femicide Observatory. [www.femicideincanada.ca](http://www.femicideincanada.ca)
9. CrackCast Show Notes – Intimate Partner Violence – March 2017  
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# Advance Care Planning and Goals of Care Review

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## Points to Focus On

**A**dvance Care Planning (ACP) and Goals of Care (GOC) discussions are extremely important for our patients to plan for their end-of-life care. ACP promotes conversation amongst patients, families, and their physicians on integral topics such as substitute decision making, end of life care, financial/health decisions, code status, and estate planning (1). More importantly, it allows individuals to think and talk about what matters the most in terms of their health goals. These goals should reflect their virtues, values, and preferences on how they want their care to be at critical and vulnerable times. Additionally, it allows families to be aware of what their loved ones' wishes are so that if the unwell patient is unable to speak for themselves, the families can act on their behalf. It is important that these conversations happen before, during, and after their visits to a doctor (hospital or clinic) on a regular basis so that patients' wishes are well understood and documented to provide the best care that aligns with their health goals.

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In the Emergency Department (ED), we are often faced with difficult scenarios where patients cannot express their care goals and their wishes are not available immediately from previous documents or from their substitute decision-makers. Unfortunately, there are many instances where these conversations never occurred previously, and thus the onus of making difficult medical treatment decisions lies on the families (or loved ones) or the physicians (2). Emphasis should be on making messages around ACP and GOC clear, concise, and empathetic to patients and their families if they are to present to the ED. Additionally, we need to be proactive and start these conversations in the EDs (even when patients are well) so that patient's wishes are upheld in the future in case their condition deteriorates.

## Adaptations Required

Emergency Medicine physicians should start goals of care conversations with our most vulnerable patients (elderly, immunocompromised, oncology, long-term care, and multiple comorbidities) to promote patients' values and preferences when it comes to end-of-life care. This includes understanding what their wishes are, introducing code discussions, and making sure patients and their families comprehend what these conversations mean (why they are happening and why they are extremely important now).

Additionally, all emergency physicians and front-line doctors should review helpful resources so that they are well equipped to start GOC discussions.

## Other Points

Target patient population:

10. All patients should be aware of advance care planning and why goals of care discussions are important. We should ideally talk about this with everyone.
11. For the most vulnerable patients, there should be an emphasis on these conversations. These include patients who are elderly, immunocompromised, oncology, long-term care, and multiple comorbidities.
12. Families of vulnerable patients must also be in the loop to make sure these discussions are being had with loved ones.

## Approach

Here are some useful ways to approach GOC and difficult conversations with your patients

1. SPIKES(4)
  - S – Setting up the interview
    - Make sure to mentally rehearse the conversation in your head
    - Set up a private setting with important significant others involved
    - Sit down and make a connection with the patient
  - P – Assessing the Patient’s Perception
    - Ask the patient about their understanding of their current medical condition
    - Let the patient speak
  - I – Obtaining the Patient’s Invitation
    - Ask permission to start the conversation
    - Ask how they would like the information to be presented (how do you want me to deliver your medical information to you?)
  - K – Giving Knowledge and Information to the Patient
    - Provide knowledge that is easy to understand
    - Be clear and do not lie – but do not be overly blunt
    - Give information in small chunks
    - Be honest
  - E – Addressing the Patient’s Emotions with Empathy
    - Observe their reactions and provide opportunities to express their emotions
    - Don’t rush this process – it may be difficult to move on without going through this step
  - S – Strategy and Summary
    - Discuss treatment options
    - Provide next steps as appropriate
    - Provide emotional counselling and referrals
    - Summarize
2. Serious Illness Conversations Guide This has been recommended by Palliative Care physicians. Refer to these documents for details:



- <http://www.bccancer.bc.ca/new-patients-site/Documents/SeriousIllnessConversationGuideCard.pdf>
  - [https://www.fraserhealth.ca/-/media/Project/FraserHealth/FraserHealth/Health-Professionals/Clinical-resources/Advance-Care-Planning---Serious-Illness/Serious-Illness\\_Mini-Reference\\_COVID19-Guide.pdf](https://www.fraserhealth.ca/-/media/Project/FraserHealth/FraserHealth/Health-Professionals/Clinical-resources/Advance-Care-Planning---Serious-Illness/Serious-Illness_Mini-Reference_COVID19-Guide.pdf)
3. Advance Care Planning/Goals of Care Tool for Physicians – Code Status from JAMA: <https://shorturl.at/gjmGK>

## Podcasts

1. MacEmerg Podcast. Special Episode - Gallagher, Williams & Dong | Goals of Care & Advanced Care Planning. <https://soundcloud.com/mac-emerg/special-episode-gallagher-williams-dong-goc-acp>
2. CMAJ Podcasts. Palliative care during a pandemic. <https://soundcloud.com/cmajpodcasts/200465-ana>

### Pearls for Junior Learners:

1. Ask for consent from the patient and your senior attending to be present in these conversations. It can be a vulnerable time for patients and respecting their privacy is vital.
2. Rehearse how to approach these conversations so that when you are asked to go see a patient for these difficult conversations you have a structure and are comfortable.
3. Empty space in conversation is fine! Patients need time to digest the information presented, make sure to listen attentively, and not be afraid of periods of silence.

## Recommended Resources for Patients or Families:

1. Death over Dinner: <https://deathoverdinner.org/>
2. Speak up Canada: [advancecareplanning.ca](http://advancecareplanning.ca) OR [speakupontario.ca](http://speakupontario.ca)

## Newspaper:

1. Wency Leung. Canadians urged to plan ahead for end-of-life decisions as toll from COVID-19 builds. The Globe and Mail. March 30, 2020. <https://www.theglobeandmail.com/canada/article-canadians-urged-to-plan-ahead-for-end-of-life-decisions-as-toll-from/>
2. Tom Blackwell. Some critically ill COVID-19 patients choosing to die at home rather than be treated with ventilator in ICU. National Post. April 2, 2020. <https://nationalpost.com/health/some-critically-ill-covid-19-patients-choosing-to-die-at-home-rather-be-treated-with-ventilator-in-icu>
3. Kevin Junghwan Dong. It's a Good Time for an Important Conversation. The Hamilton Spectator. April 16, 2020. <https://www.thespec.com/opinion/contributors/2020/04/16/its-a-good-time-for-an-important-conversation.html>

## Recommended Reading, Videos, and Podcasts:

- Speak Up Canada: [advancecareplanning.ca](http://advancecareplanning.ca) OR [speakupontario.ca](http://speakupontario.ca)
- VITALtalk - [vitaltalk.org](http://vitaltalk.org)
- Pallium - <https://www.pallium.ca/>
- American Association of Family Physicians <https://www.aafp.org/afp/topicModules/viewTopicModule.htm?topicModuleId=57>
- Ontario Palliative Care Network - Palliative Care Resources to Support Frontline Providers during the COVID-19 Pandemic: <https://www.ontariofamilyphysicians.ca/tools-resources/timely-trending/novel-coronavirus-2019-ncov/palliative-resources-covid-19-march-2020.pdf>

## Documentation Guide for Physicians:

<https://www.speakupontario.ca/wp-content/uploads/2020/04/GoC-template-Oct-2019-final-document-1.pdf>

## Podcasts:

1. MacEmerg Podcast. Special Episode - Gallagher, Williams & Dong | Goals of Care & Advanced Care Planning. <https://soundcloud.com/mac-emerg/special-episode-gallagher-williams-dong-goc-acp>
2. CMAJ Podcasts. Palliative care during a pandemic. <https://soundcloud.com/cmajpodcasts/200465-ana>

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4. Walter F. Baile, Robert Buckman, Renato Lenzi, Gary Glober, Estela A. Beale, and Andrzej P. Kudelka. SPIKES—A Six-Step Protocol for Delivering Bad News: Application to the Patient with Cancer. *The Oncologist*. 01 August 2000. <https://doi.org/10.1634/theoncologist.5-4-302>

# Chapter 3

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## Communication and Management

## How to Reassess Patients

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**Y**ou have seen the patient, collected a thorough history of pertinent positives and negatives, completed a comprehensive physical, generated a differential diagnosis, presented the case to your attending and ordered all the appropriate investigations. The next step in providing the best care in the emergency department is reassessing, reassessing, and reassessing.

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The Emergency Department is unique in that there is minimal continuity of care. Once the patient is discharged from the department you will likely no longer be involved in their care. However, on other services such as Internal Medicine, patients spend days to weeks on the ward and you are afforded the opportunity to round each day on your patient; this allows for ongoing assessments. Similarly, while on your Family Medicine rotation you may see the same patient several times over multiple weeks; this affords you the opportunity to assess how your intervention is impacting their health. The Emergency Department reassessment can be conceptualized as rounding or a follow-up appointment in a family practice. However, it occurs within the same patient interaction, over a shorter temporal period.

### Four Important Questions

As a clerk completing a thorough and timely reassessment demonstrates initiative and ownership of patient care to your attending. It allows you to monitor the patient's trajectory and intervene before they deteriorate. In a busy emergency department, it can be easy to get caught up in the new trauma that just rolled in or the patient in cardiac arrest that is 20 minutes out, but it is important to stay organized and reassess your patients. When reassessing your patients, it is important to keep the four questions in mind:

1. How is my patient doing?
2. Have I documented the encounter?
3. Do we have a plan for appropriate disposition?
4. Have I addressed all of their concerns?

### How is your patient doing? The re-interview

Before presenting a reassessment to your attending physician, you first need to complete all the data collection. It is imperative to re-interview the patient to assess if their symptoms have changed and to complete a tailored physical exam. At this time, you can address the first golden rule; have you treated the patient's symptoms. You need to assess whether the treatment plan has helped the patient. Often it can be difficult for patients to express whether their symptoms have improved or worsened. One important tool to use is the previous pain rating given by the patient in the initial history. This creates a reference point and limits recall bias, allowing you to better identify the trajectory of their symptoms. If you ask a patient "When I first saw you, you said

your pain was 7/10, how would you rate it now?”, this allows you to better identify if the analgesic has been effective or if the antiemetic has benefited the patient(1)

### **Have I documented the encounter? How to rock your ED documentation on your reassessment**

Once you have collected all the relevant information, including laboratory and radiological results, the information needs to be synthesized and documented. A “SOAP” note (Subjective, Objective, Assessment, Plan) will ensure that medico-legally you and your attending are covered but also communicate to others on the health care team what has happened in the interim with the patient. Next it is important to create an impression of the patient. The original differential should be re-visited to see which disease processes can be ruled out and which can be ruled in. Or whether a new hypothesis needs to be generated.

**Attending note:** The old adage is that “If a tree falls in the forest and no one was there to chart it... it doesn’t count!” All joking aside, writing a proper reassessment shows that you care about how the patient is doing, and that you are trending their progress. Remember to date and time the new note; similar to other services, we need to demonstrate we are “rounding” on our patients again – usually about every 1-2 hours to move the mark on something in the patient’s life. If the patient is unstable you will see that your residents and attending physicians will often round more often on the patient (e.g. every half hour, or even more frequently). Sometimes it will be to give more pain meds, sometimes it will be to make a disposition decision based on new labs or imaging results.

### **Do we have a plan for appropriate disposition?**

Next you need to address the final golden rule; do I have an appropriate disposition for my patient. After considering all the data points and reviewing the goals of the patient and the most likely diagnosis, it is important to determine a final destination for your patient. Are they safe to go home, will they need follow-up as an outpatient, or will they need to be admitted under a hospital service.

### **Have I addressed all their concerns? Asking about and addressing your patient’s fears**

When collecting new information, you should keep in mind the second golden rule: “Have I addressed the patient’s concern?” Your agenda may widely vary from the concern and goals of your patient. Always keeping in mind the wise old question, why now, why today, why has this patient decided to seek emergent care. Often it can be because they once read an article that gastric cancer often can present with shooting [abdominal pain](#), or they knew someone who ignored the same symptoms and ended up dying one week later. If you do not address their concerns then you will have done a disservice to your patient and it may lead to repeated emergency department visits.

**Attending note:** You may not be able to take care of these concerns on your own – and in fact, many patients will want to hear things from your supervising attending emergency physician. That is okay! Remember, your job is to gather the questions that you want answered, and then bring your attending into the mix. Remember that being patient centered is key.

## Rules of the Reassessment



**R**E-INTERVIEW  
**U**NSTABLE PATIENTS  
**L**ABS AND RADIOLOGY  
**E**ND-POINT  
**S**CARED

Seeing patient after patient it can be easy to forget about the reassessment. However, if you utilize the breaks and downtime in your shift then you can master the reassessment. If your staff is busy with a procedure, reviewing with a resident, or you find yourself with ten minutes of alone time it is important to run through the RULES mnemonic for each patient you are following.

- First, it is important to Re-interview patients to assess if their symptoms are improving or worsening. Such as the patient with a 9/10 migraine who was given pharmacological analgesia or the seven-year-old with gastro who was given antiemetics and IV fluids. This is an opportunity to trial a new intervention, if the previous management strategies haven't been working.
- If there are any patients you are worried about that may become it would be worthwhile to review their vitals and perform another physical exam.
- Next, you should check if any Labs or radiology reports have returned for your patient. Perhaps that d-dimer is negative on your possible [pulmonary embolism](#) or the head CT for the patient whose head trauma demonstrates an intracranial bleed.
- As you begin to collect new data it is important to determine an End-point. Perhaps all the investigations on a particular patients have returned and all the emergent pathologies have been ruled out and they can go home. Conversely, perhaps you clearly identified

worsening chronic kidney function in a patient that led to a congestive heart failure exacerbation and the patient can be referred to internal medicine.

- Finally, have you addressed what the patient is most Scared about; it is important to understand the patient's concerns and answer any questions they may have to ensure continuity of care. Utilizing each break to consider what needs to be done and who needs to be seen again will make your reassessments run smoothly.

## Wrapping Up

The final step involves **presenting the reassessment** A high level summary of the patient's chief complaint and symptoms should be provided, including all the previously discussed components. Connecting the information collected during the reassessment, with the initial history and differential will allow you and your attending to confirm or dispute your working diagnosis(2) Completing a thorough and timely reassessment in the emergency department is critical to identify deteriorating patients. It also allows lower acuity patients to be seen and discharged quickly so other patients can be seen in a timely manner. Often patients will require multiple reassessments throughout a shift, which can be helpful when there is a lot of new information for the patient to digest or your patient is quite anxious. The key is to address the three golden rules; allowing for better patients outcomes and fewer bounce backs in the emergency department(3)

## Resources

1. Crystal M. Self-Reported Pain Scales. Don't Forget the Bubbles. <https://dontforgetthebubbles.com/self-report-pain-scales/> Published February 19, 2018. Accessed March 26, 2020.
2. Maneshi A. How to survive (and like) your emergency medicine clerkship core rotation. CanadiEM. <https://canadiem.org/how-to-survive-and-like-your-emergency-medicine-clerkship-core-rotation/> Published May 4, 2015. Accessed March 26, 2020.
3. Nickson C. Managing the Emergency Department . Life in the Fast Lane. <https://litfl.com/managing-the-emergency-department/>. Published March 21, 2019. Accessed March 26, 2020.



# Consulting Others

Related topics: "ED Skills - Safe Handover"

## Points to focus upon

- Consulting others in the outpatient or non-emergency setting may be quite different than the procedures we might use in the emergency department.(1) The following mnemonics can help you to scaffold your consultation requests so that you can quickly communicate with your consulting colleagues.
- As someone new to the ED, you're already starting at a bit of a disadvantage. Previous literature has shown that familiarity is a key facet to successful consultations (2) and a prior track record may be helpful in decreasing conflict around consultations.(3)
- Previous literature notes that the interpersonal communications around consultations can be wrought with conflict, but this can be mitigated by establishing trust and using clear communication.

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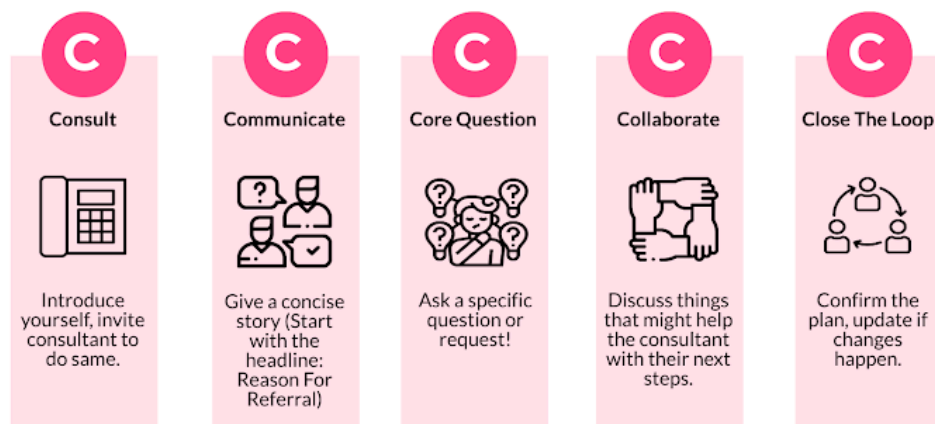
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




## Consulting Others - 5 C's Model

### 5 C's Model



Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com

## The PIQUED Approach

PIQUED			
<b>P</b>		<b>Prepare</b>	Review and know your stuff
<b>I</b>		<b>Identify</b>	Identify yourself, your redeployment status, the consultant, the patient
<b>Q</b>		<b>Question</b>	Make your clinical question very clear (e.g. Will you come admit this patient?)
<b>U</b>		<b>Urgency</b>	How sick is the patient?
<b>E</b>		<b>Educational Modifications</b>	Learn something while you're on the call if you can
<b>D</b>		<b>Debrief</b>	Connect with colleague later to see how patient did, or when they come down to ED

Infographic By: Maham Khalid (Medical Student)  
Images from: Piktochart and Flaticon.com

## The CONSULT approach

## CONSULT

<b>C</b>	<b>CONTACT COURTEOUSLY</b> Be nice to your consultants, know their name & who they are	
<b>O</b>	<b>ORIENT</b> Tell them where you need them, and who you'd like them to see!	
<b>N</b>	<b>NARROW QUESTION</b> Clarify your query. Are you asking them to do something? To provide an opinion?	
<b>S</b>	<b>STORY</b> Provide a succinct HPI and emergency department course summary	
<b>U</b>	<b>URGENCY</b> How sick is the patient? How quickly should they come?	
<b>L</b>	<b>LATER</b> Explain how they can close the loop with you	
<b>T</b>	<b>THANK YOU</b> Be nice again!	

### Tips for Junior Learners

1. Don't forget to introduce yourself, state your level (medical student vs resident), your preceptor (Dr. X), and your location (I'm XXX, a medical student working with Dr. YYY in the emergency department).
2. State the reason for your call and your suspected diagnosis (we would like to consult you on a patient who we believe has xxx).
3. Some consultants like to hear the story before getting the patient's name and location while others like that information before. It doesn't hurt to ask if they'd like the patients name/ID number/location before the story.
4. Remember it's okay to fumble as you are just starting off. Just do your best! Also, push back happens sometimes and some people may want to talk to your senior resident or preceptor. It doesn't mean you didn't do a good job. They may want to talk to them for clarifying information or other pieces of information.
5. DON'T FORGET TO DOCUMENT WHO YOU CONSULTED, THEIR NAME AND THE TIME YOU CONSULTED THEM!

### Recommended reading, videos, and podcasts

- ALiEM Card - Consultations from the Emergency Department: <http://aliemcards.com/cards/consultations-from-the-emergency-department/>
- Annals of Emergency Medicine - Conquering Consultations: A Guide to Advances in the Science of Referral-Consultation Interactions for Residency Education. <https://www.sciencedirect.com/science/article/abs/pii/S0196064418315348>

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1. Baylis J, Miloslavsky EM, Woods R, Chan TM. Conquering Consultations: A Guide to Advances in the Science of Referral-Consultation Interactions for Residency Education. *Annals of emergency medicine*. 2019 Jul 1;74(1):119-25.
2. Chan T, Sabir K, Sanhan S, Sherbino J. Understanding the impact of residents' interpersonal relationships during emergency department referrals and consultations. *Journal of graduate medical education*. 2013 Dec;5(4):576-81.

3. Chan T, Bakewell F, Orlich D, Sherbino J. Conflict prevention, conflict mitigation, and manifestations of conflict during emergency department consultations. *Academic Emergency Medicine*. 2014 Mar;21(3):308-13.
4. Chan T, Orlich D, Kulasegaram K, Sherbino J. Understanding communication between emergency and consulting physicians: a qualitative study that describes and defines the essential elements of the emergency department consultation-referral process for the junior learner. *CJEM*. 2013;15(1):42-51.
5. Kessler CS, Kalapurayil PS, Yudkowsky R, Schwartz A. Validity evidence for a new checklist evaluating consultations, the 5Cs model. *Acad Med*. 2012;87(10):1408-1412.
6. Kessler CS, Afshar Y, Sardar G, et al. A prospective, randomized, controlled study demonstrating a novel, effective model of transfer of care between physicians: the 5 Cs of consultation. *Acad Emerg Med*. 2012;19(8):968-974.
7. Podolsky A, Stern DT, Peccoraro L. The Courteous Consult: A CONSULT Card and Training to Improve Resident Consults. *J Grad Med Educ*. 2015;7(10):113-117.

# Breaking Bad News

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This review is about how to break bad news in the emergency department. While this occurs in many areas of medicine, emergency medicine is unique in that the emergency department environment can be challenging and we generally do not have pre-existing relationships with our patients to draw upon.

## Points to Focus On

The SPIKES mnemonic is a common methodology used within the ED to break bad news.

- **Setting:** Private. Find a chair and sit down. Prevent interruptions. Bring support (e.g. social worker).
- **Perception:** Determine the patient or family member's understanding of what is happening. Family members of ill/injured patients may or may not have received any information from others about what has happened.
- **Invitation:** Deliver the news and invite the patient to ask questions or provide guidance on the amount and timing of the information they would like to receive.
- **Knowledge:** Outline what has happened in an organized way using plain language. Know that they may recall little after you have delivered the news.
- **Empathy:** The patient/family may have expected (sadness) or unexpected (anger) reactions. Empathize with them.
- **Summary:** Summarize what has been discussed, what the next steps will be, and when/how they will receive additional information.

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## SPIKES Infographic



### Tips for Junior Learners

1. Ask your preceptor if you can go with them when delivering bad news for observational learning and tips. Ask for consent from the patient as well to ensure they are okay with you being there, as this may be a vulnerable time for them.
2. Pay attention to the situation - some situations are better for student participation versus some may not be. These conversations can be sensitive in nature.
3. Debrief with your supervisor/senior residents - this will help you emotionally and will help you understand the situation better.
4. Pay attention to internal cues and ask for help/support when needed! Situations can be tough and emotionally charged, but there are others who are witnessing the same situation as you, or have gone through the same situation before. Learn from others' strategies and find what works best for you.

## Recommended readings, videos, and podcasts

CanadiEM: Breaking Bad News in the ED

<https://canadiem.org/breaking-bad-news/>

Geeky Medics: Breaking Bad News (UK Resource)

<https://geekymedics.com/breaking-bad-news/>

Buckman RA. Breaking bad news: the SPIKES strategy. Community oncology. 2005 Apr 30;2(2):138-42.

# Safe Handover Practices

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Related topic: "ED skills - [Consulting Others](#)"

## Points to focus upon

Handover is when you transfer professional accountability and responsibility of at least one patient to another person, often within the same profession and within the same function. When there is a difference in skill set or practice (e.g. a community nurse practitioner asking an emergency physician to work-up a chest pain patient in the emerg. dept.), this is often referred to as a consultation or referral. (Please see "ED Skills - Consulting Others" for more on this.)

Handovers occur very frequently in the ED.(1) You will most frequently GIVE handover at the end of your shift, when there are still outstanding items pending. You may RECEIVE handover from prehospital providers during your emerg shift.

## Key information that needs to be conveyed include

- Patient's current health status (stable or not stable)
- Medications being currently administered (or recently administered)
- Treatment plans
- Advanced directives
- Recent course in emergency department since arrival.

The following are some handover tools that can augment your communication and decrease cognitive load. Both approaches listed below have been shown to improve the quality of handovers.(2,3)

### Adapted for junior learners by:

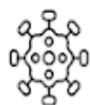
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## iSBAR (2) - Model for improving communication between clinicians



**I**llness severity



**S**ituation



**B**ackground



**A**ssessment



**R**ecommendation

Infographic by: Maroof Khalid, MD candidate

## I-PASS Handoff Program (3)

**I**llness severity

**P**atient summary

**A**ction list

**S**ituational awareness and related contingency plan

**S**ynthesis by RECIPIENT of handover



Infographic by: Maroof Khalid, MD candidate

## Other Tips for Success

A typed up set of notes may be useful to augment a verbal handover as finding a quiet place is difficult and it may be difficult to hear in the ED.

Asking the receiving team member to repeat back what they understood is a good way to close the loop. (1,3)

### Tips for junior learners

1. Make sure your ED notes are legible so that they can be easily referred to and relayed forward during handover if needed
2. If asked to give handover by a senior member of the team, be concise and clear, it can be useful organizing the patient hx and presentation prior to handover.
3. Make sure you are aware of your patients and what tests have been completed and what is still pending and make sure to continue to follow-up and check in on your patients prior to handover!

## Recommended reading, videos, and podcasts

- The BMJ - Safe Handover: <https://www.bmj.com/content/359/bmj.j4328>
- IHI SBAR Tool Kit: <http://www.ihl.org/resources/Pages/Tools/SBARToolkit.aspx>
- Royal College of Physicians. Acute care toolkit on Handover (CAUTION - British Resource): [www.rcplondon.ac.uk/guidelines-policy/acute-care-toolkit-1-handover](http://www.rcplondon.ac.uk/guidelines-policy/acute-care-toolkit-1-handover)

## References

1. Merten H, Van Galen LS, Wagner C. Safe handover. *Bmj*. 2017 Oct 9;359:j4328.
2. Haig KM, Sutton S, Whittington J. SBAR: a shared mental model for improving communication between clinicians. *Jt Comm J Qual Patient Saf* 2006;359:167-75. doi:10.1016/S1553-7250(06)32022-3 pmid:16617948.
3. Starmer AJ, Spector ND, Srivastava R, et al. I-PASS Study Group. Changes in medical errors after implementation of a handoff program. *N Engl J Med* 2014;359:1803-12.

# Safe Discharge

## Points to Focus Upon in Discussions

Verbal discharge instructions are important to provide to your patient, but this can be challenging.

### What Do You Need to Tell Them?

The SEFRAD Mnemonic:

- S - Symptomatic Management
- E - Educate
- R - Reassure
- F - Followup
- A - Alarm signs
- D - Document

**Adapted for junior learners by:**

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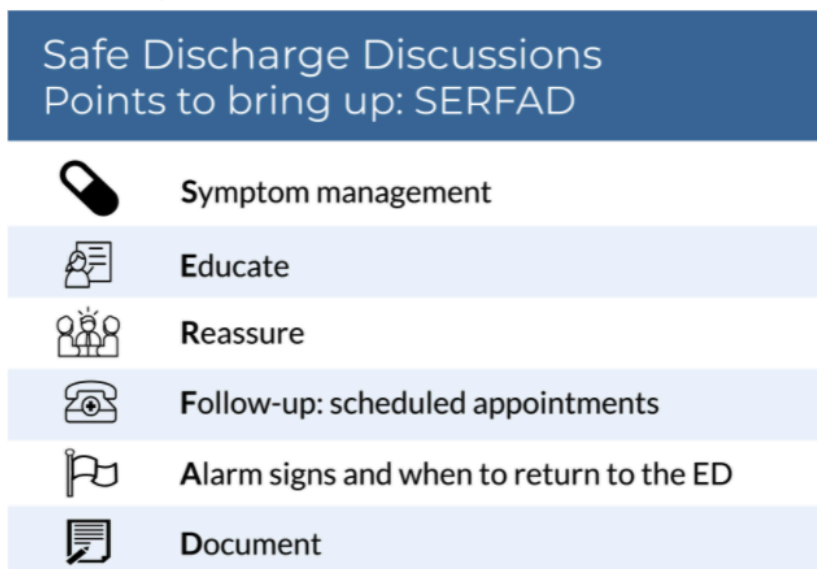
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### Practical Tips

- A recent meta-analysis (1) showed that verbal discharge instructions may not be sufficient.
  - Adding video or written feedback has also still not been shown to increase efficacy in a statistically significant way.
- What has improve outcomes is the TEACH BACK method (2).
  - What this means is that if a patient understands your discharge discussion, they should be able to teach it back to you.

### Safe Discharge Instruction Mnemonic



## Essential Elements of Written Discharge Instructions

- Patient name.
- Physician name.
- Purpose of discharge instruction (Explain why you're talking to the patient).
- Diagnosis/expected course (Based on your diagnosis).
- Potential complications (Tailored to specific presenting illness).
- Patient instructions (Be specific or tailored, if possible).
- New medication instructions.
- Follow-ups that are being set up (and contact information to close the loop).
  - If there are specific dates and times already known for the appointments, then please write these down.
- On the official chart, it is also good form to document the patient's receipt of this summary, with specific dates/times.

### Other Things to Consider

- Written language literacy of patient.
- Visual acuity of patient for reading.
- Clarity of your writing (if you are handwriting) or the font size (if you are typing and printing).

### Junior Learner Tips

1. Remember to be clear with return instructions, and use specific terms the patient can follow and remember (i.e. tell the patient to return if they are having trouble breathing after climbing a flight of stairs, not if they are short of breath on exertion).
2. Don't forget to document your discharge discussion: be clear on what instructions you gave and what follow-up appointments were scheduled.

## Recommended Readings, Videos and Podcasts

- EM Ottawa - We need to talk: Communicating with patients -<https://emottawablog.com/2019/11/we-need-to-talk-communicating-with-patients/>
- EM Docs - Maximizing the "Safe" Discharge (CAUTION American Resource) -<http://www.emdocs.net/maximizing-the-safe-discharge/>
- EM Cases - Effective Patient Counselling:<https://emergencymedicinecases.com/episode-51-effective-patient-communication-managing-difficult-patients/>
- EMJ - Discharge instructions for emergency department patients: What should we provide? -<https://emj.bmj.com/content/17/2/>
- Annals of EM - Patient Discharge Instructions in the Emergency Department and Their Effects on Comprehension and Recall of Discharge Instructions: A Systematic Review and Meta-analysis -[https://www.annemergmed.com/article/S0196-0644\(19\)30498-6/abstract](https://www.annemergmed.com/article/S0196-0644(19)30498-6/abstract)
- The Journal of Emergency Medicine - The Impact of Teach-Back Method on Retention of Key Domains of Emergency Department Discharge Instructions -<https://www.sciencedirect.com/science/article/abs/pii/S0736467917305693>

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1. Hoek AE, Anker SC, van Beeck EF, Burdorf A, Rood PP, Haagsma JA. Patient discharge instructions in the Emergency Department and their effects on comprehension and recall of discharge instructions: A systematic review and meta-analysis. *Annals of Emergency Medicine*. 2020 Mar 1;75(3):435-44.
2. Slater BA, Huang Y, Dalawari P. The impact of teach-back method on retention of key domains of emergency department discharge instructions. *The Journal of emergency medicine*. 2017 Nov 1;53(5):e59-65.
3. Taylor DM, Cameron PA. Discharge instructions for emergency department patients: what should we provide?. *Emergency Medicine Journal*. 2000 Mar 1;17(2):86-90.

# Clinical Debriefing ("Hot Debrief")

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## Why is a debrief important?

A debrief is a collaborative discussion of events that occurred during a high-stress event in the ED or acute care setting. It provides an opportunity to reflect on resuscitations, near-misses, medical errors, and patient deaths and ways to improve for future events. It also allows team members to check-in with each other and assess their well being

## Types of Debriefs

### 1. Cold Debrief:

- Longer format (written or verbal presentation)
- Occur days to weeks after an event
- Include data gathered from a defibrillator or video recordings

### 2. Hot Debrief:

- Occurs in minutes to hours after an event
- Focuses on the team's reactions and emotions to the event
- Ideal format for events in an acute care setting

## An Approach to "Hot Debriefing"

### 1. Establish the Framework for the Debrief

- Invite members of the team (in a non-judgmental manner) to participate in a debrief
- Time frame (5-10min)

### 2. Basic Assumption

- Establish a safe learning environment for team members>

### 3. Discuss Successes (what went well?)

- Leadership, communication, team dynamic

### 4. Discuss Challenges (what could be improved on?)

- PPE, equipment failure, delay to therapy

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## 5. Assess Prevention of Incident (could this have been prevented?)

- What led up to the event?

## 6. Consider a Cold Debrief

- A future debrief after the event has occurred

## 7. Summary

- Thank all members for participating
- Make yourself available for individual discussion immediately after and in the future

### Tips for Junior Learners

1. Take every opportunity to learn from the people around you. Watch what other members of the resuscitation team are doing and what their role is.
2. Some events in the ED and acute care setting can be emotionally taxing. Don't be afraid to ask for help or ask your preceptor to talk with you afterwards to discuss the event

## Recommended reading, videos, podcasts:

- Here is an example of a script  
<https://docs.google.com/forms/d/e/1FAIpQLSdwGNUVuxfOCrJPUPEBHhLSWP1-IqLfapuPEanUCWF86IUqw/viewform>
- Debriefing Webinar  
[https://youtu.be/1gQ9SoE\\_kVw](https://youtu.be/1gQ9SoE_kVw)
- Take Stock Hot Debrief Tool (UK resource)  
<https://www.rcemlearning.co.uk/foamed/take-stock-hot-debrief>

## References:

1. Rose S, Cheng A. Charge nurse facilitated clinical debriefing in the emergency department. Canadian Journal of Emergency Medicine. 2018 Sep;20(5):781-5. DOI <https://doi.org/10.1017/cem.2018.369>
2. Canadiem <https://canadiem.org/debrief-while-its-hot/>

# Chapter 5

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## Lifelong Learning



## EM-Specific Canadian Free Open Access Medical Education

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### How to Use This Part of the Primer:

As one of the sites within the the Free Open Access Medical education (FOAM, or #FOAMed) movement, we at CanadiEM.org are glad that you've enjoyed our Primer so far, but there's a lot more great Canadian content out there.

So, we have compiled a number of sites that feature Canadian FOAM that we think is amazing, aside from CanadiEM.org of course! Please enjoy the following Canadian resources.

**Updated and adapted  
for clerks by:**

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### Emergency Medicine Cases (EM Cases) Podcast:

**Host:** Dr. Anton Helman (Twitter: @EMCases)

**Link:** <https://emergencymedicinecases.com/>

**Type of resource:** Topic-based Podcast, focusing on general overview of relevant topics

Emergency Medicine Cases focuses on discussing great case-based material in emergency medicine. The podcast features some of the brightest minds in Canada's emergency medicine scene. You can subscribe to their email newsletter and receive direct-to-you content regularly.

### First 10 EM Blog

**Editor:** Dr. Justin Morgenstern (Twitter: @First10EM)

**Link:** <https://first10em.com/>

**Type of resource:** Topic-based blog, focusing on emergency medicine, critical care, and evidence-based medicine.

"First 10" is about the first ten minutes in a resuscitation room - where emergency docs tend to shine, integrating multiple sources of data and taking action in the face of uncertainty. This blog's initial goal was to create a case repository of emergent scenarios that emergency docs would need to know cold. Justin has done a marvelous job at creating a repository to help guide readers through important content and beyond.

### The Skeptics Guide to Emergency Medicine (SGEM)

#### Podcast

**Host:** Dr. Ken Milne (Twitter: @TheSGEM)

**Link:** <http://thesgem.com/>

**Type of resource:** Critical Appraisal Podcast

The SGEM features a deep dive, critical appraisal discussion about key articles relevant to emergency medicine. Ken has been at this for a while and has created nearly 300 podcasts over the years. He has also created a few e-book compendiums of their content over the years... and of course, all of it is available for free in true FOAM spirit.

## CRACKCast

**Host:** Dr. Adam Thomas (@adamdavidthomas), Chris Lipp

**Link:** <https://canadiem.org/crackcast/>

**Type of resource:** Topic-based podcast, focusing on emergency medicine (core Rosen's and clinical knowledge)

A podcast for those who have to satisfy their studying needs, the CRACK in CRACKCast is for Core Rosen's and Clinical Knowledge. This is a podcast that truly gets down to the basics by covering each and every chapter of Rosen's Emergency Medicine – in order. New episodes are published weekly on Mondays and Thursdays.

## EM Ottawa Blog

**Editors:** Dr. Hans Rosenberg (Twitter: @hrosenberg33) & Dr. Shahbaz Syed (Twitter: @DDxDino)

**Link:** <https://emottawablog.com/>

**Type of resource:** FOAM contributions featuring the University of Ottawa's faculty and residents.

The CanadiEM family is very proud that our digital scholar graduate Dr. Shahbaz Syed is now heading up this operation at his home shop. The EMottawa blog features lots of Canadian content featuring faculty and resident writers from their programs.

## EM Sim Cases

**Editors:** Dr. Jared Baylis (Twitter: @baylis\_jared) Dr. Chris Heyd (Twitter: @cgheyd)

**Twitter:** @EMSimCases

**Link:** <http://emsimcases.com/>

**Type of resource:** FOAM Simulation Case Repository

Founded by Dr. Kyla Caners, this peer reviewed emergency medicine simulation case repository is somewhat legendary at this point. It contains many freely accessible resources for those interested in running simulation cases for their department. Perfect resource for those newly engaged with the in situ simulation world that COVID-19 has ushered in.

## Mac Emerg Podcast

**Hosts:** Dr. Teresa Chan, Dr. Brendon Trotter, Dr. Kevin Dong, Dr. Spencer Sample, Dr. Joanna Dida, Dr. Lauren Beals, Dr. Ben Forestell

**Link:** <https://sites.google.com/medportal.ca/macemerg-cpd/podcast>

**Type of resource:** Podcast sharing insights and stories from Mac-affiliated personnel.

From Niagara to Brampton, from the ivories in Hamilton to the community shops all around -this podcast brings you some interesting new insights and stories from Mac-affiliated faculty members and trainees.

## ClerkCast

**Hosts:** Dr. Ben Forestell & Dr. Lauren Beals

**Link:** <https://canadiem.org/clerkcast-episode-1/>

**Type of resource:** Topic-based podcast

ClerkCast is a new medical education podcast written by medical students for medical students, designed to help new learners excel in the ED. Each episode covers an approach to a common ED presentation, and walks you through a case the same way you would on shift. We've got 10 high-yield topics coming your way on everything from [chest pain](#) to trauma, so stay tuned for some great content!