Emergency Medicine Clerkship at the Larner College of Medicine Handbook

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Emergency Medicine Clerkship at the Larner College of Medicine Handbook
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Ottawa ankle and foot rule, Canadian C-Spine Rule, Canadian Head CT Rule, Nexus Rule, PECARN Rule, Glasgow Coma Score
**Standard HPI:**

Chief Complaint
Location +/- radiation
Onset/Setting
Duration/Timing
Severity
Quality/Characteristics
Better/Worse
Personal hx of sx/ Family hx of sx
Associated sx
Treatments
Social hx: Alcohol use, drug use, smoking hx, living situation, support system, employment hx

**ED critical questions:**

Last tetanus shot
Last menstrual period
Alcohol history/ Last drink/ last time used drugs

ROS:
General/Constitutional
HEENT
Cardiac
Respiratory
Gastrointestinal
Heme/Lymph
Skin
Genitourinary
Endocrine
Musculoskeletal
Neurological
Psychiatric
Allergies

**ED Presentation:**
30 seconds with “Worst First” differential if patient in acute need of critical care

or 3-minute presentation if less acute

Chief Complaint (life/limb threatening or not)

HPI (opening line should include past medical history)

Medications/Allergies

Physical Exam

Summary statement including problem assessment (still use worst first differential)

Plan

*** Family history, Surgical history, Social history, ROS should be obtained during the interview but included in the presentation ONLY if **pertinent** to the chief complaint

Unlike in Internal medicine or outpatient medicine, in emergency medicine the key is to consider the most life-threatening condition first even if it is less likely. Start with the worst possible diagnosis and work your way down to the least threatening diagnosis. Your plan should be based on ruling out the highest risk conditions.
**Abdominal Complaint:**

**Exam:**

**Inspect** for scars, rashes, striae, irregular contour, pulsations, peristalsis

**Auscultate:**

-Listen for clicks and gurgles or absence of bowel sounds

-Listen for bruit in systole and diastole (systolic bruit is common) over the aorta and iliac arteries

**Percuss** in all four quadrants

**Palpate** in all four quadrants beginning furthest from site of pain

**Palpate** the spleen and liver

**Palpate** inguinal nodes

Assess for: **Rebound sign, Rovsing’s sign, Psoas sign, Obturator sign, Murphy’s sign, CVA tenderness.**

**Beware the elderly patient:** SMA ischemia, aortic aneurysms, SBO, appendicitis are all surgical emergencies in the elderly.

**Have a low threshold for CT scan in patients >65 years old.**

**In patients with pain out of proportion to exam, consider bowel ischemia→ get lactate in lab orders.**
<table>
<thead>
<tr>
<th>RUQ</th>
<th>LUQ</th>
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<tbody>
<tr>
<td>Biliary colic</td>
<td>Gastritis</td>
</tr>
<tr>
<td>Acute cholecystitis</td>
<td>Pancreatitis</td>
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<tr>
<td>Acute pancreatitis</td>
<td>MI</td>
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<tr>
<td>Perforated duodenal ulcer</td>
<td>Left lower lobe pneumonia</td>
</tr>
<tr>
<td>Acute hepatitis</td>
<td>Splenic abscess</td>
</tr>
<tr>
<td>Retrocecal Appendix</td>
<td>Splenic infarct/rupture</td>
</tr>
<tr>
<td>MI</td>
<td></td>
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<tr>
<td>Right lower lobe pneumonia</td>
<td></td>
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<td>Hepatic Abscess</td>
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<tr>
<td>Herpes Zoster</td>
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**Next Steps:** Ultrasound & Liver Enzyme labs

<table>
<thead>
<tr>
<th>RLQ</th>
<th>LLQ</th>
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</thead>
<tbody>
<tr>
<td>Appendicitis</td>
<td>Sigmoid diverticulitis</td>
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<tr>
<td>Enteritis</td>
<td>Enteritis</td>
</tr>
<tr>
<td>Ureteral Stone</td>
<td>Ureteral stone</td>
</tr>
<tr>
<td>Cecal diverticulitis</td>
<td>PID</td>
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<tr>
<td>PID</td>
<td></td>
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<tr>
<td>Ovarian Cyst</td>
<td>Ovarian Cyst</td>
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<tr>
<td>Ruptured ectopic</td>
<td>Ruptured ectopic</td>
</tr>
<tr>
<td>Ovarian torsion</td>
<td>Ovarian torsion</td>
</tr>
<tr>
<td>Mesenteric adenitis</td>
<td>Mesenteric adenitis</td>
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<tr>
<td>Meckel’s diverticulum</td>
<td>Meckel’s Diverticulum</td>
</tr>
<tr>
<td>Endometriosis</td>
<td>Endometriosis</td>
</tr>
<tr>
<td>Mittelschmerz</td>
<td>Mittelschmerz</td>
</tr>
<tr>
<td>Leaking aneurysm</td>
<td>Leaking aneurysm</td>
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<tr>
<td>Groin hernia</td>
<td>Groin hernia</td>
</tr>
</tbody>
</table>

**Next Steps:** CT/ Ultrasound (appendicitis)

Kidneys, Ureters, Bladder (KUB) radiograph (volvulus)
Pelvic ultrasound (ovarian torsion)
Abdominal ultrasound/ CT (ruptured cyst)
HCG, UA

**Next Steps: IV/Oral contrast CT**

Pelvic ultrasound (ovarian torsion)
Abdominal ultrasound/ CT (ruptured cyst)
HCG, UA
**Chest Pain:**
Evaluate: Airway, Breathing, Circulation (resuscitate as needed)

**Pulmonary Exam:**
- **Inspect:** Look for asymmetrical movement of the chest, depressions, or delayed movement
- **Percuss:** across all lung fields
- **Auscultate:** bilateral lung fields

**Cardiac Exam:**
- **Auscultate:** Carotid arteries bilaterally, APTM regions of heart
- **Palpate:** Carotid arteries, femoral pulses, radial pulses, distal pulses, PMI
- **Assess:** Pitting edema, unilateral erythema, pulses

**Chest Pain Differential:**
5 Lethal Causes of Chest Pain (besides ACS)
- Aortic Dissection
- Esophageal Rupture
- Pneumothorax
- Pulmonary Embolism (See appendix for WELLS criteria and PERC Rule)
- Cardiac Tamponade

**Other Causes:** - **Cardiac:** Myocardial infarction/ischemia, Pericarditis
- **Pulmonary:** Pneumonia
- **Gastrointestinal:** Esophagitis, Biliary colic, Cholecystitis, Pancreatitis
- **Other:** Musculoskeletal, Herpes Zoster

**Next Steps: EARLY POCUS**
- **Cardiac:** EKG, cardiac enzymes, Chest x-ray/ CT Angio of chest/TEE, CBC, Type and Cross
**Pulmonary:** Chest x-ray, CT Angio of chest (PE), V/Q scan, DVT ultrasound

**Gastrointestinal:** LFT’s, RUQ US

**Cardiac Guidelines:**

**CHADS2-VAsc Score** (risk of thromboembolic event)

**C**- Congestive Heart Failure (1)

**H**- Hypertension (1)

**A**₂- Age (≥75= 2)

**D**- Diabetes Mellitus (1)

**S**₂-Stroke/TIA history (2)

**V**- Vascular disease (1)

**A** - Age (65-74= 1)

**Sex** Category - Female (1)

Score:
0 → no treatment or ASA
1 → Warfarin or ASA
2-6 → Warfarin with INR goal of 2-3
Valvular disease → anticoagulation

**HEART score for Cardiac Events**

**History:**
- Highly suspicious (2)
- Moderately suspicious (1)
- Slightly suspicious (0)

**EKG:**
- Significant ST depression (2)
- Nonspecific repolarization disturbance (1)
- Normal (0)

**Age:**
- ≥65 (2)

**ED physicians recommended to start oral anticoagulants on Atrial Fibrillation patients at risk for complications during their ED visit.**
- 45-65 (1)
- \( \leq 45 \) (0)

Risk Factors: hypercholesterolemia, hypertension, diabetes mellitus, cigarette smoking, positive family history, obesity
- \( \geq 3 \) risk factors or history of atherosclerotic disease (2)
- 1-2 risk factors (1)
- No risk factors (0)

Troponin:
- \( > 3 \times \) normal limit (+2)
- 1-3X normal limit (1)
- \( < \) normal limit (0)

Score: likelihood of having a major adverse cardiac event within six weeks.
Total:
- 0-3 \( \rightarrow \) low risk (less than 2% risk of adverse event)
- 4-6 points \( \rightarrow \) risk of cardiac event is 12-16.6\% (recommend admission and further workup)
- 7-10 \( \rightarrow \) high risk of cardiac event (50-65\%) and admission is recommended.

**HASBLED Score: Prediction for bleeding risk in patients with atrial fibrillation**

- H-Hypertension
- A-Abnormal renal or liver function
- S-Stroke
- B-Bleeding
- L-Labile INR
- E-Elderly (>65)
- Drugs or Alcohol (Antiplatelet agents or NSAIDS, Alcohol >8 drinks/week)

**Score:**
- 0-1: Relatively Low Risk- Consider Anticoagulation
- 2-3: Moderate Risk- Anticoagulation can be considered.
- 4-5: High Risk- Alternatives to anticoagulation should be considered.
- >5: Very High Risk
EKG Basics: Rule of 4’s

Four Features:
- Rate: 60-100 BPM (lower = Bradycardia, higher = Tachycardia)
- Rhythm: Sinus or not sinus?
- Axis:
- Clinical Picture/ History

Four Waves:
- P wave (look at lead II)
- QRS complex (look for Q waves in all leads and notice if progression of QRS complex is appropriate in chest leads, check amplitude of QRS complex)
- T wave (look for T waves in all leads, note inversions, concordance/discordance with QRS complex, T wave flattening)
- U wave (absent/ present)

Four Intervals:
- PR interval: 0.12-0.20 seconds (3-5 small squares)
- QRS width: < 0.12 seconds (3 small squares)
- ST segment (depression, elevation, sloping, flattening)
- QT Interval (> 440 ms in men or >460 ms in women = prolonged)
Shortness of Breath:

Additional HPI questions:
Assess shortness of breath when doing daily activities (walking up stairs etc.)
History of cardiac workup (EKG, Stress test, angiogram)
History of cardiac symptoms, family cardiac history
Ask about Pulmonary Embolism risk factors (prolonged immobility, recent bone fracture, OCP’s, smoking history)
Review previous EKG’s and previous Chest X-ray’s

Physical Exam:
Evaluate: Airway, Breathing and Circulation (resuscitate as needed)
Pulmonary Exam: EARLY POCUS
Inspect: Look for asymmetrical movement of the chest, depressions, or delayed movement
Percuss: across all lung fields
Auscultate: bilateral lung fields
Cardiac Exam:
Auscultate: Carotid arteries bilaterally, APTM regions of heart
Palpate: Carotid arteries, femoral pulses, radial pulses, distal pulses, PMI
Assess: Pitting edema in lower extremities, redness or swelling unilaterally in extremities

Differential Diagnosis:

<table>
<thead>
<tr>
<th>Cardiac:</th>
<th>Pulmonary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrhythmia</td>
<td>Asthma</td>
</tr>
<tr>
<td>CHF</td>
<td>Epiglottitis</td>
</tr>
<tr>
<td>MI</td>
<td>COPD exacerbation</td>
</tr>
<tr>
<td>PE</td>
<td>Pneumonia</td>
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<td></td>
<td>Pleural Effusion</td>
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<td></td>
<td>Pneumothorax</td>
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<tr>
<td>Toxic Inhalation</td>
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<td>------------------</td>
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<tr>
<td><strong>Trauma:</strong></td>
<td></td>
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<tr>
<td>Hemothorax</td>
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<tr>
<td>Pneumothorax</td>
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<tr>
<td>Pulmonary contusion</td>
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<tr>
<td>Near Drowning</td>
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<tr>
<td>Aspiration</td>
<td></td>
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<tr>
<td>Flail chest</td>
<td></td>
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<tr>
<td><strong>Other:</strong></td>
<td></td>
</tr>
<tr>
<td>Anemia</td>
<td></td>
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<tr>
<td>Angioedema</td>
<td></td>
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<tr>
<td>Hyperventilation</td>
<td></td>
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<tr>
<td>Hypovolemia</td>
<td></td>
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<tr>
<td>Metabolic acidosis with respiratory compensation</td>
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<tr>
<td>Sepsis</td>
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</table>

**Next Steps:**
EKG
Radiology depending on leading diagnosis or to rule out life threatening cause
Early POCUS to differentiate wheezing, Pulmonary Edema, and COPD
Cardiac monitoring and pulse oximetry
Labs depending on leading diagnosis
**Pulmonary Embolism Approach:**

**Pulmonary Embolism Rule-Out Criteria (PERC)**

Patients do NOT need pulmonary embolism testing if they do NOT meet any of the below criteria:

- Age > 50
- HR > 100
- O2 saturation <95% on room air
- PMH of VTE
- Trauma or surgery in last 4 weeks
- Hemoptysis
- Exogenous Estrogen
- Unilateral leg swelling

**WELLS Criteria (Risk stratification for Pulmonary Embolism)**

- Symptoms of DVT (3)
- PE as likely or more likely than other diagnosis (3)
- HR >100 BPM (1.5)
- Immobilization for >3 consecutive days, surgery in the previous 4 weeks (1.5)
- Previous DVT or PE (1.5)
- Hemoptysis (1.0)
- Malignancy (1.0)

Score:

0-4 = PE unlikely → Check D-Dimer
Score >4 = PE likely → need V/Q Scan or CT Pulmonary Angiography to Dx

**Rapid Sequence Intubation:**

Indications for Intubation:

- Airway protection and patency
- Respiratory failure
- Minimize O2 consumption and optimize O2 delivery
- Unresponsive to pain, terminate seizure, neuroprotection
- Temperature control

- Safety (during transport or procedures in setting of psychosis)

Process:

<table>
<thead>
<tr>
<th>Induction Agents</th>
<th>Neuromuscular Blockade</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Ketamine</td>
<td>- Suxamethonium</td>
</tr>
<tr>
<td>- Etomidate</td>
<td>- Rocuronium</td>
</tr>
<tr>
<td>- Fentanyl</td>
<td>- Vecuronium</td>
</tr>
<tr>
<td>- Midazolam</td>
<td></td>
</tr>
<tr>
<td>- Propofol</td>
<td></td>
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<tr>
<td>- Thiopental</td>
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</tbody>
</table>
Seizures:

Additional HPI questions:
New seizure or previously diagnoses
Witness to events: incontinence, biting tongue, gaze deviation, recovery duration, involvement of extremities, altered mental status
- Find out home medications

Physical exam: Full neuro exam, mental status exam, memory assessment, look for mouth lacerations/trauma

Differential:
Alcohol
Arrhythmia
Drugs
Eclampsia
Febrile seizure (children)
Head trauma
Hypoglycemia
Infection
Intracranial space occupying lesion
Metabolic disturbance
Toxicity
Stroke
Subarachnoid hemorrhage
TIA
Withdrawal
**Next Steps:** Blood glucose, CBC, BMP, blood cultures (febrile), EKG, EEG if concerned about ongoing seizure activity

- **CT/MRI if new onset seizure**

-Levels of home seizure meds (Keppra, Lamictal, Lithium, Depakote)

-Keppra Loading (safe treatment)
**Syncope:**

**Additional HPI questions:**
Prior history of syncopal events
Triggering event (prolonged sun exposure, overheating, overeating, visual stimuli or fright, alcohol)
Prodrome phase: feeling unwell, dizzy, tired, tunnel vision
Seizure activity: incontinence, foaming at mouth, tongue biting, tonic movement (can have benign syncope with twitching), recovery time
Cardiac activity: exertion induced, pallor, sweating, palpitations, chest pain, cardiac history, flushing after event
Physical Exam: Cardiac exam, neuro exam, rectal exam if GI bleed suspected

**Vasovagal syncope can be triggered by specific events:**
- Hemorrhage
- Hypotension
- Hyperventilation
- Micturition

**Carotid sinus syncope: pressure on carotid sinus causing syncope triggered by:**
- Shaving
- Turning head
- Collar tightening
## Differential Diagnosis:

<table>
<thead>
<tr>
<th>Cardiac Causes:</th>
<th>Metabolic Causes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrhythmia/Bradycardia/Tachycardia</td>
<td>Hypoglycemia</td>
</tr>
<tr>
<td>Prolonged QT</td>
<td>Hypothyroid</td>
</tr>
<tr>
<td>Sick Sinus</td>
<td>Hypoxemia</td>
</tr>
<tr>
<td>Structural abnormality</td>
<td></td>
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<tr>
<td>Aortic Stenosis</td>
<td></td>
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<tr>
<td>Mitral valve prolapse</td>
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<tr>
<td>Cardiac outflow obstruction</td>
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<table>
<thead>
<tr>
<th>Circulatory:</th>
<th>Neurological:</th>
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<tbody>
<tr>
<td>GI Bleed</td>
<td>Hyperventilation</td>
</tr>
<tr>
<td>Hypovolemia</td>
<td>Panic attack</td>
</tr>
<tr>
<td>PE</td>
<td>Seizure</td>
</tr>
<tr>
<td>Ruptured ectopic pregnancy</td>
<td>Subarachnoid hemorrhage</td>
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<tr>
<td>Ruptured aortic aneurysm</td>
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<table>
<thead>
<tr>
<th>Other:</th>
<th>Syncope + Symptoms:</th>
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<tbody>
<tr>
<td>Drug induced</td>
<td>Syncope + chest/back</td>
</tr>
<tr>
<td>B-Blockers</td>
<td>pain:</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>• PE, MI,</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Aortic Dissection</td>
</tr>
</tbody>
</table>

### Syncope + Symptoms:
- Syncope + chest/back pain:
  - PE, MI, Aortic Dissection
- Syncope + Abdominal pain:
  - GI Bleed
  - Ruptured Ectopic
  - Ruptured abdominal aneurysm
- Syncope + Headache:
  - Subarachnoid hemorrhage
Next Steps: EKG (arrhythmias, intervals, Brugada pattern, ARVD), bedside echo, urine pregnancy test (UPT), glucose test

Red Flags:

- Exertional Syncope
- Seated Syncope
- Family History of sudden death (HOCM, ARVD)

San Francisco Rule: prediction tool for patients at high risk of serious outcome:

C – History of congestive heart failure

H – Hematocrit < 30%

E – Abnormal findings on 12-lead ECG or cardiac monitoring ($^{17}$) (new changes or non-sinus rhythm)

S – History of shortness of breath

S – Systolic blood pressure < 90 mm Hg at triage
**Weakness:**

**Additional HPI questions:**
Generalized or localized
Additional symptoms (blurry vison, headache, slurred speech, fever, chest pain)
Weight loss, medication use, social situation (especially for elderly)

**Physical Exam:**
Cardiac exam
Neurological exam
Ambulate patient/ Orthostatics

**Differential Diagnosis:**

<table>
<thead>
<tr>
<th>Cardiac:</th>
<th>Metabolic:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrythmia</td>
<td>Dehydration</td>
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<tr>
<td>Infarction</td>
<td>Electrolyte Disorders</td>
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<tr>
<td>Ischemia</td>
<td>Hypothyroidism</td>
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<td>Steroid myopathy</td>
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<thead>
<tr>
<th>Drugs and toxins:</th>
<th>Neurological:</th>
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<tbody>
<tr>
<td>Alcoholic myopathy</td>
<td>Cerebrovascular accident</td>
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<tr>
<td>Botulism</td>
<td>Multiple sclerosis</td>
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<tr>
<td>Carbon monoxide</td>
<td>Myasthenia gravis</td>
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<td>TIA</td>
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<th>Infection:</th>
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<tbody>
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<td>Cellulitis</td>
<td>Anemia</td>
</tr>
<tr>
<td>CNS infection</td>
<td>Myocardial Infarction</td>
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<tr>
<td>Pneumonia</td>
<td>Vertigo</td>
</tr>
<tr>
<td>Urinary tract</td>
<td></td>
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</tbody>
</table>

**Next Steps:** EKG, Urinalysis, Chest x-ray (pneumonia exclusion), Head CT if considering CVA
**Headache:**

**Additional HPI Questions:**
Severity, onset (thunderclap vs. gradual), associated symptoms (AMS, fever, focal)
Response to treatment, treatment attempts
Immunocompromised condition
Drug use or toxin exposure

**Physical Exam:**
Neuro Exam, mental status assessment
Look for signs of trauma
Palpate for tenderness, arterial tenderness
Visual acuity, pupil reactions, papilledema
Skin exam for rashes, oral cavity, and ears for infection sources

**Differential Diagnosis:**
Acute glaucoma
Cluster and tension headache
Head injury
Hypertension
Meningitis/encephalitis
Space occupying lesion
Raised ICP
Sinusitis
Stroke
Subarachnoid hemorrhage
Subdural hematoma
Temporal arteritis

**Next Steps:**
Usually no testing needed for benign migraine, ESR if arteritis suspected
CT scan for AMS, focal deficits, or acute-onset w/Nausea or vomiting
CTA within 6 hours onset for suspected ICP prior to lumbar puncture

**Headache Red Flags:**
>50 years old
Fever
Focal Neuro changes/ vision changes

**Altered Mental Status/Neuro Complaint:**
**Additional HPI questions:**
Last known normal
History of dementia, baseline function, activities of daily living (if elderly)
Medication use/ access to medications
Seizure history or recent head trauma
Recent travel or infection

**Physical Exam:**
CN II-XII (including visual acuity)
Motor System: tone, movement at rest (fasciculations, twitching), strength, pronator drift, ROM in extremities
Reflexes: Biceps, patella, brachioradiales, triceps, Achilles, Babinski
Sensation: Vibration, soft touch, sharp touch
Coordination: Rapid alternating movements, point to point movements (heel to shin, finger to nose), gait (heel, toe, tandem, regular gait), Romberg test
Differential:
**Largely depends on findings and history

Coma Differential: AEIOU TIPPS

A: Alcohol
E: Epilepsy, Encephalopathy, Electrolytes, Endocrine
I: Insulin (hypoglycemic)
O: Opiates and toxins
U: Uremia/ metabolic causes
T: Trauma (head injury), Temperature (hypothermia)
I: Infection (meningitis)
P: Psychiatric, Porphyria
P: Poisons, Psychogenic Coma
S: Shock, Stroke, Space occupying lesions, Subarachnoid Hemorrhage

Next Steps:
Head CT/MRI if indicated by symptoms, electrolyte panel, thyroid test, BMP, Narcan, POC Glucose
# Mini-Mental State Examination (MMSE)

Patient's Name: ___________________________  Date: ____________

*Instructions: Score one point for each correct response within each question or activity.*

<table>
<thead>
<tr>
<th>Maximum Score</th>
<th>Patient's Score</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>“What is the year? Season? Date? Day? Month?”</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>“Where are we now? State? County? Town/city? Hospital? Floor?”</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient’s response is used for scoring. The examiner repeats them until patient learns all of them, if possible.</td>
</tr>
</tbody>
</table>
| 5             |                 | “I would like you to count backward from 100 by sevens.” (93, 86, 79, 72, 65, …)  
Alternative: “Spell WORLD backwards.” (D-L-R-O-W) |
| 3             |                 | “Earlier I told you the names of three things. Can you tell me what those were?” |
| 2             |                 | Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them. |
| 1             |                 | “Repeat the phrase: ‘No ifs, ands, or buts.'” |
| 3             |                 | “Take the paper in your right hand, fold it in half, and put it on the floor.”  
(The examiner gives the patient a piece of blank paper.) |
| 1             |                 | “Please read this and do what it says.” (Written instruction is “Close your eyes.”) |
| 1             |                 | “Make up and write a sentence about anything.” (This sentence must contain a noun and a verb.) |
|               |                 | “Please copy this picture.” (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) |

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<tr>
<th>Maximum Score</th>
<th>Patient's Score</th>
<th>Questions</th>
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<tbody>
<tr>
<td>30</td>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

**Score:**
- > 24 normal
- 19-23 mild impairment
- 10-18 moderate impairment
- < 9 severe impairment
### Shock: End organ hypoperfusion

#### Classifications:

<table>
<thead>
<tr>
<th>Distributive</th>
<th>Obstructive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Septic</strong></td>
<td><strong>Pulmonary</strong></td>
</tr>
<tr>
<td><strong>SIRS</strong></td>
<td><strong>Vasculature</strong> (PE, Pulmonary Hypertension)</td>
</tr>
<tr>
<td><strong>Neurogenic</strong></td>
<td><strong>Mechanical</strong></td>
</tr>
<tr>
<td><strong>Anaphylactic</strong></td>
<td>(Tension pneumothorax, Pericardial tamponade, constrictive pericarditis, restrictive cardiomyopathy)</td>
</tr>
<tr>
<td><strong>Drug and toxin-induced</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Endocrine</strong></td>
<td></td>
</tr>
<tr>
<td>(Addison’s, myxedema)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cardiogenic</th>
<th>Hypovolemic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiomyopathic</strong></td>
<td><strong>Hemorrhagic</strong></td>
</tr>
<tr>
<td><strong>Arrhythmic</strong></td>
<td><strong>Non-hemorrhagic</strong></td>
</tr>
<tr>
<td><strong>Mechanical</strong> (aortic or mitral valve insufficiency or acute valvular defects, free wall, or septum deficits)</td>
<td>(fluid loss from 3rd spacing, renal loss, skin loss)</td>
</tr>
</tbody>
</table>
**Signs of Shock:**
- Hypotension
- Tachycardia
- Oliguria
- Altered mental status
- Tachypnea
- Cool, Clammy, Cyanotic skin
- Metabolic acidosis, hyperlactatemia

**Approach to the patient with undifferentiated hypotension or shock:**

**Initial approach**

<table>
<thead>
<tr>
<th>Clinical condition consistent with shock?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Securing the airway*, establish intravenous access, draw blood for laboratory studies, administer a bolus of intravenous fluids</td>
</tr>
<tr>
<td>Is life-saving or early intervention needed?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Brief targeted history, examination, and in some cases point-of-care ultrasound together with administration of life-saving maneuvers or early interventions, eg, chest tube for tension pneumothorax, pericardial effusion drainage for cardiac tamponade, IV epinephrine for anaphylaxis, IV antibiotics for overwhelming sepsis, IV dexamethasone for adrenal crisis, drainage or emergent surgery for hemorrhage, institution of ACLS protocols for hemodynamically significant arrhythmias, coronary revascularization for MI, surgical repair of ruptured valve, thrombolysis for PE</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Consider alternate etiologies, eg, chronic hypotension, drug-induced hypotension, autonomic dysfunction, vasovagal syncope, peripheral vascular disease</td>
</tr>
<tr>
<td>Is the patient stabilized?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Focused clinical history and examination</td>
</tr>
<tr>
<td>Refer to the algorithm on the approach to the patient with undifferentiated hypotension or shock: Ongoing resuscitation</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Continue resuscitation and empiric therapies for presumed diagnoses</td>
</tr>
</tbody>
</table>

The shaded boxes indicate the points in the process at which no further action needs to be taken, a diagnosis has been made, or continued resuscitation is required.
Lab workup:
- Serum lactate
- Renal Assessment
- LFT’s
- Cardiac Enzymes and natriuretic peptides
- CBC and Differential
- Coagulation studies and D-Dimer level
- Blood gas analysis

Imaging:
- FAST Exam (POCUS)
- Pulmonary Artery Catheterization

Treatment:
Hemodynamic Support
IV Fluids
Vasopressors
Treat source/cause of Shock (infection, hemorrhage etc.)
**Sepsis:**
Risk of developing sepsis in any patient with an infection or bacteremia

Clinical Presentation: Often nonspecific signs
- Symptoms/ signs of an infection source (cough, abscess etc.)
- Arterial Hypotension
- Temperature < 36? C or >38.3? C
- HR > 90 BPM
- Tachypnea
- Signs of end-organ perfusion (warm flushed skin → cool, mottled skin, ileus/ absent bowel sounds, AMS, obtundation, oliguria, anuria)

**keep in mind how underlying medical conditions can alter presentation of symptoms as can medications interfering with shock response of body.**

Immediate investigations:
- CBC with differential, LFT’s, BMP, Coagulation studies, D-Dimer level
- Serum lactate
- Peripheral blood cultures from 2 different sites
- Urinalysis
- Microbiologic cultures from suspected sources
- Arterial Blood Gas
- Imaging of suspected site

**SIRS Criteria:**
Temp > 38.0 or <36
HR >90
RR >20
WBC >12 or <4
Lactate

**sofa (quick Sequential Organ Failure Assessment) score**
- Respiration rate > 22
- Altered mentation
- Systolic Blood pressure \( \leq 100 \text{ mmHg} \)

Score \( \geq 2 \) associated with poor outcomes

**1 Hour protocol**: Improved mortality and morbidity when initiated within one hour of sepsis recognition

**Hour-1 Bundle**

*Initial Resuscitation for Sepsis and Septic Shock*

1. **Measure lactate level.**
   - Remeasure lactate if initial lactate elevated (> 2 mmol/L).

2. **Obtain blood cultures before administering antibiotics.**

3. **Administer broad-spectrum antibiotics.**

4. **Begin rapid administration of 30 mL/kg crystalloid for hypotension or lactate \( \geq 4 \text{ mmol/L} \).**

5. **Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure \( \geq 65 \text{ mmHg} \).**

**Bundle**: SurvivingSepsis.org/Bundle

**Complete Guidelines**: SurvivingSepsis.org/Guidelines
NEWS2 (National Early Warning Scale)

Respiratory Rate
- \( \leq 8 \) (3)
- 9-11 (1)
- 12-20 (0)
- 21-24 (2)
- \( > 25 \) (3)

Hypercapnic respiratory failure (yes/no)

Oxygen requirements
- Room air (0)
- Supplemental O2 (2)

Temperature
- \( \leq 35.0 \) (3)
- 35.1-36.0 (1)
- 36.1-38.0 (0)
- 38.1-39.0 (1)
- \( > 39.1 \) (2)

Systolic BP
- \( \leq 90 \) (3)
- 91-100 (2)
- 101-110 (1)
- 111-219 (0)
- \( > 220 \) (3)

Pulse
- \( \leq 40 \) (3)
- 41-50 (1)
- 51-90 (0)
- 91-100 (1)
- 111-130 (2)
- \( > 131 \) (3)

Consciousness
- Alert (0)
- New onset confusion/ disorientation/agitation, responds to voice, responds to pain vs. unresponsive (3)
Appendix:

Orthopedic rules:

Ottawa Ankle Rule: An ankle X-Ray series is only required if there is any pain in the malleolar zone and...

- Bone tenderness at the posterior edge or tip of the lateral malleolus
- OR Bone tenderness at the posterior edge or tip of the medial malleolus
- OR an inability to bear weight both immediately and in the emergency department for four steps

Ottawa Foot Rule: A foot X-Ray series is only required if there is any pain in the midfoot zone and...
- Bone tenderness at the base of the fifth metatarsal
- OR Bone tenderness at the navicular
- OR an inability to bear weight both immediately and in the emergency department for four steps
Head and Neck Injuries: Imaging decision rules

Canadian C-Spine Rule

- Age > 65
- Extremity paresthesia’s
- Dangerous mechanism (fall from > 3 ft/5 stairs, axial load injury, high speed MCV/rollover/ejection, bicycle collision, motorized recreational vehicle

NEXUS Criteria

- Focal neurologic deficit present
- Midline spinal tenderness present
- Altered level of consciousness present
- Intoxication present
- Distracting injury present

Canadian Head CT Rule:

Only applies to patients with MINOR head injury with: witnessed LOC, amnesia or witnessed disorientation, an initial GCS score >13 in ED, and injury within 24 hours

High-Risk Criteria (likely to need neurological intervention)
- GCS < 15 at two hours post-injury
- Suspected open or depressed skull fracture
- Any sign of basilar skull fracture (hemotympanum, Raccoon eyes, Battle’s sign, CSF oto or rhinorrhea)

Medium Risk Criteria (likely to have brain injury)
- Retrograde amnesia to event ≥ 30 minutes
Dangerous mechanism (pedestrian struck by motor vehicle, ejection from the motor vehicle, fall from > 3 feet or > 5 stairs)

**PECARN Rule for Pediatric Head Trauma (rule out need for head CT)**

- **Age < 2**
  - GCS < 15, palpable skull fracture, or signs of altered mental status
  - Occipital, parietal or temporal scalp hematoma; History of LOC≥5 sec; Not acting normally per parent or Severe Mechanism of Injury?

- **Age ≥ 2**
  - GCS < 15, palpable skull fracture, or signs of altered mental status
  - History of LOC or history of vomiting or Severe headache or Severe Mechanism of Injury?

**Glasgow Coma Score:**

**Eye Opening Response**
- Spontaneous--open with blinking at baseline 4 points
- To verbal stimuli, command, speech 3 points
- To pain only (not applied to face) 2 points
- No response 1 point

**Verbal Response**
- Oriented 5 points
- Confused conversation, but able to answer questions 4 points
- Inappropriate words 3 points
- Incomprehensible speech 2 points
- No response 1 point

**Motor Response**
- Obeys commands for movement 6 points
- Purposeful movement to painful stimulus 5 points
- Withdraws in response to pain 4 points
• Flexion in response to pain (decorticate posturing) 3 points
• Extension response in response to pain (decerebrate posturing) 2 points
• No response 1 point

**Head Injury Classification:**

Severe Head Injury: GCS score < 8 *(INTUBATE)*

Moderate Head Injury: GCS score 9 -12

Mild Head Injury: GCS score 13- 15

**Modified Centor Score for Streptococcal Pharyngitis:**
- Age 3-14 (+1)
- Age 15-44 (0)
- Age >44 (-1)
- Exudate or swelling on tonsils (+1)
- Tender/ Swollen anterior cervical lymph nodes (+1)
- Fever >100°F or 38°C (+1)
- Cough (0), Absent (+1)

Score: >4 = 50% chance of Strep → Rapid antigen detection testing, or throat culture can be considered, or empiric antibiotics can be considered

**Glasgow-Blatchford Risk Score for Upper GI Bleeding**
- BUN 18.2-22.4 (2)
- BUN 22.5-28 (3)
- BUN 28.1-70 (4)
- >70.1 (6)

- Hgb (men):
  - 12-13 (1)
  - 10-11.9 (3)
  - < 9.9 (6)

- Hgb (women):
  - 10-12 (1)
  - < 9.9 (6)
Systolic BP (mmHg):
100-109 (1)
90-99 (2)
<90 (3)

HR >100 bpm (1)
Melena (1)
Syncope (2)
Hepatic diseases (2)
Heart Failure (2)

Score:
0 → Discharge home
>2 → admit to hospital
>10 → admission, increased risk for morbidity

Next Steps:

Check ABC’s, Type and Cross blood, insert 2 large bore IV’s, start IV fluid, start omeprazole, consider NGT to irrigate stomach with room temperature normal saline, consult GI and admit. Emergency EGD if severe hemorrhage
Sources:


http://www.theottawarules.ca/ankle_rules

https://wikem.org/wiki/Atrial_fibrillation_(main)