The Republic of Iraq
Ministry of Health
Directorate of operation and emergency
Medical center
Emergency Medicine Department

Scientific Manual for Emergency Medicine 2023

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Dedication

The Department of Emergency Medicine, which culminated in the issuance of this guide to our health institutions wishing them progress, achieving their aspirations for a more distinguished and prosperous health service in all areas of public and emergency especially

Introduction

Dear readers,

This handbook is an initiative developed in order to help you succeed in emergency medicine practice.

It provides concise approaches to key patient presentations you will encounter in the emergency department.

This guide has been peer-reviewed by staff physicians to make sure evidence is up-to-date and accurate.

Based out of Ottawa, our hope is that this resource will benefit Doctors and help bridge the emergency medicine knowledge gap from pre-clerkship to clinical practice.

How to use this Guide

Topics are subdivided according to background, assessment, investigations, and management.

Background
This section provides common definitions, path physiology, etiology or risk factors for certain conditions. Differential diagnoses are also discussed ("Symptoms Approach" section).
Assessment
Common historical and physical exam features are mentioned here. Diagnostic criteria or techniques/methods used to aid in diagnosis may also be noted.
Investigations
Relevant labs, radiological evaluation and adjunctive tests are mentioned for consideration of diagnostic workup.
Management
General and disease-specific management approaches are discussed. Disposition and discharge criteria may also be noted.

Key references: Used for further reading. Some sources are provided because they are deemed useful to a reader seeking additional information.

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Resuscitation

Airway

Decision to Intubate

Failure to maintain or protect airway (ie. low GCS, airway trauma) Failure to ventilate/oxygenate (ie. low or declining SpO_2, rising pCO_2) Anticipatory (ie. trauma, overdose, inhalation injury, AECOPD, CHFe)

Assessment

Difficult bag-valve mask ventilation "BOOTS"
B = Beard; O = Obese; O = Older; T = Toothless; S = Snores/Stridor
Difficult intubation "LEMON"
L = Look for gestalt signs E = Evaluate the 3-3-2 rule: 3 fingers mouth opening, 3 fingers hyo-mental distance, 2 fingers from thyroid cartilage to floor of mouth M = Mallampati score O = Obstruction or Obesity N = Neck mobility (ie. ankylosing spondylitis, rheumatoid arthritis)

Airway techniques

Temporizing Measures
Chin lift/jaw thrust, BVM, suctioning, nasal airway, oral airway, LMA
Definitive Airway
Orotracheal/nasotracheal intubation, surgical airway (percutaneous or open cric)

Airway methods

Rapid Sequence Intubation (RSI)
Blind nasotracheal intubation
Awake oral intubation
Oral intubation without any agents (ie. "crash" airway)

Rapid Sequence Intubation (6Ps)

Preparation
Prepare equipment and medications
Pre-oxygenation
100% O2 x3 mins OR ask pt to take deep breaths on 100% O2
Pre-treatment (optional)
Reactive airways: +/- lidocaine 1.5mg/kg Cardiovascular disease: fentanyl 3mcg/kg Increased ICP: fentanyl 3mcg/kg
Paralysis with induction
Administration of sedative (ie. ketamine, propofol, etomidate) followed by muscle relaxant if indicated (ie. succinylcholine or rocuronium)
Place tube with proof
Intubate patient and confirm tube placement
Post-intubation management
CXR, ongoing analgesia and sedation, ongoing resuscitation

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 1. Emergency Medicine Journal 2005; 22(2): 99-102.

Breathing

Definitions

Acute respiratory failure = pO2 < 50mmHg +/- pCO2 > 45mmHg
Type 1= respiratory failure without hypercapnia
Diffusion problem: pneumonia, ARDS V/Q mismatch: PE Shunt Low ambient FiO_2: high altitude Alveolar hypoventilation
Type 2a= respiratory failure with hypercapnia, normal lungs
Disorder of respiratory control: overdose, brainstem lesion, CNS disease Neuromuscular disorders: muscular dystrophy, GBS, Myasthenia Gravis, ALS Anatomic: trauma, ankylosing spondylitis, kyphosis/severe scoliosis
Type 2b= respiratory failure with hypercapnia, abnormal lungs
Increased airway resistance: AECOPD, asthma exacerbation Decreased gas exchange: scarring, IPF

Assessment

Look	Listen	Feel
Mental status, color, chest wall movement, accessory muscle use	Auscultate for breath sounds Signs of obstruction Air entering or escaping	Tracheal deviation, crepitus, flail segments, chest wounds

Investigations

Labs: CBC, electrolytes, cardiac enzymes +/- D-dimer, VBG

Tests: Chest X-ray +/- Chest CT

Management of breathing

Spontaneously breathing patient
Nasal prongs Face mask, Non-rebreather face mask
Temporizing measures for inadequate ventilation
Bag-valve mask +/- nasal airway High flow nasal oxygenation (ie. Mastech) CPAP/BiPAP: acute exacerbations of CHF, COPD, asthma
Definitive measures for inability to maintain/protect airway
Oro-tracheal intubation Surgical airway
Additional modalities
Needle thoracostomy for tension pneumothorax Tube thoracostomy to drain pleural effusions or hemothoraces, and to treat pneumothoraces

Key References: Journal of Critical Care 2016; 34: 111-115. Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 2.

Circulation

Causes of shock

Hypovolemic shock	Hemorrhage GI losses	Third spacing
Obstructive shock (intra-thoracic)	Pulmonary embolism Cardiac tamponade Tensionpneumothorax	Valvular dysfunction Congenital heart disease Air embolism
Distributive shock (vasodilation)	Septic shock Anaphylactic shock Neurogenic shock	Drug overdose Adrenal crisis
Cardiogenic shock	ACS Cardiomyopathy	Cardiac structural damage Dysrhythmias

Assessment

Rosen's empirical criteria for circulatory shock (>4/6)	
Ill appearance or AMS	HR > 100 bpm
RR > 20 or paCO2 <32	Base deficit <-4 or lactate >4
Urine Output < 0.5mL/kg/hr	Arterial hypotension >30min continuous

Investigations

Labs: CBC, electrolytes, BUN, Cr, LFTs, TnI, VBG, lactate

Tests: CXR, ECG, POCUS – RUSH exam (cardiac, IVC, lungs, aorta)

Management

Hemorrhagic hypovolemic shock
Control hemorrhage (tourniquets, direct compression, pelvic binders) Aggressive fluids (IV warm crystalloids), blood product transfusion (1:1:1 pRBCs:platelets:FFP)
Obstructive shock
Tension pneumothorax: needle decompression then chest tube Cardiac tamponade: IV crystalloids, pericardiocentesis PE: IV crystalloid, inotropes, thrombolysis
Anaphylactic shock
Epinephrine IM, IV crystalloids, antihistamines, corticosteroids
Septic shock
Broad-spectrum antibiotics, IV crystalloids +/- norepinephrine Goals: Urine Output >0.5mL/kg/h, CVP 8-12mmHg, MAP >65mmHg, ScvO2 >70%, lactate clearance
Cardiogenic shock
Maintain MAP > 65 with fluid boluses to optimize preload Norepinephrine 5mcg/min, dobutamine 2.5 mcg/kg/min, Treat underlying cause: cath lab, ECMO support, heart transplant
Cellular Toxins
Antidotes for various toxins (see toxicology)

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 6.

Trauma Resuscitation

Primary Survey

1 Airway	3 Circulation
Assess patency of airway, look for obstruction (blood, emesis, teeth, foreign body), ensure C-spine precautions, RSI	Assess LOC, signs of shock (HR, BP, skin color, urine output, base deficits) Estimate degree of hemorrhagic shock
2 Breathing	4 Disability
Expose chest, assess breathing, auscultate for breath sounds Rule out tension pneumothorax	GCS assessment Neurological evaluation
5 Exposure/Environment	
Fully expose patient, logroll patient to inspect for injuries, spine tenderness and rectal exam for high-riding prostate and tone. Keep patient warm and dry to prevent hypothermia	

Secondary Survey

Full physical exam: head and neck, chest, abdomen, MSK, neuro
SAMPLE history, collateral history
FAST exam: subxiphoid pericardial window, perisplenic, hepatorenal (Morison's pouch), pelvic/retrovesical

Investigations

Bloodwork: CBC, lytes, BUN, Cr, glucose, lactate, INR/PTT, fibrinogen, B-hCG, tox bloodwork (EtOH, ASA, APAP), T+C, U/A
Labs: Full portable X-rays (spine, chest, pelvis)
CT – for stable patients; unstable patients may require urgent OR

The Deadly Triad

Coagulopathy
Hypothermia
Acidosis

Management

Resuscitation parts
Blood component ratios: 1 pRBCs: 1 FFP: 1 platelets Tranexamic acid: 1g IV over 10 minutes then 1g IV over 8 hours
Head trauma
Seizure management, treat suspected raised ICP, neurosurgical intervention for severe head injury/bleeds
Spinal cord trauma
Immobilize, treat neurogenic shock, consult spine service
Chest trauma
Airway management, thoracotomy for blunt vs. penetrating trauma as per EAST guidelines, surgical intervention for life-threatening pulmonary, diaphragmatic, esophageal, aortic, myocardial injuries
Abdominal trauma
Laparotomy for hemodynamically unstable and hollow organ injuries
Orthopedic injuries
Reduce and immobilize when possible, adequate analgesia, consult ortho

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 36. ATLS Manual, ACS – 9th ed, 2012.

Symptoms Approach

Syncope

Definition: sudden and transient loss of consciousness with loss of postural tone accompanied by a rapid return to baseline

Pathophysiology: dysfunction of both cerebral hemispheres or the brainstem (reticular activating system), usually from hypo-perfusion

Differential Diagnosis

Cardiac	Rhythm disturbances: dysrhythmias, pacemaker issues Structural: outflow obstruction (aortic stenosis, HOCM), MI Other CV diseases: dissection, cardiomyopathy, PE	
Non-Cardiac	Reflex (neurally mediated)	Vasovagal: sensory or emotional reactions Orthostatic: postural related, volume depletion Situational: coughing, straining Carotid sinus pressure: shaving Subclavian steal: arm exercises
	Medications	CCBs, B-blockers, digoxin, insulin QT prolonging meds Drugs of abuse
	Focal CNS hypoperfusion	Hypoxia, epilepsy, dysfunctional brainstem

Assessment

History: syncope character (ask about exertion!), cardiac risk factors, comorbidities, medication/drug use, family history, orthostatic symptoms Rule out seizure/stroke/head injury

Physical: cardiac exam (murmurs, rate), CNS exam

Investigations

Labs: CBC, glucose, lytes, extended lytes, BUN/Cr, CK/TnI, B-hCG

ECG intervals	ECG rates
Short PR: WPW Long PR: conduction blocks Deep QRS: HOCM Wide QRS: BBB, Vtach, WPW QT intervals: Congenital QT syndrome	Tachydysrhytmias: SVT, Afib, Vtach, Vfib Bradyarrhytmias: AV conduction blocks, sinus node dysfunction

Management

General
ABCs, monitors, oxygen, IV access
Cardiogenic syncope
Consult cardiology for workup, pacemaker consideration
Non-cardiogenic syncope
Benign causes or low-risk syncope: discharge with GP follow-up Consider outpatient cardiac workup
Risk stratification prediction rules
Canadian Syncope Risk Score

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 15. CMAJ 2011; 183(15): 1694-1695. CMAJ 2016; 188(12): E298.

Altered Mental Status

Definition: decrease in LOC caused by either diffuse CNS dysfunction (toxic/metabolic causes) or primary CNS disease

Differential Diagnosis

Drugs
Abuse: Opiates, benzodiazepines, alcohol, illicit drugs Accidental: Carbon monoxide, cyanide Prescribed: Beta-blockers, TCAs, ASA, acetaminophen, digoxin Withdrawal: Benzodiazapines, EtOH, SSRIs
Infection
CNS: meningitis, encephalitis, cerebral abscess Systemic: sepsis, UTI, pneumonia, skin/soft tissue, bone/joint, intraabdominal, iatrogenic (indwelling lines or catheter), bacteremia
Metabolic
Kidneys: electrolyte imbalance, renal failure, uremia Liver: hepatic encephalopathy Thyroid: hyper or hypothyroid Pancreas: hypoglycemia, DKA, HHS
Structural
Bleeds: ICH, epidural hematoma, subdural hematoma, SAH Brain: Stroke, seizures, surgical lesions, hydrocephalus Cardiac: ACS, dissection, arrhythmias, shock

Assessment

History: Collateral from family/friends/EMS, onset and progression, preceding events, past medical history, medications, history of trauma, comparison to baseline

Physical: ABCs, primary survey, vital signs including temp and glucose, rapid neurological exam (GCS and focal neurological deficits)

Investigations

Labs: CBC, lytes, glucose, BUN, Cr, LFTs, INR/PTT, serum osmolality, VBG, troponin, urinalysis, drug levels.

Tests: ECG, CXR, CT head

Management

General
Monitors, oxygen, vitals, IV access
Treatment
Treat underlying cause, universal antidotes (dextrose, oxygen, naloxone, thiamine), broad-spectrum Abx, warm/cool, BP control
Disposition
Consider admission for working up underlying cause

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 16.

Headache

Common Types

Migraine: POUND (pulsatile, onset 4-72hrs, unilateral, N/V, disabling intensity), photophobia/phonophobia, chronic, recurrent, +/- aura
Cluster: unilateral sudden sharp retro-orbital pain, <3hours usually at night, pseudo-Horner's symptoms, precipitated by alcohol/smoking
Tension: tight band-like pain, tense neck/scalp muscles, precipitated by stress or lack of sleep

Differential Diagnosis

Intra-cranial	Extra-cranial
Bleed: epidural, subdural, subarachnoid, intracerebral hemorrhage **Infection**: meningitis, encephalitis, brain abscess **Increased ICP**: mass, cerebral venous sinus thrombosis	Acute angle closure glaucoma Temporal arteritis Carotid artery dissection CO Poisoning

Assessment

History: Red flags (sudden onset, thunderclap, exertional onset, meningismus, fever, neurological deficit, AMS), symptoms of increased ICP (persistent vomiting, headache worse lying down and in AM)
Physical: vitals, detailed neuro exam (cranial nerves, gait, coordination, motor/sensory, reflexes), neck for meningeal irritation, eye exam (slit lamp, IOP), temporal artery tenderness

Investigations

Neuroimaging to rule out deadly causes. Most benign headaches do NOT need further investigation. Refer to Ottawa SAH Rule.
LP: if CT head negative (>6h from onset) but suspicion of SAH
ESR/CRP: if suspect temporal arteritis

Management

Common benign headache regimen
Fluids: No clear evidence, but consider in dehydrated patient **Antidopaminergic agent:** Metoclopramide 10mg IV **Analgesic:** Acetaminophen 1g po **NSAIDs:** Ketorolac 15-30mg IV or Ibuprofen 600mg po **Steroids:** Dexamethasone 10mg po/IV (rebound migraine prophylaxis)
Non-traditional uses
Oxygen, sumatriptan, verapamil – used for cluster headaches **Magnesium, lidocaine, propofol, ketamine – for refractory headaches, emerging evidence** **Nerve blocks:** limited efficacy

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 20. Headache 2016; 56: 911-940.

Shortness of Breath

Definitions

Tachypnea: RR > 18 in adults
Hyperpnea: high minute ventilation to meet metabolic demands
Orthopnea: dyspnea lying flat
Paroxysmal Nocturnal Dyspnea: sudden dyspnea at night

Differential Diagnosis

Pulmonary	Cardiac
Airway obstruction Respiratory failure (refer to Type 1 vs Type 2 in "Breathing" section) Anaphylaxis Pulmonary embolism Tension pneumothorax	Pulmonary edema Myocardial infarction Cardiac tamponade Pericardial effusion Arrhythmias
Toxic-metabolic	**Neuro-endocrine**
Toxin ingestion (organophosphates, CO poisoning) Sepsis DKA	Thyrotoxicosis Guillain-Barre syndrome Amyotrophic lateral sclerosis Multiple sclerosis

Assessment

History: OPQRST, recent travel, trauma, PE risk factors (Well's criteria, PERC rule), sick contacts
Physical: appearance, signs of respiratory distress, cardiac/resp exam

Investigations

Blood work: CBC, lytes, BUN/Cr, VBG, cardiac enzymes +/- D-dimer
Tests: ECG, bedside U/S, CXR (portable if unstable)

Management

General
Monitors, oxygen, vitals, IV access, ABCs
Intubate
If not protecting airway or significant respiratory distress
Empiric treatment
Trauma: ATLS guidelines Anaphylaxis: epinephrine, antihistamines, steroids, fluids Cardiac causes: see various cardiac sections below Asthma/COPD: oxygen, bronchodilators, corticosteroids +/- antibiotics Infection: antibiotics, consider broad-spectrum if septic

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 25.

Chest Pain

Differential Diagnosis

Deadly Six (PET MAC)	Cardiac
Pulmonary embolism **E**sophageal rupture/mediastinitis **T**ension pneumothorax **M**yocardial infarction **A**ortic dissection **C**ardiac tamponade	Pericarditis Myocarditis Endocarditis
Respiratory	**GI**
Pneumonia Pleural effusion Acute chest syndrome (sickle cell) Lung or mediastinal mass	**Esophagus** – Mallory-Weiss tear, esophageal spasm **Stomach** – GERD, dyspepsia/PUD **Pancreas** - pancreatitis **Gallbladder** - biliary colic, cholecystitis, cholangitis
MSK	**Other**
Intramuscular pain Rib pathology	Panic attack Herpes Zoster

Assessment

History: character of pain, cardiac risk factors (see HEART score), PE risk factors (see PERC rule), recent trauma, neuro symptoms

Physical: appearance, cardiac exam, resp exam, neuro screen, vitals + pulse deficits

Investigations

Tests: ECG, CXR +/- CTPA

Labs: CBC, lytes, abdo panel, CK/TnI +/- D-dimer

Management

General	ABCs, monitors, oxygen, vitals, IV access, equipment
ACS	ASA, nitro (avoid in RV infarct), clopidogrel/ticagrelor, LMWH, code STEMI (PCI vs. thrombolytics)
PE	Anticoagulation +/- thrombolysis for massive PE
Esophageal rupture	Urgent thoracics consult, IV antibiotics, NPO, further imaging
Tension pneumothorax	Needle decompression (2nd ICS at MCL) then chest tube (4th or 5th ICS)
Tamponade	Pericardiocentesis
Dissection	Urgent vascular consult, reduce BP and HR with IV
Disposition	Diagnosis and risk stratification dependent

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 26.

Chest Pain Risk Stratification

HEART score

Inclusion Criteria	Exclusion Criteria
Patients ≥21 years old presenting with symptoms suggestive of ACS	New STEMI >1mm or other new ECG changes, hypotension, life expectancy < 1 years, noncardiac medical/surgical/psychiatric illness
H = History	
0 = slightly suspicious +1 = moderately suspicious +2 = highly suspicious	
E = ECG	
0 = normal +1 = No ST depression but LBBB, LVH, repolarization changes +2 = ST depression/elevation not due to LBBB, LVH, or digoxin	
A = Age	
0 = age < 45 +1 = age 45 – 64 +2 = age ≥ 65	
R = Risk factors	
Risk factors = HTN, hypercholesterolemia, DM, obesity (BMI > 30), smoking (current, or smoking cessation ≤ 3 months), positive FHx (parent/sibling with CVD < 65yo), atherosclerotic disease (prior MI, PCI/CABG, CVA/TIA, or PVD) 0 = No known risk factors +1 = 1-2 risk factors +2 = ≥3 risk factors or history of atherosclerotic disease	
T= Troponin (initial)	
0 = initial troponin ≤ normal limit 1 = initial troponin 1-2X normal limit 2 = initial troponin >2X normal limit	
Interpretation	
Scores 0-3: 0.9 – 1.7% risk of MACE Score 4-6: 12-16.6% risk of MACE Score ≥ 7: 50-65% risk of MACE	Use the HEART Pathway (HEART score + delta TnI) to further lower risk of MACE (not prospectively validated but 1% risk of MACE in retrospective data)

PERC Rule

Inclusion Criteria	Exclusion Criteria
Patients where pre-test probability of PE is considered to be low-risk(< 15%)	Moderate to high risk for PE
Patients can be safely ruled out and do not require further workup if no criteria are positive:	
Age ≥ 50, HR ≥ 100, SaO_2 < 95% on room air, unilateral leg swelling, hemoptysis, recent surgery or trauma (<4 weeks ago), prior PE or DVT, hormone use (OCPs, hormone replacement, estrogen)	

Key References: Neth Heart J. 2008; 16(6): 191-6. J Thromb Haemost 2008; 6(5): 772-80.

Abdominal Pain

Differential Diagnosis

RUQ	Epigastrium	LUQ
Hepatitis Biliary colic Cholecystitis/Cholangitis* Pancreatitis* Pneumonia Pleural effusion PE*	Gastritis Dyspepsia/PUD Duodenitis Pancreatitis* Cardiac – ACS*	Pancreatitis* Gastritis Pneumonia Pleural effusion PE*
Right Flank	**Umbilicus**	**Left Flank**
Colitis Perforation* Obstruction* Renal colic Pyelonephritis AAA*	Colitis Perforation* Obstruction* Aortic dissection* AAA*	Colitis Perforation* Obstruction* Renal colic Pyelonephritis AAA*
RLQ	**Hypogastric**	**LLQ**
Appendicitis Ectopic pregnancy* PID, TOA Testicular torsion, epididymitis, orchitis Ovarian torsion Renal colic	UTI (Cystitis) Renal colic Obstruction	Diverticulitis* Ectopic pregnancy* PID, TOA Testicular torsion, epididymitis, orchitis Ovarian torsion Renal colic

Can't-miss Diagnoses	Risk Factors
Ruptured ectopic	Hx of STI/PID, recent IUD, previous ectopic, smoking, fallopian tube surgery, tubal ligation
Ruptured AAA	Elderly, hx HTN/DM, smoking, trauma hx
Pancreatitis	Alcohol use, biliary pathology
Cholangitis	Charcot's Triad: fever, RUQ pain, jaundice
Mesenteric ischemia	Elderly, CAD, CHF, dehydration, infection
Obstruction	Operative or malignant history, elderly
Perforated viscus	Risk factors for diverticulitis or PUD, malignancy or instrumentation (ie. colonoscopy)
Comp. diverticulitis	Elderly, low-fibre diet, Western population

Assessment

History: OPQRST, associated symptoms (N/V, fever, chills, bowel movement, urinary symptoms, pelvic discharge/bleeding)

Physical: abdominal exam +/- pelvic exam, cardiac/resp exam

Investigations

Labs: CBC, lytes, BUN/Cr, LFTs, lipase, lactate, B-hCG +/- CK/TnI Tests: ECG, CXR, bedside US as indicated

Formal abdo U/S (biliary pathology, ectopic, AAA) +/- CT abdo/pelvis

Management

ABCs, NPO, analgesics, anti=emetics, consult surgery as needed

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 27.

Pelvic Pain

Differential Diagnosis

Gynecological		
Ovaries: Ruptured cyst, abscess, torsion **Fallopian tubes:** Salpingitis, tubal abscess, hydrosalpinx **Uterus:** PID, endometriosis, fibroids **Pregnancy related** (1st trimester): Ectopic pregnancy, threatened abortion, ovarian hyperstimulation **Pregnancy related** (2nd-3rd trimester): Placental abruption, round ligament pain, Braxton-Hicks contractions Other: Bartholin abscess		
Urinary tract	**Urological**	**Other**
Urolithiasis Pyelonephritis Cystitis	Testicular torsion Prostatitis	Sexual or physical abuse

Assessment

History: OPQRST, associated symptoms (vaginal bleeding, discharge, dyspareunia, bowel or bladder symptoms), pregnancy and sexual history
Physical: vitals, abdominal exam
Pelvic exam (assess cervical motion tenderness, adnexal tenderness)
Speculum exam (look for discharge, blood, take samples as needed)

Investigations:

Labs: CBC, lytes, BUN/Cr, b-hCG, +/- vaginal and cervical swabs Tests:
Bedside U/S – rule out ectopic, free fluid assessment Formal abdo/pelvic ultrasound

Management

General
ABCs, IV access, analgesia, antiemetics, +/- admit and consult
Ovarian cyst
Uncomplicated: analgesia with follow-up Hemoperitoneum or hemodynamically unstable: surgery
Ovarian torsion/Testicular torsion
Surgical detorsion or removal
PID
Severe infection: admit with IV antibiotics (cefoxitin 2g IV q6h IV + doxycycline 100mg IV q12h x24hrs then switch to po) Mild-moderate infection: Ceftriaxone 250mg IM x 1 + doxycycline 100 po BID x 14 days

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 33.

Back Pain

Deadly Differential Diagnosis

Spinal	Vascular
Cauda equina and spinal cord compression: Spinal metastasis Epidural abscess/hematoma Disc herniation Spinal fracture with subluxation Meningitis Vertebral osteomyelitis Transverse myelitis	Aortic Dissection Ruptured AAA Pulmonary Embolism Myocardial Infarction

Assessment

History: focus on red flags, fracture history, cancer risk, infection risk Red flags (BACK PAIN): bowel/bladder dysfunction, anesthesia (saddle), constitutional symptoms (night pain, weight loss, fever/chills), chronic disease, paresthesias, age >50, IVDU/infection, neurological deficits

Physical: vitals + pulse deficits, inspect skin for infection/trauma, abdo exam for AAA, cardiac exam (aortic murmur), MSK lower back exam, neuro exam (lower extremity, reflexes, rectal tone), post void residual

Investigations

Bloodwork: usually not indicated unless suspected infection (CBC, ESR, CRP)

Bedside U/S: rule out AAA, look for bladder distention post-void

PVR: cauda equina syndrome (PVR >200cc has sensitivity of 90% for CES)

Management

Cauda equina syndrome
Urgent MRI, spine consult, analgesia, IV dexamethasone
Aortic dissection
Immediate specialist consultation, IV labetalol to control HR and BP
Ruptured AAA
Fluid resuscitation, immediate OR if unstable
Epidural abscess or vertebral osteomyelitis
MRI to definitively diagnose +/- bone scan (osteomyelitis), broad spectrum antibiotics, orthopedics consult
MSK back pain
Analgesia (WHO pain ladder) Multidisciplinary approach with GP follow-up

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 35.

Medical Emergencies

Anaphylaxis

Definition: life-threatening immune hypersensitivity systemic reaction leading to histamine release, vascular permeability and vasodilation

Common triggers: foods (egg, nuts, milk, fruits), meds (antibiotics, NSAIDs), insect bites, local anesthetics, occupational allergens, aeroallergens

Differential Diagnosis: shock (of any etiology), angioedema, flush syndrome, asthma exacerbation, red man syndrome

Diagnostic criteria:

Acute onset (minutes to hours) + ANY of the following three:
Involvement of skin +/- mucosa WITH EITHER respiratory difficulty or low BP
Exposure to likely allergen with 2/4 signs: **Skin-mucosal involvement** (urticarial, angioedema, flushing, pruritis) **Respiratory difficulties (**dyspnea, wheezing, stridor, hypoxemia, rhinitis) **Low BP** (hypotonia, syncope, pre-syncope, headache, collapse) **GI symptoms** (abdo pain, cramps, N/V)
Low BP after exposure to known allergen

Assessment

General: TREAT FIRST, ABCs, monitors, oxygen, vitals, IV access
Appearance, respiratory distress, visualize swelling (lips, tongue, mucous membrane)

History: exposure to any known or likely allergen, co-morbidities, recent medication use, family history, atopy

Management

General management
If need to protect airway: ketamine as induction agent Epinephrine: 0.3-0.5 mg IM (1:1000 conc.) to anterolateral thigh q5-10 mins Antihistamines: Benadryl 50mg IV/PO, Ranitidine 50mg IV/150mg PO Steroids: Methylprednisolone 125mg IV/prednisone 50mg po
Refractory hypotension
Epinephrine drip 1-10ug/min IV (titrate to desired effect) Consider norepinephrine 0.05 – 0.5ug/kg/min
Patients with beta-blockers
IF epinephrine unsuccessful, glucagon 1-5mg IV over 5-10 mins followed by 5-15ug/min infusion
Disposition
May discharge as early as 2 hours if stable. Arrange follow-up with GP in 2448 hrs to watch for biphasic reaction. Education to avoid allergen, consider allergy testing, Epi-pen prescription Meds at discharge: Benadryl 50mg po OD, Ranitidine 150mg po OD and prednisone 50mg po

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 109. The World Allergy Organization Journal 2011; 4(2): 13-37.

Asthma

Definition: chronic inflammatory airway disease with recurrent reversible episodes of bronchospasm and variable airflow obstruction

Triggers: URTIs, environmental allergens, smoking, exercise

Classification (CAEP/CTS Asthma Severity):

Respiratory Arrest/Fatal
Appearance: altered mental status, cyanotic, decreased resp. effort Vitals: low HR, high RR, low O_2 sat <90% despite oxygen Exam: Silent chest – consider preparing for intubation
Severe
Appearance: agitated, diaphoretic, labored respirations, difficulty speaking Vitals: high HR, high BP, O_2 sat 90-95% Exam: worsening resp. distress, exp/insp. wheezing, FEV1 <40% predicted
Moderate
Appearance: SOB at rest, cough, congestion, nocturnal symptoms Vitals: O_2 sat >95% Exam: exp. wheezing, FEV1 40-60% predicted
Mild
Appearance: SOBOE, chest tightness Vitals: O_2 sat >95% Exam: exp. wheezing, FEV1 >60% predicted

Assessment

History: triggers, recent infection, thorough asthma hx including prior exacerbations, hospitalizations + interventions/ICU stays, family history

Good asthma control: daytime symptoms <2/week, no activity limitation, no nocturnal symptom, rescue puffer <2/week, normal PFT

Physical: vitals, sign of distress, accessory muscle use, respiratory exam

Investigations: CXR, ECG +/- VBG, +/- PEFR (to estimate FEV1), bloodwork (CBC – infection, lytes – potassium)

Management

Treat exacerbation ("0.5 – 5 - 50")
Atrovent 0.5mg nebulized OR 4-8 puffs via MDI+spacer q20mins x 3 Ventolin 5mg nebulized OR 4-8 puffs via MDI+spacer q20mins x 3 Prednisone 50mg oral **NOTE:** MDIs are superior to nebs, however if patient too tachypneic use nebs
Severe asthma
$MgSO_4$ 2g IV over 30 mins Epinephrine 0.3mg IM then 5mcg/min IV infusion Ketamine 1mg/kg (in conjunction with BiPAP)
Respiratory failure
Consider NiPPV first (BiPAP) Intubate (LAST RESORT): ketamine 1mg/kg IV + succinylcholine 1.5mg/kg IV Involve ICU early

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 73. CMAJ 1996; 155(1): 25-37.

Chronic Obstructive Pulmonary Disease

Risk factors: smoking (#1), occupational dust, chemical exposure

Triggers of AECOPD: viral URTI, pneumonia, environmental allergens or pollutants, smoking, CHF, PE, MI

Assessment

Cardinal symptoms: ↑ SOB ↑ sputum production ↑sputum purulence

Key elements on history: duration of symptoms, severity of airflow limitation, number of previous episodes (total/hospitalizations), co-morbidities, premorbid functional status, present treatment regimen, previous use of mechanical ventilation, use of home oxygen

Clinical signs of severity: rapid shallow pursed-lip breathing, use of accessory muscles, paradoxical chest wall movements, worsening or new onset central cyanosis, peripheral edema, hemodynamic instability, decreased LOC or confusion, decreased O_2 sat

Investigations

Labs: CBC, electrolytes, VBG

Tests: CXR, ECG, pulse oximetry

Management

Oxygen
Venturi masks (high-flow devices) preferred over nasal prongs Target SaO2: >88% Goal PaO2 = 60-65 mmHg
Bronchodilators
SABA: salbutamol 2.5-5mg via nebulizer or 4-8 puffs via MDI with spacer q15mins x3 prn Anticholinergic: Ipratropium bromide 500mcg via nebulizer or 4-8 puffs q15mins x3 prn
Systemic corticosteroids
Oral is equivalent to IV in most exacerbations Oral prednisone 40-60mg for 5-10 days IV methylprednisolone 125 mg BID-QID (for severe exacerbations or not responding to oral steroids)
Antibiotics
Indication: ≥2 of: inc sputum production 2) inc sputum purulence 3) inc SOB Simple exacerbation: amoxicillin, 2nd/3rd gen cephalosporin, macrolide, doxycycline or TMP/SMX
Ventilation
NIPPV such as CPAP or BiPAP (consider in respiratory acidosis, severe dyspnea or distress)
Intubation
For life-threatening exacerbations, failed NIPPV, altered LOC, severe hypoxemia, cardiovascular instability, respiratory or cardiac arrest

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 74. Am J Respir Crit Care Med 2013; 187(4):347-365.

Myocardial Infarction

Definition: evidence of myocardial ischemia on the spectrum of ACS (unstable angina, NSTEMI and STEMI). Diagnosed by cardiac marker abnormalities and one of: ECG changes, HPI consistent with ACS.

Stable Angina
Transient episodic chest discomfort secondary to myocardial ischemia Precipitated by exertion or emotion, lasts < 15 mins, relieved by rest or nitro
Unstable Angina
Angina with minimal exertion or at rest, new-onset angina, angina post MI/PCI/CABG, worsening change from baseline anginal symptoms, increased duration of pain or threshold, or decreased response of typically effective angina medications
NSTEMI
Infarction without ST elevation
STEMI
Infarction with ST elevation: ≥1mm STE in 2 contiguous leads For V1 – V3 leads: >1.5 mm for females; >2.5 mm for males under 40; >2mm for males over 40

Assessment

History: character of pain, associated symptoms (diaphoresis, radiating pain, vomiting, and exertional pain have highest LRs for AMI)

Classic risk factors: male, smoking, diabetes, HTN, FHx, dyslipidemia

Atypical features in: women, elderly, diabetics, non-Caucasians, dementia

Complications of AMI: arrhythmias, cardiogenic shock, papillary muscle rupture, pericarditis, stroke

Physical: vitals, cardiac exam, resp exam, pulses, signs of complications

Investigations: ECG (ST-T changes, new BBB, pathological Q waves), CXR

Labs: CBC, lytes, cardiac enzymes

Management

General
ABCs, monitors, oxygen, vitals, IV access Pain control: NTG (avoid for RV infarcts) or morphine if resistant to NTG
ACEi, B-blockers, statins
No role for ED use. ACEi + statins should be started within 24-48hrs of presentation.
Antiplatelet therapy
ASA 325 mg chewed Clopidogrel 300mg po OR ticagrelor 180mg po (if going for primary PCI)
Antithrombotic therapy
Primary PCI: UFH 4000 units (max) then 12 U/kg/hr Fibrinolytics: enoxaparin or fondaprinux IV bolus then sc dose daily
Goals
Primary PCI: within 90 mins of hospital arrival Lytics: <12 hours of symptoms OR cannot get to PCI centre within 120 mins, given within 30 mins of hospital arrival

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 78. Circulation 2013; 127:00-00.

Congestive Heart Failure

Etiology: CAD, HTN, valve abnormalities, cardiomyopathy, infarction, pericardial disease, myocarditis, cardiac tamponade, metabolic disorders (ie. hypothyroidism), toxins, congenital

Precipitants of CHF exacerbation

Cardiac	Medications
Ischemia, dysrhythmias, mechanical complications (ie. papillary muscle rupture)	Forgot meds, negative inotropes (CCB, b-blocker), NSAIDs, steroids
High cardiac output	**Other**
Anemia, infection, pregnancy, hyperthyroidism	Lifestyle (high salt intake), renal failure, PE, HTN

Assessment

Symptoms	Signs
Left-sided: **SOB**, orthopnea, PND, nocturia, fatigue, altered mental status, syncope, angina, pulmonary congestion (cough, wheeze) **Right-sided**: fatigue, abdominal distension, swelling, weight gain	**General**: Tachypnea, tachycardia, hypertension, hypotension, weak pulses **Left-sided**: hypoxia, crackles, wheezes, S3 or S4 **Right-sided**: pitting edema, JVP elevation, hepatomegaly, ascites

Investigations

Labs: CBC, electrolytes, AST, ALT, BUN, Cr, Troponin, BNP (or NT-proBNP)
Tests: CXR, ECG, POCUS (systolic function, pulmonary edema)

Management

General
ABCs, monitors, 100% O_2 non-rebreather facemask, vitals, IV access, position upright, +/- Foley catheter, treat precipitating factor Morphine 1-2 mg IV prn
First line
Nitroglycerin 0.4mg sl q5min (if sBP>100) +/- topical nitroglycerin patch (0.2-0.8mg/h) Furosemide: generally double home dose
Second line
Double furosemide dose Nitroglycerin infusion (start at 10 mcg/min and titrate) If hypotensive (sBP<90): norepinephrine 2-12 mcg/min or dobutamine 2.5mcg/kg/min

Key References: Canadian Journal Cardiology 2007; 23(1): 21-45. Circulation 2009; 119: 1977-2016. Journal of Cardiac Failure 2010; 16(6): e134-156

Cardiac Dysrhythmias

Causes: Enhanced automaticity: MI, drugs, toxins, lyte imbalances
Triggered activity: Torsades de Pointes, post-MI reperfusion
Re-entry: VT and SVT

Main classifications

Bradydysrhythmias and AV conduction blocks
10 = prolonged PR interval **2**0 **(Mobitz I)** = gradual PR interval prolongation then QRS drop **2**0 **(Mobitz II)** = PR interval constant with QRS drop **3**0 = P wave and QRS complex unrelated, PP and RR intervals constant
Supraventricular tachydysrhythmias (narrow QRS)
Regular rhythm Atrial: sinus tachycardia, atrial tachycardia, atrial flutter AV: SVT (AVNRT > AVRT), junctional tachycardia **Irregular rhythm** Atrial: atrial fibrillation, multifocal atrial tachycardia, SVT w/ aberrancy
Ventricular tachydysrhythmias (wide QRS)
Regular rhythm: Ventricular tachycardia, SVT with aberrancy **Irregular rhythm**: Ventricular fibrillation, polymorphic VT, Afib with WPW

Assessment

Unstable patient: altered mental status, respiratory distress, hypotension, syncope, chest pain with AMI, signs of CHF, shock
Stable patient: light-headedness, SOBOE, palpitations, mild anxiety

Management

General: Monitors, oxygen, continuous monitoring, IV access
Initial approach: ABCs, treat symptomatic and unstable patients immediately

ACLS Guidelines (for unstable patients)

Bradycardia algorithm
Atropine 0.5mg IV bolus q3-5mins x 6 +/- infusions: dopamine 2-10 mcg/kg/min OR epi 2-10 mcg/min If ineffective: transcutaneous pacing, prepare for IV pacing Type II 2^0 AV block OR 3^0 AV block: transcutaneous pacing
Tachycardia algorithm
Synchronized cardioversion (with premedication)
Atrial fibrillation/Atrial flutter
Synchronized cardioversion (higher risk of stroke if rhythm >48hrs and patient not anticoagulated)
VF/pVT
Shock-CPR-shock cycles, epinephrine 1mg IV q3-5mins, consider amiodarone 300mg IV bolus with 2nd dose 150mg IV
PEA/Asystole
CPR, airway support, IV access, epinephrine 1mg IV q3-5mins

*See detailed **ACLS algorithms** in a separate section

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 6. Heart & Stroke Foundation: ACLS provider manual – 2015.

Vascular Emergencies

Ruptured AAA

Risk factors: FHx, HTN, PVD/CAD, DM, connective tissue disease, smoking

AAA < 5cm	AAA 5 cm – 7 cm	AAA > 7 cm
0.3% risk of	10% risk of	20% risk of rupture/yr

Assessment

Classic Triad: acute onset back/abdo/flank pain + hypotension (with or without syncope) + pulsatile abdominal mass

Other presentations: syncope, UGIB/LGIB, high output CHF, ureteral colic, bowel obstruction symptoms

Tests: POCUS to detect AAA (>3cm), ECG, CT (for stable patient)

Management

General
ABCs, monitors, oxygen, vitals, IV access STAT vascular surgery consult
Resuscitation
IV crystalloids, blood - aim for systolic BP 90 – 100 mmHg Massive transfusion protocol
Urgent surgical intervention
Open surgery with graft replacement or endovascular aneurysm repair
Post-op Complications
Infection – graft contamination or hematogenous seeding **Ischemia** – SC ischemia, CVA, visceral ischemia **Aortoenteric fistula** – commonly present as GI bleeding **Endo Leak** – blood flow outside of the graft lumen

Acute Arterial Occlusion

Definition: acute embolus or arterial thrombosis, true emergency as irreversible damage can occur within 6-8 hours

Risk factors: atherosclerosis, MI with LV thrombus, AFib, valve stenosis, stent/grafts

Assessment

History (6Ps): pain, paresthesia, pallor, polar, pulselessness, paralysis (late finding)

Tests: Doppler probe to leg with proximal BP cuff – perfusion pressure <50mmHg, ABI < 0.5

Management

STAT vascular surgery consult
Immediate heparinization with 5000 IU bolus Revascularization vs. CT angiogram (depends on if emboli from Afib vs. secondary to PVD)

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 86+87. NEJM 2012; 366(23): 2198-2206. *BMJ* 2000; 320: 854-857.

Deep Vein Thrombosis and Pulmonary Embolism

Risk Factors: venous stasis (surgery or trauma), vessel injury (surgery or trauma), hypercoagulability (inherited thrombophilia, active malignancy, estrogen, prior PE/DVT)

Assessment

Modified Wells Criteria for DVT	Wells Criteria for PE
1 Active cancer **1** Paralysis, paresis or recent immobilization of lower limb **1** Bedridden > 3 days or major surgery in last 12 weeks **1** Tenderness along DV system **1** Entire leg swollen **1** Calf swelling 3 cm > asymp. side **1** Pitting edema in symptomatic leg **1** Superficial non-varicose veins **1** Previous DVT **-2** Alternative diagnosis **Results:** DVT unlikely = score ≤ 1 DVT likely = score ≥ 2	**3** Signs + symptoms of DVT **3** PE = #1 diagnosis **1.5** HR > 100 **1.5** Immobilization > 3 days OR surgery in last 4 weeks **1.5** Hx DVT/PE **1** Hemoptysis **1** Active cancer **Results:** Non-high risk = 0-4 points High risk = >4 points
How to interpret results from Wells Criteria	
DVT unlikely Order D-Dimer: if negative = no DVT If positive = obtain leg Doppler **DVT likely** Obtain leg Doppler	Non-high risk Order D-Dimer: if negative = no PE If positive = obtain CTPA High risk Obtain CTPA
PERC Rule	
Apply to patient where diagnosis of PE is being considered, but patient is deemed low-risk. If PERC negative AND clinician's pre-test probability is <15%, there is <2% chance of PE.	PERC negative if: Age<50, HR<100, SpO2<95%, no hemoptysis, no estrogen use, ho history of surgery/trauma, no prior PE/DVT, no present signs of DVT

Management

DVT
LMWH (warfarin bridge required) or fondaparinux Heparin infusion for patients with renal impairment Transition to oral anticoagulation x3-12 months
PE
Similar treatment as DVT tPA reserved for massive PE, cardiac arrest, extensive clot burden

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 88. J Thromb Haemost 2008; 6:772-80. NEJM 2003; 349(13):1227-35.

Gastrointestinal Bleeding

Risk Factors: medications (NSAIDs, anticoagulants), excessive vomiting, bleeding disorders, malignancy, alcohol use, ulcer history, H. pylori

Differential Diagnosis

Upper GI bleed (proximal to Ligament of Treitz)
Peptic ulcer disease (gastric > duodenal) Gastritis/esophagitis Esophageal varices Mallory-Weiss tears Gastric cancer
Lower GI bleed (distal to Ligament of Treitz)
Colitis (inflammatory, infectious, ischemic) Anorectal pathology (hemorrhoids, fissures, proctitis) Angiodysplasia Diverticulosis Malignancy

Assessment

History: blood quantity/quality, symptoms of anemia (fatigue, SOB, chest pain), Hx liver disease, medication review, smoking/EtOH, bleeding disorders, constitutional symptoms

Beware mimics: Pepto-Bismol, iron ingestion can cause dark stools

UGIB: hematemesis, coffee ground emesis, melena, BRBPR if brisk UGIB

LGIB: hematochezia, BRBPR

Physical: ABCs, vitals, inspect nasal-oral cavity, abdominal exam, DRE

Investigations

Labs: CBC, lytes, INR/PTT, BUN/Cr, lactate, VBG, T+S/T+C

Tests: ECG, CXR +/- CT if indicated for LGIB

Management

General
ABCs, monitors, oxygen, vitals, 2 large bore IVs, GI consult Intubate early if suspect unprotected airway or risk of aspiration Transfusion threshold: Hb < 70, Plt < 50, or hemodynamically unstable or with active bleeding
UGI Bleed
Pantoloc 80mg IV bolus then 8mg/h infusion Octreotide 50mcg IV bolus then 50mcg/h infusion – for suspected variceal bleeding Ceftriaxone 2g IV: for suspected variceal bleeds, prevention of SBP Tranexamic acid: hemodynamically unstable patients (no clear evidence) Balloon tamponade: crashing GI bleeding patient
LGI Bleed
NPO, IV fluids, manage underlying etiology (ie. Abx, steroids) Colonoscopy to evaluate cause of bleeding

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 30.

TIA and Stroke

Definition

ACA stroke
Leg > face/arm contralateral motor + sensory deficits Bowel and bladder incontinence Impaired judgement/insight
MCA stroke
Face/arm > leg contralateral motor + sensory deficits Contralateral hemianopia; gaze preference towards lesion Aphasia (dominant) or neglect (non-dominant)
PICA stroke (Wallenberg syndrome)
Pain/temperature loss on contralateral side + ipsilateral face Ipsilateral Horner's-like syndrome 4D's: dysphagia, diplopia, dysarthria, dysphonia
TIA
Transient episode of neuro dysfunction without acute infarction

Assessment

History: time of onset (usually abrupt, maximal), LOC (usually normal, non-significant decrease), focal symptoms, headache (pain more suggestive of hemorrhagic stroke or dissection)
Stroke mimics: seizure, migraine, syncope, metabolic derangements, sepsis, tumor, conversion disorder, Todd's paralysis
Physical Exam: Vitals, neuro (NIHSS scale), look for comorbidities
CV (dissection, arrhythmias, valvular pathology)
Labs: CBC, lytes, extended lytes, glucose, BUN, Cr, INR, PTT
Neuroimaging: acute stroke (CT/CTA immediately), low-risk TIAs (plain non-contrast CT head), high-risk TIAs (CTA head/neck)

Management

General
ABCs, monitors, oxygen, vitals, IV access +/- intubation (severe strokes) BP control: lower if HTN severe (>220/120), BP < 185/110 if giving tPA Consult neurology, admission to stroke unit
Antiplatelet therapy
TIA – start ASA TIA on ASA – dual antiplatelet therapy x 21 days Acute stroke – don't give acutely, start ASA daily once discharged
Thrombolytics
Alteplase given within 4.5 hours (ideal = 90 minutes) +/- Intra-arterial thrombectomy by IR (within 6 hours)
TIA management
Risk stratification, early CT angio of carotids +/- endarterectomy
Stroke prevention
Primary: stratify based on $CHADS_2$ (stroke), $ABCD_2$ (TIA), Rx ASA or DOACs Secondary: oral anticoagulation started 1-2 weeks post stroke

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 101. NEJM 1995; 333:1581-1588. AMJ Neuroradiol 2001; 22:1534-1542.

Diabetic Emergencies

Definitions

DKA	HHS
Predominantly Type 1 DM Insulin deficiency + stressor ↑ counter-regulatory hormone excess ↑inc lipolysis (ketoacidosis) and osmotic diuresis (dehydration) **Serum glucose:** > 16 mmol/L **Other labs:** HCO3 < 15 pH <7.3 **Onset**: hours to days **Features**: moderate dehydration, acidosis, often young	Predominantly Type 2 DM Relative insulin deficiency + stressor ↑counter-regulatory hormone excess ↑osmotic diuresis (dehydration) **Serum glucose**: > 30 mmol/L **Onset**: days to weeks **Features**: severe dehydration, hyper-osmolality, often elderly with AMS
Stressor (7 Is): infection, infarction, iatrogenic (change in insulin dose), incision (surgery), intoxication, initial (diagnosis), insulin (too little or none)	

Assessment

History: N/V, abdominal pain, polyuria/polydipsia, weakness, anorexia
Physical Exam: rapid, deep breathing (Kussmaul) respirations
Tachycardia, ileus, acetone breath

Investigations

Labs: glucose, urine/serum ketones, beta-hydroxybutyrate, CBC, lytes, extended lytes, glucose, BUN, Cr +/- cultures, cardiac enzymes (if indicated)

Management

Fluid resuscitation

NS 1-2 L over 1 hours
Change to D5$^{1}/_{2}$NS when BG < 16

Insulin

Short acting insulin Regular
Infusion of 0.1 U/kg/h (goal = lower BG by 4-5)
Once gap closed: continue infusion x 1hr but overlap + switch to sc insulin

Electrolyte replacement

Potassium
K < 3.3 mmol/L: hold insulin and give 40 mmol/L KCl
K 3.3 – 5 mmol/L: give 20-30 mmol/L KCl
K > 5 mmol/L: recheck K in 1-2 hours
Phosphate
Low phosphate can be replaced if severe levels or metabolic disturbances (muscle weakness, paralysis, rhabdomyolysis)
Sodium: Pseudohyponatremia common due to dilutional decrease

Disposition

Admission if: first time presentation, co-morbidities, unable to close gap, iatrogenic complications (ARDS, cerebral edema, fluid overload), or DKA/HHS due to stressors listed above (ie. need to manage MI or sepsis in hospital)
Education: diet, insulin administration, fluid replacement

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 118.

Sepsis

Definitions

Old Definitions (2012)	
SIRS	2 or more of: T < 36 or > 38.3 | HR > 90 | RR > 20 or CO2 < 32 | WBC < 4 or > 12
Sepsis	SIRS criteria + documented or suspected infection
Severe sepsis	Sepsis + end-organ dysfunction (high lactate, elevated Cr, low UOP, hepatic/marrow dysfunction)
Septic shock	Severe sepsis + tissue hypoperfusion despite fluid resuscitation
New Definitions (2016)	
Sepsis	Life threatening organ dysfunction caused by dysregulated response to infection

Assessment

History: associated symptoms, full review of systems, co-morbidities
Physical Exam: vitals, volume status, look for a focus

Investigations

Full septic workup: CBC, lytes, extended lytes, BUN/Cr, LFTs, VBG, lactate, INR/PTT, blood/urine C+S), ECG, CXR
RUSH exam: heart (PSL, 4 chamber), IVC view, Morrison's and splenorenal views, bladder window, aorta, pneumothorax

Management

General
Monitors, oxygen, vitals, 2 large bore IVs **3-hour recommendation (2016):** draw lactate, IVF, early antibiotics, send cultures **6-hour recommendation (2016)**: repeat lactate, fluid assessment, maintain MAP > 65
Resuscitation
Fluids: 1-2L NS IV bolus initially, then guided by clinical reassessment Vasopressors: if not fluid responsive, norepinephrine 2-12 mcg/min Steroids: if refractory to fluids + pressors, hydrocortisone 100mg IV
Antibiotics
Empiric treatment: Pip-Tazo 3.375g IV + Vancomycin 1g-1.5g IV Meningitic doses: Ceftriaxone 2g IV + Vancomycin 2g IV + dexamethasone 10mg IV +/- Acyclovir 1g IV (for HSV encephalitis)
Early goal-directed therapy
Not recommended anymore but first two targets important: *MAP >65 mmHg *UOP > 0.5 cc/kg/hr CVP 8-12 mmHg, $SvcO_2$ > 70%, HCT > 30%
Disposition
Admission to medicine for source control +/- ICU

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 6. NEJM 2001; 345(19): 1368-77. JAMA 2016; 315(8): 801-10. Crit Care Med 2017; 45(3): 486-552.

Electrolyte Disturbances

History: review of systems, neurologic symptoms (headache, lethargy, weakness, muscle cramps, dec LOC, personality changes), co-morbidities, infection, intake + losses, past history of electrolyte disturbances

Hyperkalemia: [K] > 5.5 mmol/L

Causes
Pseudohyperkalemia (#1), chronic renal failure, acute acidosis, medications* (ACEi, NSAIDs, K-sparing diuretics, digoxin, septra), cell death (rhabdo, burn/crush injuries, hemolysis, TLS)
ECG changes
Peaked T waves → PR prolongation → loss of P waves → widened QRS → sine wave
Management
Protect: 1 amp CaCl or 3 amps Ca gluconate (*if ECG changes noted) **Shift:** 1-2 amps D50W + 10 U R insulin, albuterol nebs +/- bicarbonate (if acidotic) **Excrete**: fluids, Lasix, PEG3350 +/- dialysis if critical K or unable to excrete

Hypokalemia: [K] < 3.5 mmol/L

Causes
Renal losses (diuretics), non-renal losses (vomiting, diarrhea), metabolic alkalosis
ECG changes
Loss of T waves → U waves → prolonged QT → TdP, VTach, Vfib
Management
Replace: KCl 10-20 mmol/hr IV or KCl 40-60 mmol po q2-4hrs HypoMg: $MgSO_4$ 500mg/h IV to ensure K being driven into cells

Hyponatremia: [Na] < 135 mmol/L

Causes
Hypo-osmolar most common - hypervolemic (CHF, cirrhosis, nephrotic syndrome), euvolemic (SIADH), hypovolemic (adrenal insufficiency, vomiting, diuretics)
Management
Known acute (<24-48h) [Na]<120 or symptomatic (dec LOC, focal neurological symptoms): max Na 8mmol/L in 24 h to prevent central pontine myelinolysis **Dose option**: IV 3% saline 100cc IV over 10 mins (if seizing)

Hypercalcemia: [Ca] > 2.6 (corrected for albumin)

Causes
Malignancy (breast, lung, kidney), hyperPTH, granulomatous diseases, medications (thiazides, Li, estrogen, vitamin A/D toxicity)
ECG changes
Short QT, ST elevation, bradyarrhythmias, AV block
Management
Bolus NS until normal perfusion, then infusion to 200cc/hr with goal of UOP 2L/day. Lasix to promote diuresis, bisphosphonates and calcitonin.

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed,

ENT Emergencies - Vertigo

Peripheral causes

Benign Paroxysmal Positional Vertigo (BPPV)
Short lived, positional, associated with nausea/vomiting No auditory symptoms (tinnitus or hearing loss)
Vestibular neuronitis
Sudden and severe vertigo, increasing intensity over hours, symptoms subside over days to weeks. Exposure to infection or toxins. No auditory symptoms
Labyrinthitis
Positional, co-existing ENT infection, +/- febrile/toxic appearance Auditory symptoms: mild to severe hearing loss
Meniere's disease
Recurrent episodes of sudden severe rotational vertigo, N/V, lasts hours. Auditory symptoms: tinnitus, hearing loss

Central causes: cerebellar hemorrhage, PICA stroke, head trauma, vertebrobasilar migraine, Multiple sclerosis, temporal lobe epilepsy

Assessment

Peripheral: sudden severe onset lasting seconds-minutes, horizontal/rotary nystagmus, worsened by position, auditory findings, NO neurological findings
Central: gradual onset, weeks to months, vertical nystagmus, may have neurological findings, NO auditory findings
Acute vestibular syndrome: acute onset + ONGOING vertigo >24hrs, N/V
Physical exam: gait/coordination, neuro exam, Dix-Hallpike (pc BPPV) or Roll Test (hc BPPV), HINTS exam (IF patient has AVS)

Dix-Hallpike test (diagnose posterior-canal BPPV)
Head turned 45^0 to one side while patient sitting. Patient moved to supine position with head hanging over edge of bed. Observe for nystagmus. Repeat with patient looking 45^0 in other direction.
Roll test (diagnose horizontal-canal BPPV)
Patient initially supine, head on bed. Turn head 90^0 to one side, observe for nystagmus. Repeat by straightening head and turning in the other direction.
HINTS exam (patients with AVS to differentiate vestibular neuronitis vs. posterior stroke)
Head Impulse: corrective saccade as examiner turns head to affected side is normal (ie. it is a peripheral cause) Nystagmus: vertical or down-beating nystagmus is abnormal (ie. central) Test of

Management

Peripheral
Epley's Manouver for BPPV, betahistine for Meniere's, Abx/steroids for vestibular neuronitis or labyrinthitis
Central
neuroimaging required, neuro consult + stroke management

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed,

ENT Emergencies

Epistaxis

Causes: trauma (nasal, digital, facial), URI, allergies, low humidity, polyps, foreign body, idiopathic causes (familial), systemic causes (atherosclerosis, anticoagulation, pregnancy, coagulopathies, diabetes, liver disease)

Assessment: visualize nares + oropharynx for active bleeding

Labs: CBC, INR/PTT +/- cross+type

Management

General
ABCs, vitals, volume assessment **Initial step**: compress cartilaginous part of nose x 20mins **Next step**: compress x 20 mins with lidocaine/epinephrine-soaked pledget +/- Silver nitrate if able to identify site +/- Consider TXA intranasally or IV
Anterior bleeds (90% Kesselbach's plexus)
Anterior packing: nasal tampon, rhino rockets or Vaseline gauze pack Apply anterior pack to active side first, if ineffective, pack both nares
Posterior bleeds
Epistat or foley catheter. Apply traction once inserted. Keflex x 5d course or until pack removal to prevent TSS

Pharyngitis

Etiology: **viruses (rhinovirus, adenovirus), bacterial (Group A Strep)**

Assessment

History: **odynophagia, URI symptoms, complications are rare (ie. rheumatic fever)**

Physical Exam: vitals, ABCs, red flags

Can't Miss Diagnoses
Peritonsillar abscess: muffled voice, uvular deviation Retropharyngeal abscess: drooling, airway compromise Tracheitis: may be confused with croup, stridor, labored breathing Epiglottits: fever, stridor, rapidly progressive swelling

Modified Centor Criteria	
Age **3-14 years old = +1** **15-44 years old = 0** **>44 years old = -1**	**Tonsillar exudates = + 1** **Tender anterior cervical lymph nodes = + 1** **Temp >38^{0}C = +1** **Absent cough = +1**

Management: fluids, antipyretics, single dose dexamethasone may reduce pain/duration.

Antibiotics reduce symptoms by 16 hours. They do NOT reduce incidence of suppurative complications.

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 23+72.

Urological Emergencies

Renal Colic

Risk factors: hereditary (RTA, G6PD deficiency, cystinuria, oxaluria), lifestyle (minimal fluid intake, excess vit C, oxalation, purines, calcium), meds (loop diuretics, acetazolamide, topiramate), medical conditions (UTI, IBD, gout, DM, hypercalcemia), obesity

Assessment

History: unilateral flank pain +/- radiating to groin, "writhing" in pain, N/V, trigonal irritation (frequency, urgency)
Physical Exam: vitals (fever, HR, RR), abdominal exam, CVA tenderness
Investigations: CBC, urinalysis, B-hCG (females)

CT
Vast majority do NOT need CT imaging Relative indications: first presentation of renal colic, elderly patients, suspicion of a serious alternative diagnosis
Ultrasound
Most helpful in detecting hydronephrosis (98% sensitivity)
KUB
Plain X-rays are neither sensitive or specific for detection of renal stones. KUB may be used to follow stone progression.

Management

General	IV NS if clinically dehydrated
N/V	Zofran 4-8mg IV
Analgesia	Morphine 2mg IV + ketorolac 30mg IM/IV or Naproxen 500mg po
MET	Tamsulosin 0.4mg po OD x3 weeks (large stone >4mm or distal stones)
Disposition	can be safely discharge with appropriate GP/urology follow-up
Urology consult	intractable pain, infected stone, compromised renal function (single kidney, transplanted kidney, bilateral obstruction)

UTI and Pyelonephritis

Causes: E. coli (85%), Klebsiella, Proteus, Saprophyticus

Assessment

History: UTI (frequency, urgency, dysuria, hematuria), pyelo (fever/chills, flank pain, N/V), associated vaginitis/cervicitis symptoms, sexual history
Investigations: Urine dipstick, urine R+M, urine C+S +/- CBC, BUN/Cr

Management

Uncomplicated UTI
Septra DS po BID x 3 days Macrobid 100mg BID x 5 days If suspected STI: Levofloxacin 500mg po daily x 1 week + CTX 250mg IM x1
Complicated UTI/Uncomplicated Pyelonephritis
Ciprofloxacin 500mg po BID or Septra DS po BID x 10-14 days Consider US/CT imaging for complicated UTI
Complicated Pyelonephritis
Ceftriaxone 1g IV q24h

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 99. NEJM 2014; 371(12):1100-10. Cochrane DB Syst Rev 2014;4:CD008509

Environmental Emergencies

Hypothermia (T < 35^0C)

Causes: inc heat loss (EtOH, environmental), dec thermogenesis (hypothyroidism, hypoglycemia, adrenal insufficiencies), impaired thermogenesis (toxins, CNS lesions, SC injury)

Risk factors: low SES, age extremes, drug OD, psych co-morbidities

Assessment

Mild (32^0 - 35^0C): excitation response (↑HR/BP/RR, +shivering)
Moderate (28^0 - 32^0C): physiologic slowing, NO shivering, AMS, ataxia
Severe (24^0 - 28^0C): dysrhythmias (brady>slow Afib>Vfib>asystole), irritable myocardium (avoid invasive heart procedures), fixed/dilated pupils

Investigations

Labs: CBC, lytes, BUN/Cr, VBG, lactate, INR/PTT, glucose
Tests: ECG (Osborne waves), pCXR (aspiration pneumonia, pulmonary edema)

Management

General
Monitors, O_2, IV access, vitals + rectal or foley temp, remove wet clothes
Cardiac arrest
Focus on rewarming Ensure NO pulse x 1 min then ACLS protocol (can try 1-3 shocks for Vfib)
Passive rewarming (T> 32^0C)
Cover patients with insulating blanket, let body generate heat
Active rewarming (T< 32^0C)
Warming blankets, radiant heat, place extremities in 45^0C water Non-invasive: warm IVF (42^0C), warm O_2 Invasive: heated irrigation (pleural, stomach, peritoneal, bladder), dialysis, ECMO

Heat Stroke (T > 40.5^0C)

***differentiated by heat exhaustion by AMS/elevated LFTs**

Classic/non-exertional: elderly, heat waves, indoors with no AC
Exertional: young athletes, runners

Assessment

Classic: dry/hot skin, not always dehydrated, HIGHER mortality
Exertional: diaphoretic skin, profound dehydration, more morbidities (liver failure, renal failure, DIC, lactic acidosis)

Management

General	
Monitors, cooled IV fluids, rapid evaporative cooling Antipyretics NOT effective (as not a hypothalamus problem, can also make DIC/liver failure worse)	
Treat symptoms	
Shivering: midazolam 2mg IV Seizures: Lorazepam 2mg IV	Rhabdomyolysis: IVF, Lasix, $NaHCO_3$ Hyperkalemia: protect, shift, eliminate

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 138+139.

Common Fractures

Assessment

History: mechanism of injury, associated neurological symptoms, blood loss

Exam: ABCs +vitals, look + feel, active and passive ROM, neurovascular status, assess bleeding/open fractures, complications of compartment syndrome, examine joint above and below fracture

Investigations: radiographs as clinically indicated, use decision rules for ankle/foot/knee to guide your assessment

General Management

Provide adequate analgesia with foundation (Tylenol + Advil) and opiods
Reduce and immobilize as appropriate. Repeat imaging and neurovascular status post reduction.
Appropriate ortho/plaster clinic follow-up

Upper Limb

Colle's fracture: FOOSH. Distal radial fracture with dorsal displacement.

Exam: "dinner fork deformity"

Management: reduction to restore radial length and correct dorsal angulation

Scaphoid fracture: 15-40yo with FOOSH. High complication rate (5-40% with AVN/non-union).

Exam: limited wrist/thumb ROM, snuff box tenderness, axial loading of 1st MC, pain to scaphoid tubercle volarly

Management: thumb spica splint for suspected fractures (even if negative XR) x 6-12 weeks, repeat imaging in 10 days.

Proximal humeral fracture: high energy trauma (young), FOOSH (elderly).

Management: minimally displaced (closed reduction with sling immobilization), anatomic neck fractures or displaced (ORIF)

Boxer's fracture: blow on distal-dorsal aspect of closed fist. Angulation of neck of 5th metacarpal into palm.

Management: Closed reduction if angulation >40^{0}. If stable, ulnar gutter splint for 4-6 weeks.

Lower Limb

Ankle fracture: inversion/eversion injury. Risk-stratification based on Weber's classification.

Management: non-operative (Non-WB BK cast), operative (most of Weber Type B/all Type C)

Jones fracture: Stress injury. Midshaft 5th MT fracture. High incidence of non-union.

Management: Non-WB BK cast x 6 weeks.

Hip fracture: direct force to hip, fall (elderly), rotational force

Exam: shortened and externally rotated leg, painful ROM

Management: based on Garden classification. Elderly usually get hemi-/total hip arthroplasty. Young adults get ORIF.

Key References: Rosen's Emergency Medicine: Concepts and Clinical Practice – 8th ed, 2014; Chapter 51+58.

Toxicology

Differential Diagnosis

"Hot and Crazy" (DIMES)
Drug-related: sympathomimetics (cocaine, amphetamines, caffeine, PCP, **k**etamine), anticholinergics, ASA, SS/NMS/MH, EtOH withdrawal **I**nfection: meningitis, encephalitis, sepsis **M**etabolic: hypoglycemia, uremia, electrolytes, thyrotoxicosis, pheo **E**nvironmental: heat stroke **S**tructural: ICH
"Low and slow" (ABCDO)
ADHD tablets (clonidine) **B**eta-blockers **C**alcium-channel blockers **D**igoxin **O**piates/Organophosphates

Common Toxidromes

Anticholinergics	
Vitals: hyperthermia, tachycardia **Signs:** mydriasis, dry skin **Symptoms:** agitation, hallucination, constipation, urinary retention "dry as a bone, red as a beet, blind as a bat, mad as a hatter, hot as a hare"	Antidepressants Antihistamines Antipsychotics Antispasmodics Atropine Carbamazepine
Cholinergics	
Vitals: hypotension, bradycardia **Signs:** miosis, diaphoresis, seizures **Symptoms:** urination, bronchospasm, vomiting, diarrhea	Organophosphates Nerve gas Mushroom Anticholinesterase
Sympathomimetics	
Vitals: hyperthermia, tachycardia, HTN **Signs:** mydriasis, diaphoresis, seizures **Symptoms:** agitation, anxiety	Amphetamines Cocaine LSD Ephedrine
Sedative/Hypnotics	
Vitals: hypothermia, hypotension, bradypnea **Signs:** respiratory depression, miosis (opioids), altered LOC	EtOH, BZDs, GHB Opioids (morphine, heroin, fentanyl) Barbiturates

Basic Approach (ABCDE

Airway	Intubate early if impending airway compromise
Breathing	Think metabolic derangements if low RR
Circulation	Ensure patient is well perfused
Detect and correct	Consider universal antidotes (dextrose, oxygen, naloxone, thiamine), correct vitals, correct signs (ie. seizure), consider decontamination/enhanced elimination
Emergency antidotes	Specific antidotes and treatments

Drugs and Dosages

Analgesia

Acetaminophen 325mg or 500mg tablets (max 4g daily)
Ibuprofen 200mg tablets (max 2400mg daily) Naproxen 250mg tablets (max 1250mg daily) Morphine 0.1-0.2mg/kg (max 15mg IV q4h)

Procedural sedation

Propofol 0.25-1mg/kg IV
Ketamine 1mg/kg (often used in conjunction with propfol)
Fentanyl 0.5-1 mcg/kg IV
Midazolam 50mcg/kg IV (often used in conjunction with fentanyl)

Antiemetics

Dimenhydrinate 50-100mg PO/PR/IM/IV (max 400mg daily)
Ondansetron 4-8mg PO/IV (max 16mg daily)
Haldol 0.5-2mg PO/IV

Anaphylaxis

Epinephrine 0.3mL (1:1000) IM anterolateral thigh
Diphenhydramine 50mg IV
Ranitidine 50mg IV
Methylprednisolone 125mg IV
Glucagon 1mg IV/IM

Anxiolytics/Anticonvulsants

Lorazepam 0.5-2mg po/IM/IV q6h or 4mg IV q5min (status epilepticus)
Phenytoin 20mg/kg IV at 25-50 mg/min (call neuro) Phenobarbital 20mg/kg IV at 50mg/min (call neuro)

ACLS drugs

Adenosine 6mg IV rapid push over 3 seconds, repeat at 12mg IV
Amiodarone 150mg over 10 mins x2, infusion 1mg/min x 6hrs then 0.5mg/min x 18hrs
Atropine 0.5-1mg IV push (max 0.04mg/kg or 3mg)
Diltiazem 0.25mg/kg slow IV push over 2 mins
Epinephrine 1mg IV q3-5mins (no max)
Epinephrine drip 2-10mcg/min
Dopamine drip 2-10mcg/min
Lidocaine 1 mg/kg (max dose 3mg/kg)
Magnesium 1-2g IV push
Procainamide 20-30mg/min (max 17mg/kg) then 1-4mg/min infusion
Sodium bicarb 1mEq/kg IV, repeat at half dose in 10 mins

Clinical Decision Rules

Ottawa Ankle Rules

Inclusion Criteria	Exclusion Criteria
Adult patient (has ALSO been validated in pediatrics), any mechanism of blunt ankle injury	Age < 18, pregnant, isolated skin injury, injury older than 10 days, reassessment of same injury
Ankle X-ray only required if	
Bony tenderness at posterior edge/tip of lateral OR medial malleolus OR inability to take 4 complete steps in ED	
Foot XR only required if	
bony tenderness at base of 5th MT OR navicular OR inability to take 4 complete steps in ED	

Ottawa Knee Rules

Inclusion Criteria	Exclusion Criteria
Adult patient, blunt knee injury, "knee" = patella, head/neck of fibula, proximal 8cm of tibia and distal 8cm of femur	Age < 18, pregnant, isolated skin injury, injury older than 7 days, return for reassessment, AMS, paraplegic, multi-trauma
Knee X-ray only required if	
Age > 55 OR isolated patellar tenderness OR fibular head tenderness OR inability to flex 90^{0}C OR inability to take 4 complete steps in ED	

Canadian CT Head Rule for Minor Head Injury

Inclusion Criteria	Exclusion Criteria
Head injury resulting in witnessed LOC/disorientation or definite amnesia; initial ED GCS > 13; injury within 24hrs	Minimal head injury, obvious penetrating skull injury, acute neurological deficits, unstable vital signs assoc. with major trauma, seizure prior to ED assessment, bleeding disorder, pregnant
High risk criteria (for neurological intervention)	
GCS < 15 at 2hrs after injury, suspected open or depressed skull fracture, signs of basal skull fracture, vomiting > 2 episodes, age > 65	
Medium risk criteria (for brain injury on CT)	
Amnesia before impact >30 mins, dangerous mechanism	

Ottawa SAH Rule

Inclusion Criteria	Exclusion Criteria
Alert patients >15yo, new severe atraumatic headache, max intensity within 1 hour	New neurological deficits, prior aneurysm, prior SAH, known brain tumors, chronic recurrent headaches (>3 headaches of same character/intensity for >6 months)
CT is indicated if any criteria are present	
Neck pain/stiffness, witnessed LOC, age > 40, onset during exertion, thunderclap headache, limited neck flexion on examination	

Key References: BMJ 2010; 341:c5204. Ann Emerg Med 1992; 21(4):384-390. Ann Emerg Med 1995; 26(4):405-413. Lancet 2001; 357(9266):1391-6.

Risk Stratification Scales

Canadian Syncope Risk Score

Inclusion Criteria	Exclusion Criteria	
Age>16, present to ED with syncope within 24 hours	Prolonged (>5min) LOC, AMS, witnessed seizure, major trauma, intoxication, language barrier, head trauma	
Clinical Evaluation	**Investigations**	**ED Diagnosis**
-1 Vasovagal Predisposition +1 Hx heart disease +2 sBP<90 or sBP>180	+2 Elevated TnI +1 QRS axis <-30^0 or >100^0 +1 QRS >130ms +2 Corrected QT>480ms	-2 Vasovagal syncope +2 Cardiac syncope
Interpretation	Total score = -3 to 11 Score of 0 = 1.9% risk of serious adverse event within 30d Score of 11 = 83.6% risk of serious adverse event within 30d	

Ottawa Heart Failure Risk Scale

Inclusion Criteria	Exclusion Criteria	
Age>50, symptoms consistent with CHFe (acute SOB, fluid retention, underlying cardiac abnormality) and/or response to diuretics	O_2 < 85%, HR>120, sBP<90, confusion, ischemic chest pain, acute STEMI on ECG, prognosis of weeks (due to chronic disease), arrival from LTC	
Initial Assessment	**Investigations**	**Walk Test**
+1 Hx of stroke or TIA +2 Hx of intubation for respiratory distress +2 HR > 110 on ED arrival +1 SaO_2 < 90% on EMS or ED arrival	+2 STEMI on ECG +1 BUN>12mmol/L +2 HCO_3>35mmol/L +2 Elevated TnI +1 ProBNP>5mcg/L	+1 SaO_2<90%, HR>110 during 3-min walk test, or too ill to walk
Interpretation	Total score = 0 to 15 Score of 0 = 2.8% risk of serious adverse event within 14d Score of 9 = 89% risk of serious adverse event within 14d	

Ottawa TIA Risk Score

Inclusion Criteria	Exclusion Criteria	
Age>18, ED diagnosis of TIA	Confirmed stroke, decreased LOC, presentation >7days following onset of most recent TIA	
Clinical Findings		**Investigations**
+2 First TIA (in lifetime) +2 Symptoms >10min +2 History of carotid stenosis +3 Already on antiplatelet therapy +1 History of gait disturbance +1 History of unilateral weakness -3 History of vertigo +3 Initial triage diastolic BP >110 mmHg +1 Dysarthria or aphasia (history of examination)		+2 Afib on ECG +1 New or old infarction on CT +2 Platelet count >400 +3 Glucose >15
Interpretation	Total score = -3 to 14 Score of 0 = 0.04% risk of stroke within 7d Score of 14 = 27.6% risk of stroke within 7d	

Key References: CMAJ 2016; 188(12):E289-298. AEM 2017; 24(3):316-327. Stroke 2014; 45(1):92-100.

ACLS

Electrical Cardioversion

Indications
Paroxysmal SVT **Atrial fibrillation/Atrial flutter** **Ventricular Tachycardia**
Pre-medication
Midazolam 1-5mg +/- fentanyl 50-200mcg **Propofol 50-150mg IV** **Ketamine 0.25-1.5mg/kg IV** **Etomidate 20mg IV**
Synchronized Cardioversion
pSVT/Aflutter: 150J biphasic or 300J monophasic **Vtach/Afib: 200J biphasic or 360J monophasic**

Atrial Fibrillation or Atrial Flutter

General
Assess ABCs if stable, monitors, O_2, vitals, IV access, ECG
Unstable Chest pain, SOB, LOC, low BP, CHF, AMI
Cardioversion (200J biphasic or 360J monophasic)
Stable
1 Rate control if HR>120
Narrow complex: Diltiazem 20mg IV or Verapamil 2.5-5mg IV or Metoprolol 5mg IV or Amiodarone 150mg over 10 mins or Digoxin 0.5mg IV **Wide complex (WPW or BBB):** Procainamide 30mg/min to 17mg/kg or Amiodarone 150mg over 10mins
2 Rhythm control
Afib < 48 hours: electrical cardioversion or pharmacological cardioversion (procainamide, amiodarone) **Afib > 48 hours:** anticoagulate x 3 weeks prior to and 4 weeks after cardioversion. Alternatively long-term rate control with beta-blockers or CCB

Ventricular Fibrillation/Pulseless Ventricular Tachycardia

General
Intubate, ventilation, early IV/IO access to administer medications Treat reversible causes: hypovolemia, hypoxia, acidosis, hyper/hypokalemia, hypothermia, toxins, ischemia
Shock-CPR-Shock Cycles
1 Shock first (200J biphasic or 360J monophasic) **If defibrillator not immediately available start CPR** then shock ASAP 2 High quality CPR for 2 min Push hard (2-2.4 inches) and fast (100-120/min), complete chest recoil, minimize interruptions, avoid excessive ventilations (10/min), change compressors q2min, monitor end-tidal CO_2 3 Shock
Drugs provided during CPR
Epinephrine: 1mg IV q3-5min **Amiodarone:** 300mg IV bolus (preferred), 150mg IV (2^{nd} dose) **Lidocaine** for refractory VF: 1.5mg/kg IV q3-5min (max 3mg/kg) **Magnesium sulfate** for polymorphic VT: 2g IV

ACLS

Wide Complex Tachycardia (85-95% = VT)

General
Assess ABCs if stable, monitors, O_2, vitals, IV access, ECG, CXR
Unstable **Chest pain, SOB, LOC, low BP, CHF, AMI**
Prepare for synchronized cardioversion (200J biphasic or 360J monophasic) Consider premedication
Stable **Consider cardioversion as meds only revert VT 30% of the time**
Procainamide: 20-50mg/min (max 17mg/kg) **Amiodarone**: 150mg over 10 mins (repeat x2 PRN) **Magnesium sulfate** for polymorphic VT: 2g IV *Avoid multiple antidysrhythmics sequentially (to prevent proarrhythmogenic effects). If one fails, go to electrical cardioversion.

Paroxysmal Supraventricular Tachycardia (AVnRT, AVRT)

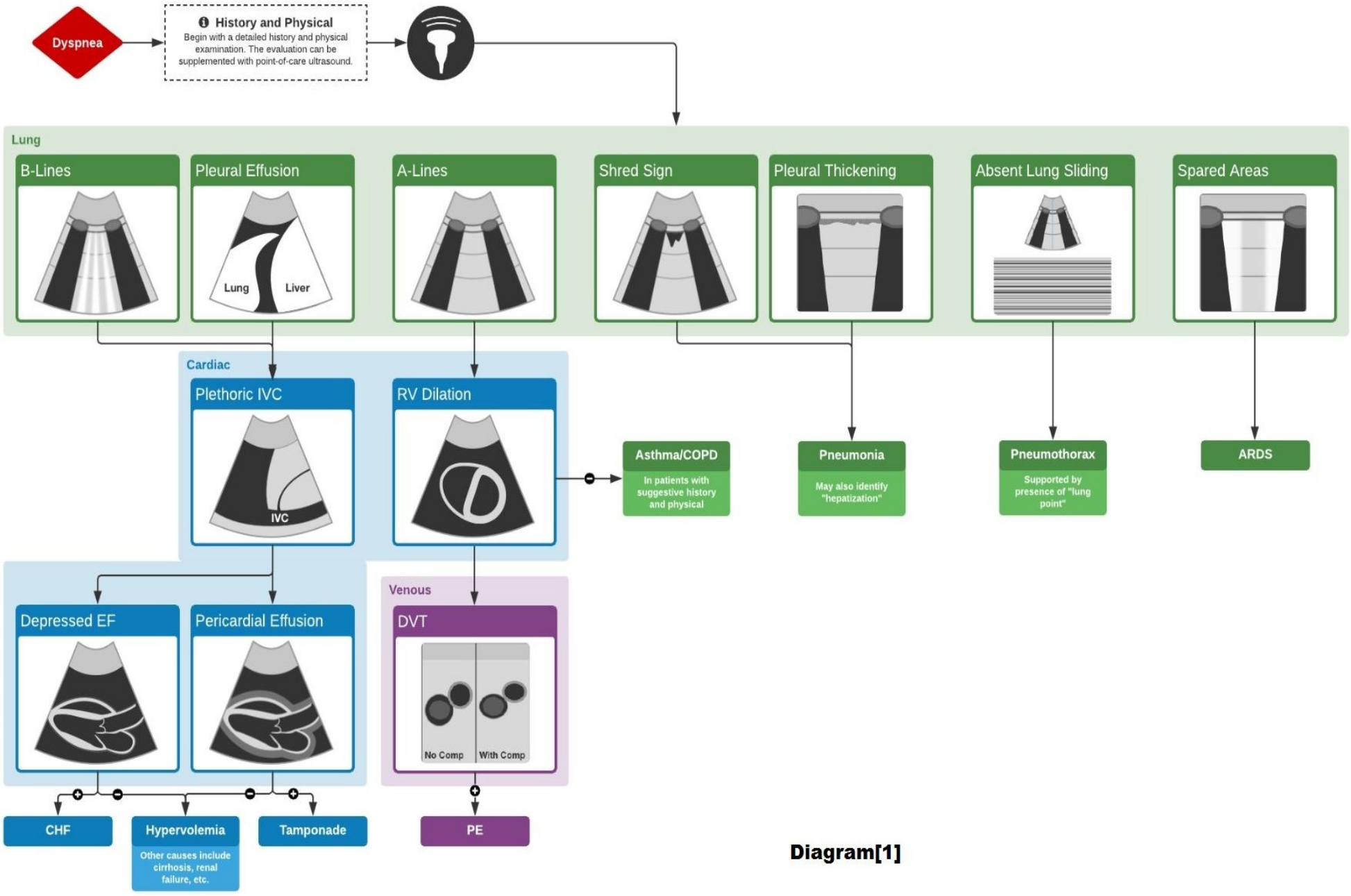
Unstable **Chest pain, SOB, LOC, low BP, CHF, AMI**
Synchronized cardioversion (150J biphasic or 300J monophasic) Consider premedication
Stable
Vagal manoeuvres **Adenosine:** 6mg IV over 3 secs (1st dose), 12mg IV (2nd dose) **Diltiazem:** 20mg IV over 2 min (1st dose), 25mg IV (2nd dose) **Metoprolol:** 5mg IV (max 15mg) **Verapamil:** 2.5-5mg IV over 2 min, repeat 5-10mg in 10 mins

Pulseless Electrical Activity or Asystole

General
Intubate, ventilation, early IV/IO access to administer medications, POCUS
Management
1 Ongoing CPR **2** Treat reversible causes: **5Hs** (hypovolemia, hypoxia, hydrogen acidosis, hyper/hypokalemia, hypothermia) and **5Ts** (toxins, tamponade, tension pneumothorax, thrombosis – coronary, thrombosis – pulmonary) **3** Epinephrine 1mg IV q3-5mins

Bradycardia (HR < 60)

General
ABCs, monitors, O_2, vitals, IV access
Unstable **Chest pain, SOB, LOC, low BP, CHF, AMI**
Atropine 0.5mg q3-5min (max 3mg) – Not effective for 3^0 heart block Transcutaneous pacing Transvenous pacing Consider infusions: Dopamine 2-10 mcg/kg/min OR Epinephrine 2-10 mcg/min
Stable
1^0 AV block or Type I 2^0 AV block: Observe Type II 2^0 AV block or 3^0 AV block: transcutaneous pacing trans venous pacing


Dyspnea
History and Physical
Begin with a detailed history and physical examination. The evaluation can be supplemented with point-of-care ultrasound.
Lung
B-Lines
Pleural Effusion
Lung
Liver
A-Lines
Shred Sign
Pleural Thickening
Absent Lung Sliding
Spared Areas
Cardiac
Plethoric IVC
IVC
RV Dilation
Asthma/COPD
In patients with suggestive history and physical
Pneumonia
May also identify "hepatization"
Pneumothorax
Supported by presence of "lung point"
ARDS
Depressed EF
Pericardial Effusion
Venous
DVT
No Comp
With Comp
CHF
Hypervolemia
Other causes include cirrhosis, renal failure, etc.
Tamponade
PE

Diagram[1]

Diagram [2]

Initial therapy for all patients
- Remove wet garments
- Protect against heat loss and wind chill (use blankets and insulating equipment)
- Maintain horizontal position
- Avoid rough movement and excess activity
- Monitor core temperature
- Monitor cardiac rhythm[1]

Assess responsiveness, breathing, and pulse

Pulse and breathing present

What is core temperature?

34°C to 36°C (mild hypothermia)
- Passive rewarming
- Active external rewarming

30°C to 34°C (moderate hypothermia)
- Passive rewarming
- Active external rewarming of truncal areas only[1,3]

<30°C (severe hypothermia)
- Active internal rewarming sequence (see below)

Active internal rewarming[2]
- Warm IV fluids (43°C)
- Warm, humid ***oxygen*** (42°C to 46°C)
- Peritoneal lavage (KCl-free fluid)
- Extracorporeal rewarming
- Esophageal rewarming tubes[4]

Continue internal rewarming until
- Core temperature >35°C or
- Return of spontaneous circulation or
- Resuscitative efforts cease

Pulse or breathing absent
- Start CPR
- ***Defibrillate*** VF/pulseless VT up to a **maximum** of 3 shocks (200 J, 200 to 300 J, 360 J or per AED; see VF/VT algorithm and AED algorithm)
- Attempt, confirm, secure airway
- Ventilate with warm, humid ***oxygen*** (42°C to 46°C)[2]
- Establish IV access
- Infuse warm normal saline (43°C)[2]

What is core temperature?

<30°C
- Continue CPR
- Withhold IV medications
- Limit shocks for VF/VT to maximum of 3
- Transport to hospital

>30°C
- Continue CPR
- Give IV medications as indicated (but space at longer than standard intervals)
- Repeat defibrillation for VF/VT as core temperature rises

Notes:
1. This may require needle electrodes through the skin.
2. Many experts think these interventions should be done only in-hospital, though practice varies.
3. Methods include electric or charcoal warming devices, hot water bottles, heating pads, radiant heat sources, and warming beds.
4. Esophageal rewarming tubes are widely used internationally and are expected to become available in the United States.

Diagram[3]

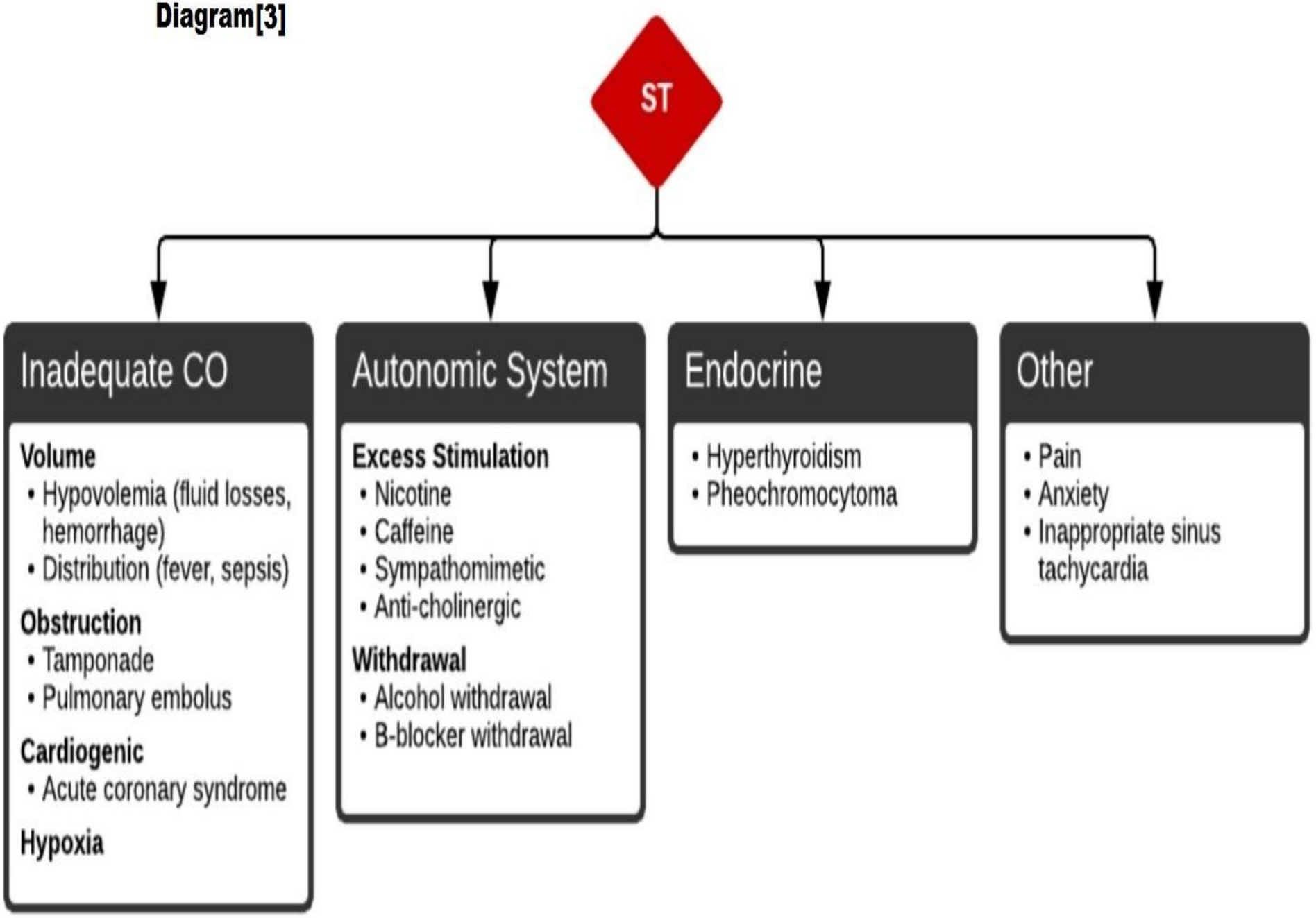

ST
Inadequate CO
Volume
• Hypovolemia (fluid losses, hemorrhage)
• Distribution (fever, sepsis)
Obstruction
• Tamponade
• Pulmonary embolus
Cardiogenic
• Acute coronary syndrome
Hypoxia
Autonomic System
Excess Stimulation
• Nicotine
• Caffeine
• Sympathomimetic
• Anti-cholinergic
Withdrawal
• Alcohol withdrawal
• B-blocker withdrawal
Endocrine
• Hyperthyroidism
• Pheochromocytoma
Other
• Pain
• Anxiety
• Inappropriate sinus tachycardia

Diagram [4]

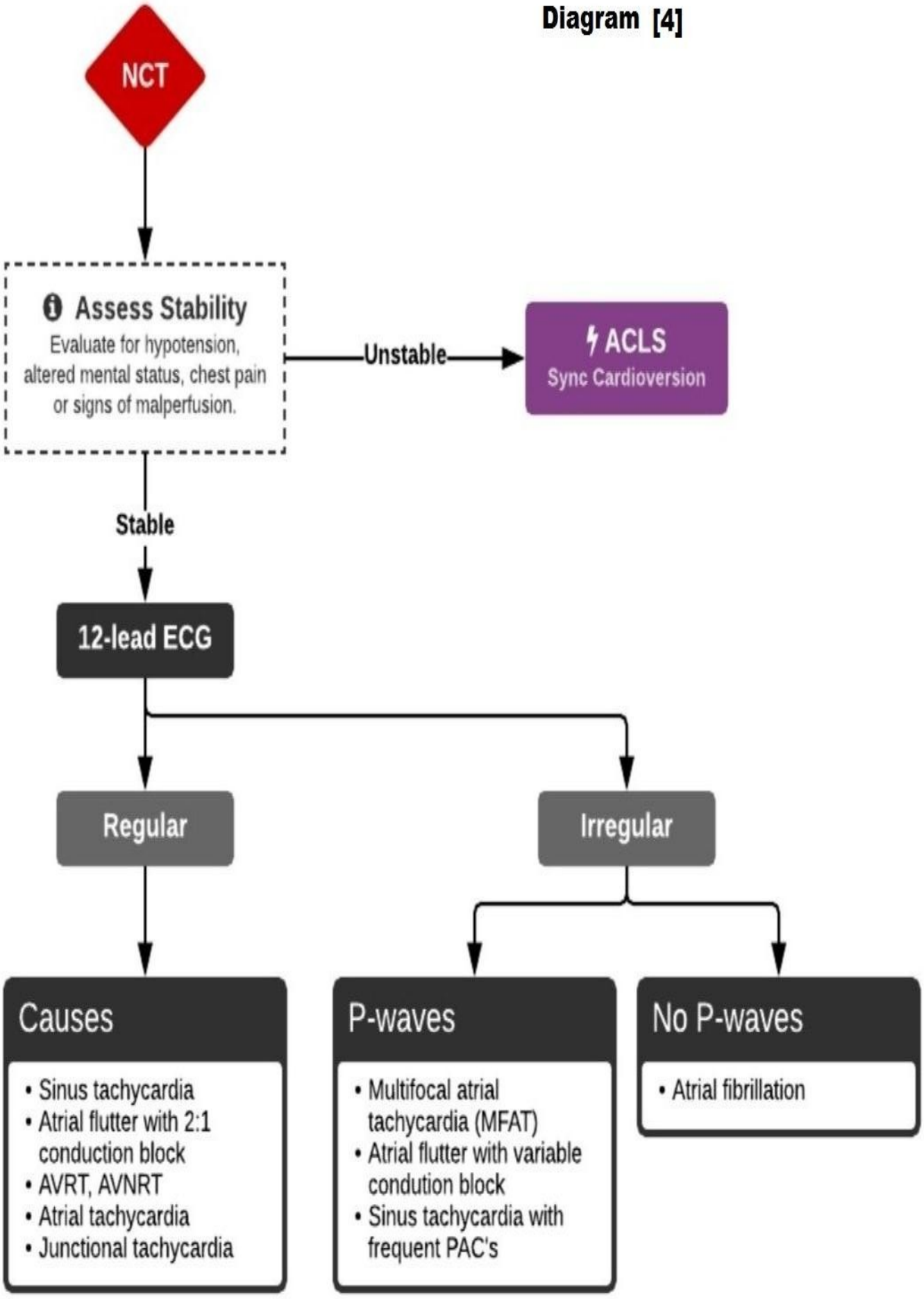

NCT
Assess Stability
Evaluate for hypotension, altered mental status, chest pain or signs of malperfusion.
Unstable
ACLS
Sync Cardioversion
Stable
12-lead ECG
Regular
Irregular
Causes
• Sinus tachycardia
• Atrial flutter with 2:1 conduction block
• AVRT, AVNRT
• Atrial tachycardia
• Junctional tachycardia
P-waves
• Multifocal atrial tachycardia (MFAT)
• Atrial flutter with variable condution block
• Sinus tachycardia with frequent PAC's
No P-waves
• Atrial fibrillation

Diagram [5]

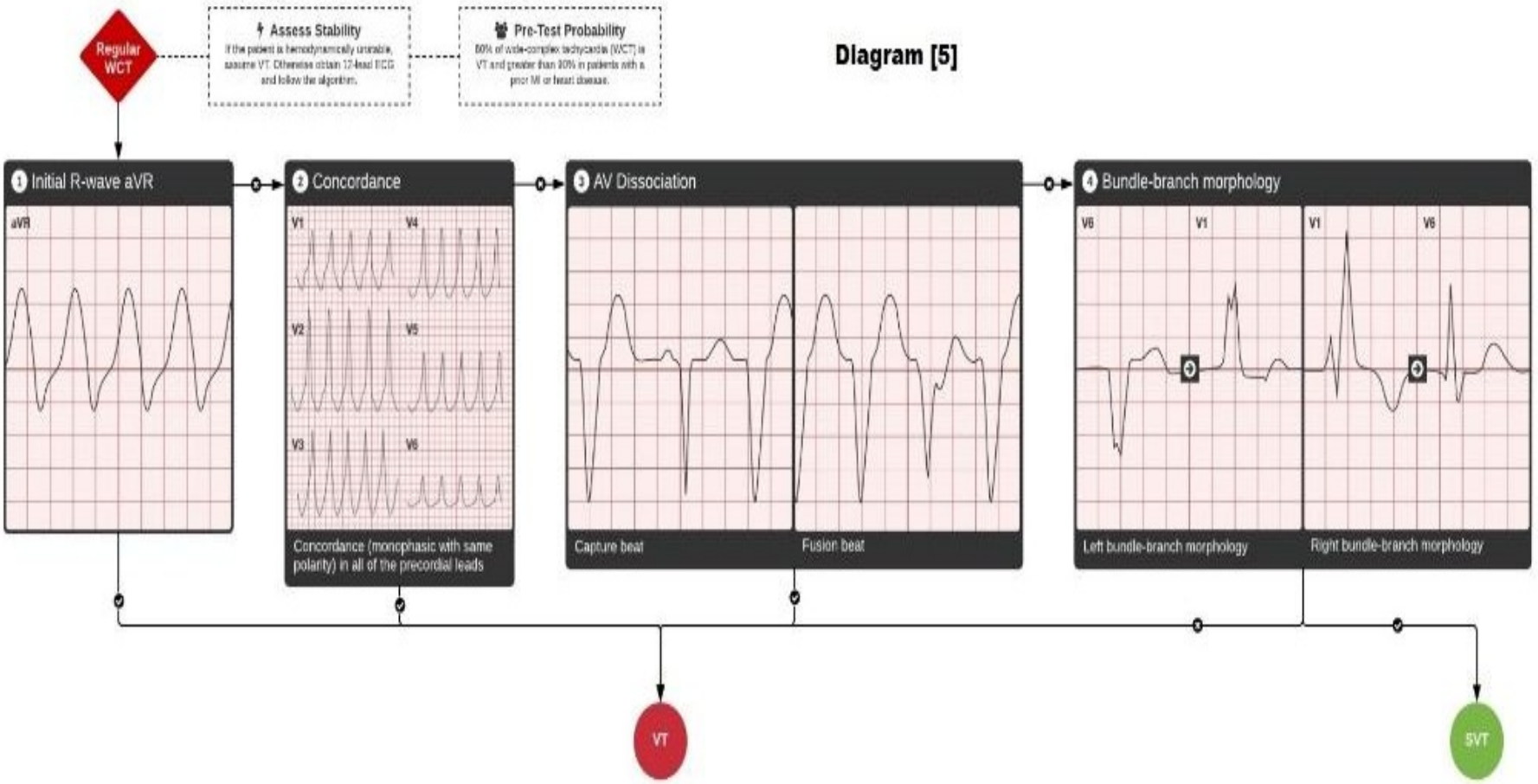
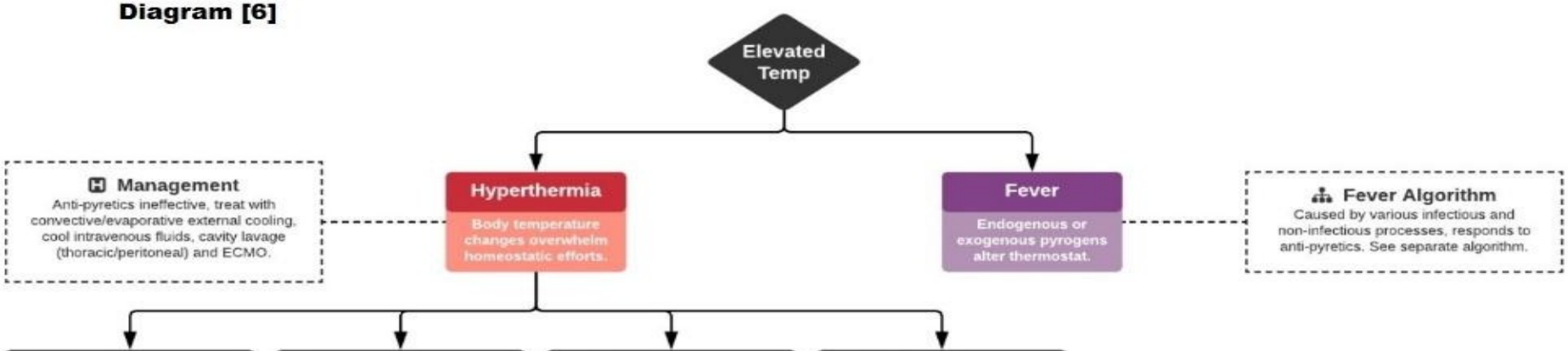

Regular WCT
Assess Stability
If the patient is hemodynamically unstable, assume VT. Otherwise obtain 12-lead ECG and follow the algorithm.
Pre-Test Probability
80% of wide-complex tachycardia (WCT) is VT and greater than 90% in patients with a prior MI or heart disease.
1 Initial R-wave aVR
aVR
2 Concordance
V1
V4
V2
V5
V3
V6
Concordance (monophasic with same polarity) in all of the precordial leads
3 AV Dissociation
Capture beat
Fusion beat
4 Bundle-branch morphology
V6
V1
V1
V6
Left bundle-branch morphology
Right bundle-branch morphology
VT
SVT

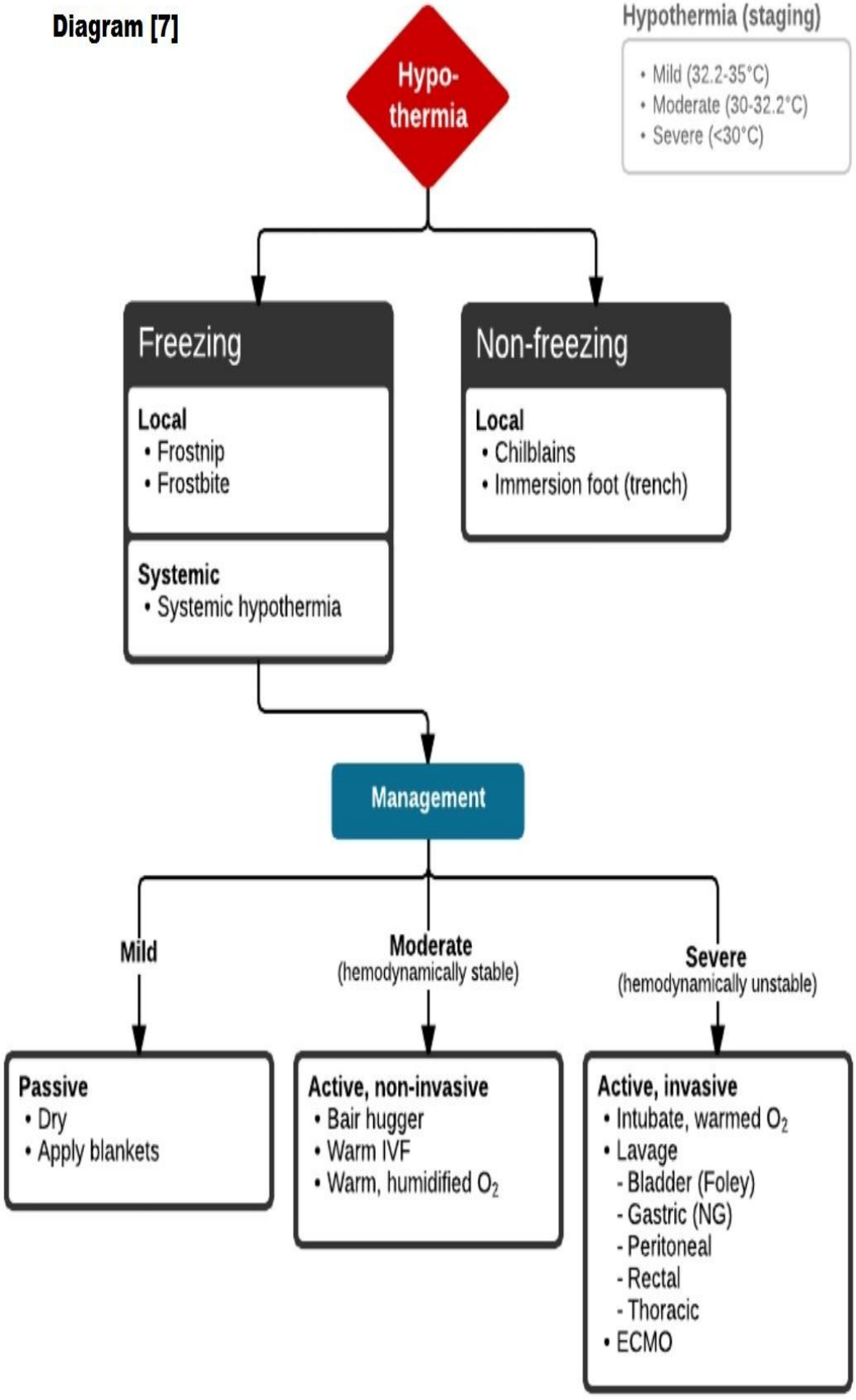
Diagram [6]



Drug-induced Hyperthermic Syndromes

Condition	NMS	Serotonin Syndrome	Malignant Hyperthermia
Medication History	Dopamine agonist	Proserotonergic drug	Inhaled anesthetic, Succ.
Time to Onset	1-3 days	<12h	30min
Muscle Tone	Lead-pipe rigidity	Increased (LE)	Rigor-mortis rigidity
Reflexes	Decreased	Increased, Clonus	Decreased
Mental Status	Stupor, Coma	Agitation	Agitation
Pupils	Normal	Dilated	Normal
Mucosa	Sialorrhea	Sialorrhea	Normal
Bowel Sounds	Normal, Decreased	Hyperactive	Decreased
Treatment	± Dantrolene, Bromocriptine	Benzo, Cyproheptadine	Dantrolene

Diagram [7]


Hypothermia (staging)
• Mild (32.2-35°C)
• Moderate (30-32.2°C)
• Severe (<30°C)
Hypo-thermia
Freezing
Local
• Frostnip
• Frostbite
Systemic
• Systemic hypothermia
Non-freezing
Local
• Chilblains
• Immersion foot (trench)
Management
Mild
Moderate
(hemodynamically stable)
Severe
(hemodynamically unstable)
Passive
• Dry
• Apply blankets
Active, non-invasive
• Bair hugger
• Warm IVF
• Warm, humidified O_2
Active, invasive
• Intubate, warmed O_2
• Lavage
- Bladder (Foley)
- Gastric (NG)
- Peritoneal
- Rectal
- Thoracic
• ECMO

جمهورية العراق
وزارة الصحة
مديرية العمليات والخدمات الطبية
قسم طب الطوارئ

Founded 1920 تأسست
Iraqi Ministry of Health
وزارة الصحة العراقية

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الدكتورة الاستشارية هند محمود السيلاني
الدكتور الاختصاص مروان زكريا يحي
الدكتور الاختصاص نصرت شاكر

جمهورية العراق
وزارة الصحة
مديرية العمليات
والخدمات الطبية
قسم طب الطوارئ

الدليل العلمي لطب الطوارئ 2023