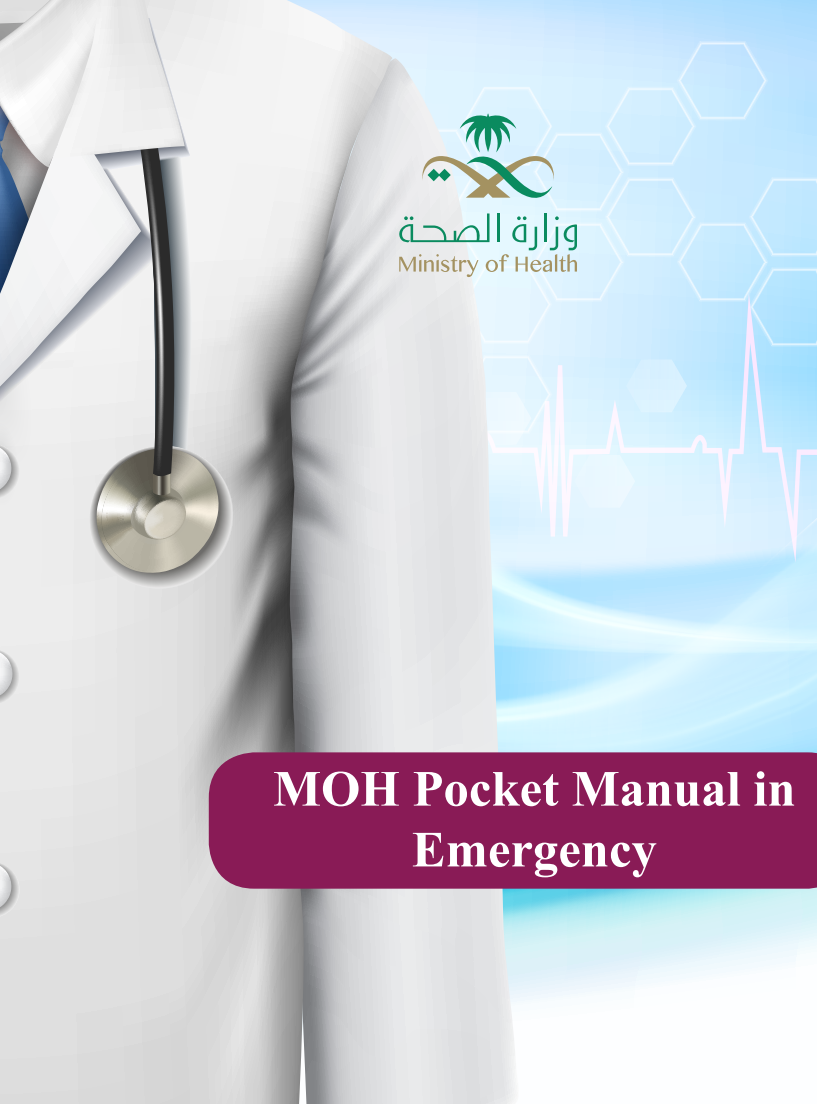


MOH Pocket Manual in Emergency

Contents

Contents

CRADIAC EMERGENCY

Acute ST Elevation and Non

ST Elevation Myocardial Infarction

Overview

Acute coronary syndrome involves:

1. ST elevation acute myocardial infarction
2. Non–ST-segment elevation acute myocardial infarction
3. Unstable angina (UA).

Acute ST elevation myocardial infarction typically occurs when a clot leads to complete occlusion of a coronary artery with trans mural , or full thickness myocardial infarction .

The ECG will show ST segment elevation in the involved area of the heart.

Non–ST-segment elevation acute coronary syndromes (NSTE-ACS) refers to a disease process characterized by reduced coronary blood flow resulting in coronary ischemia without ST-segment elevations on an electrocardiogram (ECG).

NSTE-ACS include both non–ST-segment elevation acute myocardial infarction (MI), as defined by positive biomarkers for MI, and unstable angina (UA), as defined by negative biomarkers.

Clinical Presentation

- History
  - Chest pain, when it started, what it feels like (stabbing, crushing, pressure, aching), and if it radiates to other parts of the body.
  - Jaw/shoulder/ neck/arm pain.
  - Dizziness, nausea.
  - Shortness of breath.

- Physical Examination
  - Hemodynamic stability, signs of heart failure/left ventricular dysfunction.
  - Exclusion of noncardiac and nonischemic cardiac causes requires a thorough examination of the patient's chest wall—including inspection and palpation—as well as careful examination of cardiac and pulmonary functions.

Differential diagnosis

- Heart

Acute coronary syndrome
Pericarditis
Myocarditis
Endocarditis
Valvular disease

- Lungs

Pulmonary embolus
Pneumothorax
Pneumonia
Empyema
Hemothorax
COPD

- Esophagus

Esophagitis
GERD
Spasm
Foreign body
Rupture (Boerhaave's)
Esophegeal Tear

- Work up
  - CBC.
  - Electrolytes.
  - Coagulation studies.
  - Cardiac enzymes.
  - ECG.
  - Cardiac biomarkers.

Management

○ Prehospital Care:

- Three goals:

(1) Delivering patients to an appropriate health care facility as quickly as possible.

(2) Preventing sudden death and controlling arrhythmias by using acute cardiac life support (ACLS) protocol when necessary.

(3) Initiating or continuing management of patients during inter-facility transport.

- Checklist to get from the EMS team includes the following information:

1. The person who initiated EMS involvement (patient, family, bystander, transferring hospital) and why.

2. Complaints at the scene.

3. Initial vital signs and physical examination results, as well as notable changes.

4. Therapies given prior to arrival and the patient's response.

5. ECGs done at an outside hospital or en route, noting the context in which notable ECGs were printed.

6. The patient's code status (if known).

7. Family contacts for supplemental information and family members who may be on their way to the ED, as they may be helpful in completing or verifying the history.

In hospital care for STEMI:

- Assess and stabilize airway, breathing, and circulation.
- Do ECG.
- Provide oxygen; attach cardiac and oxygen saturation monitors; establish IV access.
- Treat arrhythmia rapidly according to ACLS protocols.
- Give aspirin 162 to 325 mg (non-enteric coated), to be chewed and swallowed (allergy to aspirin is an absolute contraindication) .
- Give three sublingual nitroglycerin tablets (0.4 mg) one at a time, spaced five minutes apart if patient has persistent chest discomfort, hypertension, or signs of heart failure and there is no sign of hemodynamic compromise and no use of phosphodiesterase inhibitors, inferior MI with right ventricular extension.
- Give morphine sulfate (2 to 4 mg slow IV push every 5 to 15 minutes) for persistent discomfort or anxiety.

Select reperfusion strategy:

- Primary percutaneous coronary intervention (PCI) strongly preferred, especially for patients with cardiogenic shock, heart failure, late presentation, or contraindications to fibrinolysis.
- Treat with fibrinolysis if PCI unavailable within 90-120 minutes, symptoms <12 hours, and no contraindications
- Give antiplatelet therapy (in addition to aspirin) to all patients:
    - ❖ Patients treated with fibrinolytic therapy: Give clopidogrel loading dose 300 mg if age less than 75 years; if age 75 years or older, give loading dose of 75 mg.
- Give anticoagulant therapy to all patients:
- Unfractionated heparin:

-For patients undergoing primary PCI, we suggest an initial intravenous (IV) bolus of 50 to 70 units/kg up to a maximum of 5000 units.

-For patients treated with fibrinolysis, we suggest an IV bolus of 60 to 100 units/kg up to a maximum of 4000 units and for patients treated with medical therapy (no reperfusion) an IV bolus

of 50 to 70 units/kg up to a maximum of 5000 units.

-Both should be followed by an IV drip of 12 units/kg per hour (goal aPTT time of 1.5 to 2 times control or approximately 50 to 75 seconds).

Disposition

- Admit to ICU

In hospital care for NSTEMI:

o Management

- High-risk patient:

:"Early "invasive-

1. Discuss with cardiology.
2. Clopidogrel 300 mg or GPIIb/IIIa inhibitor.
3. Prompt PCI.

- Not high-risk patient:

-Early "conservative":

Clopidogrel 300 mg.

Disposition

- Admit to ICU.

o Alert

- Sudden onset of severe pain.
- Occurring during exercise.
- Lasting longer than 15 minutes.
- Associated with shortness of breath.
- Nausea/vomiting and sweating.
- Radiation to left arm or jaw.
- In case of inferior myocardial infarction , you must do Right side and Posterior ECGs to rule out Right ventricular or Posterior MI .

Atrial Fibrillation: Management Strategies

Overview

- Cardiac causes:
  - Mitral valve disease.
  - Myocardial disease.
  - Conduction system disorders.
  - Wolff-Parkinson-White syndrome.
  - Pericardial disease.

Conditions associated with AF include:

- Thyrotoxicosis.
- Hypothermia.
- Alcohol use.
- Severe infection.
- Hypoxia.
- Pulmonary emboli.
- Pneumonia.
- Kidney disease.
- Obesity.
- Diabetes mellitus.
- Digoxin toxicity.
- Electrolyte abnormalities.
- Intrathoracic surgery, such as cardiac or pulmonary surgery, or invasive cardiac studies.

Atrial Fibrillation is categorized as follows:

- First detected episode.
- Recurrent (after two or more episodes).
- Paroxysmal (if recurrent AF terminates spontaneously).
- Persistent (if sustained beyond 7 days).

Clinical Presentation

- History
  - Anxiety, palpitations, shortness of breath, dizziness, chest pain, or generalized fatigue.
  - Medications and alcohol and drug use.

Physical Examination

- Vital signs.
- Oxygen saturation.
- Evidence of thyroid disease (eg, exophthalmos and enlarged thyroid).
- Evidence of deep vein thrombosis/pulmonary embolus (e.g., unilateral lower extremity swelling or tenderness).
- The cardiac evaluation: rate, rhythm, and the presence of heart murmurs.

Differential diagnosis

Rhythm	Atrial Frequency, beats/min	Ventricular Frequency, beats/min	P-wave
Sinus tachycar- dia	100-180	100-180	Precedes every QRS complex
Atrial fibrillation	400-600	irregu- ,60-190 larly irregular	Absent
Atrial flutter	250-350	regu- ,75-150 lar, sometimes alternating block	Sawtooth
Atrioven- tricular nodal reentrant tachycar- dia	180-250	180-250	In QRS complex ((R
Atrial tachycar- dia	120-250	75-250	Precedes QRS; P-wave differs from sinus P- wave
Multifo- cal atrial tachycar- dia	100 <	100 <	or more dif- 3 ferent P-wave morphologies at different rates

Atrial fibrillation with Wolff-Parkinson-White syndrome	400-600	with ,180-300 wide, bizarre QRS complexes	Absent

Work up

- Electrocardiogram.
- Complete blood cell count.
- Metabolic panel.
- Hepatic function panel.
- Coagulation studies.
- A thyroid panel.
- Chest radiography.

Management

- Prehospital Care:
  - Cardioversion considered if the patient exhibits signs of hemodynamic compromise or poor coronary artery perfusion.

- In hospital care:
  - ❖ Unstable Patients: as :
    - Altered mental status.
    - Ischemic chest discomfort.
    - Acute heart failure.
    - Hypotension.
    - Signs of shock or hemodynamic compromise.

- Immediate direct current cardioversion:
  - 200 J biphasic.
  - 200-360 J monophasic.
  - Can consider lower energy for atrial flutter.
  - Anticipate failure.

o If no success repeats direct current cardioversion:

- Increase energy level.
- Consider anterior-posterior pad placement for biphasic defibrillators.
- Time with patient's respiratory cycle, shock during full expiration.

❖ Stable Patients:

If Suspicion for accessory pathway?

- Wide, bizarre QRS complexes.
- Ventricular rate > 250 bpm.
- History of Wolff-Parkinson-White syndrome.
- Prior ECG with delta wave.

o Give: Amiodarone.

If No suspicious of accessory pathway:

- Diltiazem < 0.2 mg/kg slow IV bolus or 2.5 mg/min drip up to 50 mg total.

Or

- Amiodarone: 150 mg over the FIRST 10 minutes (15

mg/min) followed by 360 mg over the NEXT 6 hours (1 mg/min) then 540 mg over the REMAINING 18 hours (0.5 mg/min).

- Beta blockers as :

Esmolol 0.5 mg/kg over one min loading dose then 0.06-0.2 mg / kg/ min

Metoprolol 2.5 -5 mg bolus over 2 min , up to 3 doses.

o Disposition

- Admission of new-onset AF only for patients with de-compensated heart failure or myocardial ischemia or for patients who are highly symptomatic and in whom adequate rate control cannot be achieved.

- Follow your hospital policy of admission .

- Alert

- Palpitations during exertion or palpitations with associated syncope or pre-syncope.
- ECG abnormalities.
- Family history of sudden cardiac death or with a first-degree relative affected by an inheritable heart condition.
- Cardioversion needs procedural sedation and analgesia.

Bradydysrhythmias

Overview

Categories of Bradydysrhythmias

Bradydysrhythmia Category	Bradydysrhythmia Type
Sinus node dysfunction	• Sinus bradycardia • Sinus arrest • Tachy-brady syndrome • Chronotropic incompetence
AV blocks	• First-degree AV block • Second-degree AV block (Mobitz type I or Wenckebach) • Second-degree AV block (Mobitz type II) • Third-degree AV block (complete heart block)

Clinical Presentation

History

Assessing the History of the Patient with Bradydysrhythmia

History	Possible Underlying Pathology
Preceding angina symptoms	Myocardial ischemia/infarction
Fevers, travel to endemic areas, tick bite	Infectious agent
Cold intolerance, weight gain, increased fatigue	Hypothyroidism
Headache, mental status change, recent head trauma, falls	Intracranial causes, including intracranial hemorrhage
Abdominal pain or distention	Intra-abdominal hemorrhage
Recent additions or changes to medications	Drug toxicity
History of end-stage renal disease, receiving dialysis	Hyperkalemia

Cancer history, receiving treatment	Acute or long-term toxicity from chemotherapeutic agents
Severe pain, anxiety, strong emotion preceding the event	Vasovagal reflex, neurocardiogenic

Physical Examination

- Perfusion can be confirmed with the identification of strong peripheral pulses, brisk capillary refill, and warm extremities.
- Evidence of heart failure may be suggested by lower-extremity edema, elevated jugular venous distention, or rales in the lower lung fields.

o Differential diagnosis

Category	Disease Process
Ischemia and infarction	Inferior myocardial infarction, especially involving the right coronary artery
Neurocardiogenic or reflex-mediated	Vasovagal reflex Hypersensitive carotid sinus syndrome Intra-abdominal hemorrhage Increased intracranial pressure
Metabolic, endocrine, and environmental	Hypothyroidism Hyperkalemia Hypothermia
Infectious and postinfectious	Chagas disease (Trypanosoma cruzi) Lyme disease (Borrelia species) Viral agents (parvovirus B19, coxsackievirus B, etc) Syphilis (Treponema pallidum)
Toxicologic	Therapeutic doses of prescribed drugs, overdoses of drugs, or poisoning

Work up

- Electrolyte levels, especially potassium.
- A drug level should be obtained on all patients who are currently taking digoxin.
- Thyroid function testing.
- Cardiac biomarkers.
- CT of the head.
- Chest x-ray.

Management

o Prehospital Care:

- Maintain patent airway; assist breathing as necessary.
- Oxygen (if hypoxemic).
- Cardiac monitor to identify rhythm.
- Monitor blood pressure and oximetry.
- IV access.
- 12-lead ECG, if available.

- Looking for evidence of hemodynamic instability, including hypotension and altered mentation.
- Treated in the field and en route to the ED by protocols and procedures based on the Advanced Cardiac Life Support (ACLS) algorithm.

In hospital:

o The Unstable Patient:

- Airway control, oxygen administration, and ventilatory assistance.

- Atropine administration remains the first-line medication for unstable and symptomatic patients with bradydysrhythmias:

-The recommended dose is 0.5 mg intravenously every 3 to 5 minutes, with a maximum dose of 3 mg.

- If atropine administration has been ineffective, a beta-adrenergic agent (such as dopamine, epinephrine, or isoproterenol) should be considered.

- Dopamine infusion should be initiated at 2 to 10 mcg/kg/min in patients who have failed to improve with atropine.

Or

- Epinephrine I V infusion 2 to 10 mcg/min .

- Pacing should be initiated in unstable patients who have not responded to atropine or beta-adrenergic agents.

The Stable Patient:

- Identify the underlying etiology of the bradydysrhythmia.

Drug or Toxin	Specific Antidotes and Therapies for Toxicological Causes of BradydysrhythmiasAntidote or Therapy
Beta blockers	Glucagon: 5 mg IV; can be repeated every 10 min, up to 3 doses
Calcium channel blockers	Calcium gluconate 10%, 30 to 60 cc IV - Insulin (regular): 1 unit/kg bolus + 0.5 - units/kg/h infusion; supplement glucose as needed
Digitalis (digoxin	Digoxin immune Fab (Digibind® or DigiFab®): empirically, 10-20 vials (if serum digoxin level is available, product insert can be (used for more exact dosing guide
Opioids	Naloxone: 0.4 mg IV, then 2 mg IV if no response
Organophosphates	Atropine: 2 mg IV; double every 3-5 min until pulmonary secretions are manageable
	Pralidoxime (2-PAM): 2 g IV over 10-15 min, repeated every 6 h

Disposition

- Symptomatic bradydysrhythmias are admitted.
- Unstable patient admitted to ICU.

Hypertension

Overview

Definitions of Hypertension

Hypertensive emergency

Blood pressure > 140/90 mm Hg with impending or progressive

Target organ dysfunction

Hypertensive urgency

Blood pressure > 180/120 mm Hg without impending or progressive

Target organ dysfunction

Hypertensive crisis

A hypertensive emergency or urgency

Mean arterial pressure

Average blood pressure reading over 1 cardiac cycle; can be

calculated

As [systolic blood pressure + (2 x diastolic blood pressure)] ÷ 3

Essential hypertension

Hypertension without a specific secondary cause

Secondary hypertension

Hypertension related to an underlying pathologic process, e.g., adrenal disease; renal disease; or drug effects, interactions, or withdrawal.

Clinical Presentation

History

Key Questions Regarding History of the Present Illness

Question Comments/Concerns

- Have you ever been told you have high blood pressure?

Open-ended, inclusive question; many people do not think they have high blood pressure if they are taking—or have in the past taken—medication for it.

- Do you have any chest pain?

Myocardial infarction, aortic dissection

- Do you have any shortness of breath?

Myocardial infarction, aortic dissection, pulmonary edema, heart failure

- Are you on any medications, or are you using any recreational drugs or herbal medicines? Neuroleptic malignant syndrome; serotonin syndrome; cocaine, phencyclidine, or other sympathomimetic.

- Have you recently stopped taking any medications or recreational drugs or herbal medicines?

Delirium tremens, clonidine and other drug withdrawal

- Have you had any focal weakness, slurring of speech, numbness, or clumsiness?

Stroke, transient ischemic attack, intracranial hemorrhage

- Do you snore or wake up during sleep? Do you feel tired throughout the day? Obstructive sleep apnea

- Have you had high blood pressure in the past that has not responded to multiple medications?

Physical Examination

- Vital signs should be checked and rechecked, including pulses and BPs in all extremities.
- A funduscopic examination.
- Checking the thyroid and reflexes.
- A complete cardiopulmonary examination is critical for establishing the patient's baseline, and an abdominal examination should assess for evidence of an aortic aneurysm.
- The neurologic examination.

Differential Diagnosis

- Stroke.
- Aortic dissection.
- Drug intoxication: cocaine, amphetamine, monoamine oxidase inhibitor.
- Drug withdrawal: antihypertensive, alcohol, sedative hypnotics.
- Renal failure.
- Pheochromocytoma or other.

- Tumor.
- Thyroid storm.

Work up

- Complete blood cell count.
- Serum chemistry.
- Electrocardiogram.
- Chest radiograph.
- Urine drug screen.
- Urinalysis.
- Pregnancy test.

o Management

o Prehospital Care

- Evaluated for signs or symptoms of end-organ damage.
- History, including the medications.

In hospital care:

Asymptomatic Patients with BP Less Than 180/110 mm Hg:

-Patients with BP measurements less than 180/110 mm Hg with no signs of End organ damage ,do not need to be treated in the ED

-Instead, these patients should follow up with a primary care provider within 1 week.

Patients with BP Over 180/110 mm Hg and a History Of

Hypertension on Antihypertensive Medications:

-If these patients have missed their medications, they may be restarted on the drugs.

-Efforts should be made to ensure that the barriers that prevented the patient from taking the medications are addressed.

-For those patients who are compliant with their medications but still have an elevated BP, adjustments must be made.

Asymptomatic Patients with BP Over 180/110 mm Hg and No History of Hypertension:

-In this scenario, patients should be started on antihypertensive medication (no need to aggressive lowering of BP) , and regular follow-up in OPD clinic .

Parenteral Drugs for Treatment of Hypertensive Emergencies:

Drug	Dose	Onset of Action	Duration of Action	Adverse Effects	Special Indications
Vasodilators					
Sodium nitroprusside	0.25-10 µg/kg/min as IV infusion	Immediate	1-2 min	Nausea, vomiting, muscle twitching, sweating, thiocynate and cyanide intoxication. May increase intracranial pressure	Most hypertensive emergencies; caution with high intracranial pressure or azotemia

Nicardipine hydrochloride (not in the MOH formulary)	5-15 mg/h IV	5-10 min	15-30 min, may exceed 4 hrs	Tachycardia, headache, flushing, local phlebitis	Most hypertensive emergencies except acute heart failure; caution with coronary ischemia
	0.1-0.3 µg/kg/min IV infusion	< 5 min	30 min	Tachycardia, headache, nausea, flushing	Most hypertensive emergencies; caution with glaucoma

Nitro-glycerin	5-100 µg/min as IV infu-sion	2-5 min	5-10 min	Headache, vomiting, methemo-globin-emia, tolerance with prolonged use	Coro-nary isch-emia
Enala-prilat (not in the MOH formu-lary)	1.25–5 mg every 6 hrs IV	15-30 min	6-12 hrs	Precipi-tous fall in pressure in high-renin states; variable response	Acute left ven-tricu-lar fail-ure; avoid in acute myo-car-dial in-farc-tion

Hydralazine hydrochloride	10-20 mg IV 10-40 mg IM	10-20 min IV 20–30 min IM	1-4 hrs IV 4-6 hrs IM	Tachycardia, flushing, headache, vomiting, aggravation of angina	Eclampsia
Adrenergic Inhibitors					
Labetalol hydrochloride	20-80 mg IV bolus every 10 min 0.5-2.0 mg/min IV infusion	5-10 min	3-6 hrs	Vomiting, scalp tingling, bronchoconstriction, dizziness, nausea, heart block, orthostatic hypotension	Most hypertensive emergencies except acute heart failure

Esmolol hydrochloride	250–500 µg/kg/ min IV bolus, then 50–100 µg/kg/min by infusion; may repeat bolus after 5 min or increase infusion to 300 µg/min	1-2 min	10-30 min	Hypotension, nausea, asthma, first-degree heart block, heart failure	Aortic dissection, perioperative
Phentolamine	5–15 mg IV bolus	1-2 min	10-30 min	Tachycardia, flushing, headache	Catecholamine excess

Outpatient Oral Medications for Hypertension Management:

Agent	Starting Dose	Maximum Useful Dosage	Indication	Contraindication
Thiazide diuretics (eg, hydrochlorothiazide)	12.5 mg daily	25 mg daily	Drug of choice for uncomplicated hypertension1; works well with other agents	Gout, , hypokalemia, hypercalcemia
ACE inhibitor (eg, fosinopril, lisinopril)	5-10 mg daily	40 mg daily	Patients with CHF, diabetes, previous MI with low ejection fraction	Bilateral renal artery stenosis; hypovolemia

Angioten-sin receptor blockers (eg, losartan)	25-50 mg daily	100mg daily	Similar efficacy to ACE inhibitors; used for patients who cannot toler-ate these inhibitors or in addi-tion to them	Bilateral renal artery stenosis; hy-povolemia

β-Blockers (eg, metoprolol)	25-50 mg bid	200 mg bid	Patients with coronary artery disease; longterm management of CHF; rate control; hyperthyroidism	Not a good monotherapy for lone hypertension; heart block; bradycardia; sick sinus syndrome; bronchospasm; acute decompensated CHF exacerbation

Calcium channel blockers (eg, diltiazem)	180-240 mg Daily	360-540 mg daily (formulation dependent)	Rate control or coronary artery disease in patients who cannot take β-blockers	Not a good monotherapy for lone hypertension; long-acting agents are safer than short-acting agents; heart block; bradycardia; acute decompensated CHF exacerbation; sick sinus syndrome
a-2 Agonist (eg, clonidine)	0.1 mg bid	0.3 mg tid	Hypertension resistant to other modalities	Poor adherence to medical regimen

Hydralazine (unknown mechanism of vasodilation)	10 mg 4 qid	100 mg tid	Hypertension associated with pregnancy; hypertension associated with CHF in African Americans resistant to other modalities	Coronary artery disease

Disposition

- If the BP is greater than 200/120 mm Hg ,oral antihypertensive therapy should be started. For BP greater than 180/110, follow-up should occur within 1 week. If prompt follow-up cannot be ensured, then further consideration for BP treatment or titration of existing BP medications should be given.

- For BP greater than 140/90 mm Hg, follow-up within one week is recommended.

- Patients with hypertensive emergencies admitted to the intensive care unit after receiving titratable IV antihypertensive agents.

Acute aortic emergency

Overview

Acute aortic syndrome is defined as three related conditions:

(1) Aortic dissection.

(2) Intramural hematoma.

(3) Penetrating atherosclerotic ulcer.

Aortic dissection is defined as:

- Acute if it occurs within 2 weeks of the onset of symptoms.
- Subacute if it occurs between 2 and 6 weeks.
- Chronic if it occurs more than 6 weeks from the onset of pain. (Some authors describe aortic dissections > 2 weeks as chronic).

Two main anatomic classification systems for aortic dissections :that are defined based on the involvement of the proximal aorta

(1) The DeBakey classification.

(2) The Stanford classification.

In the DeBakey classification, there are 3 types.

- Type I originates in the ascending aorta and extends into the aortic arch and descending aorta.
- Type II is confined only to the ascending aorta.
- Type III originates in the descending thoracic aorta and is further subdivided into
  - type IIIa, which is limited to the descending thoracic aorta.
  - type IIIb, which extends below the diaphragm.

The proximal aorta is defined as the aorta proximal to the brachio-cephalic artery; the descending aorta is defined as the aorta distal to the left subclavian artery.

In the Stanford classification system, aortic dissection is defined .according to whether the ascending aorta is involved or not

- Stanford type A dissections involve the ascending aorta (similar to DeBakey type I and II).
- Stanford type B dissections involve the descending aorta (similar to DeBakey type III).

Clinical Presentation

- History

- Time of onset.
- Symptoms.
- location of pain especially in the (chest, back, or abdomen),
- Character of pain.
- Radiation of pain.
- Alleviating or aggravating factors.
- Other associated symptoms.
- Past medical history.
- History of long-standing hypertension.
- Previous cardiac surgery.
- Previous aortic pathology.
- Medications.
- Information about allergies to intravenous iodinated contrast.
- Family history.
- Social history.

Physical Examination

- Hypertensive (49%), normotensive (35%), hypotensive (8%), or in shock (8%).
- Pulse deficit.
- The pulmonary examination.
- Cardiac examination: new murmurs, distant heart sounds, jugular venous distension, and tachycardia.
- Neurological findings.
- Mesenteric ischemia.
- Syncope.

Differential diagnosis

- Aortic Regurgitation.
- Aortic Stenosis.
- Cardiac Tamponade.
- Cardiogenic Shock.
- Cardiomyopathy.

- Cerebrovascular Accident.
- Gastrointestinal Bleed.
- Hemorrhagic Shock.
- Hypovolemic Shock.
- Hiatal Hernia.
- Hypertensive Urgency.
- Mediastinitis.
- Myocardial Infarction.
- Myocarditis.
- Pancreatitis.
- Pericarditis.
- Pleural Effusion.
- Pneumonia.
- Pulmonary Embolism.
- Thoracic Outlet Syndrome.

- Work up

- Ultrasound.
- CT.
- MRI.
- Conventional Aortography/Angiography.
- CBC.
- Electrolytes.
- Coagulation studies.
- BLLOD GROUPING & CROSS MATCHING.
- Cardiac enzymes.
- LFT'S.
- Pancreatic enzymes.
- Urinalysis.
- ECG.

Management

o Prehospital Care:

- Rapidly transporting them to the appropriate facility.
- Transported via advanced life support.
- Intravenous access.
- Cardiac monitor.
- Supplemental oxygen.
- Intravenous fluids should be given if the patient is hypotensive.
- Close monitoring of vital signs.

In hospital care:

- A target heart rate of < 60 beats/min and a systolic blood pressure between 100 and 120 mm Hg are recommended to prevent progression of dissection.
- Intravenous narcotics titrated to pain control.
- Intravenous beta-blockers administered first.

Options include propranolol, metoprolol, labetalol, or esmolol.

- Esmolol has the advantage of a very short half-life, while labetalol is an alpha- and beta-receptor antagonist and may be more effective in controlling both heart rate and blood pressure as a single agent.

- Patients with contraindications to beta-blockers (eg, severe asthma, chronic obstructive pulmonary disease, acute congestive heart failure, or cocaine toxicity) should be given intravenous calcium-channel blockers such as verapamil or diltiazem.

- In cocaine toxicity, intravenous benzodiazepines should be given to decrease the sympathetic drive.

- To further reduce blood pressure, intravenous vasodilator (not used alone).

Medication	Dosage	Comments
Beta blockers (recommended as first-line treatment; target heart rate < 60 beats/min		
Esmolol Beta 1-receptor blocker	Bolus 500 mcg/kg IV, then infusion at 50-200 mcg/kg/min	Preferable due to short half-life and easy titration; may be preferred inasthma/COPD
Labetalol Alpha 1-, beta 1-, and beta 2-receptor blocker	10-20 mg IV push q10min up to 300 mg maximum; infusion 0.5-2.0 mg/min	May be used as a single agent
Metoprolol Beta 1-receptor blocker	5 mg IV q5min up to 15 mg maximum	No IV infusion available
Propranolol Beta 1-, beta 2-receptor blocker	1 mg IV q5 min up to 0.15 mg/kg maximum	No IV infusion available
Calcium-channel blockers (target heart rate < 60 beats/min)		

Diltiazem	Bolus 0.2-0.25 mg/kg IV, then infusion 5-15 mg/.hr	Second-line for heart rate control when beta blockers are contraindicated (e.g., cocaine toxicity, COPD, or asthma exacerbation)
Verapamil	5-10 mg IV	NA
Vasodilators (give beta blocker first to prevent reflex tachycardia; target SBP 100-120 mm Hg)		
Nitroglycerin	Start 10-20 mcg/min infusion. Titrate 5-10 mcg/min q10min to a maximum of 100 mcg/min	Not a first-line vasodilator

Disposition

- Admission to the intensive care unit.
- Close monitoring.
- Strict blood pressure and heart rate control.
- Type A aortic dissections will usually require transfer to a center with cardiac surgery capabilities.
- Type B aortic dissections may be cared for by either a cardiothoracic surgeon or a vascular surgeon, depending on the institution.
- Coordination of care with the treating surgeon will determine whether or not surgical repair is indicated.

Deep Venous Thrombosis

Overview

- Venous thrombosis is a condition in which a blood clot (thrombus) forms in a vein. This clot can limit blood flow through the vein, causing swelling and pain.
- Most commonly, venous thrombosis occurs in the "deep veins" in the legs, thighs, or pelvis this is called a deep vein thrombosis, or DVT.

Clinical Presentation

o History

- When did the pain start? The time line of pain onset is important; pain that has been present for weeks without change is unlikely to be acute DVT. This may lead to suspicion for other conditions, such as ongoing arterial insufficiency.
- Did the pain begin with any event, such as localized trauma or a strain?
- Did the pain come on suddenly, or more slowly?
- Were there any associated occurrences with the onset

of pain, such as a “pop” that may be associated with a muscle, tendon, or cyst rupture?

- Is there any swelling in the leg and, if so, where?
- Is there any redness, or does the skin feel hot?
- Has this ever happened before?
- Have you been immobilized recently, either due to injury/surgery, or for other reasons, such as a lengthy automobile trip?
- Past Medical History:
    - ❖ Malignancy or a history suggestive of malignancy.
    - ❖ Recent hospitalization, pregnancy (including current pregnancy, recent pregnancy (within 2 months), and recent abortions or miscarriages) and the puerperium, use of hormonal agents, or known acquired or inherited thrombophilia.
    - ❖ Obesity and smoking.

Physical Examination

- Signs of immobility (e.g., presence of a cast).
- Tenderness and its location.
- Swelling or pain upon squeezing the calf.
- Palpation of a painful area, especially the calf, reveals a thickened, thrombosed vein.

Differential diagnosis

- Cellulitis.
- Baker's Cyst.
- Superficial thrombophlebitis.

Work up

- CBC.
- Electrolytes.
- PT/PTT and INR.
- Venography.
- Duplex ultrasound.
- D-Dimer.

Management

o Prehospital Care:

- Primarily supportive.
- If the patient is asymptomatic, then no need for intravenous access.
- Start heparin if transportation time is prolonged and patient was moderate to high risk.

In hospital care:

- Unfractionated heparin using a loading dose of 80 units/kg, then 18 units/kg/h.

- The heparin dose is subsequently adjusted based on PTT measurement after 6 hours of infusion, usually once the patient has been admitted to the hospital.

- Low molecular weight heparin as:

  - Enoxaparin one mg /kg SC every 12 hours.

  - Delteparin 100IU/kg SC every 12 hours.

    OR

    200IU/kg SC every day.

  - Tinzaaparin 175 IU/kg SC every day.

Disposition

- Admit most patients with DVT for intravenous unfractionated heparin.

- Patients who are sent home after a negative duplex ultrasound should have a repeat ultrasound examination in 5 to 7 days.

- Patients who are low-risk, have a negative duplex ultrasound, and a negative (reliable) D-dimer do not require any further ultrasound examination, unless the concern for DVT otherwise increases (e.g., worsening symptoms).

PULMONARY EMERGENCY

Acute Bronchial Asthma in the Emergency Department

Overview

- Risk Factors for Death from Asthma:

  - Previous severe exacerbation (ie, intubation, ICU admission).
  - Two or more hospitalizations for asthma in the past year.
  - Three or more ED visits for asthma in the past year.
  - Hospitalization or ED visit for asthma in the past month.
  - Using > 2 canisters of a short-acting beta agonist per month.
  - Difficulty perceiving asthma symptoms or severity of exacerbations.
  - Social History.
  - Low socioeconomic status or inner-city residence.
  - Illicit drug use.

- Major psychosocial problems.
- Comorbidities.

- Cardiovascular disease.
- Concomitant lung disease.
- Chronic psychiatric disease.

Abbreviations: ED, emergency department; ICU, intensive care unit.

Clinical Presentation

○ History

- Past history of sudden severe exacerbations
- Prior intubation for asthma
- Prior asthma admission to an intensive care unit
- Two or more hospitalizations for asthma in the past year
- Three or more emergency department care visits for asthma in the past year

- Hospitalization or an emergency department care visit for asthma within the past month
- Use of >2 MDI short-acting β2-agonist canisters per month
- Current use of or recent withdrawal from systemic corticosteroids
- Difficulty perceiving severity of airflow obstruction
- Comorbidities such as cardiovascular diseases or other systemic problems
- Serious psychiatric disease or psychosocial problems
- Illicit drug use, especially inhaled cocaine and heroin

Physical Examination

- Alterations in mentation or consciousness.
- Diaphoresis.
- Tachypnea and tachycardia
- Use of accessory muscles of respiration.

- Wheezing.
- Identify the complications of asthma such as pneumonia, pneumothorax, or pneumomediastinum.

Differential diagnosis

Adults

Chronic obstructive pulmonary disease

Acute coronary syndromes

Congestive heart failure

Pulmonary embolism

Pneumothorax

Pneumonia

Airway foreign body

Gastroesophageal reflux disease

Vocal cord dysfunction

Cystic fibrosis

Chronic bronchitis

Sinus disease

Upper respiratory tract infection.

Children

Croup

Viral and bacterial pneumonia

Airway foreign body

Bronchiolitis

Tracheomalacia

Viral upper respiratory tract infection

Work up

- Complete blood count (if patient is for admission).
- Electrolyte evaluation (if patient has dehydration or for admission)..
- Arterial blood gas (if patient is not responding to initial treatment).
- Chest radiography (if there is no response to treatment or pneumonia).

Management

- Prehospital Care:
  - Oxygenation monitoring with pulse oximetry,
  - Hemodynamic monitoring with noninvasive blood pressure.
  - Inhaled short acting beta agonists by nebulizer or metered-dose inhaler with spacer.

In hospital care:

	Mild-Moderate	Severe
FEV_1 or PEFR%	>50%	Unable or <50%
Oxygen	Maintain SaO_2 >90%	Maintain SaO_2 >90%
Nebulized solution Salbutamol (ventoline)	5 mg q20–30 min × 3 doses	
MDI with spacer: Racemic albuterol (90 mg/puff)	6–12 puffs q20 min for up to 4 hr. (with supervision)	Same but may be unable to do (with supervision)

Inhaled anticholinergic: Nebulized ipratropium solution	0.5 mg q20–30 min × 3 doses (mix with albuterol solution)	
Systemic corticosteroids	Oral (preferred): 40–60 mg prednisone or equivalent IV (unable to take PO or absorb): 60–125 mg methylprednisolone (or equivalent)	40–60 mg prednisone or equivalent 60–125 mg methylprednisolone (or equivalent)
IV magnesium sulfate (FEV_1 <25%)	Not indicated	2–3 g over 20 min

FEV1, forced expiratory volume in 1 second; MDI, metered-dose inhaler; PEFR, peak expiratory flow rate; SaO2, oxygen saturation in arterial blood.

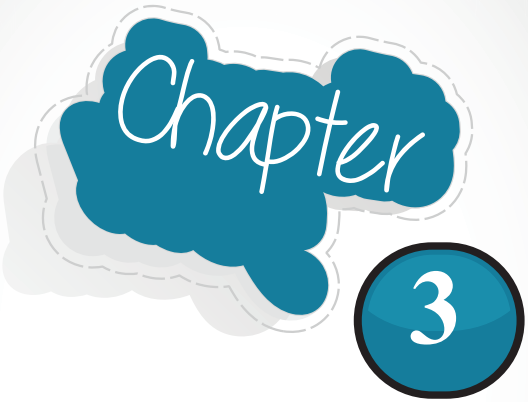
Disposition

	Good Response	Incomplete Response	Poor Response
FEV_1 or PEFR% (predicted/ personal best)	>70%	>50% but <70%	<50%
Disposition site:			
Home	Yes	No, continue therapy	No, continue therapy
Observation unit	No	Yes, if available	Yes, if available and appropriate
Hospital ward	No	Yes, if no observation unit.	Yes, if appropriate
Critical care unit	No	No	Yes, if with respiratory insufficiency/failure

FEV_1, forced expiratory volume in 1 second; PEFR, peak expiratory flow rate.

Alert

- Still have significant symptoms.
- Concerns about compliance (with treatment regime).
- Living alone or socially isolated.
- Psychological problems.
- Physical disability or learning difficulties.
- Previous near fatal or brittle asthma.
- Exacerbation despite adequate dose steroid tablets pre-presentation (current steroid use).
- Presentation at night.
- Pregnancy.
- Normal PCO_2 is a worsening sign.



NEUROLOGICAL EMERGENCY

Acute Headache

Overview

o Tension-Type Headache

1. At least 10 episodes of headache attacks lasting from 30 minutes to 7 days

2. At least two of the following criteria:

• Pressing/tightening (nonpulsatile) quality

• Mild or moderate intensity (may inhibit but does not prohibit activity)

• Bilateral location

• No aggravation by walking, stairs, or similar routine physical activity

3. Both of the following:

• No nausea or vomiting (anorexia may occur)

• Photophobia and phonophobia are absent, or one but not both are present.

Migraine without Aura

1. At least five headache attacks lasting 4 to 72 hours (untreated or unsuccessfully treated), which have at least 2 of the 4 following characteristics:

• Unilateral location.

• Pulsating quality.

• Moderate or severe intensity (inhibits or prohibits daily activities).

• Aggravated by walking, stairs, or similar routine physical activity.

1. During headache, at least one of the two following symptoms occur:

• Phonophobia and photophobia.

• Nausea and/or vomiting.

Cluster Headache

1. At least 5 attacks of severe unilateral orbital, supraorbital, and/or temporal pain lasting 15 to 180 minutes untreated, with One or more of the following signs occurring on the same side as the pain:

• Conjunctival injection

• Lacrimation

• Nasal congestion

• Rhinorrhea

• Forehead and facial sweating

• Miosis

• Ptosis

• Eyelid edema

1. Frequency of attacks is from one every other day to 8 per day.

Other Primary Headaches

Includes:

Primary exertional headache

• Hypnic headache.

• Primary thunderclap headache.

• Primary headache associated with sexual activity.

Clinical Presentation

○ History

- Detailed account of the current headache.

- Special attention to "red flag" symptoms that may suggest a dangerous secondary etiology:

•New headache in-patient older than 50 years of age.

• Maximal intensity within minutes of onset (thunderclap headache).

• Posterior headache with neck pain or stiffness.

• Change in vision.

• Change in consciousness.

• Syncope.

• History of HIV or immunocompromised.

• History of malignancy.

• Pregnancy or postpartum.

• History of neurosurgery or cerebral shunt

• Headache with seizure.

- The onset.
- Location.
- Quality of the headache as well as associated symptoms.
- Explore differences between the current headache and prior headaches.
- As such, the descriptive "worst headache" must be taken in the context of other signs and symptoms.

Important Secondary Causes of Headache:

Secondary Headache Causes	Red-Flag Findings
Subarachnoid hemorrhage	Thunderclap (sudden, severe onset) headache
Meningitis	Fever, neck stiffness, immunosuppression
Temporal arteritis	Jaw claudication, vision changes, polymyalgia rheumatica
Carbon monoxide poisoning	Waxing and waning headache, cluster of cases
Acute glaucoma	Unilateral vision change, eye pain, and redness

Cervical artery dissection	Neck pain, trauma, stroke symptoms, Horner syndrome
Venous sinus thrombosis	Pregnancy, postpartum, hypercoagulable, oral contraceptive use
Intracerebral tumor	Chronic progressive headaches, papilledema, history of malignancy
Cerebellar infarction	Ataxia, dysmetria, vertigo, vomiting
Idiopathic intracranial hypertension	Papilledema, worse when lying flat, obesity
Pituitary apoplexy	Hypotension, hypoglycemia, hyponatremia, visual field deficit, history of pituitary tumor
Pre-eclampsia	Hypertension, proteinuria, nondependent edema, pregnancy
Hypertensive encephalopathy	Altered mental status, hypertensive, neurologic signs in nonanatomic distribution
Subdural hematoma	Trauma, coagulopathy
Intracerebral hemorrhage	Hypertension, cerebral aneurysm, arteriovenous malformation

Physical Examination

- Neurologic Examination.
- Ophthalmologic Examination.
- Head and Neck Examination.
- Cardiopulmonary and abdominal examinations.

General History Questions For Evaluation Of Headache	
History Questions	Concerning Responses
Onset: • When did the headache start? • What were you doing when it started?	Sudden headache with exercise, coughing, straining, or orgasm is concerning for SAH.
Provocation: • What makes the pain better or worse? Position? Exercise? Straining?	Pain exacerbated by supine position or cough is concerning for increased ICP.
Quality: • Describe the pain. • Where is the pain located?	Occipital headache with neurologic signs of dysarthria, dysphagia, double vision, or ataxia are concerning for posterior bleed, tumor, or stroke.

Radiation: • Does the pain move or radiate?	Pain with radiation down the neck or neck stiffness is concerning for SAH, meningitis, or carotid or vertebral artery dissection.
Severity: • How long until your headache reached its maximum?	Thunderclap headache (maximal pain within minutes of onset) is concerning for secondary pathology including SAH, venous sinus thrombosis, or intracranial hemorrhage.
Temporal: • Has the pain changed over time	Chronic, progressively worsening headaches are concerning for possible structural mass or lesion.
Associated: • Are there any other symptoms you have had?	Associated neurologic deficits, vision changes, or fever are concerning for dangerous secondary etiology.
Abbreviations: ICP, intracranial pressure; SAH, subarachnoid hemorrhage	

Selected Concerning Neurologic Examination Findings For The Headache Patient	
CranialNerve/Examination Finding:	Possible Cause:
CN II – Optic nerve or its central connections • Vision loss / visual field deficit	• Unilateral vision loss can be the result of ischemia, temporal arteritis, glaucoma, or optic neuritis. • Bilateral visual field loss suggests CNS involvement posterior to the optic chiasm.
CN III – Oculomotor nerve • Defect in pupillary constric¬tion, eyelid raise, extraocular movements (down and out eye)	• May indicate posterior com¬municating artery aneurysm, uncal herniation, SAH, or mass lesion. • Consider cavernous sinus thrombosis.
CN VI – Abducens nerve • Defect in lateral movement of eye	• Consider increased or de¬creased ICP, brain herniation.

Ataxia, coordination deficit • Unsteady gait, unable to perform finger-to-nose, heel-to-shin	• Consider cerebellar infarct or bleed. • Consider posterior/vertebral injur
Altered mental status	Concern for mass or vascular lesion, SAH, hypertensive encephalopathy, meningitis, venous sinus thrombosis, carbon monoxide poisoning, or dissection.
Abbreviations: CN, cranial nerve; CNS, central nervous system; ICP, intracranial pressure; SAH, subarachnoid hemorrhage.	

Differential diagnosis

- Trauma, SAH, CNS tumor/mass.
- Cerebral/dural venous thrombo¬sis, pituitary apoplexy, hyper¬tensive encephalopathy.
- Meningitis, SAH, idiopathic intracranial hyper-tension.
- Acute glaucoma.

- Temporal arteritis.
- Carbon monoxide.

o Work up

- Noncontrast head computed tomography (CT).
- (MRI).
- Magnetic resonance venography (MRV) BRAIN.
- Lumbar puncture with cerebrospinal fluid analysis.
- Visual acuity and intraocular pressure.
- ESR.
- Carboxyhemoglobin.

Excluding Secondary Causes Of Headache, By Study	
Test	Secondary Cause
Noncontrast CT head	Trauma, SAH, CNS tumor/mass
MRI/MRV brain	Cerebral/dural venous thrombosis, pituitary apoplexy, hypertensive encephalopathy
Lumbar puncture with cerebro¬spinal fluid analysis and OP (opening pressure)	Meningitis, SAH, idiopathic intracranial hypertension
Visual acuity with IOP	Acute glaucoma
Erythrocyte sedimentation rate	Temporal arteritis
Carboxyhemoglobin	Carbon monoxide
Abbreviations: CNS, central nervous system; CT, computed tomography; IOP, intraocular pressure; MRI, magnetic resonance imaging; MRV, magnetic resonance venography; OP, .opening pressure; SAH, subarachnoid hemorrhage	

Management

o Prehospital Care:
Generalized recommendations include the following:

1. Eliciting a basic history.

2. Evaluating mental status.

3. Performing a brief neurologic examination.

NB: If there is any abnormality in the neurologic or mental status examination or if the patient appears unwell, emergent transport .should be activated

In the field, the initial approach includes:

- Making the patient comfortable prior to giving medications.
- Adjusting temperature.
- Minimizing unnecessary light or noise.
- Placement into a comfortable position.
- Acetaminophen can be used as a first-line medication.

In hospital care:

- Secondary headaches must be excluded first.

Primary headache:

NSAIDs - first-line therapy for migraine headaches:

For mild pain:

- Ibuprofen 400-600 mg PO.
- CONSIDER Sumatriptan 100 mg PO or 6 mg SQ.

For severe pain:

- Diphenhydramine 25 mg IV
- And
- Prochlorperazine 10 mg IV.

Or

- Metoclopramide 20 mg IV.

Consider

- Dexamethasone 10 mg IV.

- IV Fluid.
- Triptan.
- Consider expert consultation.

Contraindications for Triptan Use:

- Uncontrolled hypertension.
- Ischemic heart disease.
- Prinzmetal angina.
- Cardiac arrhythmias.
- Multiple risk factors for atherosclerotic vascular disease.
- Primary vasculopathies.
- Basilar and hemiplegic migraine.
- Use of ergot in past 24 hours.
- Use of MAOI or SSRI.
- Use of triptan in past 24 hours.

Management of Cluster Headache

Acute abortive therapy for cluster headaches falls into two groups:

1. Oxygen; 6-10 L facemask.
2. And Sumatriptan 6 mg SQ.

Medications For Primary Headache, Dosing, And American .Academy Of Neurology Quality Of Evidence		
Medication	Dose	AAN Quality of Evidence
Ibuprofen	mg PO 400-600	A
Aspirin	mg PO 1000	A
Naproxen	mg PO 500-825	B
Ketorolac	mg IV 15-30	B
Acetaminophen	mg PO 900-1000	B
Aspirin / acetamino-phen / caffeine	mg / 500 mg / 130 500 mg PO	A
Dihydroergotamine IV	mg IV 0.5-1	B
Chlorpromazine	mg/kg IV 0.1	B/C
Metoclopramide	mg IV 20	B
Prochlorperazine	mg IV 10	B
Sumatriptan SQ	mg SQ 6	A
Sumatriptan PO	mg PO 100	A
Opioids	Varies	B
Dexamethasone	mg PO/IV 6-10	C

Abbreviations: AAN, American Academy of Neurology; IV, .intravenous; PO, by mouth; SQ, subcutaneous

Disposition

- To set return precautions.

Patients should be given return precautions for red-flag signs.

Alerts of Dangerous Secondary Headaches:

•New headache in-patient older than 50 years of age.

• Maximal intensity within minutes of onset (thunderclap headache).

• Posterior headache with neck pain or stiffness.

• Change in vision.

• Change in consciousness.

• Syncope.

• History of HIV or immunocompromised.

• History of malignancy.

• Pregnancy or postpartum.

• History of neurosurgery or cerebral shunt

• Headache with seizure.

- Follow-up with a primary doctor.

Adult Acute Bacterial Meningitis

Overview

Risk Factors for Meningitis:

- Age greater than 50 years.
- Upper respiratory tract infection.
- Otitis media.
- Sinusitis.
- Mastoiditis.
- Head trauma.
- Recent neurosurgery.
- Compromised immune system (eg, resulting from human immu• nodeficiency virus [HIV], diabetes mellitus, asplenia, alcoholism, cirrhosis/liver disease, malnutrition, malignancy, cirrhosis/liver disease, malnutrition, malignancy, and immunosuppressive drug therapy).
- Crowded living conditions.

Clinical Presentation

- Headache And Nausea
- Fever
- Altered Mental Status
- Neck Stiffness/Nuchal Rigidity
- Kernig And Brudzinski Signs

Other Signs/Symptoms

- Tripod position with the knees and hips flexed, the back arched at a lordotic angle, the neck extended, and the arms brought back to support the thorax.
- Focal neurologic deficits.
- Rash.
- Arthritis.

Differential diagnosis

- Encephalitis.
- Aseptic meningitis.
- Intracranial abscess.
- Metabolic encephalopathy.

Work up

- Complete Blood Cell Count, Chemistry Panel, Lactate Level, and Blood Cultures, coagulation profile.
- Computed Tomography.
- Lumbar Puncture.

Management

- Prehospital Care:
  - Standard personal protective equipment such as facial masks.
  - Vital signs and mental status during transport.
  - Administer supplementary oxygen.
  - Blood glucose check.
  - Glasgow Coma Scale (GCS) score.
  - Two large-bore IVs with normal saline infused.
  - Pain medication.

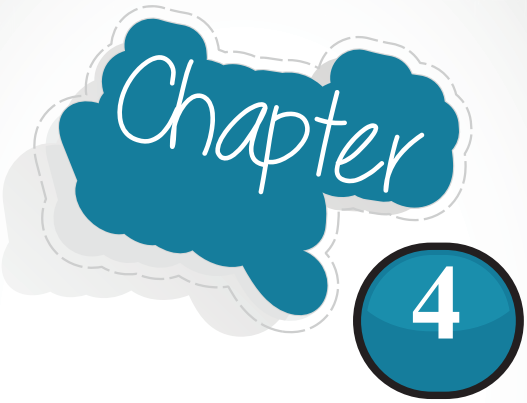
In hospital care:

- Dexamethasone.
- Empirical antimicrobial:

Predisposing Factor	Common Bacterial Pathogen	Antimicrobial Therapy
Age 16-50 years	Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae (nonimmunized (patients	Vancomycin plus a third-generation cephalosporin
Age > 50 years	Streptococcus pneumoniae, Neisseria meningitidis, Listeria monocytogenes, aerobic gram-negative bacilli	Vancomycin plus a third-generation cephalosporin and ampicillin
Immunocompromised System	Listeria monocytogenes, aerobic gram-negative bacilli, Streptococcus pneumoniae, Neisseria meningitidis	Vancomycin plus a third-generation cephalosporin and ampicillin
Cerebrospinal Trauma	Staphylococci, aerobic gram-negative bacilli, Streptococcus pneumoniae	Vancomycin plus either a third-generation cephalosporin with anti-pseudomonal coverage or meropenem

Disposition

- Admission to hospital.



TOXICOLOGY

Acetaminophen (Paracetamole,APAP) Overdose

Toxicity in adults is likely to occur after a single ingestion of greater than 150 mg/kg or 10 g over a 24-hour period.

Progression of Liver Disease after Acute APAP Ingestion:

Stage/Approximate Duration	Description	Results of Laboratory Tests	Manifestations
Stage 1 0-24 hours	Preclinical injury phase	Normal ↑ AST in severe poisoning	Asymptomatic or mild, nonspecific symptoms: nausea, vomiting, anorexia, malaise
Stage 2 24-72 hours	Onset of liver injury	↑ ALT, h AST, ↑ bilirubin, ↑ PT, ↑ lactate, ↑ phosphate, ↑ creatinine	Nausea, vomiting, RUQ pain

Stage 3 72-96 hours	Maximal hepatotoxicity	↑ LFTs, ATN, ↑ creatinine, ↑ ammonia	Jaundice, coagulation defects, hypoglycemia, renal failure, encephalopathy, coma, MSOF
Stage 4 5-7 days	Recovery phase	Normalization	Complete resolution of hepatotoxicity

Clinical Presentation

- History
  - Dose and time of APAP ingestion.
  - Formulation of APAP ingested the pattern of use (single dose or repeated doses).
  - Duration of ingestion.
  - Concomitant ingestions.
  - Intent of use (e.g., suicidal gesture or for analgesia).
  - History of trauma.

- Coexisting illnesses.
- Witnesses and/or family members.
- History of liver injury or alcoholism.

Physical Examination

- ABCs
- The heart should be monitored for dysrhythmias.
- Tachycardia may suggest congestion of a sympathomimetic or anticholinergic agent.
- Dehydration.
- Blood loss.
- Pain.
- Agitation.
- Tachypnea may indicate metabolic acidosis, respiratory alkalosis, or hypoxia.
- Abdomen to detect RUQ pain and hepatic enlargement,
- Mental status which could suggest encephalopathy.
- Pupils

- Skin
- Evidence of depression, suicide attempts, psychiatric illnesses.

Differential diagnosis

- Ascending cholangitis.
- Biliary disease.
- Hepatorenal syndrome.
- Hypercalcemia.
- Ischemic hepatitis (shock liver).
- Fulminant viral hepatitis(hepatitis A, B, B/D, or E;Epstein-Barr, cytomegalovirus)
- Pancreatitis.
- Perforated viscus.
- Reye's syndrome.
- Toxin-induced hepatic failure:

❖ Mushroom toxicity (amatoxin).

❖ Other toxins.

- Work up

- Obtain blood paracetamol level at 4 hours after ingestion.
- In patients who have a toxic APAP level, follow-up serum testing 12 to 24 hours after the first results.
- A serum APAP concentration drawn between 4 and 24 hours after an isolated ingestion should be plotted on the Rumack-Matthew Nomogram.
- CBC
- LFT'S
- Serum lipase concentration.
- URIN ANALYSIS
- Toxicology Panel And Rumack-Matthew Nomogram
- Coagulation Studies
- Chemistry Panel And Other Blood Work
- Pregnancy Test
- Electrocardiography
- Head Computed Tomography

Management

- Prehospital Care
  - Amount of APAP ingested and any congestion.
  - Evidence of trauma.
  - Vital signs, monitoring cardiac and pulse oximetry, and administering supplemental oxygen.
  - Plasma glucose concentration.
  - Obtunded patients should be intubated.
  - A suspected suicide attempt or intentional poisoning by a third party, the patient should be brought to the ED for evaluation and treatment regardless of the amount ingested.

In hospital care

- Activated charcoal (up to one hours after ingestion).
- Administer antidotal therapy (N-acetylcysteine):

The loading dose is 140 mg/kg, followed every 4 hours by additional doses of 70 mg/kg, to total of 17 doses.

- Treat fulminant hepatic failure.

- Refer patient for urgent liver transplant if criteria are met.

- Provide supportive and appropriate follow-up care:

Control nausea and vomiting

Manage renal dysfunction

- Admission
- Monitor and treat hypoglycemia
- Vitamin K and fresh frozen plasma for coagulopathy.

Disposition

- If the level is not toxic with normal AST level patient is at minimal risk for toxicity, and treatment with NAC is not indicated, can be given medical clearance and a psychiatric evaluation. At discharge, patients should be instructed to return immediately if symptoms of hepatic injury arise (e.g., abdominal pain, vomiting).

- Hepatotoxicity, renal dysfunction, or multisystem organ involvement, admission to the intensive care unit (ICU).

Carbon Monoxide Poisoning

Overview

- At room temperature, CO is a gas that is odorless, tasteless, and not irritating.
- Carbon monoxide impairs oxygen delivery and peripheral utilization, causing cellular hypoxia.
- Carbon monoxide binds to hemoglobin with an affinity more than 200 times that of oxygen after rapidly diffusing across the pulmonary capillary membrane, forming Carboxyhemoglobin (COHb) resulting in leftward shift of the normal oxyhemoglobin dissociation curve, which reduces tissue oxygen delivery.

Clinical Presentation

- History

Questions to ask include:

- Where was the patient found, and under what circumstances?
- Was there clear evidence of CO exposure?
- Was there loss of consciousness?

• Was there evidence of trauma?

• Was a finger stick glucose determination performed?

• Was noninvasive co-oximetry performed?

• Was prehospital ECG performed?

•Was there evidence of attempted self-harm or suicidal intent?

Physical Examination

- Trauma, neurologic, and cardiovascular examinations.
- Oropharynx for edema and soot.
- Neck should be carefully examined for the presence of stridor.
- Cardiac wheezing" or crackles in the lungs, signifying myocardial depression secondary to smoke inhalation.

Differential diagnosis

- Acute respiratory distress syndrome.
- Alcohol toxicity.
- Altitude illness.
- Cluster headache.

- Cyanide poisoning.
- Depression.
- Diabetic ketoacidosis.
- Encephalitis.
- Gastroenteritis.
- Hypoglycaemia.
- Hypothyroidism.
- Labyrinthitis.
- Lactic acidosis.
- Meningitis.
- Methaemoglobinaemia.
- Migraine.
- Smoke inhalation.
- Tension headache.
- Alcohol toxicity.
- Narcotic toxicity.

- Work up

- Co-oximetry.
- Carboxyhemoglobin Testing (in ABG).
- Cardiac Biomarkers.
- Lactate.
- Pregnancy Testing.
- Toxicological Testing (if there is coingestion).
- Chest x-ray.
- Computed Tomography.
- ECG.

Management

- Prehospital Care:

    - Recognize the potential for CO poisoning and examination of the scene for evidence of combustion or abnormal odors or fumes.

- An intravenous (IV) catheter.
- Empiric treatment with oxygen during transport is recommended.

○ In hospital care:

Signs of end-organ dysfunction and COHb level significantly elevated:

• Treat with normobaric oxygen (NBO)- (100% O2).

• Discuss hyperbaric oxygen (HBO) treatment with HBO chamber staff.

Disposition

❖ Patients who did not have loss of consciousness.

- Complete recovery from any symptoms.
- COHb level has returned to normal.
- No evidence of end-organ damage (ECG changes, elevated cardiac biomarkers, neurological deficits) may be safely discharged to home.

❖ Patients with end-organ toxicity will require hospitalization, with or without HBO therapy.

o Alert

- Severe headaches.
- Dizziness.
- Mental Confusion.
- Nausea.
- Fainting.
- Pregnancy.

HEMATOLOGICAL EMERGENCY

Sickle cell disease in emergency department

Overview

- Sickle cell disease (SCD) is genetically mutated hemoglobin (HbS) forms rigid polymers when deoxygenated; giving red blood cells a characteristic sickled shape. Increased blood viscosity and cell adhesion produce intermittent vaso-occlusion.

- The vaso-occlusive phenotype of SCD, which is marked by higher hemoglobin, manifests with frequent painful crises and is associated with a higher risk for developing acute chest syndrome.

- The hemolytic phenotype is characterized by lower baseline levels of hemoglobin and elevated markers of hemolysis.

Clinical Presentation

○ History
-Pain:

-What complications of SCD have you had?

-Pain - Acute chest syndrome – Stroke - Infections - Avascular necrosis - Priapism –Cholecystitis - Splenic sequestration - Renal failure - Pulmonary hypertension - Pulmonary disease - Leg ulcers - Vision loss

-What surgeries have you had?

Cholecystectomy - Splenectomy - Joint replacement – Tonsillectomy

-How often do you have pain?

-How often do you come to the ED for pain?

-Have you ever been on chronic transfusions?

-What medicines do you take for pain at home?

-What is your baseline hemoglobin level?

Medications-

Physical Examination

- Eyes.
- Mucous membranes for jaundice.
- Auscultate for cardiac murmurs.
- Focal pulmonary abnormalities.
- Abdomen: both liver & spleen.
- Each pain location.

- Signs of infection (tenderness, erythema, fluctuance).

Differential diagnosis

Common	Rare	Extremely Rare
Vaso-occlusive crisis	Acute coronary syndrome	Hepatic sequestration
Infection	Splenic sequestration	Renal infarction
Stroke	Osteomyelitis	Splenic infarction
Cholelithiasis	Transient red cell aplasia	Retinal detachment
Priapism		Mesenteric ischemia

- Work up
  - CBC.
  - L.F.T.
  - Reticulocyte count.
  - ALT.

- LDH.
- Bilirubin fractionation (direct or indirect).
- Blood typing and screening.

o Management

o Prehospital Care

- Oxygen in respiratory distress.
- IV fluid boluses to hypotensive patients.
- Administer IV opioids in pain and venous access is obtained.
- Transport patients who are already being followed by a specific hematology service to that hospital.

o In hospital care

- Start D5 ½ normal saline at the maintenance rate.

Opiate therapy:

Administer IV dose of opiate:

- Morphine 0.1-0.15 mg/kg.

Non opiate Therapy:

- Antihistamines
- Acetaminophen
- Non-Steroidal Anti-Inflammatory Drugs

Assess degree of relief every 15-30 minutes

o Disposition

Admission to hospital if:

- Uncontrolled pain.
- Blood transfusion needed.
- Infections.
- Complication of Vasso- Occlusive Crisis.

Anticoagulation Emergencies

Overview

Target INRs for the anticoagulated Patient:

Indication	Target INR (range)
Deep vein thrombosis, pulmonary embolus.	2.5 (2.0-3.0)
Atrial fibrillation	2.5 (2.0-3.0)
Mechanical heart valve	3.0 (2.5-3.5)
Mitral valve stenosis	2.5 (2.0-3.0)
Cardiomyopathy	2.5 (2.0-3.0)
Ischemic cerebrovascular disease.	2.5 (2.0-3.0)

Drugs That Potentiate Warfarin:

Drug	Effect
Sulfonamides21	Strongest effect of all antibiotics; inhibits CYP2C9 (hepatic microsomal metabolism)
Fluoroquino-lones21,25-27	Including levofloxin, initially thought not to interact. Inhibits CYP2C9 and decreases vitamin K-producing bacteria
Doxycycline	Inhibits warfarin metabolism
Amoxicillin	Inhibits warfarin metabolism
Antifungals25	Inhibit CYP2C9
Acetaminophen25	Interferes with vitamin K cycle
Metronidazole	Inhibits warfarin metabolism. De-creases vitamin K-producing bacteria
Amiodarone	Inhibits CYP2C9

Clinical Presentation

- History

- Reasons why the patient is anticoagulated.
- Last INR levels & last checked.

- Degree of anticoagulation.
- History of medications.

Physical Examination

- Level of consciousness using the Glasgow Coma Scale (GCS).
- Pupillary response.
- Motor examination.
- Sensory examination.
- Flank, back, or abdominal tenderness, the diagnosis of retroperitoneal hemorrhage must be considered.

Clinical Signs Of Retroperitoneal Hemorrhage	
Sign:	Location of ecchymosis:
Celluen's	Periumbelical
Tumer's	Flanks
Fox's	Upper thigh, inferior to inguinal ligament
Bryant's	Scrotum

Differential diagnosis

- Intracerebral/ intracranial hemorrhage.
- Spinal epidural hematoma.
- Retroperitoneal hemorrhage.
- Rectus sheath hematoma.
- Hemothorax.
- Gastrointestinal bleeding.
- Hemopericardium.
- Compartment syndrome.
- Hematuria.

o Work up

- CBC
- Chemistry Panel.
- Coagulation profile.
- Type and Screen/Crossmatch.
- Urinalysis.

o Imaging

According to presentation and possible complications.

- Head Computed Tomography.
- Abdominal Computed Tomography.
- Magnetic Resonance Imaging.

o Management

o Prehospital Care:

- All Anticoagulated patients with head injury should be transported to a facility with 24-hour diagnostic imaging, and there should be a low threshold for transporting to a trauma center with neurosurgical capabilities.
- Direct pressure at the bleeding site is recommended.
- Universal precautions including gloves, mask, and eye protection or face shield.
- Hand-washing after touching blood, body fluids, and contaminated items
- Tourniquets are not routinely indicated to control bleeding.

- In hospital care:

- Management of Supratherapeutic INR:

<u>If serious or life- threatening administer all of the following:</u>

• Vitamin K 10 mg IV slowly (Can be repeated every 12 hours).

• FFP.

• PCC or rFVIIa*.

- If no bleeding:

❖ INR = 3 to < 5

1. Omit next dose

2. Recheck INR frequently.

❖ INR = 5 to < 9

1. Omit next 1 or 2 doses

2. Recheck INR

3. Consider oral vitamin K (1- 2.5 mg) if at increased risk of bleeding,

❖ INR = ≥ 9

1. Omit next 1 or 2 doses

2. Administer oral vitamin K (2.5–5 mg)

3. Recheck INR within 24-48 hours.

* If PCC or rFVIIa is unavailable, proceed with vitamin K and FFP.

Abbreviations: FFP, fresh frozen plasma; INR, international normalized ratio; PCC, prothrombin complex concentrate; rFVIIa, recombinant activated factor VII.

Management of Minor Head Injury in the Anticoagulated Patient:

❖ <u>If INR is not elevated:</u>

Standard head injury management.

❖ If elevated INR and head CT shows intracranial hemorrhage:

<u>If serious or life- threatening administer all of the following:</u>

• Vitamin K 10 mg slow IV.

• FFP.

• PCC or rFVIIa*.

❖ If elevated INR and head CT shows no intracranial hemorrhage:

- Observe 6-12 hours, depending on hospital protocol.
- Repeat CT scan.
- Correct INR

o Disposition

- Most asymptomatic patients can be discharged home unless they have little support or they are a significant fall risk.
- significant complications of anticoagulation will result in admission.

ENDOCRINOLOGY AND ELECTROLYTE EMERGRNCY

Hypokalemic and Hyperkalemia Emergencies

Overview

- Hypokalemia, defined as a serum potassium level < 3.5 mEq/L.
- Hypokalemia is divided into the following 3 categories:

❖ Mild: K+ 3.0-3.5 mEq/L.

❖ Moderate: K+ 2.5-3.0 mEq/L.

❖ Severe: K+ < 2.5 mEq/L.

- The causes of hypokalemia fall into 3 basic categories:

(1) Inadequate potassium intake.

(2) Excessive loss of potassium.

(3) Transcellular shift of potassium.

- Hyperkalemia, defined as serum potassium level ≥ 5.5 mEq/L.
- Hyperkalemia can be divided into the following 3 categories:

❖ Mild: K_+ 5.5-6.5 mEq/L

❖ Moderate: K_+ > 6.5-7.5 mEq/L

❖ Severe: K_+ > 7.5 mEq/L

- The causes of hyperkalemia fall into 3 basic categories:

(1) Laboratory error and factitious hyperkalemia.

(2) Transcellular shifting of potassium.

(3) Potassium excretion insufficiency.

(4) increase K^+ intake

Clinical Presentation

- History
  - Generalized weakness.
  - Flaccid paralysis.
  - Loss of deep tendon reflexes.
  - Respiratory difficulty.
  - Gastrointestinal complaints.
  - Kidney disease.
  - Endocrine disease.
  - New medications started in the last year including diuretics, ARBs, ACEIs, diabetes medications, or thyroid medications.
  - Recent trauma.
  - Recent gastrointestinal illnesses.
  - Recent surgery or hospitalizations.
  - Recent changes in fluid intake or losses.
  - History of familial periodic paralysis.

Physical Examination

Organ System	Hypokalemia	Hyperkalemia
Cardiac	• Dysrhythmias • Conduction defects • Increased likelihood of dysrhythmias due to digitalis	• Dysrhythmias • Conduction disturbances
Skeletal muscle	• Weakness • Paralysis • Fasciculations and tetany	• Weakness • Paresthesia • Paralysis • Hyperreflexia • Cramping
Gastrointestinal	• Ileus • Nausea • Vomiting • Abdominal distention	• Nausea • Vomiting • Diarrhea
Renal	• Polyuria	

Differential Diagnosis

- Diabetes.
- Myocardial infarction.
- Stroke.
- Viral illnesses.
- Myasthenia gravis.
- Botulism.
- Spinal cord diseases.
- Polyneuropathies.
- Cataplexy.

o Work up

- ECG.
- Complete blood count (CBC) with platelets.
- Metabolic and renal panel.

- Urine studies.
- Arterial blood gas, serum and urine osmolality, and urine electrolytes.

o Electrocardiogram in Hypokalemia

- Flattened T-waves.
- ST-segment depression.
- U-waves.

o Electrocardiogram in Hyperkalemia

- Peaked T-wave.
- Flattened P-wave.
- Prolonged PR interval.
- Absent P-wave.
- Wide QRS.
- Sine-wave pattern.

Management

- Prehospital Care:

  - In hypokalemia, treating symptoms of the underlying cause.
  - In hyperkalemic-induced dysrhythmias and cardiac arrest, advanced Cardiac Life Support® (ACLS®) guidelines are followed.

In hospital care:

Management of Hypokalemia

- mild hypokalemia (3.0-3.5 mEq/L):
  - Asymptomatic and the treatment of their underlying disorder.
  - Potassium chloride PO 20-80 mEq/d in divided doses.
  - Discharge with recommendation to increase dietary K+
- moderate to severe hypokalemia (< 3.0 mEq/L):
  - symptomatic or has life-threaten-

ing ECG changes:

- Potassium chloride IV 20 mmol/ hr (Max rate: 20 mmol over 10 min followed by 10 mmol over 10 min).
- Magnesium sulfate IV 5 mL 50% (10 mmol [2 g]) over 30 min.

- Recheck K+ after every 40 mmol if normal renal function or after every 20 mmol (if severe renal impairment).

Management of Hyperkalemia

- Mild to moderate hyperkalemia (6.5-7.5 mEq/L).
  - Patient clinically stable.
  - Regular insulin 10 units IV plus 50 mL of D50.

- Life-threatening hyperkalemia Any of the following:

- Peaked T-waves (amplitude > R in 2 leads).
- Absent P-waves.
- Broad QRS.
- Sine wave.
- Bradycardia.
- Ventricular tachycardia.
- K^+ level more than 7.

Start:

- Calcium chloride IV 10 mL 10% (6.8 mmol) over 5 min.
- Regular insulin 10 units IV plus 50 mL of D50.
- Salbutamol 10-15 mg, nebulized.
  - Cardiac arrest (VT, VF, PEA, asystole):
  - Commence ACLS®
  - Consider hemodialysis.

Disposition

- Hypokalemic patients:

- Tolerant of potassium by mouth and whose symptoms have resolved can be discharged with a short course of potassium as long as they have close follow-up.

- If the patient remains symptomatic or does not tolerate potassium by mouth, admission is advised.

- Hyperkalemic patients:

- Potassium levels > 8.0 mEq/L, patients with acute worsening of renal function, and those with comorbid medical conditions should be admitted.

- Potassium levels ≥ 6.5 mEq/L should be treated and admitted in a monitored bed for close observation and treatment.

- Potassium level of 5.5-6.5 mEq/L, the disposition will vary depending on the underlying cause.

Diabetic Emergencies

Overview

	Diabetic Ketoacidosis	Hyperglycemic Hyperosmolar Syndrome
Ketoacidosis	Profound	Minimal or none
Glucose	~250-600 mg/dL	Often >900 mg/dL
HCO3	< 15 mEq/L	> 15 mEq/L
Osmolarity	300-325 mOsm	Often > 350 mOsm
Age	Young	Elderly
Onset	Acute; over hours to days	Chronic; over days to weeks
Associated diseases	Common	Common
Seizures	Very rare	Common
Coma	Rare	Common
Insulin levels	Very low to none	May be normal

Mortality	0%-10% (depends on underlying conditions)	20%-40%
Dehydration	Severe	Profound

Clinical Presentation

History

- Polyuria.
- Polydipsia.
- Polyphagia.
- Weight loss.
- Fatigue and weakness.
- Abdominal pain.
- Nausea and vomiting.
- Hyperventilation.
- Altered mental status.

Is there an associated infection?

Is there another associated illness?

What other medications has the patient been taking?

Physical Examination

- The mucous membranes dry.
- Skin turgor decreased.
- Sunken eyes.
- Tachycardia and hypotension.
- The pulse may be weak and thready.
- Abdominal pain or tenderness, nausea and vomiting.
- Lack of bowel sounds, and ileus.
- Compensatory hyperventilation from the metabolic acidosis (Kussmaul respiration).
- Altered mental status.
- Febrile.

- Fruity breath in DKA.

Work up

- CBC.
- Full Chemistry.
- VBG'S.
- Serum Glucose.
- Serum Ketones.
- Serum Osmolality.
- Urinalysis and Urine Culture.
- Lumbar Puncture (if clinically indicated).
- Hemoglobin A1C Determination.

Management

Prehospital Care:

- Primarily supportive.
- Providers should have access to blood glucose measurement devices.

- Intravenous line should be started and normal saline given as a bolus of up to 1 liter in the average-sized adult.

- Medications should be identified and brought to the ED.

- Identification of precipitating or comorbid illnesses.

- High incidence of infection in HHS patients has led to a recommendation for early empiric antibiotic therapy, even if no source is identified.

- Diabetic Ketoacidosis

Fluids:

- Hypotensive, administer a bolus of 1-2 liters of normal saline (0.9%) over the first hour (pediatric dose, 20-40 mL/kg).

- If hypotension persists, then give another bolus.

- If the patient is normotensive, then use 0.9% saline at 1000 cc per hour.

- The patient has renal failure or has a history of congestive heart failure, and then invasive monitoring with central venous pressure (CVP) monitor.

Insulin:

- Intravenous insulin administration regimen is continuous infusion of 0.1 units per kilogram per hour (after you have K^+ level).

Bicarbonate:

- The use of bicarbonate is not recommended for DKA.

Potassium:

-K > 5.5 mEq/L

• Hold K.

• Check K every 2 hours.

-K 3.3-5.5 mEq/L

• Give 20-30 mEq to keep serum potassium at about 4-5 mEq/L.

-K < 3.3 mEq/L

• Hold insulin.

• Give K (40 mEq in adults) per hour until K > 3.3 mEq/L.

Careful Monitoring:

- Glucose—every 1-2 hours by fingers tick (confirmed by laboratory correlation when indicated).
- Basic metabolic profile for anion gap and serum potassium—at the onset of treatment, at one and two hours after the onset of treatment, and at two- to four hour intervals until the patient is substantially better.
- Arterial or venous pHs—follow as indicated to monitor clinical status.
- Insulin dose and route of administration—every hour.
- IV fluids—every hour.
- Urine output—every hour.

Disposition

Admit the patient to the ICU if:

- hemodynamic instability;
- unable to defend the airway (this patient should be promptly intubated);
- obtunded (this patient should also be promptly intubated);
- abdominal distention, acute abdominal signs, or symptoms suggestive of acute gastric dilatation are present (surgical consultation should be considered for these patients);
- Insulin infusions cannot be administered on the ward.
- monitoring cannot be provided on the ward;
- Co-morbid disease such as sepsis.
- Myocardial infarction or trauma.

Thyroid Storm and Myxedema Coma

Overview

Thyrotoxicosis refers to any state characterized by a clinical excess of thyroid hormone. Thyroid storm represents the extreme .presentation of thyrotoxicosis

Myxedema coma is used to describe the severe life-threatening .manifestations of hypothyroidism

The term myxedema coma itself is a misnomer, as patients do not usually present with frank coma but more commonly have altered mental status or mental slowing. Myxedema actually refers to the nonpitting puffy appearance of the skin and soft tissues .related to hypothyroidism

Clinical Presentation

- History

Historical Questions In The Evaluation Of Thyroid Storm
• History of thyroid disease? • Symptoms of hyperthyroidism: tremor, agitation, weight loss, nervousness, heat intolerance, proximal weakness, palpitations, menstrual irregularity? • Thyroid manipulation? • Medication changes? • Physiologic stressors: trauma, infections, exertion? • Recent anesthesia? • Recent iodinated contrast? • Infectious syndromes?

Historical Questions In The Evaluation Of Myxedema Coma
• History of thyroid disease? • Symptoms of hypothyroidism: weight gain, hair loss, fatigue, weight gain, dry skin, voice change, depression, constipation, Menstrual irregularity? • Medication changes often with menometrorrhagia. • Physiologic/psychological stressors: infection, trauma, cold exposure, major life changes?

Physical Examination

The patient with thyrotoxicosis classically presents:

- Febrile.
- Tachycardia (widened pulse pressure).
- Tremulous.

- Weakness.
- Weight loss.
- Palpitations.

The patient with hypothyroidism classically presents:

- Blood pressure low to elevate.
- Skin changes.
- Hypothermia.
- Pseudomyotonic deep tendon reflexes.
- Depressed mental function.
- Nonpitting edema.
- Weight gain.

Differential Diagnosis in Thyroid Storm

- Hypoglycemia.
- Hypoxia.
- Sepsis.

- Encephalitis/meningitis.
- Hypertensive encephalopathy.
- Alcohol withdrawal.
- Benzodiazepine/barbiturate withdrawal.
- Opioid withdrawal.
- Heat stroke.

Differential Diagnosis in Myxedema Coma

- Hypoglycemia
- Hypoxia
- Sepsis
- Hypothermia due to environmental exposure
- Cerebrovascular accident
- Acute myocardial infarction
- Intracranial hemorrhage
- Panhypopituitarism

- Adrenal insufficiency
- Hyponatremia
- Gastrointestinal bleeding
- Conversion disorder

- Work up

  - TSH, T4 and T3.
  - Full chemistry.
  - Cardiac markers.
  - B-type natriuretic peptide level.
  - Serum lactate levels.
  - Random cortisol level.
  - Urinalysis.
  - Urine pregnancy test or b-hCG.
  - An arterial blood gas.
  - Electrocardiogram.

- Chest Radiography.
- Echocardiography.
- Computerized Tomography Head.
- Lumbar Puncture (if indicated).

Management

○ Prehospital Care:

- Support of airway, breathing.
- Vital Sign's.
- Circulation with emergent transport to the ED.
- Blood glucose levels.
- Rewarming for hypothermic patients.
- Warm humidified oxygen.
- Chemical and physical restraints.
- Cardiac monitor and have continuous pulse oximetry.

In hospital care:

- Management of myxedema coma:

  - Intravenous replacement of thyroxin.
  - T4 is administered in a dosage of 200 to 500 µg IV.

(Pediatric dosage 10 mcg/kg/d IV divided q6-8).

  - Empiric glucocorticoids.
  - Hydrocortisone at 100 mg IV (pediatric dosage 0.5-1 mg/kg IV q8) is the recommended dose.

Thyroid Storm:

Three-Step Treatment Of Thyroid Storm			
	Goal	Treatment	Effect
Step 1	Block peripheral effect of thyroid hormone	Provide continuous intravenous infusion of β-blocking agent	Slows heart rate, increases diastolic filling, and decreases tremor.
Step 2	Stop the production of thyroid hormone	Provide antithyroid medication (propylthiouracyl or methimazole) and dexamethasone.	Antithyroid decrease synthesis of thyroid hormone in the thyroid. Propylthiouracyl slows conversion of T4 to T3 in periphery. Dexamethasone decreases conversion of T4 to T3 in periphery.
Step 3	Inhibit hormone release	Give iodide 1-2 h after antithyroid medication	Decreases release of thyroid hormone from thyroid.

Disposition

Admission must be in ICU department.

UROLOGICAL EMERGECY

Rhabdomyolysis: Advances in Diagnosis and Treatment

Overview

Rhabdomyolysis is a potentially life-threatening condition characterized by the breakdown of skeletal muscle and the release of intracellular contents into the circulatory system.

Clinical Presentation

- History
  - Localizing myalgia.
  - Muscle stiffness.
  - Cramping, swelling.
  - Tea-colored urine.

Physical Examination

- Extremity swelling.
- Tenderness.
- Motor weakness.
- Sensory deficits.
- Pain with passive range of motion.

Differential diagnosis

- Coma (from any cause), prolonged general anesthesia.
- Seizures, alcohol withdrawal syndrome, strenuous exercise, tetanus, severe dystonia, acute mania.
- Thromboembolism, external compression, carbon monoxide poisoning, sickle cell disease.
- Heat stroke, malignant hyperthermia, neuroleptic malignant syndrome, serotonin syndrome, hypothermia/ frostbite.
- Lightning strike, high-voltage injury, electrical cardioversion.
- Hypokalemia (licorice ingestion, diarrhea, diuretics, primary hypoaldosteronism) hypophosphatemia, hyponatremia, hypernatremia.
- Ethanol, methanol, ethylene glycol, heroin, methadone, barbiturates, cocaine, caffeine, amphetamine, LSD, MDMA (ecstasy), mushrooms, PCP, benzodiazepines, tolu**ene, etc.**
- Crush syndrome, compartment syndrome
- Antihistamines, salicylates, neuroleptics (neurolep-

tic malignant syndrome), cyclic antidepressants and selective-serotonin reuptake inhibitors (via serotonin syndrome), anticholinergics, laxatives (likely via electrolyte abnormalities), anesthetics and paralytic agents (especially succinylcholine), quinine, corticosteroids, theophylline, aminocaproic acid, propofol, colchicine, antiretrovirals, etc.

- Bacteria: Escherichia coli, Shigella, Salmonella, Streptococcus pneumoniae, Staphylococcus aureus, Group A Streptococcus, Clostridium, etc.
- Viruses: Influenza A and B, cytomegalovirus, herpes simplex virus, Epstein-Barr virus, HIV, coxsackievirus, West Nile virus, varicella-zoster virus.
- Inherited disorders manifest with enzyme deficiencies in carbohydrate and lipid metabolism or myopathies.
- Polymyositis, dermatomyositis, Sjögren syndrome.
- Systemic lupus erythematosus.
- Hypothyroidism, thyroid storm.
- Snakebite, bee envenomation, scorpion sting, spider bite.
- Cardiac arrest, cardiopulmonary resuscitation.

- Work up

  - Serum creatine phosphokinase (CK) levels.
  - Urine Dipstick and Urinalysis.
  - Complete blood count (CBC).
  - Electrolyte evaluation.
  - Liver function tests.
  - Electrocardiogram (ECG).

Management

- Prehospital Care:

  - Rapid recognition.
  - Consideration of the diagnosis in the trauma patient with victims of building collapse or direct extremity trauma with significant swelling.
  - Immediate IV fluid resuscitation to prevent renal failure.

- In hospital care:

CK < 1000

- Repeat CK in 8 hours

CK > 1000, but < 5000

- Start 0.9% saline 400 mL/hr.
- Recheck CK periodically

CK > 5000

- Start 0.9% saline 400 mL/hr.
- Monitor hourly urine output.
- Goal: 200 mL/hr.

Disposition

.Admission in all cases

Acute Urinary Retention

Overview

Gender-Specific Causes of Acute Urinary Retention:

Women	Men
• Obstructive Causes ➢ Cystocele ➢ Tumor • Infectious Causes • Operative Causes	• Obstructive Causes ➢ BPH ➢ Meatal stenosis ➢ Phimosis/ paraphimosis ➢ Tumor • Infectious Causes • Operative causes

Abbreviation: BPH, benign prostatic hypertrophy.

Clinical Presentation

History

- The location, movement, and radiation of the pain.
- Medications.

- Chemical exposure.
- History of psychiatric illness.
- Suicidal intent or ideation.
- Weight loss, bone pain.
- Urinary frequency, urgency, hesitancy, nocturia, difficulty initiating a urinary stream, decreased force of stream, incomplete voiding, or terminal dribbling.
- Dysuria, urgency, discharge, chills, fever, low back pain, and genital itching.

Physical Examination

- Rectal examination should be performed to rule out rectal or uterine prolapse.
- Enlarged prostate.
- Phimosis or paraphimosis, lesions, and tumors.
- Uterine prolapse, cystocele, enlarged uterus, or enlarged ovaries.
- Neurological examination, focusing on strength, sensation, and lower extremity reflexes.

Differential diagnosis

- Benign prostatic hypertrophy.
- Bladder calculi.
- Bladder clots.
- Meatal stenosis.
- Neoplasm of the bladder.
- Neurogenic etiologies.
- Paraphimosis.
- Penile trauma.
- Phimosis.
- Prostate cancer.
- Prostatic trauma/ avulsion.
- Prostatitis.
- Urethral foreign body.
- Urethral inflammation.
- Urethral strictures.

- Work up

- CBC.
- Prostate-specific antigen (PSA) levels.
- Electrolytes, blood urea nitrogen, and creatinine levels.
- Urinalysis and culture.
- Renal ultrasound.
- Computed tomography [CT] scan.
- Magnetic resonance imaging (MRI).

Management

- Prehospital Care

- Alleviating pain.
- Correcting hypovolemia.
- Foley catheter placement.

In hospital care

- Complete decompression of the bladder through urinary catheterization with a double-lumen Foley catheter.
- The current American Urological Association guidelines only recommend using the 5-alpha reductase inhibitors (finasteride and dutasteride) in men with considerable prostate enlargement on digital rectal examination.
- Treatment of underlying cause.

Disposition

- Concomitant infection, significant comorbid illnesses, impaired renal function, neurological deficits, or complications of catheterization require emergent urological consultation and admission.
- With BPH, the catheter should be left in place at discharge from the ED and Follow up with a urologist within 3 days.

TRAUMA AND ENVIRONMENTAL

Severe Traumatic Brain Injury

Overview

- Classification:

  - Primary injury: Induced by mechanical force and occurs at the moment of injury; the 2 main mechanisms that cause primary injury are contact (eg, an object striking the head or the brain striking the inside of the skull) and acceleration-deceleration.

  - Secondary injury: Not mechanically induced; it may be delayed from the moment of impact, and it may superimpose injury on a brain already affected by a mechanical injury.

	Mild head injury	Moderate head injury	Severe head injury
Initial GCS	14-15	9-13	3-8
% of total	80	10	10
Mortality (%)	<1	10-15	30-50
Good functional outcome (%)	>90	20-90	<20

The most commonly used method for grading the severity of brain injury is the Glasgow Coma Score (GCS).

Glasgow Coma Score

Eye Opening (E)	Verbal Response (V)	Motor Response (M)
4=opens spontaneously 3=opens to voice 2=opens to pain 1=none	5=normal conversation 4=disoriented conversation 3=words, incoherent 2=incomprehensible sounds 1=none	6=normal 5=localizes pain 4=withdraws from pain 3=decorticate posturing 2=decerebrate posturing 1=none

Clinical Presentation

- History

AMPLE history:

- A- Allergies.
- M- Medications.
- P- past medical history.
- L- Last meal.
- E- events/environment related to the injury.
- Information from EMS, family members, or bystanders can be very valuable.
- Mechanism of injury.
- Speed involved and potential severity of trauma.
- Loss of consciousness - how long it lasted?
- Nausea.
- Vomiting.
- Visual difficulty.

Physical Examination

- Evidence of scalp trauma, skull fractures, or signs of basilar skull fracture (characteristic ecchymosis, or CSF otorrhea or rhinorrhea).
- Neurological examination.
- GCS.
- Pupillary examination.

Differential diagnosis

- Acute Stroke.
- Cerebral Aneurysms.
- Epileptic and Epileptiform Encephalopathies.
- Hydrocephalus.
- Metastatic Disease to the Brain.
- Prion-Related Diseases.
- Psychiatric Disorders Associated With Epilepsy.
- Subarachnoid Hemorrhage.
- Subdural Empyema.

- Subdural Hematoma.
- Temporal Lobe Epilepsy.
- Tonic-Clonic Seizures.

o Work up

- Blood Glucose Level.
- Evaluation of blood alcohol level.
- Urine or blood drug screen.
- CBC.
- Chemistry profile.
- Coagulation profile.
- ABG.
- Blood typing in case future transfusions.
- Electrocardiogram (ECG).
- Non-contrast CT scan.

Management

- Prehospital Care

- Bystander and emergency medical system (EMS) activation.
- Make an appropriate decision about whether the patient should be transported by air or by ground.
- A-B-C-D assessment.
- Degree of disability.
- GCS.
- Assessment and treatment of other traumatic injuries
- Full spinal immobilization.
- Oxygen saturation.
- Blood glucose.
- Supplemental oxygen
- Airways secured with an airway adjunct.
- Intubation with GCS less than 8

In hospital care:

- Airway.
- Breathing.
- Fluid Resuscitation.
- Intracranial Pressure Monitoring.
- Medical Therapy for Increased ICP: mannitol 0.25 mg - 1.0 mg/kg.
- Anticonvulsants: phenytoin or fosphenytoin (20 mg/kg or 20 phenytoin equivalents/kg respectively.

Disposition

- Hospital admission: preferably to a trauma ICU or to a neurosciences ICU.
- Early consultation with neurosurgery and trauma surgery
- ED without trauma support should be transferred to a tertiary hospital with neurosurgery and trauma surgery capabilities as soon as the patient is stable for transport and after consultation with both of these services.

Alert

- Loss of consciousness at any time.
- GCS <15 on initial assessment.
- Focal neurological deficit.
- Retrograde or anterograde amnesia.
- Persistent headache.
- Vomiting or seizures post injury.

Electrical Injuries

Overview

Comparison of High-Voltage and Low-Voltage Electrical Injuries:

Characteristic	Low-Voltage Injury	High-Voltage Injury
Voltage, V	≤ 1000 V	> 1000 V
Type of Current	Alternating current	Alternating current or direct current
Duration of Contact	Prolonged	Brief (if direct current)
Cause of Cardiac Arrest	Ventricular fibrillation	Asystole
Cause of Respiratory Arrest	Thoracic muscle tetany	Thoracic muscle tetany or indirect trauma
Muscle contraction	Tetanic	Tetanic (if alternating current); single (if direct current)

Burns	Superficial	Deep
Rhabdomyolysis	Less common	More common
Blunt injury	Does not usually Occur	Caused by falls and violent muscle contractions

Clinical Presentation

○ History

- Bystanders and Prehospital providers are a good resource regarding the electrical source, the voltage, the duration of contact, environmental factors at the scene, and resuscitative measures already provided.
- Special attention should be paid to the electrical source.
- injury that initially appears to have resulted from a low-voltage source (e.g., a household appliance) may be due to a high-voltage source
- Medical history (especially cardiac problems), medications, allergies, and tetanus immunization status should also be obtained.

Physical Examination

- The size and location of any burns and the condition of the patient's extremities noted.
- Small, well-demarcated entry and exit wounds are often seen with low-voltage electrical injuries
- Depressed, necrotic-appearing burns are more commonly observed in high-voltage injuries.
- Assessment of vision and hearing should include fundoscopic and otoscopic examination.
- look for tympanic membrane rupture,
- The full range of motion of all joints should be tested to assess for fractures and dislocations
- Serial neurovascular checks on all extremities are also necessary

Practice Guidelines For Cardiac

Monitoring After Electrical Injuries

Characteristic	Cardiac monitoring NOT required if ALL IS the following are true	Cardiac monitoring is required if ANY the following are true of the
Electrocardio-gram	Normal	Documented arrhythmia or evidence of ischemia
History of loss of con-sciousness	No	Yes
Type of injury	Low-voltage (≤ 1000 (volts	High-voltage (> 1000 (volts

Differential Diagnosis

- Chemical burn.
- Ocular burn.
- Thermal burn.
- Intracranial hemorrhage.
- Lightning Injuries.
- Respiratory arrest.
- Rhabdomyolysis.
- Seizures.
- Status Epilepticus.
- Syncope.
- Ventricular Fibrillation.

- Work up

  - Electrocardiogram.
  - CBC.
  - FULL CHEMISTRY.
  - CK levels.
  - Creatine kinase myocardial isoenzyme (CK-MB).
  - Head computed tomography (CT).

Laboratory Tests Recommended For Patients With Electrical Injuries	
Test	Rationale/Indication
CBC	All patients with injuries beyond minor cutaneous burns
Electrolytes	All patients with injuries beyond minor cutaneous burns
BUN and creatinine	All patients with injuries beyond minor cutaneous burns
Urinalysis	To evaluate for myoglobinuria (positive for blood but no red blood cells)
Serum myoglobin	If urinalysis is positive for myoglobinuria
Liver function tests/ I amylase/lipase	If intra-abdominal injury is suspected
Coagulation profile	If intra-abdominal injury is suspected or if surgical course is projected
Blood type and screen/ Crossmatch	If surgical course is projected

Management

- Prehospital Care

  - Secure the scene.
  - Turn off the power source.
  - Involve the local electric company.
  - Use (ACLS) protocols.
  - Patient's cervical spine is immobilized with a cervical collar and backboard, any fractures are splinted, and burns are covered with clean, dry dressings.
  - Large-bore intravenous line.
  - Normal saline or Lactated Ringer's Solution should be given to any patients with cutaneous burns or hypotension.
  - Transport to the closest appropriate facility

Cutaneous Injuries

- Cleaned and then covered with sterile dressings.
- Antibiotic dressings, such as mafenide acetate or sulfadiazine silver should be used to cover the wounds.
- Mafenide acetate is preferred for localized full-thickness burns because it has better penetration.
- Sulfadiazine silver is preferred for extensive burns because it is less likely to cause electrolyte abnormalities.
- Tetanus immunization.

Management of Injury to the Extremities

- When electrothermal burns affect an upper extremity, the limb should be splinted with the wrist at 35° to 45° of extension, the metacarpophalangealjoint at 80° to 90° of flexion, and nearly full extension of the proximal and distal interphalangeal joints (Z position) to minimize the space available for edema formation.
- The extremity should be kept elevated above the level of the heart to reduce edema.
- Frequent neurovascular checks of all extremities
- Treatment of compartment syndrome.

Myoglobinuria

- Fluid resuscitation should be directed at maintaining a urine output of 1.0 to 1.5 cc/kg per hour until the urine is clear of myoglobin.
- Acute myoglobinuric renal failure with life-threatening consequences.

Disposition

- Patients with injuries due to electrical burns, including lightning injury, should be referred to a burn center.
- ICU admition.
- All patients with a history of loss of consciousness, documented arrhythmias either before or after arrival to the ED (including cardiac arrest), ECG evidence of ischemia, or who have a sustained a high-voltage electrical injury should be admitted for additional monitoring.

Heat Injuries

Overview

The most serious type of heat related illness is heat stroke.

Heat stroke definition includes:

(1) A core body temperature of more than 105°F (40.5°C).

(2) Central nervous system dysfunction.

(3) Exposure to heat stress, endogenous or exogenous, and

(4) Exclusions to include CNS infection, sepsis, neuroleptic malignant syndrome or malignant hyperthermia secondary to anesthetic agents.

Risk factors for Development of Heat Stroke by Type:

Classic	Both	Exertional
• Elderly • Children • Social isolation • Confined to bed • Debilitated • Lack of air conditioning • Live on top floor of a building • Heat Wave • Chronic mental illness • Cardiopulmonary disease • Chronic illness	• Drugs • Obesity • Current febrile illness • Prior dehydrating illness • Skin diseases (i.e. anhydrosis, psoriasis) • Metabolic conditions increasing heat production (i.e. thyrotoxicosis) • Lack of acclimatization • Prior heat stroke • Previous days heat exposure • Elevated Heat Index	• Protective clothing • Recent alcohol consumption • Lack of sleep, food or water • Lack of physical fitness • Lighter skin pigmentation • Motivation to push oneself/warrior mentality • Reluctance to report problems • Lack of coach or athlete education regarding heat illness.

Clinical Presentation

- History

  - Information must be sought from EMS personnel, witnesses, and family members.
  - Medications.
  - Preceding events in order to understand the circumstances of the heat injury, e.g., medical illness or exertional activities.

Physical Examination

- ABC's and reviewing the initial vital signs.
- Tachycardia.
- Hypotension.
- Tachypnea and tachycardia.
- Mental status.
- Hydration status.

Differential Diagnosis

- Delirium Tremens.
- Diabetic Ketoacidosis.
- Encephalopathy, Hepatic.
- Encephalopathy, Uremic.
- Hyperthyroidism.
- Meningitis.
- Neuroleptic Malignant Syndrome.
- Tetanus.
- Toxicity, Cocaine.
- Toxicity, Phencyclidine.
- Toxicity, Salicylate.

○ Work up

- CBC
- Serum Chemistries

- Chest radiograph
- Computed tomography (CT) of the Head
- Electrocardiogram (ECG).
- Echocardiography.

o Diagnosis of Heat Stroke:

- A core body temperature of generally more than 105°F (40.5°C) though may be slightly lower.
- Central nervous system dysfunction.
- Exposure to heat stress, endogenous or exogenous.
- Exclusions to include CNS infection, sepsis, neuroleptic malignant syndrome or malignant hyperthermia secondary to anesthetic agents.
- Some sources include a marked elevation of hepatic transaminases, however this is not universal.

Management

- Prehospital Care

  - Patient should be placed in a shaded area.
  - Tepid water may be applied to the patient in order to initiate the evaporation process
  - Manual fanning.
  - The patient should be removed from any external heat sources if applicable.
  - EMS transport should be initiated with the appropriate level of transport capability.
  - Gradual rehydration with exertional heat stroke.
  - Clothing removal, external cooling through fanning or air-conditioning, and continuous monitoring are all appropriate prehospital measures that can be undertaken.

In hospital care:

- Heat stroke:

  - Rapidly removing clothing.
  - Pouring tepid water over the body.
  - Directing a fan on the patient.
  - Icepacks in both axillae and the groin (not used alone, but as a combination with evaporative cooling).

Aggressive cooling with goal < 38.3 °C in 30-60 min:

- ❖ if goal is reached:

Start diagnostic studies.

- ❖ If goal is not reached:

Consider invasive cooling methods:

- Gastric, pleural and bladder lavage.
- Intravascular cooling device.
- Extracorporeal circuits.

Disposition

- Admit all heat stroke victims to ICU.

MEDICATIONS LIST

Antiplatelet drugs:

Code	Item	Dosage form	Stength
545021160	Acetyl Salicylic Acid (Aspirin); (Enteric Coated)	Tablet	75 mg – 100 mg
543021233	Clopidogrel (Plavix)	Tablet	75 mg

Nitrates, Calcium-Channel blacker and Peripheral vasodilators:

Code	Item	Dosage form	Stength
544021055	Nitroglycerin	Sublingual Tablet	0.4-0.6 mg
544021051	Nitroglycerin	Ampule- vial	50 mg

Opioid Analgesic:

Code	Item	Dosage form	Stength
545024051	Morphine Sulfate	Ampule	10 mg

Fibrinolytic drugs:

Code	Item	Dosage form	Stength
543063182	Alteplase	Vial	50 mg
543063183	Reteplase	Set	10 mg
543044250 543044260	Streptokinase	Vial	250,000 I.U 750,000 I.U

Anticoagulants:

Code	Item	Dosage form	Stength
543024210	Heparin Calcium	Ampoule	5000 I.U
543024201	Heparin Sodium	Vial	25000I.U/5ml
543024214	Enoxaparin	Prefilled syringe	8000 I.U
543024208	Dalteparin	Prefilled syringe	10000 I.U

Atrial Fibrillation: Management Strategies

Antiarrhythmic drugs:

Supraventricular and Ventricular arrhythmias:

Code	Item	Dosage form	Stength
544061410	Amiodarone HCL	Tablet	200 mg
544064415	Amiodarone HCL	Ampoule	150 mg
-	Diltiazem	Vial	25mg/5ml
544031110	Diltiazem HCL	Tablet	60 mg
544031112	Diltiazem HCL SR	Tablet	90 mg

Bradydysrhythmias

Code	Item	Dosage form	Stength
545064890	Atropine Sulfate	Ampule	0.4-0.6 mg/1ml
545064892	Atropine Sulfate	Prefilled syringe	0.1mg/ml
544094610	Dopamine HCL	Ampoule or Vial	200 mg
544094612	Dopamine HCL	Premixed bag	800 mg IN 250ml D5Wmbag

544094621	Adrenaline (Epinephrine)	Prefilled Syringe	1:10000 (100mcg/ml) 10 ml
544094640	Isoprenaline HCL (Isoproterenol HCL)	Ampoule	200 mcg/ml (5 ml)

Specific Antidotes and Therapies for Toxicological Causes of Bradydysrhythmias

Code	Item	Dosage form	Stength
547064650	Glucagon	Vial	1 mg
547064655	Glucagon	Prefilled syringe	1 mg
548024310	Calcium Gluconate	Ampoule	10% (10ml)
547064580	Human Soluble Insulin (Regular)	Vial	100I.U/ml (10ml)
551054365	Digoxin immune fab	Ampoule	40 mg
551074480	Naloxone	Ampoule	40mcg/2ml
551074470	Naloxone	Ampoule	400 mcg/ml
545064890	Atropine Sulfate	Ampule	0.4-0.6 mg/1ml

545064892	Atropine Sulfate	Prefilled syringe	0.1mg/ml
551054380	Pralidoxim chloride	Vial	1gm

Hypertension

Code	Item	Dosage form	Strength
544104770	Sodium nitroprusside	Ampoule or Vial	50 mg
-	Nicardipine hydrochloride	Vial	25mg/10 mL
-	Fenoldopam mesylate	Vial	10m/ml
544021051	Nitroglycerin	Ampoule or Vial	50 mg
-	Enalaprilat	Vail	1.25 mg / ml
544104730	Hydralazine hydrochloride	Ampoule	20 mg
544104770	Sodium nitroprusside	Ampoule or Vial	50 mg
-	Nicardipine hydrochloride	Vial	25 mg / 10 ml

-	Fenoldopam mesylate	Vial	20 mg / 2 ml
544101790	Labetalol hydrochloride	Ampole or Vial	5mg/ml – 100mg/20ml
544054214	Esmolol hydrochloride	Ampoule or Vial	100 mg
544104750	Phentolamine	Ampoule or Vial	10 mg
544071450	Hydrochlorothiazide	Tablet	25 mg
544101747	Lisinopril		10 mg
544101746	Enalapril		10 mg
544101740	Captopril		25 mg
544101745	Perindopril	Tablets	4-5 mg
544101738	Fosinopril		10 mg
544101749	Losartan		50 mg
544101750	Valsartan		80 mg
544101757	Irbesartan		150 mg
544101760	Telmisartan	Tablet	80 mg

544051207	Metoprolol	Tablet	50 mg
544051201	Propranolol		10 mg
544051205	Propranolol		40 mg
544051173	Atenolol		50 mg
544051171	Atenolol		100 mg
544101795	Labetolol		100 mg
544051172	Carvidolol		6.25 mg
544051206	Bisoprolol		2.5 mg
544051180	Carvidolol		25 mg
544051203	Bisoprolol		5 mg
544051208	Metoprolol		50 mg
544051253	Satolol HCL		80 mg
		Tablet	
544031110	Diltiazem	Tablet	60 mg
544031112	Diltiazem		90 mg
544031105	((SR		30 mg
544031120	Nimodipine		40 mg
544031125	Verapamil		80 mg
544031126	Verapamil		120 mg
	Verapamil		
544101703	Clonidine	Tablet	100 mcg
544101725	Hydralazine	Tablet	25 mg

Acute aortic emergency

Code	Item	Dosage form	Strength
544054214	Esmolol	Ampoule or Vial	100 mg
544051208	Metoprolol	Ampoule	5 mg
544101790	Labetalol	Ampoule or Vial	5 mg/ml (100mg/20mg)
544021051	Propranolol	Ampoule or Vial	50 mg
-	Diltiazem	Vail	1.25 mg / ml
544034130	Verapamil	Ampoule	5 mg
544024051	Nitroglycerin	Ampoule or Vial	50 mg

Deep Venous Thrombosis

Code	Item	Dosage form	Strength
543024210	Heparin Calcium	Ampoule	5000 I.U
543024201	Heparin Sodium	Vial	25000 I.U / 5 ml
543024221	Tinzaparin	Vial	20000 IU
543024219	Tinzaparin	Prefilled syringe	18000 IU
543024220	Tinzaparin	Prefilled syringe	14000 IU

543024218	Tinzaparin	Prefilled syringe	10000 IU
543024214	Enoxaparin	Prefilled syringe	8000 IU
543024204	Deltaparin	Prefilled syringe	IU 7500
543024217	Tinzaparin Enoxaparin	Prefilled syringe	4500 IU 6000 IU
543024216	Enoxaparin	Prefilled syringe	6000 IU
543024207	Deltaparin	Prefilled syringe	5000 IU
543024212	Enoxaparin	Prefilled syringe	2000 IU
543024213	Tinzaparin	Prefilled syringe	3500 IU
543024211	Deltaparin	Prefilled syringe	2500 IU

Acute Bronchial Asthma in the Emergency Department

Code	Item	Dosage form	Strength
549012030	Albuterol	Nebulization Solution	0.5 % 20 ml / bottle
549016040	Albuterol	Metered Inhaler dose inhalations	25000 I.U / 5 ml
549016110	Ipratropium	Nebulization Solution (Unite dose ampoule)	20000 IU
547051420 547051430	Prednisolone	Tablet	5 mg 20-25 mg
547054450 547054460	Methylprednisolone	Ampoule Or vial	40 mg 500 mg
548024460	IV magnesium sulfate	Ampoule or vial	10% (20 ml)

Acute Headache

Code	Item	Dosage form	Strength
545021200	Ibuprofen	Tablet	400 mg
545024323 545024324	Sumatriptan	Tablet	50 mg-100 mg 6 mg
545031556	Diphenhydramine HCL	Vial	25 mg
546054420	Metoclopramide	Ampoule	10 mg
547054480	Dexamethasone	Ampoule	8 mg/2ml
545021160	Aspirin	Tablet	75-100 mg
545021252	Naproxen	Tablet	250 mg
	Ketorolac		
545021100	Acetaminophen	Tablet	500 mg
-	Aspirin / acetamino¬phen / caffeine	Tablet	-
545024325 -	Ergotamine Dihydroergotamine	Tablet Ampoule	1 mg -
545034510	Chlorpromazine	Ampoule	25 mg
-	Prochlorperazine	-	-

Adult Acute Bacterial Meningitis

Code	Item	Dosage form	Strength
547054480	Dexamethasone	Ampoule	8 mg/2ml
540014370	Vancomycin HCL	Vial	500 mg
540014250	Cefotaxim Sodium	Vial	1 gm
540014256	Ceftriaxone	Vial	1 gm
540014248 540014255	Cefepim	Vial	1 gm 2 gm
540014253	Cefixime	Susspension	100 mg/ 5 ml
540014135 540014140	Ampicillin Sodium	Vial	500 mg 1 gm

Acetaminophen (Paracetamol, APAP) Overdose

Code	Item	Dosage form	Strength
551051390	Activated Charcoal	Powder or suspension	50-100gm/ Container
551054355	Acetylcys-teine	Ampoule	200mg/10 ml
543014170	Vitamin K (Phytomena-dione)	Tablet	10 mg
543014150	Vitamin K (Phytomena-dione)	Ampoule	2 mg
543014160	Vitamin K (Phytomena-dione)	Ampoule	10 mg
543034240	Protamine sulfate	Ampoule	1% 50mg/5ml

Sickle cell disease in emergency department

Code	Item	Dosage form	Strength
545024051	Morphine sulfate	Ampoule	10 mg
-	Hydromorphone	Ampoule	-
545031556	Diphenhydr-amine	Vial	100 mg
545034555	Promethazine	Ampoule	50 mg
545021105	Paracetamol	Vial	1 gm

Anticoagulation Emergencies

Code	Item	Dosage form	Strength
543014160	Vitamin K (Phytom-enadione)	Ampoule	10 mg
-	Fresh Frozen Plasma	-	-
543054315	Recombinant factor VIIa	Vial	1 mg
543054316	Recombinant factor VIIa	Vial	2 mg
543054317	Recombinant factor VIIa	Vial	5 mg
-	Prothromben Com-plex Concentrate	-	-

Hypokalemic and Hyperkalemia Emergencies

Code	Item	Dosage form	Strength
548021455	Potassium chloride	Tablet	600 mg (8 mmol)
548024450	Potassium chlorid	Ampoule	15% 2mmol/ml (10ml)
548024462	Magnesium Sulfate	Ampoule	50% 5 ml
547064580	Human Soluble Insulin (Regular)	Vial	100I.U/ml (10ml)
549012030	Salbutamol	Nebulization Solution	0.5% 20ml/bottole
548034600	Dextrose	Ampoule or vial	50% 50 ml

Diabetic Emergencies

Code	Item	Dosage form	Strength
548024410	Sodium Chloride (Normal Saline)	Bottle or bag	0.9% 500 ml
548024413	Sodium Chloride (Normal Saline)	Piggy bag	0.9% 100 ml
548024412	Sodium Chloride (Normal Saline)	Piggy bag	0.9% 50 ml

547064580	Human Soluble Insulin (Regular)	Vial	100I.U/ml (10ml)
548024450	Potassium chloride	Ampoule	15% 2mmol/ml (10ml)
548024430	Sodium Bicarbonate	Bottle Or Bag	5% 250 ml
548024435	Sodium Bicarbonate	Prefilled syringe	8.4% 1mEq/ml 10 ml
548024420	Sodium Bicarbonate	Prefilled syringe	8.4% 1mEq/ml 50 ml
-	Sodium Phosphate	-	-
548024310	Calcium Gluconate	Ampoule	10% 10ml
548024462	Magnesium Sulfate	Ampoule	50% 5 ml

Thyroid Storm and Myxedema Coma

Code	Item	Dosage form	Strength
547071715	Levothyroxin sodium	Ampoule	200-500 mcg
547054405	Hydrocorti-sone	Ampoule or Vial	100 mg
544051205	Propranolol	Tablet	40 mg
544051201	Propranolol	Tablet	10 mg
544054210	Propranolol	Ampoule	1 mg
547051470	Dexametha-sone	Ampoule	5 mg
547071750	Propylthio-uracil	Tablets	50 mg
547071760	Carbimazole	Tablets	5 mg
192000055	131 l-Iodine therapy dose 50mci	Vial	50 mci

Rhabdomyolysis: Advances in Diagnosis and Treatment

Code	Item	Dosage form	Strength
548024410	Sodium Chloride (Normal Saline)	Bottle or bag	0.9% 500 ml
548024413	Sodium Chloride (Normal Saline)	Piggy bag	0.9% 100 ml
548024412	Sodium Chloride (Normal Saline)	Piggy bag	0.9% 50 ml

Acute Urinary Retention

Code	Item	Dosage form	Strength
547011025	Finasteride	Tablet	5 mg

Severe Traumatic Brain Injury

Code	Item	Dosage form	Strength
544074535	Mannitol	Infusion bottle	20% 250 ml glass bottole
545051748	Phenytoin Sodium	Capsule	50 mg
545051750	Phenytoin Sodium	Capsule	100 mg
545051760	Phenytoin Sodium	Vial	250 mg

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وزارة الصحة
Ministry of Health

M . O . H
DRUG LIST

ALPHAPITICAL
DRUG INDEX

(A)	atracurium besylate
abacvir sulfate + lamivudine + zid-ovudine	atropine sulphate
acetazolam ide	azathioprine
acetylcholine chloride	azelaic acid
(acetyl salicylic acid (asprine	azithromycin
acitren	**(B)**
acyclovir	bacillus calmette-gue rin
adalimumab	bacitrin zinc + polymixin b sulphate
adefovir dipivoxil	baclofen
adenosine	basiliximab
adrenaline hcl	bcg vaccine (bacillus calmette – Guer-(in
(adrenaline (epinephrine	beclomethasone
albendazole	bnzhexol hcl
albumen human	benzoyl peroxide
alemtuzumab	benztropine mesylate
alendronate sodium	beractant,phospholipid
alfacalcidol	betahistine dihydrochloride
allopurinol	betamethasone
alprazolam	betaxolol hcl
alprostadil (prostaglandin e1) pediatric dose	bevacizumab
alteplase	bicalutamide
aluminum hydroxide + magnesium hydroxide	bimatoprost

amantadine hcl	bisacodyl
amethocain	bisoprolol fumarate
amikacin sulfate	bleomycin
amiloride hcl + hydrochloridethiazide	bortezomib
aminoacids for adult	bosentan
aminocaproic acid	botulinum toxin type a
aminoglutethimide	bretulium tosylate
aminophyline	brimonidine tartrate
amiodarone hcl	brinzolamide
amlodipine besilate or felodephne	bromocriptine
ammonium chlorhde	b-sitosterol
amobarbitol	budesonide
amoxicilline trihydrate	budesonide 3mg capsules
amoxicilline trihydrate + clavulanate potassium	budesonide turbuhaler
amphotericin b liposomal	Bulk-forming laxative
mpicilline sodium	bupivacaine hcl
anagrelide	buprenorphine
anastrozole	bupropion
antihemorroidal / without steroids	busulfan
(anti rabies serum (horse origin	**(C)**
anti-rho(d) immunogloblin	cabergoline
(antithymocyte globulin(atg	calcipotriol
apracloidine hcl	calcipotriol + betamethasone dipropionate
aripiprazole	(calcitonin (salmon)-(salcatonin

artemether + lumefantrine	calcitriol
artemisinin	calcium carbonate
artesunate	calcium chloride
artesunate + sulfadoxine + pyrimethamine	calcium gluconate
artificial tears eye dropper	calcium lactate
(ascorbic acid (vitamin c	capecitabine
(sparaginase (crisantaspase	capreomycine
atazanavir	captopril
atenolol	carbamazepine
atorvastatin	carbimazole

carboplatin	cyclophosphamide
carboprost tromethamine	cycloserine
carboxymethyl-cellulose	cyclosporine
carmustine	cyprotone acetate + ethinyl estradiol
carteolol hcl	cytarabine for injection
carvedilol	**(D)**
caspofungin acetate	dabigatran
cafaclor	dacarbazine
cefepime hydrochloride	dactinomycin
cefixime	dalteparin
cefixime sodium	danazol
ceftazidime pentahydrate	dantrolene sodium
ceftriaxone sodium	dapsone

cefuroxime	darunavir
celecoxib	dasatinib monohydrate
cephalexin monohydrate	daunorubicin hcl
cephradine	desmopressin acetate
cetuximab	dexamethasone
chloral hydrate	Dextran (dextran40) + sodium chlorid
chlorambcil	dextromethorphan
chloramphenicol	dextrose
chlordiazepoxide hcl	diazepam
chlorhexidine gluconate	diazoxide
chloroquine	diclofenac
chlorpheniramine maleate	didanosine
chlorpromazine hcl	diethylcarbamazine citrate
chlorthalidone	digoxin
chlorzoxazone	dihydralazine mesilate or hydralazine hcl
(cholecalciferol (vitamine d3	diloxanide furoate
cholestyramine	(diltiazem hcl (sustainad release
cincalcet hydrochloride	dimenhydrinate
cinnararizine	dinoprostone
ciprofloxacin	diphenhydramine hcl
cispltin	(diphetheria,tetanus,pertussis (dpt
citalopam hydrobromide	diphetheria,tetanus vaccine for adult
clarithromycin	diphetheria,tetanus vaccine for children
clindamycin	diphetheria antitoxine

clindamycin or erythromycin for acne	dipyridamol
clindamycin phosphate	disodium pamidronate
clofazimin	disopyramide phosphate
clomiphene citrate	distigmine bromide
clomipramine hcl	dodutamine hcl
clonazepam	docetaxel
clonidine hcl	docusate sodium
clopidogral	domperidone
clotrimazole	dopamine hcl
cloxacillin or flucloxacillin sodium	dorzolamide&1
clozapine	doxorubicin
codeine phosphate	duloxetine
colchicine	dydrogesterone
colistin sulphomethate sodium	**(E)**
conjugated estrogen + norgestrel	econazole
corticorelin (corticotrophin-releasing (factor,crf	edrophonium chloride
cromoglycate sodium	efavirenz
(cyanocobalmin (vit b12	(electrolyte oral rehydration salt (ors
cyclopentolate hcl	emtricitabine

cyclophosphamide	carboplatin
cycloserine	carboprost tromethamine
cyclosporine	carboxymethyl-cellulose
cyprotone acetate + ethinyl estradiol	carmustine
cytarabine for injection	carteolol hcl

(D)	carvedilol
dabigatran	caspofungin acetate
dacarbazine	cafaclor
dactinomycin	cefepime hydrochloride
dalteparin	cefixime
danazol	cefixime sodium
dantrolene sodium	ceftazidime pentahydrate
dapsone	ceftriaxone sodium
darunavir	cefuroxime
dasatinib monohydrate	celecoxib
daunorubicin hcl	cephalexin monohydrate
desmopressin acetate	cephradine
dexamethasone	cetuximab
Dextran (dextran40) + sodium chlorid	chloral hydrate
dextromethorphan	chlorambcil
dextrose	chloramphenicol
diazepam	chlordiazepoxide hcl
diazoxide	chlorhexidine gluconate
diclofenac	chloroquine
didanosine	chlorpheniramine maleate
diethylcarbamazine citrate	chlorpromazine hcl
digoxin	chlorthalidone
dihydralazine mesilate or hydralazine hcl	chlorzoxazone

diloxanide furoate	cholecalciferol (vitamine d3)
diltiazem hcl (sustainad release)	cholestyramine
dimenhydrinate	cincalcet hydrochloride
dinoprostone	cinnararizine
diphenhydramine hcl	ciprofloxacin
diphetheria,tetanus,pertussis (dpt)	cispltin
diphetheria,tetanus vaccine for adult	citalopam hydrobromide
diphetheria,tetanus vaccine for children	clarithromycin
diphetheria antitoxine	clindamycin
dipyridamol	clindamycin or erythromycin for acne
disodium pamidronate	clindamycin phosphate
disopyramide phosphate	clofazimin
distigmine bromide	clomiphene citrate
dodutamine hcl	clomipramine hcl
docetaxel	clonazepam
docusate sodium	clonidine hcl
domperidone	clopidogral
dopamine hcl	clotrimazole
dorzolamide&1	cloxacillin or flucloxacillin sodium
doxorubicin	clozapine
duloxetine	codeine phosphate
dydrogesterone	colchicine
(E)	colistin sulphomethate sodium
econazole	conjugated estrogen + norgestrel

edrophonium chloride	corticorelin (corticotrophin-releasing factor,crf)
efavirenz	cromoglycate sodium
electrolyte oral rehydration salt (ors)	cyanocobalmin (vit b12)
emtricitabine	cyclopentolate hcl

enalapril malate	Gemfibrozil
enfuvirtide	gentamicine
enoxaparin	glibenclamide
entecvir	gliclazide
ephedrine hydrochloride	glipizide
epirubicin hcl	glucagon
epoetin (recombinant human eryth-	glycrine
(ropoietins	
ergotamine tartarate	glycopyrrolate bromide
erlotinib hydrochloride	gonadorelin (gonadotrophine-releas-
	(ing hormone, lhrh
erythromycin	goserlin acetate
escitalopram	granisetron
esmolol hcl	griseofulvin micronized
esomeprazole magnesium trihydrate	(H)
estradiol valerate	haemophilus influenza vaccine
etanercept	haloperidol
ethambutol hcl	heparinecalcium for subcutaneous injection
ethanolamine oleate	(heparine sodium (bovine
ethinyl estradiol	(hepatitis b vaccine (child
ethionamide	homatropine

ethosuximide	human chorionic gonadotrophin
etomidate	human fibrinogen
etoposide	(human isophane insulin (nph
etravirine	human menopausal gonadotrophins,-follicle
(F)	stimulating hormone + luteinizing hormone
factor ix fraction for injection, which is sterile and free of hepatitis, hivand any other infectious disease agent	human normal immunoglobulin for i.m injection
factor viii (stable lyophilized con-(centrate	(human soluble insulin (regular
fat emulsion	hyaluronidase
(felodipine retard (modified release	hydralazine hcimesilate
fentanyl citrate	hydrochlorothiazide
ferrous salt	hydrocortisone
ferrous sulphate or fumarate + folic acid	hydroxurea
filgrastim g-csf	hydroxychloroquine sulphate
finasteride	ydroxyprogesterone hexanoate
fluconazole	hydroxypropyl methylcelulose
fludarabine phoaphate	hyocine butylbromide
fludrocortisones acetate	(I)
flumazenil	ibuprofen
fluorescein	ifosfamide
fluorometholone	iloprost
fluorouracil	imatinib mesilate

fluoxetine	imidazole derivative
flupenthixol	imipenem + cilastatin
fluphenazine decanoate	imipramine hcl
flutamide	(indapamide (sustaind release
fluticasone	indinavir
fluvoxamine malate	indomethacin
follitropin	infliximab
formoterol + budesonide turbuhaler	influenza virus vaccine
foscarnet	injectable polio vaccines (ipv) (salk (vaccine
fosinopril	insulin aspart
furosemide	nsulin detmir
fusidic acid	insulin glargine
(G)	insulin lispro
gabapentine	interferon alpha
ganciclovir	interferon beta 1a
gemcitabine	ipratropium bromide
medroxyprogesterone acetate	irbesartan
mefenemic acid	irintecan hydrochloride
melfloquine hcl	iron saccharate
megestrol acetate	isoniazid
meloxicam	isoprenaline hcl (isoproterenol hcl)
melphalan	isosorbide dinitrate
memantine hcl	isosorbide dinitrate

meningococcal polysaccharide sero group (a,c,y,w-135)	isotretinoin
mercaptopurine	itraconazole
meropenem	ivabradine
mesalazine	ivermectin
mesna	**(K)**
metformin hcl	kanamycin
methadone hcl	kaolin + pectin
methotrexate	ketamine hcl
methoxsalen + ammidine	ketoconazole
methoxy polyethylene glycol-epoetin beta	ketotifen
methyldopa	**(L)**
methylerrgonovine maleate	labetalol hcl
methylphenidate	lactulose
methylperdnisolone	lamivudine
metoclopramide hcl	lamotrigine
metolazone tartrate	lansoprazole
metolazone	latanoprost
metolazone tartrate	l-carnitine
etronidazole	leflunomide
mexiletine hcl	lenalidomide
micafungin sodium	letrozole
miconazole	Leucovorin calcium
midazolam	leuprolid depo acetate
miltefosine	levamizole

minocycline hcl	levetiracetam
mirtazapine	levofaoxacin
misoprostol	levothyroxine sodium
mitomycin	lidocaine + fluorescein sodium
mitoxantrone hydrochloride	Lidocaine hcl
mixed gas gangrene antitoxin	linezolid
moclopemide	liquid paraffin
mometasone furoate	lisinopril
montelukast sodium	lithium carbonate
orphine sulphate	lomustine
moxifloxacin hydrochloride	Loperamide hcl
ultienzyme (pancreatic enzymes:pro-tease200-600u;lipse5,000-10,000u and amylase5,000-10,000u) /capsule or enteric coated tablet	lopinavir + ritonavir
multivitamins	lorazepam
mupirocin	losartan potassium
muromonab-cd3	lubricant
mycophenolate mofetil	(M)
(N)	magnesium oxide
nafarelin	mannitol
nalbuphine hcl	maprotilline hcl
naloxone hcl	measles vaccine
naphazoline	mebendazole
Naproxene	mebeverine hcl
natalizumab	mechlorethamine hcl
natamycin	meclozine + vitamine B6

phenylephrine hcl	nateglinide
phenytoin sodium	nelfinavir
phosphate enema	neomycin sulphate
phosphate salt	neostigmine methylsulpfate
phytomenadione	niclosamide
pilocarpine	nicotine(24-hour effect dose)
pioglitazone	nifedipine retard (modified release)
piperacillin + tazobactam	nilotinib
plasma protein solution	nimodipine
pneumococcal polyvalent (23 valent) vaccine	nitrazepam
poliomyelitis vaccine live oral: (sabin strain)	nitrofurantoin
polyacrylic acid	nitroglycerin
polyethylene glycol,3350-13.125g oral ppowder, sodium bicarbonate 178.5mg,sodium chloride350mg , potassium chloride 46.6mg/sachet	isosorbide dinitrate
polymyxin b sulphate + neomycin sulphate + hydrocortisone	non sedating antihistamine tablet (cetirizine or noratadine)
polystyrene sulphate resins (calcium)|	noradenalin acid tartrate
potassium salt	norethisterone
pramipexole	norfloxacin
pravastatin	nystatin
praziquantel	(O)
prazosin hcl	octreotide
prednisolone	ofloxacin

pregabalin	oily phenol injection
Prilocaine + felypressin	olanzapine
Primaquine phosphate	olopatadine hcl
Primidone	omeprazole sodium
Procainamide hcl	ondansetron
Procarbazine	orienograstim (g-csf)
Procyclidine hydrochloride	oxaliplatin
Progesterone	oxybuprocaine
Proguanil hcl	oxybutynin hcl xl
Promethazine hcl	oxymetazoline
proparacaine	oxytocin
propfol	(P)
propylthiouracil	paclitaxel
Propranolol hcl	paliperidone
Protamine sulfate	palivizumab
prothionmide	pancuronium bromide
Protirelin (thyrotrpphin-releasing hormone,trh)	pantoprazoole sodium sesquihydrate
Pseudoephedrine hcl 30mg + anti-histamine	papaverin
Pumactant phospholipid	para-amino salicylate sodium
Pura aluminum hydroxide	paracetamol
Pyrazinamide	pegaspargase
Pyrethrins	pegylated interferon alpha 2a
Pyridostigmine	pemetrexed
Pyridoxine hcl (vitamine b6)	penicillamine

Pyrimethamine	penicillin benzathine (penicillin g)
Prilocaine + felypressin	pentamidine isethionate
primaquine phosphate	pentavalent vacc.(hbv+hib+dtp)
(Q)	pentoxifylline
quetiapine	perindopril
quinidine sulfate	permethrin
quinine dihydrochloride	pethidine hcl
quinie sulphate	phenobarbital (phenobarbitone)
(R)	phenoxymethyl penicillin (penicillin v potassium)
rabies immunoglobulin for i.m injection	phentolamine mesylate
stibogluconate sodium (organic pentavalent antimony)	rabies virus vaccine
streptokinase	racemic epinphrine
streptomycin sulfate	raltegravir
strontium ranelate	ranitidine
succinylcholine choloride	rasburicase
sucralfate	recombinant factor via
sulfacetamide	repaglinide
sulfadiazine	reteplase
sulfadoxin500mg + pyrimetha-mine25mg	retinoin (vitamine a)
sulfasalazine,500mg/tablet	ribavirin
sulindac	rifabutine
sulpiride	rifampicin
sumatriptan succinate	riluzole

(T)	ringer's lactate solution
tacrolimus	risperidone
tamoxifen citrate	ritonavir
tamsulosin hcl (modified release)	rituximab
telmisartan	rivaroxaban
temazepam	rocuronium bromide
tenofovir disoproxil fumurate	ropivacaine hcl
terbinafine	rose bengal
teriparatide	rosuvastatin
terlipressin acetate	(S)
tetanus antitoxin	salbutamol
tetanus immunoglobulin for i.m injection	salmeterol + fluticasone propionate
tetanus vaccine	scorpion anti – venin
tetracosactrin (corticotrophin)	selegiline hcl
tetracycline hcl	senna
thalidomide	sevelamer
theophylline	sevoflurance
thiacetazone	sildenafil
thiamine (vitamine b1)	silver sulfadiazine (steril)
thioguanine	simethicone
thiopental sodium	simvastatin
tigecycline	sirolimus
timolol	sitagliptin phosphate
tinzaparin sodium	snake anti-venin

tiotropium	sodium acetate
tirofiban hydrochloride	sodium aurothiomalate
tobramycin + dexamethasone	sodium bicarbonate
tobramycin sulfate	sodium chloride
tolterodine tartrate	sodium cormoglycate
topiramate	sodium hyaluronate
trace elements additive (pediatric dose)	sodium hyaluronate intra-articular (mw over 3 sillion)
tramadol hcl	sodium nitropruprusside
tranexamic acid	sodium phosphate
trastuzumab	sodium valpproate
trazodone	somatropin (human growth hormone)
tretinoin	sorafenib
triamcinoloneacetonide	sotalol hydrochloride
triamterene + hydrochlorthiazide	spectinomycin hcl
trifluperazine hcl	spiramycin
trifluridine	spironolactone
trimetazidine dihydrochloride (modified release)	sterile balanced salt solution (bss)
trimethoprim + sulfamethoxazole	sterile water for injection
triple virus vaccine (measles-mumps-rubella)	verapamil hcl
triptorelin acetate	verapamil hcl (sustaind release)
tropicamide	vigabatrin
tuberculin ppd skin test	vinblastine sulfate

typhoid vaccine	(W)
(U)	warfarin sodium
urea	water for injection (sterile)
urofollitrophine f.s.h	wax removal
ursodeoxycholic acid	(X)
(V)	xylometazoline hcl
valaciclovir hcl	(Y)
valganciclover hcl	yellow fever vaccine
valsartan	(Z)
vancomycin hcl	zidovudine (azidothymidine,AZT)
varicella-zoster virus (chicken pox vaccine)	zidovudine + lamivudine
vasopressine	zinc sulfate
vecuronium bromide	zolledronic acid
venlaxine hcl (sustaind release)	zolpedem tartrate
vincristine sulfate	zuclopenthixol acetate
vinorelbine	
vitamine B1 & B6& B12	
vitamine B complex	
vitamine E	
voriconazole	

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