

General

Section Contents — one protocol

General Patient Criteria Protocol

GENERAL PATIENT CRITERIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Recommended conditions to notify physician during or after practitioner's initial assessment

- Acute myocardial infarction (AMI) or symptoms consistent with AMI — notify physician when AMI identified
- Acute central nervous system deficits
- Severe CHF
- Severe respiratory distress
- O₂ Saturation < 90% on room air, if acute
- Hypotension
- Acute altered mental status unless intoxicated
- Adult heart rate ≥ 140
- Emergency hypertension

Recommended consult criteria with physician when:

- Age < 3 months (unless experienced with this age group)
- Moderate CHF
- SBP ≥ 240 or DBP ≥ 140 at presentation (that is asymptomatic) with preexisting hypertension history
- Adult heart rate ≥ 110 at time of disposition
- Patients sent to the ED or clinic from an outlying hospital, clinic, or from home by a medical provider
- Age ≥ 70 with systemic symptoms
- Patient receives more than one pain injection
- Patient returns ≤ 14 days for same acute complaint (Does not apply to chronic recurrent complaints unless a change in the complaint)
- Elevated BP or heart rate in pregnancy or ≤ 6 weeks postpartum
- Pregnancy complications
- Chest pain (potentially consistent with angina or anginal

equivalent symptoms)

- Nonspecific chest pain age ≥ 30 with history of
 - Hypertension
 - Diabetes
 - Smoking
 - Coronary artery disease history
 - Hyperlipidemia
 - Family history of coronary artery disease by age of 60
- OR
- Age ≥ 50 without risk factors
- Abdominal pain
 - Requiring narcotics
 - Age ≥ 70
 - Diabetic
 - Uncertain diagnosis

Lab consult criteria

- Adult WBC $\geq 15,000$ or $< 1,000$ neutrophils
- Pediatric WBC $\geq 15,000$ or $< 1,000$ neutrophils
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Hemoglobin 8–10 gms (unless chronic and stable)
- Hemoglobin < 8 gms even if chronic
- O₂ Sat $\leq 94\%$ on room air if acute (or moderate dyspnea)
- O₂ Sat 2% less than chronic levels

Vital sign and age consult criteria

Fever

- Adult $\geq 104^{\circ}\text{F}$ or 40°C
- Pediatric $\geq 104.5^{\circ}\text{F}$ or 40.3°C

Hypothermia

- Temperature $\leq 95^{\circ}\text{F}$ or 35°C

Heart rate/minute

- Adult heart rate ≥ 110
- Pediatric heart rate:
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160

- 4–5 years ≥ 145
- 6–8 years ≥ 130
- 7–12 years ≥ 125
- 12–15 years ≥ 115
- 16 years or older ≥ 110

Hypertension

- Adult asymptomatic hypertension of SBP > 220 or DBP > 120 at time of disposition with history of hypertension
- Adult asymptomatic SBP > 195 or DBP > 115 at discharge without history of hypertension
- Pediatric hypertension — age < 14 years

NOTE: Specific protocols override this General Patient Criteria Protocol

Cardiovascular

Section Contents

Chest Pain Protocol

Cardiac Dysrhythmia Protocol

Hypertension Protocol

Congestive Heart Failure Protocol

Syncope/Presyncope Protocol

CHEST PAIN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Patient perception of discomfort in anterior chest or upper half of back

Differential Diagnosis

Pneumonia

- Cough
- Fever
- Chills
- Dyspnea
- Sweats
- Tachycardia

Pulmonary embolism

- Dyspnea
- Tachycardia
- Hypoxia
- Pleuritic chest pain
- Well's criteria moderate-to-high probability
- Troponin may be elevated in moderate to massive pulmonary embolism

Chest wall pain

- Chest tenderness
- Pleuritic chest pain
- Pain with movement

Angina/AMI

- Anterior chest pressure or tightness
- Left or right arm pain
- Jaw pain
- Right arm pain only with chest pain highly specific for cardiac ischemia
- Dyspnea (may be only presenting complaint in very

elderly: age ≥ 80)

- Nausea and/or vomiting
- Diaphoresis
- Indigestion
- Angina may be exertional only

Pleurisy

- Pain occurs or worsens with breathing
- No other comorbid symptoms or signs

Pneumothorax

- Pain occurs or worsens with breathing
- Dyspnea and hypoxia depending on severity

Pericarditis

- Pleuritic pain
- Fever
- Worse lying down
- Better sitting and leaning forward
- Diffuse ST segment elevation
- Diffuse PR segment depression
- Pericardial effusion
- Elevated C-reactive protein

Myopericarditis

- Elevated troponin
- Similar symptoms and findings as Pericarditis

Herpes zoster

- Vesicular dermatomal rash
- May have pain 4 days prior to rash

Aortic dissection

- Tearing pain
- Located or radiates to back
- Signs and symptoms above and below diaphragm frequently
- Ascending aorta most common location of thoracic dissection

Chest Pain with Respiratory (Pleuritic)

or Movement Exacerbation

- May need no further testing if vital signs and O2 Sat are normal and clinical suspicion is low for cardiac or serious pulmonary disease
- Consider chest x-ray and D-dimer
- Consider EKG and troponin if diagnosis is uncertain for a non-cardiac etiology
- Consider CTA chest to evaluate for pulmonary embolism
- Apply Well's criteria

Evaluation options

- Chest x-ray
- CBC if fever or tachycardic
- BMP if diabetic or tachycardic
- D-dimer (if negative with Well's criteria 0–1 makes PE unlikely)
- CT chest (see below)
- Apply Well's pulmonary embolism and DVT criteria and chart Well's score as indicated
- Record positive or negative calf tenderness and Homan's sign

Evaluation with D-dimer

D-dimer (LIA method) — some methods currently in use not reliable

- Useful if negative at cutoff value to rule out DVT or PE
- Negative D-dimer with low to moderate probability Well's DVT or PE score largely excludes venous thromboembolic disease
- Well's DVT criteria high probability: order ultrasound scan regardless of D-dimer result
- If positive — not as useful as a negative result which usually rules out VTE (venous thromboembolic) disease
- Frequently positive with
 - Hospitalization in past month
 - Chronic bedridden or low activity state
 - Increasingly positive with age without significant acute disease process
 - CHF
 - Chronic disease processes

- Edematous states

Well's DVT criteria

- One point each:
 - Active cancer
 - Paralysis/recent cast immobilization
 - Recently bedridden > 3 days or surgery < 4 weeks
 - Deep vein tenderness
 - Entire leg edema
 - Calf swelling > 3 cm over other leg
 - Pitting edema > other calf
 - Collateral superficial veins
- Two points — alternative diagnosis less likely

High probability: ≥ 3 points

Moderate probability: 1–2 points

Low probability: 0 points

Well's PE criteria score 3 or greater consider D-dimer and CT chest PE protocol (EVIDENCE-BASED)

- Suspected DVT = 3
- Alternative diagnosis less likely than PE = 3
- Heart rate > 100 = 1.5
- Immobilization/surgery past 4 wks. = 1.5
- Previous DVT/PE = 1.5
- Hemoptysis = 1
- Cancer past 6 months = 1

Well's score ≥ 6 : order CTA chest PE protocol

Document positive or negative Homan's sign or calf tenderness regardless of Well's scores

Document PERC and/or Well's scores when appropriate

Pulmonary Embolism Rule-out Criteria (PERC Rule)

(Reportedly decreases significantly the likelihood of pulmonary embolism if all 8 criteria met)

- Age < 50

- Pulse oximetry > 94%
- Heart rate < 100
- No history of DVT or VTE
- No hemoptysis
- No estrogen use
- No unilateral leg swelling
- No recent surgery or trauma hospitalization past 4 weeks

Treatment

- Treat pneumonia/bronchitis per current national recommendations and Sanford Guide
- Pericarditis: NSAID's (if uncomplicated)
- NSAID or hydrocodone, or other narcotics as needed: Avoid Demerol (meperidine)
- Treat chest pain from abdominal causes or other causes as per training, experience, and protocols

Chest Pain that Could Represent Acute Coronary Syndrome (ACS) or Stable Angina

Evaluation

- EKG
- CBC
- BMP
- Chest x-ray
- Troponin

Acute Coronary Syndrome treatment (STEMI, NSTEMI and Unstable Angina) — consult physician promptly

- Aspirin 160–325 mg chew and swallow or Clopidogrel 300 mg PO once
- Nitrates prn (See nitrate contraindications and side-effects below)
- Oxygen — maintain O2 Sat > 90%
- Morphine 2-5 mg IV q5-15 minutes prn (caution if SBP < 105 mm Hg)

Short-acting nitrates

- NTG 0.3–0.6 SL prn — may repeat x 2 q5minutes prn continued ischemic cardiac pain
- May use before anginal provoking activities
 - Comes in tablets or spray
 - Tablets need refrigeration and last 3–6 months, and should tingle tongue when used
 - NTG spray lasts 2–3 years

NTG paste if needed

- 0.5-1 inch — caution if SBP < 105 mm Hg

NTG drip if needed

- Start at 10 mcg/minute IV and titrate for chest pain and limit SBP decrease to 10% if normotensive and 30% if hypertensive
- Keep SBP \geq 90 mm Hg
- See nitrate contraindications and side-effects below

Heparin if needed

- Bolus 60 units/kg IV — NMT 4,000 units
 - 12 mg/kg/hour IV drip — initially NMT 1,000 units/hour to be adjusted to PTT 50-75 seconds
- OR

Enoxaprin if needed

- 1 mg/kg SQ q12hr
- May give first dose as 30 mg IV along with the SQ dose for STEMI
 - Age > 75 years give 0.75 mg/kg SQ and no IV dose for STEMI
- Dose 30 mg SQ qday for creatinine clearance < 30 ml/minute

Stable angina treatment

Short-acting nitrates

- NTG 0.3–0.6 SL prn — may repeat x 2 q5minutes prn continued ischemic cardiac pain
- May use before anginal provoking activities
 - Comes in tablets or spray
 - Tablets need refrigeration and last 3–6 months, and should tingle tongue when used
 - NTG spray lasts 2–3 years

Long-acting nitrates for stable angina

- Timing — taken at time of day that anginal symptoms or anginal equivalent symptoms (i.e., dyspnea) are most prevalent
- NTG 2.5 mg or 6.5 mg PO bid
- Isosorbide mononitrate
 - Standard dose — 20 mg PO bid given 7 hours apart
 - Smaller patients start 5 mg PO bid given 7 hours apart and increase to 10–20 mg PO bid given 7 hours apart over 2–3 days
 - Take on empty stomach 30 minutes prior to a meal or 1 hour after a meal
- Isosorbide mononitrate ER (extended release)
 - 30–120 mg PO qday
- Transdermal nitroglycerin (Nitro-Dur)
 - 0.2–0.4 mg/hr qday — remove for 10–12 hours each day
 - Max dose 0.4–0.8 mg/hr qday
 - Starts acting in 30 minutes and lasts 8–14 hours

Nitrate side-effects (some)

- Headache
- Hypotension
- Tachycardia
- Nausea

Nitrate contraindications

- Shock or hypotension
- SBP < 90 mm Hg or ≥ 30 mm Hg below baseline SBP in ACS
- Bradycardia < 50 beats per minute
- Tachycardia in absence of heart failure (> 100 beats per minute)
- Acute right ventricular myocardial infarction
 - Caution in inferior myocardial infarction
- Use of erectile dysfunction medications (sildenafil, tadalafil, or vardenafil)
- Severe anemia

Beta-blockers for stable angina (EVIDENCE-BASED)

- Reduce heart rate, blood pressure and cardiac contractility which decreases cardiac work and oxygen

needs

- First choice usually in stable angina
- Prolongs survival and decreases second AMI incidence

Selective beta-1 blocker

- Metoprolol (Lopressor) initially 50 mg PO bid and may be increased to 200 mg PO bid
- Metoprolol (Toprol XL) 100 mg PO qday — NMT 400 mg PO qday
- Atenolol (Tenormin) 50 mg PO qday — NMT 200 mg PO qday

Beta-blocker side effects

- Bradycardia
- Hypotension
- Worsening of asthma and COPD
- Depression
- Heart failure
- Exacerbation of angina and hypertension on abrupt withdrawal (Black Box Warning)
- Worsening of peripheral arterial disease symptoms

Contraindications

- Pre-existing sinus bradycardia (< 60 beats/minutes)
- Moderate to severe left ventricle failure and pulmonary edema
- SBP < 100 mm Hg
- Signs of poor peripheral perfusion
- 2nd and 3rd degree heart block
- Asthma and COPD
- Sick sinus syndrome without pacemaker
- Untreated pheochromocytoma

ACEI or ARB added to a beta-blocker if needed in stable angina

Consult criteria

- Notify physician promptly for ACS (STEMI, NSTEMI and Unstable angina)
- Consult physician for suspected stable angina

General Discharge Criteria for Chest

Pain

- Benign noncardiac chest pain
- Chest wall pain
- Pleurisy or pleurodynia
- Adult heart rate < 100
- Herpes zoster
- O₂ Saturation ≥ 95%
- Normal cardiac marker lab tests
- Stable and nonacute CBC, BMP and chest x-ray

Discharge instructions

- Chest pain aftercare instructions
- Follow up with primary care provider or cardiologist within 1–3 days as indicated

Consult Criteria

- Suspected angina or acute coronary syndrome
- Suspected anginal equivalent — arm, neck, jaw or epigastric pain, or dyspnea
- Acute chest x-ray abnormalities
- Pneumothorax
- Pulmonary embolism or aortic dissection/aneurysm
- Pericarditis
- Severe pain in Provider's clinical judgment
- Chest pain of uncertain etiology
- Follow General Patient Criteria Protocol (page 2) for care/evaluation not covered in this protocol

Suggested age consult criteria

- Nonspecific chest pain age ≥ 30 with history of
 - Hypertension
 - Diabetes
 - Smoking
 - Coronary artery disease history
 - Hyperlipidemia
 - Family history of coronary artery disease by age of 60
- OR
- Age ≥ 50 without risk factors

Suggested vital signs and lab consult criteria

- WBC \geq 15,000
- Elevated troponin
- Bandemia \geq 15%
- Increased anion gap
- Metabolic acidosis
- Significant electrolyte abnormality (see electrolyte disorders)
- Glucose \geq 400 mg/dL in diabetic patient
- Glucose \geq 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Chest pain with O₂ Saturation on room air < 95% in non-COPD or non-bronchospasm presentation (see Dyspnea Protocol)
- Adult heart rate \geq 100
- Developing hypotension or relative hypotension (SBP < 105 with history of hypertension)

Reference:

Circulation 2010;122:S787-S817

CHEST October 2011;140(4_MeetingAbstracts):594A-594A.
doi:10.1378/chest.1112163

CHEST August 2011;140(2):509-518.
doi:10.1378/chest.10-2468

CARDIAC DYSRHYTHMIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Disorders of cardiac rhythm

Differential Diagnosis

- Sinus tachycardia
- Atrial tachycardia
- Multifocal atrial tachycardia
- Atrial fibrillation
- Atrial flutter
- Sinus bradycardia
- Junctional bradycardia
- Atrioventricular blocks
- Premature atrial contractions
- Premature ventricular contractions

Considerations

- Unifocal premature ventricular contractions (PVCs) without associated symptoms of acute ischemic disease are usually benign and typically do not warrant treatment
- Premature atrial contractions (PACs) are usually benign
- Sinus bradycardia without hypotension usually does not warrant acute treatment
- Prolonged QTc interval on the EKG can lead to a serious arrhythmia
- PVCs with R wave on the T wave of preceding beat on the EKG or monitor can lead to ventricular tachycardia

General evaluation options

- Cardiac history
- Complete physical exam
- Associated symptoms
- Medication history
- EKG; consider monitor if heart rate ≥ 130 (adults) or ≤ 50

- CBC (depending on clinical situation)
- BMP (depending on clinical situation)
- Chest x-ray (depending on clinical situation)
- Troponin for anginal complaints or dyspnea
- BNP for dyspnea
- Consider D-dimer if PE suspected

Atrial Dysrhythmias

Sinus tachycardia

Definition

- Tachycardia in adults arising from the sinus node with a rate in adults > 100 beats/minute. Sinus tachycardia rates in pediatrics dependent on age

Considerations

- Significant sinus tachycardia (ST) that is unexplained can represent a high risk disease process
- Sinus tachycardia context is important: ST at 120 with influenza may be less concerning than ST at 105 with GI bleeding

Causes

Physiologic

- Pain or exertion

Pharmacologic

- Sympathetic agents; caffeine; bronchodilators

Pathologic

- Fever
- Dehydration
- Anemia
- Hemorrhage
- Pulmonary embolism
- Hypoxemia
- Infarction
- Ischemia
- Hyperthyroidism

Evaluation and treatment are aimed at underlying condition

Discharge instructions

- Sinus tachycardia aftercare instructions
- Follow up with PCP within 1–2 days if tachycardia persists
- Return if no improvement or worsening

Consult criteria

- Consult physician for unexplained adult $ST \geq 110$ unless otherwise specified in other protocols

Premature atrial contractions

- Commonly benign; can be anxiety provoking
- Fatigue, stress or high adrenergic state can be the cause
- Evaluation is for associated disorders and not for PACs per se
- Usually no treatment needed
- If treatment desired, atenolol 50 mg PO qday or lopressor 100 mg PO qday can be used (follow up with primary care provider)

Discharge instructions

- Premature atrial contractions aftercare instructions

Atrial fibrillation

Definition

- Lack of organized atrial electrical activity and contractions. An irregularly irregular rhythm on EKG and cardiac auscultation or pulse palpation

Differential diagnosis

- Multifocal atrial tachycardia
- Wolf-Parkinson-White Syndrome (WPW)
- Atrial flutter
- Atrial tachycardia
- Supraventricular tachycardia

Considerations

- Most common cause of dysrhythmia
- Up to 9% of patients ≥ 80 years of age are affected
- CVA risk increased (do not acutely convert if present > 48 hours without therapeutic anticoagulation)

- BNP can be elevated without CHF
- Recent onset of atrial fibrillation converts spontaneously to normal sinus rhythm in 2–3 days in 2/3 of patients
- Increases mortality 1.5–2 times more than general population without atrial fibrillation
- Risk of stroke 1.5% in age 50–59 years and nearly 30% in age 80–89 years
- Commonly heart rates are 110–140 per minute

Causes

- Hypertension
- CHF
- Coronary artery disease
- Carditis
- Sick sinus syndrome
- Alcohol
- Pulmonary embolism
- Hyperthyroidism
- Sympathetic drugs
- Pneumonia
- Hyperthermia
- Hypothermia
- Postoperative
- Hypokalemia, hypomagnesemia and hypocalcemia

Management options

- Medication management to maintain normal sinus rhythm
- Medication management to achieve rate control of atrial fibrillation
- Catheter ablation
- Anticoagulation to prevent thromboembolic disease

Signs and symptoms

- Altered mental status
- Weakness
- Hypotension
- Syncope
- Angina
- CHF
- Emboli
 - Digit ischemia

- Neurologic deficits
- Mesenteric ischemia

Evaluation options

- EKG
- CBC
- BMP
- Chest x-ray
- Troponin for anginal complaints or dyspnea
- BNP for dyspnea or suspected CHF
- Thyroid function tests if hyperthyroidism suspected
- D-dimer if pulmonary embolism suspected
- Digoxin (digitalis) level if currently prescribed

Treatment options

- No treatment may be needed if heart rate ≤ 110 per minute
- IV NS KVO
- Oxygen if dyspneic; O₂ saturation $< 95\%$ room air
- Treatment of fever or hypovolemia if contributing to rapid ventricular response > 110
- Cardizem (diltiazem) 0.25 mg/kg IV over 2 minutes (usually 20 mg initial dose)
 - May be repeated at 0.35 mg/kg IV over 2 minutes after 15 minutes of initial dose if needed (usually 25 mg)
 - Maintenance is 5–10 mg/hour IV
- Metoprolol 5 mg IV, may repeat q5 minutes prn $\times 2$
- Cardioversion with 200J with biphasic waveform device for hypotension with rapid ventricular response (notify physician immediately for cardioversion if available)
- Wide complex atrial fibrillation is potentially a life threatening rhythm — Notify physician immediately

Anticoagulation

- Aspirin 81 mg or 325 mg PO qday in low risk patients
 - Age 60–74 years
 - Female
- Coumadin (warfarin) 5–10 mg PO qday — (INR target of 2–3) with moderate or high risk factors
 - Age > 75 years
 - CAD

- CHF
- Hypertension
- Diabetes mellitus
- Mitral stenosis
- Prior TIA/CVA
- Mechanical valve
- Lovenox 1 mg/kg SQ q12hr

Discharge criteria

- Stable chronic atrial fibrillation with rate ≤ 110 and pre-existing history of atrial fibrillation
- No other concerning symptoms

Discharge instructions

- Atrial fibrillation aftercare instructions
- Prescribe aspirin 81–325 mg PO qday
- See treatment options above
- Adjust Digoxin (digitalis) if needed
- Follow up with primary care provider within 7 days

Consult criteria

- Adult heart rate ≥ 110
- Chest discomfort
- Dyspnea
- Hypotension
- Suspected hyperthyroidism
- Acute neurologic complaints or findings
- New onset atrial fibrillation
- Age > 55
- Digoxin (digitalis) toxicity
- PT/INR not therapeutic if on Coumadin (warfarin) (INR < 2)

Supraventricular tachycardia

Definition

- Tachycardia not involving the sinus node that is maintained by the atria or atrioventricular node

Differential diagnosis

- Atrial fibrillation
- Atrial flutter
- Multifocal atrial tachycardia (commonly in COPD)

patients)

- Ventricular tachycardia
- Sinus tachycardia

Considerations

- Usually narrow complexes on EKG with rapid and regular rhythm
- Episodic most commonly
- Can have wide complexes with aberrant or retrograde conduction
- Heart rate usually 150–200/minute in adults
- Higher rates may be present in WPW
- Wide complex SVT can be ventricular tachycardia — notify physician immediately
- Treatment of wide complex SVT with calcium channel blockers, beta-blockers or Digoxin (digitalis) may result in deterioration of rhythm to ventricular fibrillation if antidromic (retrograde conduction) WPW — notify physician immediately prior to antiarrhythmia drug treatment

Presenting complaints

- Palpitations
- Dizziness
- Chest pain
- Shortness of breath
- Diaphoresis

Evaluation options

- EKG (may be all that is needed in young healthy patient)
- CBC
- BMP
- Chest x-ray if respiratory complaints or findings present
- Troponin for anginal complaints
- BNP for dyspnea or suspected CHF
- Digoxin (digitalis) level if taking digoxin

Treatment options

- IV NS KVO or INT
- Oxygen if dyspneic or O₂ saturation < 95% room air
- Vagal maneuvers in stable patient
 - Breath holding

- Bearing down like in having a bowel movement
- Unilateral carotid massage for 10 seconds at a time in young healthy patients
- Face immersion in cold water

Medication treatment options (discuss with physician initially)

- Adenosine 6 mg rapid IVP followed by 10–20 ml of saline — may repeat with 12 mg if needed
- Diltiazem 0.25 mg/kg over 2 minutes (usually 20 mg in adults — may be repeated with 0.35 mg/kg IV over 2 minutes (usually 25 mg in adults)
- Wide complex tachycardia notify physician immediately

Discharge criteria

- SVT conversion in stable patient without cardiac or other concerning comorbidities

Discharge instructions

- Supraventricular tachycardia aftercare instructions
- Follow up with PCP or cardiologist within 1–7 days

Recommended consult criteria

- Discuss all cases with physician before treatment and prior to discharge

Junctional rhythm

Definition

- Heart rhythm arising from AV node

Differential diagnosis

- Second and third degree AV block
- Digoxin (digitalis) toxicity
- Sinus node dysfunction
- AV nodal reentry tachycardia
- Idioventricular rhythm

Evaluation options

- EKG
- CBC
- BMP
- Chest x-ray

- Troponin for anginal complaints
- BNP for dyspnea or suspected CHF

Treatment options

- IV NS KVO or INT
- Oxygen if dyspneic or O₂ saturation < 95% room air
- Dependant on cause of the rhythm

Recommended consult criteria

- Discuss all cases with physician

Sinus bradycardia

Definition

- Sinus rhythm < 60 beats per minute

Causes

Physiologic

- Vagal tone

Pharmacologic

- Calcium channel blockers; beta-blockers; Digoxin (digitalis)

Pathologic

- AMI
- Hypothyroidism
- Sick sinus syndrome
- Carotid hypersensitivity
- High intracranial pressure
- Hypoglycemia

Evaluation

- EKG
- Per other complaints or findings

Treatment

- Usually no treatment needed if heart rate \geq 40 in healthy patient
- IV NS bolus if hypotensive and not in CHF

Discharge criteria

- Asymptomatic sinus bradycardia \geq 50 beats/minute

Discharge instructions

- Sinus bradycardia aftercare instructions
- Follow up with PCP or cardiologist within 7 days if new onset

Consult criteria

- Heart rate < 50
- Hypotension
- Dyspnea
- Anginal complaints

Second and third degree AV block

Definition

- Second degree heart block has some atrial electrical impulses not conducted to the ventricles
- Third degree heart block has no atrial electrical impulses conducted to the ventricles

Considerations

- Can be caused by AMI or myocarditis
- Can be seen with Lyme disease
- Can occur with structural heart disease

Mobitz type 1 second degree heart block (Wenkebach)

- PR interval progressively lengthens before dropping a ventricular beat
- Can be seen in healthy athletes
- Usually asymptomatic
- May have chest pain if ischemia or myocarditis present
- Rarely have syncope
- May be drug induced — beta-blocker, calcium channel blockers, Digoxin (digitalis), amiodarone

Mobitz type 2 second degree heart block

- Intermittent dropped ventricular beats without progressive lengthening of the PR interval
- Syncope may occur
- AMI or myocarditis more common than mobitz type 1
- May be drug induced
- More serious type of heart block than mobitz type 1

Third degree heart block

- Most patients are asymptomatic
- May be hypotensive or have syncope
- Sudden death can occur
- May be caused by AMI
- Confusion can occur in elderly

Evaluation

- Cardiac monitor
- EKG
- CBC
- BMP
- Chest x-ray
- Troponin
- BNP for dyspnea or suspected CHF

Treatment

- IV NS KVO
- Oxygen if dyspneic; O₂ saturation < 95% room air
- External pacing if hypotensive and heart rate < 60 (apply external pacing pads to mobitz type 2 and third degree heart block)
- Atropine 0.3–1 mg IV – discuss with physician

Consult criteria

- Notify physician promptly on all heart block patients

Ventricular Dysrhythmias

Premature ventricular contractions

Definition

- A premature ventricular contraction caused by an ectopic cardiac pacemaker in the ventricle usually > 120 msec on EKG

Consideration

- Usually benign and stable
- Usually unifocal and needs no acute treatment

Causes

- Frequently normal finding
- Digoxin (digitalis) toxicity

- Cardiac ischemia
- Cardiomyopathy
- Hypoxemia
- Mitral valve prolapse
- Myocarditis
- Cardiac contusion
- Stimulant medications or drugs (caffeine, cocaine, methamphetamines, tobacco)
- Hypokalemia
- Hypomagnesemia
- Hypercalcemia
- CHF
- Alkalosis

Evaluation

- EKG
- BMP if comorbid conditions present or on diuretics
- Other tests as dictated by symptoms or other findings

Treatment options

- Usually none
- Correction of potassium and magnesium levels if checked and significantly abnormal
- Treat underlying condition causing PVCs if present
- If antiarrhythmia treatment desired, atenolol 50 mg PO qday or metoprolol (Lopressor) 100 mg PO qday can be used (follow up with primary care provider)

Discharge criteria

- If a benign incidental finding without concerning comorbid conditions

Discharge instructions

- PVC aftercare instructions
- Follow up with primary care provider or cardiologist as needed

Consult criteria

- EKG shows R on T phenomenon
- Comorbid conditions of concern: chest pain; dyspnea; syncope; etc.
- Potassium ≤ 2.5 mEq/L
- Digoxin (digitalis) toxicity

- Prolonged QTc interval
- New onset renal insufficiency

PVC couplets or multifocal PVCs

- Consult physician
- Usually needs no treatment
 - Treating the cause may be indicated unless benign
 - If antiarrhythmia treatment desired, atenolol 50 mg PO qday or metoprolol (Lopressor) 100 mg PO qday can be used (follow up with primary care provider)

Accelerated idioventricular rhythm (AIVR)

Definition

- Wide complex ventricular rhythm
- Rate 40–120 per minute

Considerations

- Associated with reperfusion in AMI

Treatment

- Observe
 - Treating with antiarrhythmia drugs can cause asystole — do not treat patient with these drugs

Consult criteria

- Discuss all cases of AIVR with physician promptly

Ventricular tachycardia

Definition

- Tachycardia originating from the ventricles that is $\geq 120/\text{minute}$ and is wide complexed of $\geq 140 \text{ msec}$ on EKG

Causes

- Cardiac ischemia
- Hypokalemia, hypomagnesemia, or hypocalcemia
- QT prolonging drugs
- Digoxin (digitalis) toxicity

Symptoms or findings

- May be asymptomatic, especially in nonsustained

ventricular tachycardia (30 beat run or less)

- Chest pain
- CHF
- Hypotension
- Altered mental status

Evaluation

- Order EKG; CBC; BMP; chest x-ray; troponin
- Cardiac monitor

Treatment per physician if available

- IV NS KVO
- Oxygen to keep O₂ saturation > 94%
- Lidocaine 1 mg/kg IV up to 100mg — may repeat × 2 up to 3 mg/kg followed by drip of 2–4 mg/min IV
or
- Amiodarone 150 mg IV over 10 minutes followed by drip of 1 mg/min
- Have nurse deploy cardiac defibrillation pads on patient
- Activate cardiac code and start CPR and ACLS if no pulse present and patient unconscious

Warning

- Treating “**slow ventricular tachycardia**” (rate ≤120 beats/minute) with an antiarrhythmia drug, may actually be treating accelerated idioventricular rhythm (a life sustaining ventricular escape rhythm), resulting in asystole and death

HYPERTENSION PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Adult SBP > 140 or DBP > 90
- Age 1 \geq 104/58
- Age 6 \geq 115/75
- Age 12 \geq 125/82
- Age 17 \geq 138/87

Considerations

- Most hypertension is acutely asymptomatic
- Care should be exercised in too aggressively over-treating asymptomatic hypertension acutely
- Blood pressure usually comes down with repeated measurements only. Repeat q15 min. prn
- Poor outcomes possible from lowering blood pressure too much acutely

Hypertensive categories

- Hypertensive urgency: SBP \geq 180 or DBP \geq 115 with cardiac risk factors
- Severe uncontrolled hypertension: SBP \geq 180 or DBP \geq 115 without cardiac risk factors
- Hypertensive emergency: elevated blood pressure with acute end organ compromise or injury

Evaluation

- Complete history and physical exam
- Detailed cardiopulmonary exam
- Check for peripheral edema
- Asymptomatic hypertension in above hypertensive categories, excluding hypertensive emergency, by itself may require no further acute tests
- BMP and U/A (for protein/blood) can be considered, especially if starting new hypertensive medications or in pregnancy
- Add CBC if pregnant to check platelet count

- EKG, CXR, BNP and troponin for acute signs/symptoms of cardiac disease
- Hypertensive urgency — lab appropriate to address existing risk factor screening

Treatment Options

- Hypertensive urgency — begin treatment within 24–48 hours per primary care provider
- Severe asymptomatic hypertension — begin treatment within 1–7 days per primary care provider
- SBP > 200 or DBP > 120 at discharge can begin treatment as indicated; May need 2 medications or combination medication
- Hypertensive emergency consult physician for treatment options
- Hypertensive emergency blood pressure should not be lowered more than 25% acutely
- IV therapy safer in hypertensive emergency: better control
- See CVA/TIA Protocol for CVA/TIA presentation

Discharge Criteria

- Asymptomatic SBP < 220 or DBP < 120 mm Hg
- No concerning comorbidities

Discharge instructions

- Hypertension aftercare instructions
- Follow up with PCP within 1–2 days if SBP \geq 200 mm Hg or DBP \geq 110
- Patient to notify PCP of visit and blood pressure readings within 1–2 days

Consult Criteria

- SBP \geq 240 or DBP \geq 140 at presentation (asymptomatic) with preexisting hypertension history
- Asymptomatic SBP > 220 or DBP > 120 at time of disposition with history of hypertension
- Asymptomatic SBP > 195 or DBP > 115 at time of disposition without history of hypertension
- Hypertension in pregnancy or within 6 weeks postpartum
- Hypertensive emergency
- Acute cardiac, neurologic or renal disorder suspected

- Intracranial hemorrhage, TIA, CVA, CHF, angina, MI, acute renal failure
- New onset renal insufficiency or worsening renal insufficiency
- See [General Patient Criteria Protocol](#).

Initiation of Outpatient Treatment Options (if desired)

SBP 140–159 or DBP 90–99

- HCTZ 25 mg PO qday

SBP 160–199 or DBP 100–115

- Lisinopril 5–10 mg PO qday (chronic renal insufficiency use 5 mg PO qday)
- HCTZ 25 mg PO qday

SBP > 200 or DBP > 115

- Clonidine 0.2 mg PO tid
- HCTZ 25 mg PO qday

Stable angina

- Atenolol 50 mg PO qday

Congestive heart failure

- Lisinopril 5–10 mg PO qday
- Lasix (furosemide) 20–40 mg PO qday

Other medications than listed above are acceptable as indicated

CONGESTIVE HEART FAILURE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Cardiac dysfunction secondary to decreased ability of the left ventricle (LV) to eject or fill with blood

Systolic dysfunction

- Decreased left ventricular ejection fraction (LVEF) < 50%

Diastolic dysfunction

- Abnormal left ventricular filling
- LVEF > 50%

Differential Diagnosis

- Pneumonia
- COPD
- Bronchitis
- Pulmonary embolism
- Noncardiac pulmonary edema
- Adult respiratory distress syndrome

Considerations

- Main treatment is vasodilatation in nonhypotensive patients
- Isolated right heart failure is without dyspnea or pulmonary congestion
- Troponin can be mildly elevated with CHF alone

BNP

- BNP < 100 rules out CHF if not obese (lower in obese patients: < 50 is cutoff)
- Elevated in renal insufficiency or renal failure (sometimes markedly)
- BNP > 200 CHF likely

- BNP > 500 : acute exacerbation likely

BNP level cutoffs dependent on assays used

Classification of heart failure

- Class 1 – no limitation of normal physical activity
- Class 2 – slight limitation of activity (fatigue, dyspnea)
- Class 3 – marked limitation of activity
- Class 4 – symptoms at rest

Findings

- Fatigue
- Malaise
- Dyspnea
- Peripheral pitting edema
- Orthopnea and paroxysmal nocturnal dyspnea
- Rales
- Cough
- Hepatomegaly
- Ascites
- Jugular venous distension
- Hypotension
- Cardiac gallop sounds

Chest x-ray

- Cephalization of flow
- Cardiomegaly
- Pleural effusion
- Accurate in diagnosis
- Can have delayed findings

Evaluation

- EKG
- Chest x-ray (upright if possible)
- CBC
- BMP
- Troponin
- BNP

Treatment Options (Non-hypotensive

Patients)

- Oxygen
- IV KVO
- Nitroglycerin (NTG) SL — may repeat to decrease SBP 15–20% (if SBP \geq 110)
- Nitroglycerin paste ½–1 inch (if SBP \geq 110)
- Captopril 25 mg PO (or SL) if NTG not decreasing SBP adequately
 - If SBP \geq 110 (effects start in 10 minutes and peaks in 30–40 minutes)
 - ACE inhibitors prolong survival
- Lasix (furosemide) 40–80 mg IV bolus (match home single dose) or 1 hour infusion (infusion appears to work better)
- Preferable to use vasodilators initially if possible
- Avoid morphine

Discharge Criteria

- Good response to treatment for mild chronic CHF
- Back to baseline respiratory function on room air

Discharge instructions

- CHF aftercare instructions
- Follow up with PCP or cardiologist within 1 day
- Return immediately if worse

Consult Criteria

- CHF exacerbation including
 - Inadequate response to treatment
 - New onset congestive heart failure
 - Preferable to discuss all cases with physician prior to discharge
- Normotensive (contact physician for treatment options if SBP $<$ 120)
- Hypotension (notify physician)
- Elevated troponin
- Chest pain or anginal symptoms
- Presyncope or syncope

SYNCOPE/PRESYNCOPE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definitions

- Transient loss of consciousness or near loss of consciousness secondary to decreased perfusion of brain

Differential Diagnosis

- Cardiac arrhythmia
- Pulmonary embolism
- TIA
- CVA
- Seizures
- Dehydration
- Aortic stenosis
- Hypoglycemia
- Subarachnoid hemorrhage
- Hemorrhage
 - GI bleeding
 - Ectopic pregnancy
- Adrenal insufficiency
- Sepsis

Causes

- Neurally mediated
 - Vasovagal
 - Situational
 - Carotid sinus
- Psychiatric
- Orthostatic
 - Volume depletion or hemorrhage
 - Advanced age
- Medications
- Neurologic
- Cardiac
- Unknown

Considerations

- EKG recommended in all patients
- Testing for unexplained syncope is based on risk factors
- Vasovagal episode is the most common cause
- Medication can cause syncope or presyncope

Clinical important features suggestive of specific cause

Exertion

- Aortic stenosis
- Mitral stenosis
- Coronary artery disease

Head rotation

- Carotid-sinus syncope

Arm exercise

- Subclavian steal

Red Flags

- Exertional onset: ischemic coronary disease or aortic stenosis
- Chest pain: ischemic coronary disease
- Severe headache: subarachnoid or cerebral hemorrhage
- Low back pain: aortic dissection or aneurysm
- Dyspnea: pulmonary embolism or CHF
- Palpitations: symptomatic arrhythmia
- Neurologic deficits

Evaluation

- Syncope/presyncope lasting < 20 seconds in healthy patients get an EKG, but may not need further testing if all the following exist:
 - Age < 50
 - Normal physical exam
 - Normal vital signs and O2 sat on room air
 - No comorbidities
 - Clinically had a vasovagal episode
 - No other complaints
- Perform orthostatic vital signs

- Blood pressure measurements in both arms for comparison
- Apply Well's pulmonary embolism and DVT criteria and chart Well's score as indicated
- Record positive or negative calf tenderness and Homan's sign

All other patients order options

- CBC
- BMP
- Chest x-ray
- EKG
- UCG if pregnancy possible
- Check stool hemoccult if any of the following
 - Acutely anemic
 - Tachycardic
 - Orthostatic vital signs
 - Melena or rectal bleeding history
- Chest pain: order troponin (angina) and D-dimer
- Consider CT head for neurologic complaints, findings or headache (low yield otherwise)

Evaluation with D-dimer

D-dimer (LIA method) — some methods currently in use not reliable

- Useful if negative at cutoff value to rule out DVT or PE
- Negative D-dimer with low to moderate probability Well's DVT score largely excludes venous thromboembolic disease
- Well's DVT criteria high probability: order ultrasound scan regardless of D-dimer result
- If positive — not as useful as a negative result which usually rules out VTE (venous thromboembolic) disease
- Frequently positive with
 - Hospitalization in past month
 - Chronic bedridden or low activity state
 - Increasingly positive with age without significant acute disease process
 - CHF
 - Chronic disease processes
 - Edematous states

Well's DVT criteria

- One point each:
 - Active cancer
 - Paralysis/recent cast immobilization
 - Recently bedridden > 3 days or surgery < 4 weeks
 - Deep vein tenderness
 - Entire leg edema
 - Calf swelling > 3 cm over other leg
 - Pitting edema > other calf
 - Collateral superficial veins
- Two points — alternative diagnosis less likely

High probability: ≥ 3 points

Moderate probability: 1–2 points

Low probability: 0 points

Well's PE criteria score 3 or greater consider D-dimer and CT chest PE protocol

- Suspected DVT = 3
- Alternative diagnosis less likely than PE = 3
- Heart rate > 100 = 1.5
- Immobilization/surgery past 4 wks = 1.5
- Previous DVT/PE = 1.5
- Hemoptysis = 1
- Cancer past 6 months = 1

Well's score ≥ 6 : order CTA chest PE protocol

Document positive or negative Homan's sign or calf tenderness regardless of Well's scores

Document PERC and/or Well's scores when appropriate

Pulmonary Embolism Rule-out Criteria (PERC Rule)

(Reportedly decreases significantly the likelihood of pulmonary embolism if all 8 criteria met)

- Age < 50

- Pulse oximetry > 94%
- Heart rate < 100
- No history of DVT or VTE
- No hemoptysis
- No estrogen use
- No unilateral leg swelling
- No recent surgery or trauma hospitalization past 4 weeks

Treatment Options

- Dehydration give oral rehydration in nontoxic pediatric or adult patients (see Gastroenteritis protocols)
- IV NS rehydration in all others as needed
- Blood transfusion for bleeding with anemia and symptomatic volume loss prn
- Anti-emetics prn
- Treatment aimed at cause of syncope or presyncope

Discharge Criteria

- Benign cause of syncope or presyncope in healthy patient age < 50 years

Discharge instructions

- Syncope or presyncope aftercare instructions
- Follow up with PCP within 1–2 days
- Consider ambulatory holter monitor
- Return if symptoms recur

Consult Criteria

- Syncope or presyncope > 30 seconds
- Age ≥ 50 (elderly will usually need hospital admission)
- GI bleeding
- Acute anemia, or chronic anemia with hemoglobin < 8 gms or a decrease in hemoglobin > 1 gm from previous levels
- Hypotension or tachycardia
- O2 sat < 95 on room air or acute dyspnea
- Relative hypotension (SBP < 105 with history of hypertension)
- Abnormal EKG
- Cardiac dysrhythmia

- Positive orthostatics (a normal finding occasionally in elderly)
- Unclear cause of syncope or presyncope
- Chest pain or arrhythmia

Comorbid conditions present

- Hypertension
- Diabetes
- Cardiac
- Pulmonary disease
- Pregnancy
- Pulmonary embolism
- DVT
- Neurologic complaints or findings
- Toxic ingestion
- Dehydration
- Fever

Lab and x-ray consult criteria

- New onset renal insufficiency or worsening chronic renal insufficiency
- Metabolic acidosis (increased anion gap)
- Hemoglobin decrease > 1 gm or creatinine increased > 0.5 from baseline
- Elevated LFT's
- Elevated amylase or lipase
- WBC $\geq 15,000$
- Bandemia $\geq 15\%$
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 200 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Acute thrombocytopenia

Reference:

CHEST August 2011;140(2):509-518.
doi: 10.1378/chest.10-2468

Respiratory

Section Contents

Dyspnea Protocol

Pneumonia Protocol

Adult Asthma/Acute Bronchitis Protocol

Allergy Protocol

DYSPNEA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Subjective perception of shortness of breath

Differential Diagnosis

- COPD
- Asthma
- Bronchitis
- Pneumonia
- CHF
- Angina
- Pulmonary embolism
- Pleural effusion
- Cardiac tamponade
- Pulmonary hypertension
- Pneumothorax

Dyspnea of Uncertain Cause

Evaluation

If CHF suspected order:

- BNP
- BMP
- CBC
- Troponin
- EKG
- Chest x-ray

Consider pulmonary embolism if Well's PE criteria score 3 or greater

- Order D-dimer (can be frequently positive without DVT/PE in elderly, with history of hospitalization within past month, cancer history, edematous conditions, bedridden — see Chest Pain or Syncope Protocols)

Well's Pulmonary Embolism Criteria

- Suspected DVT = 3
- Alternate diagnosis less likely than pulmonary embolism = 3
- Heart rate > 100 = 1.5
- Immobilization/surgery past 4 wks = 1.5
- Previous DVT = 1.5
- Hemoptysis = 1
- Cancer past 6 months = 1

Well's PE score > 6

- Order CTA chest PE protocol
- Document positive/negative Homan's sign or calf tenderness
- If anginal equivalent suspected as complaint in elderly, refer to Chest Pain Protocol

Discharge criteria

- Panic disorder or benign hyperventilation
- Benign cause of dyspnea (i.e., mild to moderate asthma or bronchitis responding well to treatment)

Consult physician

- If angina equivalent suspected
- CHF suspected or diagnosed
- Pulmonary embolism suspected
- Uncertain diagnosis as cause of symptoms
- Discuss with physician if D-dimer positive or Well's PE criteria ≥ 3 and DVT and/or PE is considered as possible cause of dyspnea

Principles of Asthma and COPD Management

- Recognizing severity of exacerbation
- Using correct therapy
- Identify and treat any precipitants
- Make correct disposition

COPD Exacerbation

Evaluation options

- Monitor cardiac and pulse oximetry

- EKG
- Troponin
- CBC
- BMP
- Chest x-ray (check radiology report if and when available)) and view x-ray and compare to prior films
- Consider ABG if severely dyspneic or significant respiratory fatigue
- BNP if CHF is a consideration

Initial Treatment options

- Albuterol with or without atrovent, up to 3 treatments prn 10–20 minutes apart
- Oxygen therapy to keep O₂ Sat ≥ 92%

Steroid treatment options useful for moderate to severe exacerbations — EVIDENCE-BASED (caution with diabetes)

- Effectiveness starts around 6 hours after dosing
 - Prednisone 40–60 mg PO
OR
 - Depomedrol (methylprednisolone acetate) 80–160 mg IM
OR
 - Decadron (dexamethasone) 10 mg IV
OR
 - Solumedrol (methylprednisolone) 80–120 mg IV

Discharge treatment options

- Albuterol or Combivent inhaler with or without spacer q4hr prn
- Rx PO zithromax or doxycycline × 5 days, or per Sanford Guide

Systemic steroid treatment options (caution with diabetes)

- Prednisone 40–60 mg qday PO for 5 days
OR
- Depomedrol (methylprednisolone acetate) 80–120 IM
OR
- Decadron (dexamethasone) 10 mg IV

Inhaled steroid treatment options for COPD

- Consider inhaled steroid Rx to start only after acute exacerbation has resolved
- Prescribe double dose if already on single strength dose

OR

- Advair discus bid (combination of long acting beta-agonist and steroid) to be used only after acute exacerbation has resolved

Discharge criteria

- If patient returns to near baseline function with respiratory effort and O2 saturation level
- Follow up with primary care provider in 1–5 days depending on severity of presentation and response to therapy

Discharge instructions

- Follow up with primary care provider in 1–5 days depending on severity of illness and response to treatments
- Provide COPD exacerbation aftercare instructions
- Return if worse

Consult physician on

- Work of breathing is moderate to severe post-treatment
- Wheezing not resolving satisfactorily
- Patient feels they are too dyspneic to go home
- WBC $\geq 15,000$ or $< 3,000$; Neutrophil count $< 1,000$
- Acute thrombocytopenia
- Bandemia $\geq 15\%$
- Anion gap > 18
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL new onset diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO2 or elevated anion gap)
- Heart rate ≥ 110 after all treatment is completed
- Pneumthorax is present

Acute Asthma and Bronchitis

Peak flow % of predicted

- Mild disease > 70%
- Moderate disease 40–69%
- Severe disease < 40%

Initial Treatment Options

- Albuterol with or without atrovent up to 3 treatments prn: 15–20 minutes apart
- Oxygen therapy to keep O₂ Sat ≥ 92%; Monitor pulse oximetry

Steroid treatment options useful for moderate to severe exacerbations in adults (caution with diabetes)

- Effectiveness starts around 6 hours after dosing
 - Prednisone 40–60 mg PO
- OR
- Depomedrol (methylprednisolone acetate) 80–160 mg IM
- OR
- Decadron (dexamethasone) 10 mg IV
- OR
- Solumedrol (methylprednisolone) 80–120 mg IV

Steroid treatment options useful for moderate to severe exacerbations in children — EVIDENCE-BASED (caution with diabetes)

- Effectiveness starts around 6 hours after dosing
 - Prednisolone 0.5–1 mg/kg PO (NMT 60 mg)
- OR
- Decadron (dexamethasone) 0.6 mg/kg IV or IM (NMT 10 mg)

Additional treatment options for severe exacerbations

- Terbutaline 0.25 mg SQ prn q15–20 minutes up to 3 as needed for age ≥ 12 years
 - Caution if history of coronary artery disease
- Terbutaline 0.005–0.01 mg/kg SQ q15–20 minutes up to 3 — age < 12 years (NMT 0.4 mg per dose)
- Epinephrine 0.3 mg SQ for adults
 - Caution if history of coronary artery disease
- Epinephrine 0.01 mg/kg in children not to exceed adult dose
- MgSO₄ (magnesium sulfate) 1–2 gms IV over 20

minutes in adults per physician

- MgSO₄ (magnesium sulfate) 25–50 mg/kg IV over 10–20 minutes per physician (NMT 2 gm) for children
- Heliox 70:30 — do not use if > 30% oxygen needed to maintain O₂ saturation

Discharge treatment options

- Albuterol or Combivent inhaler with or without spacer q4hr prn
- If bacterial infection suspected: Rx PO Zithromax (azithromycin) or doxycycline (age > 8 years) × 5 days, or per Sanford Guide
- Viral infection (most healthy patients) = no antibiotics

Discharge systemic steroid treatment options (caution with diabetes)

- Prednisone 20–60 mg qday for 5 days (no taper needed) age ≥ 12 yrs
OR
- Depomedrol (methylprednisolone acetate) 80–120 mg IM age ≥ 12 yrs
OR
- Decadron (dexamethasone) 10 mg IV for adults or 0.6 mg IV for children not to exceed adult dose
- Pediatrics: prednisolone 1–2 mg/kg PO qday for 5 days (NMT 60 mg per day)

Discharge inhaled steroid options

- Consider inhaled steroid Rx to start only after acute exacerbation has resolved
 - Prescribe double dose if already on single strength dose
OR
 - Advair discus bid — age > 3 years (combination of long acting beta-agonist and steroid) to be used only after acute exacerbation has resolved

Discharge Criteria

- Good response to therapy
- If patient returns to near baseline function with respiratory effort and O₂ saturation level
- Wheezing resolution and no significant respiratory

distress

- Peak flow $\geq 70\%$ predicted if checked
- O₂ saturation $> 93\%$ on room air
- Good follow up and compliance
- Primary care provider to follow up within 1–3 days if symptoms persist

Discharge instructions

- Follow up with primary care provider in 1–5 days depending on severity of illness and response to treatments
- Provide asthma or bronchitis aftercare instructions

Consult Criteria

- Severe respiratory distress on presentation (notify physician immediately)
- Insufficient response to treatment
- Wheezing not resolving adequately
- Patient or family feels they are too dyspneic to go home
- Cardiac cause of dyspnea suspected or confirmed
- Pneumothorax
- Immunosuppression
- Peak flow $< 70\%$ predicted if measured after treatment is finished
- O₂ saturation $< 94\%$ on room air post treatments
- O₂ Sat $< 92\%$ in COPD patient on room air or at home O₂ concentrations if on home O₂ therapy
- Significant comorbid conditions
- Heart rate ≥ 110 post treatment in adults
- Hypotension develops or relative hypotension SBP < 105 with history of hypertension
- Return visit for same acute dyspnea episode
- Immunosuppression
- Age ≥ 60

Vital signs and age consult criteria

- Age < 6 months
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170

- 1–3 years ≥ 160
- 4–5 years ≥ 145
- 6–8 years ≥ 130
- 7–12 years ≥ 125
- 12–15 years ≥ 115
- 16 years or older ≥ 110
- Developing hypotension or relative hypotension (SBP < 105 with history of hypertension)
- O2 Sat $< 94\%$ on room air in non-COPD patient

Reference:

CHEST August 2011; 140(2):509-518.

doi: 10.1378/chest.10-2468

PNEUMONIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Infection of pulmonary parenchymal tissue

Differential Diagnosis

- Pulmonary embolism
- COPD
- Asthma
- CHF
- Bronchitis
- Adult Respiratory Distress Syndrome
- Fluid overload from ESRD
- Bronchopulmonary dysplasia in children with history of prematurity

Considerations

- Number one leading cause of death from infectious disease
- Community acquired causes
 - Strep pneumoniae
 - Mycoplasma pneumoniae
 - H. influenzae
 - Legionella pneumophila
 - Klebsiella pneumoniae
 - Influenza
- Comorbid conditions
 - Advanced age
 - Smoking
 - COPD
 - Diabetes
 - Alcoholism
 - CHF
 - HIV
 - Immunosuppression
- Signs and Symptoms

- Cough
- Sputum production
- Fever
- Chills
- Rigors
- Dyspnea
- Chest pain
- WBC $\geq 15,000$ suggests bacteria infection
- Very high or very low WBC predicts increased mortality

Evaluation

- CBC
- Chest x-ray (may be negative even if pneumonia is present)
- ABG if moderate to severe respiratory distress or fatigue
- See Dyspnea Protocol
- Blood cultures if toxic or hypotensive and/or patient is to be admitted

Treatment Options

- Oxygen for O₂ saturation $< 95\%$ (in COPD patient $< 92\%$) or respiratory distress
- Viral pneumonia needs no treatment unless immunosuppressed
- IV NS or oral rehydration if dehydrated (see Gastroenteritis Protocols for rehydration therapy)

Nontoxic patient treatment that is to be discharged

No chronic cardiopulmonary disease

- Zithromax PO
OR
- Doxycycline PO x 10 days

Chronic cardiopulmonary disease present

- Second or third generation cephalosporin PO x 10 days
OR
- Augmentin (amoxicillin/clavulanate) x 10 days PO
PLUS Zithromax PO
OR

- Levaquin (levofloxacin) PO as a single agent x 10 days
- May use Sanford Guide

For patients with significant respiratory distress, hypoxemia, toxicity, or are to be admitted:

- IV NS
- IV Zithromax and Rocephin (ceftriaxone) (non-ICU)
- IV piperacillin/tazobactam (Zosyn) 4.5 gms — ICU or nursing home patient
- Consult physician

Discharge Criteria

- Nontoxic patient
- No respiratory distress
- O2 saturation >93%

Discharge instructions

- Pneumonia aftercare instructions
- Follow up with primary care provider within 1–3 days
- Return if worse

Consult Criteria

- Significant pneumonia
- Patients that the Provider feels need admission
- Significant respiratory distress
- High fever $\geq 104^{\circ}\text{F}$ (40°C)
- Temperature $< 96^{\circ}\text{F}$ (35.5°C)
- Appears ill or toxic
- Metabolic or respiratory acidosis
- Immunosuppression
- See Dyspnea Protocol

Vital signs and age consult criteria

- Age > 65 or < 6 months
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175

- 6–12 months ≥ 170
- 1–3 years ≥ 160
- 4–5 years ≥ 145
- 6–8 years ≥ 130
- 7–12 years ≥ 125
- 12–15 years ≥ 115
- 16 years or older ≥ 110
 - Developing hypotension or relative hypotension (SBP < 105 with history of hypertension)
 - O2 Sat $< 94\%$ on room air in non-COPD patient; O2 Sat $< 92\%$ in COPD patient on room air or home O2 Rx

Lab and x-ray consult criteria

- New onset renal insufficiency or worsening renal insufficiency
- WBC $\geq 15,000$ or $< 3,000$; Neutrophil count $< 1,000$
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Anion gap > 18
- Significant electrolyte abnormality
- Glucose ≥ 300 mg/dL in diabetic patient
- Glucose ≥ 200 mg/dL in new onset diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Pleural effusion

ADULT ASTHMA/ACUTE BRONCHITIS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Reversible acute bronchospasm and airway resistance secondary to infectious, allergic, environmental or internal causes

Differential Diagnosis

- Panic disorder
- Pneumonia
- Bronchitis
- CHF
- COPD
- Pulmonary embolism
- Anaphylaxis
- URI
- Vocal cord dysfunction
- Laryngospasm
- Epiglottitis
- Croup
- Retropharyngeal abscess

Considerations

- Cough is commonly the first symptom
- Viral URI, allergens or environmental factors are the precipitants frequently
- Severe episode may have decreased breath sounds without wheezing
- Inability to speak more than 2–3 words at a time indicates a severe episode
- Steroids very useful — both PO and inhaled (inhaled steroids are for prophylaxis)
- Usually there is pre-existing asthma or bronchitis history

Peak flow % of predicted

- Mild disease > 70%
- Moderate disease 40–69%
- Severe disease < 40%

Risk Factors

- Prior intubation
- Visit in the last month
- Hospitalization > 1 time
- Two emergency visits past year
- Current or recent systemic steroid use
- Concomitant disease
- Illicit drug use

Evaluation

- Complete history and physical exam
- Assess respiratory effort
- O2 saturation
- Consider peak flows before and after aerosols
- CBC and/or BMP for significant tachycardia and fever
- Check radiology interpretations prior to discharge if available

Chest x-ray

- If pneumonia suspected
- Significant respiratory distress
- CHF considered as possible cause of dyspnea
- Respiratory distress not responsive to aerosols
- Age \geq 50
- Cardiac history

If CHF suspected

- BNP
- Troponin
- EKG

Treatment Options

- Supplemental oxygen for O2 Sat < 95% room air or significant respiratory distress
- Albuterol with or without atrovent aerosol every 15–20 minutes prn — up to 3 treatments total

Steroid treatment options useful for moderate to severe exacerbations in adults — EVIDENCE-BASED (caution with diabetes)

Effectiveness starts around 6 hours after dosing

- Prednisone 40–60 mg PO
OR
- May give Decadron (dexamethasone) 0.6 mg/kg IM instead (NMT 10 mg) if PO route not usable (caution with diabetes)
OR
- Depomedrol (methylprednisolone acetate) 120–160 mg IM (caution with diabetes)

Additional treatment options if needed for severe exacerbations

- Epinephrine 0.3 mg SQ (caution with coronary artery disease history)
- Terbutaline 0.25 mg SQ prn q15–20 minutes up to 3 treatments as needed (caution with coronary artery disease history)
- MgSO₄ (magnesium sulfate) 1–2 gms IV over 20 minutes in adults per physician
- MgSO₄ (magnesium sulfate) 25–50 mg/kg IV over 10–20 minutes per physician (NMT 2 gm) for children
- Heliox 70:30 — do not use if > 30% oxygen needed

Discharge medications

- Albuterol MDI with or without spacer prn
- Antibiotics are not usually needed
 - Consider antibiotics in smokers
 - If bacteria infection suspected, may use Sanford Guide
 - Zithromax PO

Discharge systemic steroid treatment (caution with diabetes)

- Prednisone 40–60 mg PO × 5 days (NMT 60 mg qday)
OR
- Decadron (dexamethasone) 0.6 mg/kg IM instead (NMT 10 mg) if PO route not usable

Discharge inhaled steroids for asthma only

- Consider inhaled steroid Rx only after the acute exacerbation has resolved
- Prescribe double dose if already on single strength dose

OR

- Advair discus bid for asthma or COPD only (combination long acting beta-agonist and steroid) to be used only after acute exacerbation has resolved

Discharge Criteria

- Good response to therapy
- Wheezing resolution and no significant respiratory distress
- Peak flow $\geq 70\%$ predicted if checked
- O₂ saturation $> 93\%$ on room air
- Good follow up and compliance
- Primary care provider to follow up within 1–3 days if symptoms persist

Discharge instructions

- Follow up with primary care provider in 1–5 days depending on severity of illness and response to treatments
- Provide asthma or bronchitis aftercare instructions

Consult Criteria

- Severe respiratory distress on presentation (notify physician immediately)
- Insufficient response to treatment
- Family feels patient is too ill to go home
- Peak flow $< 70\%$ predicted if measured after treatment is finished
- Moderate or severe respiratory distress post treatment
- O₂ saturation $< 94\%$ on room air post treatments
- Significant comorbid conditions
- Heart rate ≥ 110 post treatment
- Hypotension develops or relative hypotension SBP < 105 with history of hypertension
- Return visit for same acute episode
- Immunosuppression

- Age ≥ 60

Lab and x-ray consult criteria

- New onset renal insufficiency or worsening renal insufficiency
- WBC $\geq 15,000$ or $< 3,000$; Neutrophil count $< 1,000$
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Anion gap > 18
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 200 mg/dL in new onset diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Pleural effusion

ALLERGY PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Systemic reaction to chemical mediator release secondary to IgE sensitization from allergen

Considerations

- Most reactions are minor with itching and localized or generalized urticaria
- Anaphylaxis is due to IgE antibody release of histamine and vasoactive mediators
- Symptom presentation possibilities
 - Occurs within 30 minutes usually
 - Can be mild
 - Wheezing
 - Dyspnea
 - Shock
 - Airway obstruction
 - Death
 - Can occur on long-term medication
- Urticaria
 - Etiology unknown usually
 - Usually self-limited
- True opioid allergy rare — usually GI upset or pseudoallergy
- Anaphylactoid reactions to contrast
 - Direct stimulation of mast cells and basophils
 - Seafood allergic patients are not allergic to radiographic contrast material
 - Related to high osmolarity of contrast materials
 - Narcotics can also cause anaphylactoid reactions
- Angioedema (may appear with urticaria)
 - Bradykinin mediated
 - Commonly from ACE inhibitors
 - Decreased metabolism of bradykinin
 - Hereditary C1 esterase deficiency
 - Leads to increased bradykinin

- Positive family history
- Caution using steroids in diabetic patients
- Caution using epinephrine in patients with coronary disease risk factors

Evaluation

- Vital signs
- Oropharyngeal and respiratory distress assessment
- Pulmonary and cardiac exam
- Skin exam
- Chest x-ray for significant respiratory distress or O₂ saturation < 93% on room air
- Soft tissue neck films for hoarseness or complaints/findings of throat swelling
- CBC and BMP for moderate to severe systemic reactions

Urticaria

- Vascular reaction of the skin with transient wheals, soft papules and plaques usually with pruritus

Treatment options

Benadryl (diphenhydramine)

- Adult: 50 mg PO or IM
- Pediatrics: 1–2 mg/kg PO or IM (NMT 50 mg)
- May continue for 5–7 days PO

Pepcid (famotidine)

- Adult: 20 mg IV or 40 mg PO
- Pediatric: 0.25 mg/kg IV or 0.5 mg/kg PO (not to exceed maximum adult dose)

Epinephrine

- Do not use if history of coronary artery disease
- Adult: 0.3 mg SQ
- Pediatrics: 0.01 mg/kg SQ not to exceed adult dose

Consider steroids (caution if diabetic)

- Prednisone 40–60 mg PO qday for 5–7 days (> 40 kg)
- Prednisone/prednisolone 1 mg/kg PO qday for 5–7 days (< 40 kg)

Discharge criteria

- Discharge with good resolution of rash and itching

Discharge instructions

- Follow up with primary care provider within 7 days
- Avoid offending agent if known
- Provide urticaria aftercare instructions

Angioedema

- Non-life threatening presentation treated same as urticaria
- Less responsive to treatment than urticaria
- Evaluate for airway compromise or significant oropharyngeal swelling
- Oxygen prn
- Consult promptly for posterior oropharyngeal angioedema
- Discharge mild lip or non-oropharyngeal angioedema with normal vital signs and no distress
- Stop ACE inhibitors if currently taking

Additional treatment if needed

Epinephrine (per physician)

- Caution if history of coronary artery disease
- Adult: 0.3–0.5 mg SQ; (if respiratory distress notify physician promptly)
- Pediatrics: 0.01 mg/kg SQ not to exceed adult dose; give IV or IM (anterior thigh) if respiratory distress (notify physician promptly)
- Responds to fresh frozen plasma or C1 esterase inhibitor concentrate

Mild Anaphylaxis

- Urticaria/angioedema
- O₂ saturation > 94% room air
- No respiratory distress
- Normotensive
- No tachycardia

Treatment options

Benadryl (diphenhydramine)

- Adult: 50 mg PO or IM
- Pediatric: 1–2 mg/kg PO or IM (NMT 50 mg)

- Continue for 5–7 days PO

Pepcid (famotidine)

- Adult: 20–40 mg IV/PO
- Pediatric: 0.25 mg/kg IV/PO (NMT 40 mg)

Consider steroids

- Prednisone 40–60 mg PO qday for 5–7 days (> 40 kg)
- Prednisone/prednisolone 1 mg/kg PO qday for 5–7 days (< 40 kg)

Additional treatment if needed

Epinephrine

- Do not use if history of coronary artery disease
- Adult: 0.3 mg SQ
- Pediatrics: 0.01 mg/kg SQ not to exceed adult dose

Moderate Anaphylaxis

(Notify physician)

- Urticaria/angioedema
- Wheezing
- O2 saturation 90–94% room air
- Moderate respiratory distress
- No hypotension

Treatment options

Oxygen: nasal or mask (≥ 5 liters/minute if mask used)

Benadryl (diphenhydramine)

- Adult: 50 mg IV or IM
- Pediatric: 1–2 mg/kg IV or IM (NMT 50 mg)

Pepcid (famotidine)

- Adult: 20–40 mg IV
- Pediatric: 0.25 mg/kg IV (NMT 40 mg)

Albuterol aerosol

- With or without atrovent
- Repeat q15 min \times 2 additional treatments prn
- Continuous prn (for severe dyspnea)

Additional treatment if needed

Epinephrine

- Caution if history of coronary artery disease
- Adult: 0.3 mg SQ (notify physician promptly)
- Pediatric: 0.01 mg/kg SQ not to exceed adult dose (notify physician promptly)

Glucagon

- 1–2 mg IV if on beta-blocker or resistant to epinephrine

Steroids

- Adult: Solumedrol (methylprednisolone) 125 mg IV
- Pediatric: 1–2 mg/kg IV
- Prednisone 40–60 mg PO qday for 5–7 days (> 40 kg) if discharged
- Prednisone/prednisolone 1 mg/kg (NMT 60 mg) PO qday for 5–7 days if discharged (pediatrics)
- May give Decadron (dexamethasone) 0.6 mg/kg IM instead (NMT 10 mg)

Severe Anaphylaxis

(Notify physician immediately)

- Urticaria/angioedema
- Wheezing
- O₂ saturation < 90% room air
- Severe respiratory distress
- Oropharyngeal airway swelling or compromise
- Hypotension
- Intubation if impending respiratory failure — notify physician immediately
- Observation for 6 hours if to be discharged by physician
- Usually admitted

Treatment options

Oxygen: nasal or mask (> 5 liters/minute if mask used)

For shock

- IV NS 1–2 liters rapidly if hypotensive adult
- 20 cc/kg IV NS if hypotensive pediatric patient — may repeat × 2 prn

Benadryl (diphenhydramine)

- Adult: Benadryl (diphenhydramine) 50 mg IV (preferred) or IM
- Pediatric: 1–2 mg/kg IV (preferred) or IM (NMT 50 mg)

Pepcid (famotidine)

- Adult: 20–40 mg IV
- Pediatric: 0.25 mg/kg IV (NMT 40 mg)

Albuterol aerosol

- With or without atrovent
- Repeat q15 min × 2 prn
- Continuous prn for severe dyspnea

Steroids

- Adult
 - Solumedrol (methylprednisolone) 125 mg IV
 - Prednisone 40–60 mg PO qday for 5–7 days (> 40 kg) if discharged
- Pediatric
 - Solumedrol (methylprednisolone) 1–2 mg/kg IV (NMT 125 mg)
 - Prednisone/prednisolone 1 mg/kg (NMT 60 mg) PO qday for 5–7 days if discharged (pediatrics)
 - May give Decadron (dexamethasone) 0.6 mg/kg IM/IV instead (NMT 10 mg)

Additional treatment if needed

Epinephrine (consult physician before administering if possible)

- Adult: 0.3–0.5 mg IV (if in shock) or IM anterior thigh
 - 1 mg IV if no pulse
 - Activate ACLS and call a code
- Pediatric: 0.01 mg/kg IV (if in shock) or IM anterior thigh (do not exceed adult doses)
- Caution with history of coronary artery disease

Glucagon

- 1–2 mg IV if on beta-blocker or resistant to epinephrine (consult physician if possible)

Discharge Criteria

- Good resolution of rash and itching in urticaria
- Discharge patients presenting with mild symptoms that have observation post-treatment for 2–4 hours without symptoms

Discharge instructions

- Follow up with primary care provider within 7 days
- Avoid offending agent if known
- Provide allergy aftercare instructions
- Return if worse

Consult Criteria

- Hypotension
- O₂ saturation < 95% on room air after treatments
- Moderate to severe anaphylaxis or respiratory distress on presentation or during stay
- Altered mental status
- Oropharyngeal or throat swelling or complaints of throat swelling or dyspnea
- Wheezing not resolved
- Adult heart rate ≥ 110 post treatment
- Pediatric heart rate post treatment
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Endocrine

Section Contents

Diabetes and Hypoglycemia Protocol

Hypothyroidism Protocol

Hyperthyroidism Protocol

DIABETES AND HYPOGLYCEMIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Defect in glucose regulation secondary to inadequate secretion of insulin or resistance to insulin

Considerations

Types

- Type 1: dependent on exogenous insulin to live
- Type 2: does not need insulin to live (peripheral insulin resistance and insulin-secretory defect)
- Type 2 can present initially as DKA (diabetic ketoacidosis) in African-Americans or Hispanic descent patients
- Gestational — appears with pregnancy only

Complications

- Increased infections
- Peripheral arterial insufficiency
- Skin ulcers and gangrene of lower legs and feet
- Hyperglycemic and hypoglycemic emergencies
- Pediatric cerebral edema with hyperglycemic emergencies

Vascular

- Retinopathy
- Renal insufficiency and failure
- Coronary arteries occlusion
- Aortic atherosclerosis
- Stroke

DKA

- Secondary to stress
 - Infection most common
 - AMI

- Pregnancy
- Surgery
- Average adult fluid deficit is 6–10 liters (osmotic diuresis)
- Plasma glucose > 250 mg/dL (usually > 350 mg/dL)
- Adjustment to serum Na (sodium) levels — each additional 100 mg% over plasma glucose of 100 add 1.6 mEq/L to serum Na levels
- Potassium body deficit can be severe despite initial normal serum level (a decrease of 0.3–0.7 mEq/L for each decrease of pH of 0.1)
 - Total body potassium deficit is 3–5 mEq/kg
- IV PO₄ (phosphorous) may be needed if respiratory failure occurs
- Arterial pH < 7.3 (with venous pH add 0.03 if used instead of ABG)
- Serum osmolality > 320 mOsm/L
- Serum bicarbonate < 18
- Moderate ketonuria or ketonemia

Symptoms and findings (some or all)

- Weakness
- Weight loss
- Mental status changes
- Dry mucous membranes
- Tachycardia
- Nausea and vomiting
- Abdominal pain
- Kussmaul respirations (deep rapid breathing)
- Peripheral vasodilatation can cause normothermia or hypothermia despite infection

Evaluation

- CBC
- BMP
- Accucheck
- Chest x-ray
- U/A
- ABG or venous pH (add 0.03 to adjust to arterial pH)
- Blood, urine or infected site cultures if infection suspected

Serum osmolality

- If < 320mOsm/L, look for another cause of altered

mental status

- Osmolol gap $> 10-20$; suspect substance ingestion (normal < 10)
 - Gap = Osmolality measured – Osmolality calculated (Osmolality calculation equation: $2(\text{Na} + \text{K}) + \text{glucose}/18 + \text{BUN}/2.8$; normal 280–300mOsm/L)
 - Ethanol $\text{mg\%/}4.6$ is added to osmolol gap equation if present
 - Gap > 50 carries high specificity for toxic alcohol such as methanol, ethylene glycol, or isopropyl alcohol
 - Normal gap < 10

Fluid therapy

Adult

- IV NS infused 15–20 cc/kg/hour (1–1.5 liters average)
- Continue NS if corrected Na is low
- 0.45% NS at 4–14 cc/kg/hour after bolus infusion if “corrected” Na is normal or high
- Add potassium 20–30 mEq/L when serum K reaches < 5.3 mEq/L (if urine output 0.5–1 cc/kg/hour)

Pediatric (< 16 years of age)

- IV NS 10–20 cc/kg/hour; may repeat prn; should not exceed 50 cc/kg total over 4 hours
- Continued IV with 0.45% or NS at 5 cc/kg/hour after initial fluid therapy
- If altered mental status acutely occurs, suspect cerebral edema (treatment 1–2 gms/kg mannitol IV — per physician)

Insulin therapy

- Start after IV fluids given for one hour
- Check K^+ level first (can cause K^+ to drop; can be dangerous if already low; should be at least 3.3 mEq/L)

Adults

- Bolus 0.15 units/kg IV and/or continuous infusion 0.1 unit/kg/hour (up to 5–7 units/hour)
- Should decrease plasma glucose 50–75 mg%/hour (if not, check hydration status)

Pediatrics

- Insulin bolus not recommended
- Continuous infusion same as adult

Potassium

- Add potassium 20–40 mEq to each liter of IV fluids when serum K^+ < 5.3 if urine output 0.5–1 cc/kg/hour or initial potassium < 3.3 mEq/L
 - Serum K^+ 4.5–5.2 mEq/L give 10 mEq/hour IV
 - Serum K^+ 3.0–4.5 mEq/L give 20 mEq/hour IV
 - Serum K^+ initially < 3.0 mEq/L hold off starting insulin and give potassium IV

Consult criteria

- All DKA patients after initial assessment

Hyperglycemic Hyperosmolar Syndrome (HHS)

- Develops over days or weeks
- Plasma glucose > 600
- Serum osmolality > 320 mOsm
- Profound dehydration: adult 8–12 liters fluid deficit
- Small amount of ketonuria; small or absent ketonemia
- Serum bicarbonate > 15
- Arterial pH > 7.3
- Some alteration of consciousness
- Higher mortality than DKA

Associated medications contributing to HHS

- Diuretics
- Propranolol
- Calcium channel blockers
- Dilantin
- Cimetidine
- Corticosteroids

Evaluation

- Same as for DKA

Treatment options

- IV NS 10–20 cc/kg/hour; may repeat prn; should not

exceed 50 cc/kg total over 4 hours

- Continued IV with 0.45% or NS at 5 cc/kg/hour after initial fluid therapy
- Add D51/2NS or D5NS when plasma glucose reaches 300 mg/dL
- Start insulin infusion 0.1 unit/kg/hour (up to 5–7 units/hour) after first hour of IV fluid therapy
 - Insulin doses often lower than used in DKA

Potassium treatment

- Add potassium 20–40 mEq to each liter of IV fluids when serum K^+ < 5.3 mEq/L if urine output 0.5–1 cc/kg/hour or initial potassium < 3.3 mEq/L
 - Serum K^+ 4.5–5.2 mEq/L give 10 mEq/hour IV
 - Serum K^+ 3.0–4.5 mEq/L give 20 mEq/hour IV
 - Serum K^+ initially < 3.0 mEq/L hold off starting insulin and give potassium IV

Consult criteria

- Notify physician on all HHS patients

Hypoglycemia

Differential diagnosis

- CVA
- TIA
- Epilepsy
- Multiple sclerosis
- Psychosis

Considerations

Caused by:

- Accidental or intentional overdose of diabetic medications
- Sepsis
- Alcohol use
- Decreased caloric intake

Symptoms

- Severity symptoms depends on glucose level and rate of glucose decline
- Symptoms may be masked by beta-blockers
- Altered and decrease mental status

- Sweating
- Shaking
- Anxiety

Evaluation

- History and physical exam
- Medication and food intake history
- Accucheck every 30 minutes \times 2 hours or longer until stable glucose levels achieved
- BMP
- CBC if infection suspected
- Chest x-ray if pneumonia or aspiration suspected, or hypoxic
- U/A if infection suspected

Treatment options

- Awake and alert: complex calorie intake PO
- Altered mental status: IV D50W 1 amp adults (100 calories)
- D25W — 1 gm/kg in pediatrics not to exceed adult dose
- D12.5W for neonates (1 gm/kg)
- D10W drip at 75–100 cc/hour (adult) if repeat D50W boluses needed for recurrent hypoglycemia or hypoglycemic agent overdose
- Glucagon 1 mg IM if no IV access
 - May not work with depleted glycogen stores in malnutrition
 - Liver disease
 - Alcoholics
 - Neonates
- Octreotide can be used in sulfonylurea refractory hypoglycemia
- Hydrocortisone IV for adrenal insufficiency

Discharge criteria

- Stable glucose levels in diabetic patients on preexisting insulin therapy
- Good home support
- Reliable patient

Discharge instructions

- Hypoglycemia aftercare instructions

- Follow up with primary care provider within 12–24 hours

Consult criteria

- Oral hypoglycemia therapy (usually need admission)
- Fasting hypoglycemia on no diabetic medication
- Intentional insulin overdose
- Poor home situation
- Abnormal vital signs
- Continued altered mental status
- Significant comorbidities (cancer, hepatic disease, malnutrition, etc.)

Hyperglycemia without DKA or HHS

Considerations

- Most diabetic patients with elevated glucose levels are asymptomatic
- High glucose levels can affect body water balance
- Acute treatment for levels up to 400 mg/dL usually not needed unless there is a concurrent disease process

Evaluation

- Glucose < 400 mg/dL without other disease processes or symptoms may not need further testing acutely in patient with history of poor control (if vital signs normal and mentation changes or comorbidities absent)
- Tests are directed to disease processes that may be elevating glucose levels
- BMP
- CBC if infection or inflammatory process suspected
- U/A if UTI suspected

Discharge criteria

- If new onset obese adult patient with DM without DKA or HHS and glucose \leq 300
- Diabetic history with glucose < 400 mg/dL
- No metabolic acidosis
- No dehydration
- Normal vital signs and no mentation changes

Discharge instructions

- Hyperglycemia aftercare instructions
- Follow up with primary care provider within 1–5 days
- Return if patient develops symptoms

Consult criteria

New onset

- New adult onset DM with glucose ≥ 300 mg/dL
- New onset pediatric DM with glucose ≥ 200 mg/dL
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)

Diabetic patient with

- Significant comorbid symptoms
- Metabolic acidosis
- Vomiting
- Dehydration
- Tachycardia
- Hypotension
- Relative hypotension SBP < 105 with history of hypertension
- Orthostatic vital sign changes
- Progressive renal insufficiency creatinine increase > 0.5
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Glucose ≥ 400 mg/dL in asymptomatic diabetic patient

Treatment for Type 2 Adult Diabetes If Desired

Obese

Monotherapy

- Metformin 500 mg PO bid with or after meals $\times 1$ week, increase weekly by 500 mg to achieve 1000 mg PO bid
- Decreases HbA1c approximated 1.5%

Second drug if needed

- Glyburide (Micronase) 2.5 mg PO qday after breakfast (elderly 1.25 mg PO)—may need to decrease metformin to prevent hypoglycemia (warn patient about possibility of hypoglycemia)

Third drug if needed

- Exenatide (Byetta) 5 mcg SQ bid x 1 month and then may increase as needed to 10 mcg SQ bid
 - Give 1 hr. before AM and PM meals
- OR
- Insulin glargine 10 units SQ—adjust by 1 unit/day to achieve fasting glucose < 100 mg/dL

Non-obese

Monotherapy

- Metformin 500 mg PO bid with or after meals x 1 week, increase weekly by 500 mg to achieve 1000 mg PO bid
 - Decreases HbA1c approximated 1.5%
- OR

- Glyburide (Micronase) 2.5 mg PO qday after breakfast (elderly 1.25 mg PO)

Second drug if needed

- Metformin 500 mg PO bid with or after meals x 1 week, increase weekly by 500 mg to achieve 1000 mg PO bid
- OR

- Glyburide (Micronase) 2.5 mg PO qday after breakfast (elderly 1.25 mg PO)

Third drug if needed

- Exenatide (Byetta) 5 mcg SQ bid x 1 month and then may increase as needed to 10 mcg SQ bid
 - Give 1 hr. before AM and PM meals
- OR
- Insulin glargine 10 units SQ—adjust by 1 unit/day to achieve fasting glucose < 100 mg/dL

Elderly

Monotherapy

- Prandin 0.5–4 mg PO up to qid ac (not to exceed 16

mg qday)

Monotherapy failure

- Consider switch to NPH insulin 10 units SQ bedtime

Asians

Monotherapy

- Pioglitazone (Actos) 30 mg PO qday — do not use in bladder cancer, history of bladder cancer or symptomatic heart failure

Second drug if needed

- Metformin 500 mg PO bid with or after meals × 1 week, increase weekly by 500 mg to achieve 1000 mg PO bid

Third drug if needed

- Micronase 2.5 mg PO qday after breakfast (elderly 1.25 mg PO)

OR

- Exenatide (Byetta) 5 mcg SQ bid x 1 month and then may increase as needed to 10 mcg SQ bid (not FDA approved with Actos)

- Give 1 hr. before AM and PM meals

OR

- Insulin glargine 10 units SQ—adjust by 1 unit/day to achieve fasting glucose < 100 mg/dL

Symptomatic patients

- Prandin 0.5–4 mg PO up to qid ac (not to exceed 16 mg qday) or insulin to decrease glucose at start of monotherapy initiation

HYPOTHYROIDISM PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Deficiency or lack of thyroid hormone that causes slowing of metabolic processes

Differential Diagnosis

- Hypothermia
- Sepsis
- Depression
- Constipation
- Addison's disease
- Chronic fatigue syndrome
- Dysmenorrhea
- Goiter — lithium induced
- Nontoxic goiter
- Hypopituitarism
- Subacute thyroiditis
- Iodine deficiency
- Ovarian insufficiency
- Prolactin deficiency

Considerations

- Deficiency of thyroid hormone
- Develops over months to years
- Primary hypothyroidism 95% of cases
- Secondary hypothyroidism 5% of cases
- Postpartum thyroiditis is 5% and usually occurs 3–6 months after delivery
- Myxedema coma is a rare, life threatening condition usually of elderly women
 - Precipitated by environmental stress, infection and medications
 - Frequently a clinical diagnosis initially

Signs and symptoms

- Goiter

- Cold intolerance
- Hypothermia
- Bradycardia
- Lethargy
- Depression
- Hair loss
- Dry coarse skin
- Weight gain
- Constipation
- Headache
- Husky voice
- Deep tendon ankle jerk reflex with prolonged recovery phase
- Ataxia

Causes

- Idiopathic
- Hashimoto's thyroiditis
- Radioiodine treatment for hyperthyroidism (Grave's disease)
- Thyroid resection
- Lithium
- Amiodarone
- Dilantin
- Carbamazepine
- Iodides
- Pituitary or hypothalamic disorders: tumor, radiation, surgery, sarcoidosis
- Postpartum

Evaluation

- Complete history and physical examination

Testing options depending on history and findings

- CBC
- BMP
- Chest x-ray for pericardial effusions and cardiomegaly
- ABG if respiratory insufficiency
- EKG
- U/A

- Thyroid stimulation hormone (TSH)
- Thyroid function tests if available

Treatment Options

- Mild symptoms or subclinical disease refer to primary care provider or endocrinologist
- Preferable for primary care provider to start thyroid hormone replacement
 - Synthroid 0.1 mg PO qday — age \leq 60 years
 - Synthroid 0.025–0.05 mg PO qday — age $>$ 60 years (1/2 of this dose if history of heart disease) — discuss with physician

Myxedema coma — notify physician immediately

- End of spectrum of hypothyroidism
- IV NS as needed for hypotension
- Levothyroxine 400 mcg IV slow infusion
- May need intubation
- Hydrocortisone sodium succinate (Solu-Cortef) 100 mg IV
- Treat any infection
- Passive rewarming

Discharge Criteria

- Mild disease

Discharge instructions

- Hypothyroidism aftercare instructions
- Follow up with primary care provider within 7 days
- Return if worse

Consult Criteria

- Unstable patient
- Altered mental status
- Hypothermia
- Metabolic or respiratory acidosis
- Respiratory insufficiency
- Refer to [General Patient Criteria Protocol](#).

HYPERTHYROIDISM PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Conditions from excess thyroid hormone

Differential Diagnosis

- Panic disorder
- Septic shock
- Delirium tremens
- Neuroleptic malignant syndrome
- Serotonin syndrome
- Withdrawal syndromes
- Heat illness
- Cocaine toxicity
- Sympathomimetic drug overdose
- Congestive heart failure
- Pheochromocytoma
- Pregnancy

Considerations

- Grave's disease most common form — autoimmune disease
- 1–2% of patients progress to thyroid storm
- Thyroid storm is potentially fatal

Signs and Symptoms

- Tachycardia
- Weight loss
- Heat intolerance
- Fever
- Diaphoresis
- Dehydration
- Diarrhea
- Goiter
- Hypotension
- Atrial fibrillation

- Exophthalmos and lid lag (Grave's disease only)
- Fine tremor

Causes

- Grave's disease — most common
- Idiopathic — second most common (toxic multinodular goiter)
- Subacute thyroiditis
- Postpartum thyroiditis
- Overdose of thyroid hormone
- Iodine induced
- Amiodarone

Thyroid storm

Severe symptoms

- Shock
- Fever
- Altered mental status
- Psychosis
- CHF
- Jaundice

Precipitated by

- Stress
- Infection
- Surgery
- Cardiovascular events
- Preeclampsia
- DKA or HHS
- Stopping antithyroid medication
- Vigorous palpation of thyroid

Evaluation

- Complete history and physical examination

Testing

- CBC
- BMP
- Calcium
- LFT's
- EKG

- Thyroid function tests
- TSH

Treatment Options

- O2 supplemental
- Tylenol for fever (no aspirin)

Moderate thyrotoxicosis

- PTU 150–450 mg/day PO or NG tube
- Propranolol 20–40 mg PO q4hr until tachycardia controlled
- Decadron (dexamethasone) 2 mg PO or IV q6hr in adults
- Decadron (dexamethasone) 0.15 mg/kg/dose PO or IV q6hr in pediatrics (not to exceed adult dose)

Thyroid storm treatment options

- IV NS 100–200 cc/hr in adults or higher if needed for vital sign findings
- IV NS 1–3 × daily fluid maintenance prn for pediatrics

Propylthiouracil (PTU)

- Adult: 600–1,000 mg IV
- Pediatric: 5–7 mg/kg/day

SSKI

- 1–5 drops PO 1 hour after PTU

Decadron (dexamethasone)

- Adult: 2 mg IV q6hr
- Pediatric: 0.15 mg/kg IV

Propranolol

- 1–2 mg IV; repeat q 10–15 min. prn (caution with CHF and DKA)

Outpatient treatment

- Initiate PTU 150 mg PO qday as outpatient

Discharge Criteria

- Mildly symptomatic patients that respond to therapy

Discharge instructions

- Hyperthyroidism aftercare instructions
- Follow up with primary care provider or endocrinologist within 1–2 days

Consult Criteria

- Moderate thyrotoxicosis
- Fever
- Thyroid storm — notify physician immediately
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Toxic Ingestions

Section Contents — one protocol

Toxicology Protocol

TOXICOLOGY PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

Principles of toxicology

- Reduce exposure (remove from skin and environment)
- Reduce absorption
- Increase elimination
- Supportive care
- Give specific therapy and antidotes when appropriate

Pearls

- Most pediatric accidental ingestions of common OTC medications are of low dose and may require only observation for 2–4 hours
- Intentional ingestions require acute psychiatric intervention
- Ascertain types and amount of ingestion

Syrup of Ipecac not usually recommended

Activated charcoal

- Usually of no benefit
- Can be used if no aspiration risk < 1 hour post ingestion with serious ingestions
- May be considered > 1 hour post serious ingestion with agents that delay absorption or GI transit

Orogastric lavage use indications

- Presentations approximately within one hour post-ingestion
- No known antidote
- Substance does not bind activated charcoal

Whole bowel irrigation indications and considerations

- With lithium and iron ingestion
- In “body stuffers”
- Beware of aspiration risk
- Avoid with decreased bowel sounds, surgical

abdomen, hypotension

Toxidromes (causes and symptoms)

Opioids

Agents

- Narcotics

Findings

- CNS depression
- Respiratory depression
- Miosis

Sympathomimetics

Agents

- Cocaine
- Amphetamine

Findings

- Agitation
- Pupil dilation
- Diaphoresis
- Tachycardia
- Hypertension
- Hyperthermia

Cholinergic

Agents

- Insecticides

Findings

- Salivation
- Lacrimation
- Diaphoresis
- Nausea
- Vomiting
- Urination
- Defecation
- Muscle fasciculations
- Weakness
- Bronchorrhea

Anticholinergic

Agents

- Antihistamines
- Atropine
- Scopolamine

Findings

- Altered mental status
- Dilated pupils
- Dry/flushed skin and mucous membranes
- Urinary retention
- Decreased bowel sounds
- Hyperthermia

Salicylates

Agents

- Aspirin
- Oil of wintergreen (1 tsp lethal in child weighing < 10 kg; 1 cc has 14 gms of salicylate)

Findings

- Tachypnea
- Respiratory alkalosis
- Metabolic acidosis
- Altered mental status
- Tinnitus
- Tachycardia
- Nausea
- Vomiting
- Diaphoresis

Hypoglycemia

Agents

- Oral hypoglycemia agents
- Insulin

Findings

- Altered mental status
- Diaphoresis
- Tachycardia
- Hypertension

Serotonin syndrome

Agents

- Meperidine or dextromethorphan + MAOI
- SSRI (selective serotonin reuptake inhibitor) + tricyclic antidepressant
- SSRI + amphetamine
- Tricyclic antidepressant + amphetamine
- MAOI + amphetamine
- SSRI overdose

Findings

- Altered mental status
- Increased muscle tone
- Hyperreflexia
- Hyperthermia

Evaluation

- Complete history and physical exam
- Contact Poison Control Center or consult physician
- Monitoring and EKG with potentially toxic ingestions
- Send someone to patient's home to obtain ingestants if necessary
- BMP
- Specific drugs levels if available
- Calculate anion gap: $\text{Na} - \text{Cl} - \text{HCO}_3$
- CT head for altered mental status not clearly attributable to toxin
- Evaluate for comorbid conditions
- ASA and acetaminophen nomograms as indicated

Anion gap mnemonic — A CAT MUDPILES

- A – Alcoholic ketoacidosis
- C – Cyanide; carbon monoxide
- A – Aspirin; other salicylates
- T – Toluene
- M – Methanol; metformin
- U – Uremia
- D – DKA
- P – Paraldehyde; phenformin
- I – Iron; INH
- L – Lactic acidosis
- E – Ethylene glycol
- S – Starvation

Osmolol gap > 10–20 suspect substance ingestion (Normal < 10)

- Gap = Osmolality measured – Osmolality calculated
(calculation equation: $2(\text{Na} + \text{K}) + \text{glucose}/18 + \text{BUN}/2.8$; normal 280–300mOsm/L)
- Ethanol mg%/4.6 is added to osmolol gap equation if present
- Gap > 50 carries high specificity for toxic alcohol such as methanol, ethylene glycol, or isopropyl alcohol
- Normal gap < 10

Treatment Options

- Nontoxic ingestions: observation and discharge with instructions and follow up
- Suspected toxic ingestions: refer to previous Considerations section and contact Poison Control Center or consult physician
- IV NS
- Hypotension
 - Adult IV NS 500–1000 cc bolus if hypotensive (consult physician)
 - Pediatrics 20 cc/kg IV NS bolus, may repeat $\times 2$ prn (consult physician)
- Specific antidotes per physician (or poison control center)
- Coma cocktail
 - Dextrose
 - Naloxone (Narcan)
 - Thiamine
 - Flumazenil (**do not use if known, suspected or**

possible chronic benzodiazepine user)

Hemodialysis indications for severe ingestions

- Ethylene glycol or methanol (fomepizole should be given also as treatment)
- Salicylate
 - Level > 90 in acute ingestion
 - Level > 60 in chronic ingestion
 - Severe symptoms
 - Unable to alkalinize urine in a less severe ingestion
 - Massive ingestion (death may result if not hemodialyzed promptly)
- Phenobarbital
- Theophylline
- Lithium
- Valproic acid level > 750 or severe symptoms
- Diethylene glycol
- Massive acetaminophen > 1000 mcg/ml if early post-ingestion

Seizures

- Adult: lorazepam 2–6 mg IV; may repeat q10–15 minutes prn
- Pediatric: lorazepam 0.05–0.1 mg/kg IV; may repeat q10–15 minutes prn (NMT 10 mg)
- If no IV available in children, use Diastat (diazepam rectal gel)
 - Age up to 5 years: 0.5 mg/kg
 - Age 6–11 years: 0.3 mg/kg
 - Age > 12 years: 0.2 mg/kg
 - Round up to available dose: 2.5, 5, 7.5, 10, 12.5, 15, 17.5, 20 mg/dose
- Midazolam IV/IM/PR/ET/intranasal 0.1–0.2 mg/kg/dose; not to exceed a cumulative dose of 10 mg)

Antidotes (if clinically indicated)

- Acetaminophen: N-acetylcysteine
 - Give if ingestion suspected with elevated ALT
 - Give even if acetaminophen induced hepatic failure present and acetaminophen no longer measurable
- Anticholinergic: physostigmine
- Benzodiazepines: flumazenil (thought to increase

seizure potential — controversial)

- Beta-blockers: glucagon
- Calcium channel blockers: calcium chloride, insulin
- Calcium channel blocker severe toxicity
 - CaCl 1–3 gms (10–30 mg/kg) q30 min. prn up to 8 doses
 - High dose insulin therapy
 - Bolus of 0.5–1 Unit/kg, followed by a drip with a rate of 0.5–1 Unit/kg/hr
 - If blood glucose < 250 give supplemental IV glucose (D10)
 - Accucheck q15 min. to avoid hypoglycemia
 - Levophed IV if hypotensive per physician
- Carbon monoxide: 100% O₂; consider hyperbaric chamber
- Coumadin (warfarin): vitamin K, FFP
- Cyanide: cyanide antidote kit
- Digoxin (digitalis): digibind
- Ethylene glycol and methanol: fomepizole
- Iron: deferoxamine
- INH: pyridoxine (vitamin B₆)
- Methemoglobinemia: methylene blue
- Organophosphates: atropine and/or PAM, atrovent aerosol for bronchospasm
- Tricyclic antidepressants: NaHCO₃
- Opiates: narcan (naloxone) for toxic narcotic overdose
 - For adults: 0.4–2 mg IV or IM
 - For pediatrics: narcan (naloxone) 0.1 mg/kg IV or IM (NMT 2 mg)

Lipid antidote — local anesthetic overdose or intra-arterial injection with cardiac arrest (consult physician immediately to assume care of patient)

- Start ACLS
- Give Intralipid 20% 1 cc/kg over 1 minute; repeat twice more at 3–5 minute intervals
 - Convert to an infusion at a rate of 0.25 mL/kg/min, continuing until hemodynamic stability is restored; do not exceed 8 cc/kg
 - May be useful for fat soluble agent toxicity such as verapamil
- No human trials performed
- Anecdotal reports and animal data available only

- Lipidrescue.org recommended as reading for those interested in this therapy

Discharge Criteria

- Psychiatrically cleared
- No toxicity present or is totally detoxified
- Hemodynamically stable
- Good follow up and home situation

Discharge instructions

- Drug or substance ingestion aftercare instructions
- Refer for substance abuse treatment as indicated
- Follow up with PCP within 1 days as needed
- Return if worse

Consult Criteria

- Notify physician immediately for potentially dangerous ingestions or toxicity
 - Unstable vital signs
 - Metabolic acidosis
 - Altered mental status
- Acetaminophen ingestion
 - Pre-school child of 200 mg/kg or greater
 - Older child and adult > 150 mg/kg or total dose of 7.5 gms
 - Nomogram positive for toxicity
 - Liver function abnormalities
 - Delayed presentation
- Aspirin 150 mg/kg or serum level > 40 mg%
 - Lethal dose 300 mg/kg
- Discuss toxic ingestions with physician

Neurology

Section Contents

Headache Protocol

Dizziness Protocol

CVA/TIA Protocol

Bell's Palsy Protocol

Adult Seizure Protocol

Pediatric Seizure Protocol

Delirium Protocol

HEADACHE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Cephalic pain disorder

Differential Diagnosis

- Tension headache
- Migraine headache
- Cluster headache
- Sinusitis
- Otitis media
- Trigeminal neuralgia
- Brain tumor
- Subarachnoid hemorrhage
- Subdural hematoma
- Epidural hematoma
- Temporal arteritis
- Chronic daily headache
- Thunderclap headache
- Analgesic rebound headache
- CVA
- Meningitis
- Encephalitis
- Normal pressure hydrocephalus
- Ventricular peritoneal shunt malfunction
- Temporal mandibular joint disorder

Considerations

- "Functional" or "Primary" headache
 - No detectable cause (not uncommon)
 - Migraine
 - Cluster
 - Headache tension type
- "Organic" or "Secondary"
 - From pain sensitive structures; vessels; periosteum
 - Post concussion headaches

- Spinal tap headaches
- History is one of the more important tools in headache evaluation
- New headache type in elderly suggestive of a higher risk process
- Do not use response to therapy to judge seriousness of headache
- Subarachnoid hemorrhage (SAH) 1% of all headaches in ED
 - Sudden onset and reaching maximal intensity in seconds to minutes
 - 1/3 not exertional
 - May awake with SAH
 - Sentinel leak in SAH headache may improve over time

Historical red flags

- Sudden onset or onset with exertion
- New, progressive, frequent headaches
- Trauma
- Cancer history
- Immunosuppression/HIV
- Clotting disorders
- First headache
- Worst headache
- Fever

Evaluation

- Complete history and physical exam
- Check gait, motor and sensory exam
- Funduscopic exam

Lab (usually not needed in most headaches)

- CBC
- ESR (age > 50 years: temporal arteritis) — not needed with no changes in chronic headache pattern
- Carbon monoxide level prn
- UCG prn

Benign Headaches — Tension, Migraine, Cluster

General treatment options for all types of benign

headaches

- Decadron (dexamethasone) 10 mg IV or IM for adults may be ordered, when not contraindicated, to decrease return visits for same headache
- O2 therapy can be given for all types of headaches

Tension headache

- Pressing or tightening (nonpulsatile quality)
- Frontal-occipital location
- Bilateral: mild/moderate intensity
- Not aggravated by physical activity

Treatment

- NSAID's PO prn
- Tylenol prn
- Fiorinal 1–2 PO q4hr prn not to exceed 6 per 24 hour period
- Midrin 1–2 caps qid PO prn

Migraine

Associated with:

- Photophobia
- Phonophobia
- Nausea and vomiting
- May be unilateral or bilateral
- Aura occurs 20%
 - Scotoma (blind spots)
 - Fortification (zigzag patterns)
 - Scintilla (flashing lights)
 - Unilateral paresthesia/weakness
 - Hallucinations
 - Hemianopsia

Treatment options

- Compazine (prochlorperazine) 5–10 mg IV or IM
- Thorazine (chlorpromazine) 75 mg with Benadryl (diphenhydramine) 25 mg IM
- Ergots DHE 1 mg IV or IM
- Reglan (metoclopramide) 10 mg IV or IM
- Sumatriptan 6 mg SQ (do not use with history of coronary artery disease) — read drug information
- Maxalt (rizatriptan) 5–10 mg PO q2h prn for headache not to exceed 30 mg/d (do not use with

history of coronary artery disease) — read drug information

- Midrin 2 caps PO initially then 1 cap PO q1hr prn not to exceed 5 caps/day
- Toradol (ketorolac) 30–60 mg IM (do not use if creatinine is elevated)
- Compazine suppository (prochlorperazine) 25 mg PR bid prn
- Narcotic prn (not as preferred)

Cluster

- Lancing and severe
- Sudden onset — peaks in 10–15 minutes
- Unilateral facial
- Duration: 10 minutes to 3 hours per episode
- Character: boring and lancing to eye
- Distribution: first and second divisions of the trigeminal nerve (approximately 18–20% of patients complain of pain in extratrigeminal regions)
- Frequency: may occur several times a day for 1–4 months (often nocturnal)
- Periodicity: circadian regularity in 47%
- Remission: long symptom-free intervals occur in some patients 2 months to 20 years

Treatment options

- O2 8 LPM face mask or 100% nonrebreather mask
- Sumatriptan 6 mg SQ (do not use with history of coronary artery disease) — read drug information
- Lidocaine 1 cc of a 10% solution placed on a swab in each nostril for 5 minutes is potentially helpful
- Capsaicin applied intranasally (has a burning sensation side effect)

Trigeminal neuralgia

- Commonly idiopathic
- Shock like severe pains in the distribution of trigeminal nerve
- Onset usually around age 60–70 years of age
- Pains last seconds to less than 2 minutes
- Can be triggered by specific activities such as eating, talking, brushing teeth, etc.
- No associated neurologic deficits

- A sensory deficit excludes the diagnosis

Glossopharyngeal neuralgia

- Pain is over the distribution of glossopharyngeal nerve triggered by coughing, yawning, swallowing cold liquids

Occipital neuralgia

- Pain is in the posterior scalp region

Treatment options of cranial neuralgias

- Carbamazepine 200 mg PO bid to start (DOC)
 - Titrate increasing dose every 3 days by 200 mg
 - Effective dose is usually 600–1200 mg qday
 - Instruct patient they will need monitoring for aplastic anemia and severe leucopenia
- Dilantin (phenytoin) for carbamazepine failures (lower rate of success in treating neuralgia)
 - Dose of 300–600 mg PO qday (levels need monitoring)
 - Cerebyx (fosphenytoin) 250 mg IV for severe attack
- Lamictal (lamotrigine) 100–400 mg PO qday (NMT 250 mg PO qday in children)

Discharge criteria

- Uncomplicated cases

Discharge instructions

- Trigeminal neuralgia aftercare instructions
- Follow up with PCP or neurologist in 7–10 days

Consult criteria

- Complicated cranial neuralgias

Temporal arteritis

- True emergency of the elderly
 - Age of onset 50–70 years of age
 - Six times more common in females than in males
- Headache localized over eye or to scalp
- Fever, malaise and weight loss are associated symptoms
- Jaw claudication is important associated symptom
- Frequently associated with polymyalgia rheumatica

(joint and muscles aches)

- ESR 50–100
- C-reactive protein elevated usually
- Vision loss can occur early in course of disease

Treatment

- Prednisone 40–80 mg PO bid for several months to one year

Discharge criteria

- Minimal symptoms can be treated as outpatient
- Severe symptoms or question of eye involvement should be admitted with IV high dose steroid treatment and ophthalmology consultation obtained
- Discuss all temporal arteritis cases with physician

Discharge instructions

- Temporal arteritis aftercare instructions
- Follow up with PCP within 1 day
- Return for visual changes

Consult criteria

- Discuss all temporal arteritis cases with physician

Headaches Prompting CT Brain Scan Consideration

- Worst headache of life — Consider lumbar puncture if CT negative
- Change in headache from previous headache symptoms/patterns
- Neurologic complaints
- New onset seizure with headache
- Complaints of altered mental status
- Migraine aura that is sensory or motor
- Change in migraine aura
- Focal deficits
- Headache > 24 hours
- Thunderclap headache
- Headache in elderly
- Historical Red Flag Headaches
- Recommend that all CT brain scan patients prior to discharge should be discussed with physician

Consider Following “Don’t Miss Diagnoses”

(Perform testing for possible diagnoses when suspected)

- Subarachnoid hemorrhage
- Meningitis and encephalitis
- Temporal arteritis
- Acute narrow angle closure glaucoma
- Hypertensive emergencies
- Carbon monoxide poisoning
- Cerebral venous sinus thrombosis (seen, for example, with OCP use or with women with coagulopathy)
- Trigeminal neuralgia
- Pseudotumor cerebri
- Acute strokes
- Mass lesions

Discharge Criteria

- Benign headache diagnosis and prognosis
- Trigeminal or cranial neuralgias refer to neurologist (website tna.support.org)

Discharge instructions

- Headache aftercare instructions
- Refer to PCP or neurologist within 7–10 days as needed
- Return if headache persists > 24 hours

Consult Criteria

- Headache with fever unless consistent with a benign process
- Neck/nuchal rigidity
- Headaches where CT brain scan performed
- Follow [General Patient Criteria Protocol](#) for care/evaluation not covered in this protocol
- Possible High Risk Headache
- Acute neurologic complaints or findings
- Above diagnosis suspected in the “Don’t miss diagnosis” section
- Return visit for same headache
- Age ≥ 60 unless known chronic headache patient

without pattern change

- Questionable diagnosis
- Status migrainosus (> 24 hours; dehydration)
- "Historical Red Flags" headache

Lab consult criteria

- Adult WBC $\geq 14,000$ or $< 1,000$ neutrophils
- Pediatric WBC $\geq 15,000$ or $< 1,000$ neutrophils
- Bandemia
- Thrombocytopenia — acute
- Metabolic acidosis
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in new onset diabetes
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)

DIZZINESS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definitions

- Sensation of being off balance or of movement of body or surrounding environment

Differential Diagnosis

- Vestibular disorder of inner ear
- Cardiac arrhythmia
- Pulmonary embolism
- TIA
- CVA
- Seizures
- Dehydration
- Aortic stenosis
- Hypoglycemia
- Subarachnoid hemorrhage
- Hemorrhage
 - GI bleeding
 - Ectopic pregnancy
- Adrenal insufficiency
- Sepsis
- Hypotension

Considerations

- Vertigo: peripheral ("inner ear") or central
- Disequilibrium: suggests CNS disorder

Can be:

- Presyncope
- Generalized weakness
- Cardiopulmonary
- Metabolic
- Emotional disorder

Peripheral Vertigo

- Sensation of movement worsened with head movement or position change
- Horizontal nystagmus; rotary nystagmus
- Nausea and vomiting
- No vital sign abnormalities
- No focal neurologic deficits, neurologic complaints or other significant comorbidities
- No further testing may be needed

Central vertigo

- Not worse on movement
- Vertical nystagmus
- Infrequent nausea and vomiting
- Central nervous system findings present

Evaluation

- Complete history and physical examination
 - Check for nystagmus, gait abnormalities
 - Hallpike maneuver prn
- For benign peripheral vertigo no further testing may be needed
- Consider CT brain scan for
 - Ataxia
 - Vertical nystagmus
 - Neurologic deficits or complaints
 - Headache
 - Consult physician
- CBC, BMP, EKG, CXR as indicated for patients that may have a disorder besides peripheral vertigo causing symptoms
- Toxicology screen and medication levels as indicated
- Follow Chest Pain, Dyspnea, TIA, Syncope/Presyncope or other Protocols as indicated

Treatment Options

- Benign Paroxysmal Positional Vertigo: Epley maneuver
- Peripheral benign vertigo: meclizine, or Phenergan (promethazine), or benzodiazepines can be considered
- Consider steroids and/or acyclovir (or valacyclovir — Valtrex) — or other herpes medication for vestibular neuronitis or labyrinthitis
- Avoid antihistamines if not peripheral vertigo

Discharge Criteria

- Peripheral vertigo with normal vital signs and O2 saturation
- Not ataxic
- Acute central nervous system or metabolic disorder not suspected

Discharge instructions

- Provide dizziness aftercare instructions
- Refer to primary care provider, neurologist or ENT within 10 days as needed

Consult Criteria

- Neurologic abnormalities or complaints
- If CT brain scan needed or performed
- Cardiogenic, pulmonary, toxicology cause of dizziness
- Age ≥ 70
- Uncertain or unknown cause of dizziness
- Syncope or presyncope > 30 seconds
- Refer to [General Patient Criteria Protocol](#)

Lab and x-ray consult criteria

- New onset renal insufficiency or worsening renal insufficiency
- WBC $\geq 15,000$ or $< 3,000$; Neutrophil count $< 1,000$
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Increased anion gap
- Metabolic acidosis
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Pleural effusion
- New onset renal insufficiency or worsening renal insufficiency

CVA/TIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- TIA — An acute and temporary neurologic dysfunction caused by a focal decrease in blood flow to the central nervous system
- CVA — A neurologic dysfunction caused by a focal decrease in blood flow to the central nervous system that causes death in the affected area

Differential Diagnosis

- CVA
- Bell's palsy
- Migraine
- Subarachnoid hemorrhage
- Brain tumor
- Multiple sclerosis
- Intracerebral hemorrhage
- Seizure disorder
- Transient global amnesia (TGA)
- Hypoglycemia

Considerations

- TIA always lasts less than 24 hours
 - They usually last 15 minutes to 1 hour in duration
- Up to 40% of patients with TIA have actually had small infarctions by MRI criteria
 - 10.5% of TIA's will have a CVA within 90 days
 - Half of these will occur within 2 days
 - Up to 21 % of CVA's will die or have major cardiac event
- Up to 16% of TIA patients will have a headache
- Most TIA patients should be hospitalized; especially cardiogenic etiology and crescendo TIA's
- Syncope is seldom a TIA

Symptoms

- Acute in onset
- Focal
- Reaching intensity within seconds
- Begin at the same time
- Most common symptoms and signs are
 - Motor and/or sensory deficit on one side of the body
 - Loss of speech or comprehension
 - Loss of vision in one eye or one hemifield
- Vertebrobasilar CVA/TIA presenting as syncope is typically associated with other brainstem signs:
 - Diplopia
 - Ataxia

Most common symptoms and signs

- Hemiparesis
- Hemiataxia
- Hemisensory loss
- Speech difficulty
- Visual difficulty — diplopia or visual loss

High risk factors to develop CVA following TIA

- Age > 60
- Diabetes
- TIA lasting > 10 minutes
- Motor weakness
- Speech impairment

0 factors = 0% CVA; 5 factors = 34% CVA occurrence

TIA mimics

Migraines

- Migraines symptoms usually migrate and grow, without the abrupt symptoms of TIA

Syncope

- Hypoperfusion usually produces loss of consciousness, but focal deficits can occasionally be seen, especially after an episode of true syncope

Vertigo

- True vertigo without other findings is seldom central. Look especially for other brainstem signs

Epilepsy

- Focal paralysis without motor activity occurs rarely

TGA

- Transient global amnesia without any other neurologic deficit

Intracerebral hemorrhage

- Symptoms rarely are transient

Multiple sclerosis

- Onset is typically much slower than TIA

Hypoglycemia

- Some alteration in consciousness usually present

Nondescript complaints

- Acute onset of focal symptoms is occasionally a conversion reaction, but be aware of the possibility of embellishment of a real deficit

Evaluation Options

- CBC
- CMP
- EKG
- CT brain scan at time of initial presentation
- Chest x-ray
- C-RP
- ESR
- PT/INR
- Assess for focal neurologic deficits in addition to cardiac and general exam
- Check gait as needed

Assess for other causes

- Migraines
- Seizures
- Vertigo
- TGA
- Medication side effect/toxins
- Multiple sclerosis
- Intracerebral hemorrhage
- Lumbar puncture if subarachnoid hemorrhage is

suspected

- Blood cultures if infected emboli are suspected (e.g., SBE)

Acute CVA presentations less than 4.5 hours from onset (notify physician)

- Rapidly perform NIHSS (NIH Stroke Scale) and examine patient
- Order stat CT brain without contrast
- Consult physician and neurologist immediately after ordering CT brain scan
 - If available and appropriate to the specific institution and the patient's clinical situation, order contrast CT brain after plain CT brain completed per physician (renal patients discuss with physician or radiologist prior to contrast)
- Determine patient eligibility for t-PA with physician and a course of action if possible
- Repeat NIHSS immediately when patient returns from CT brain scan and discuss with physician
 - To give thrombolysis treatment, blood pressure targets initially are:
 - $SBP \leq 185$ mm Hg
 - $DBP \leq 110$ mm Hg
- Follow established specific institution's acute stroke policies if present instead of this section

Time targets for t-PA candidates

- Door to Provider: 10 min
- Access to neurologic expertise: 15 min
- Door to CT scan completion: 25 min
- Door to CT scan interpretation: 45 min
- Door to treatment: 60 min
- Admission to monitored bed: 6 hr

TIA Treatment Options

- Aspirin 325 mg per day (if no cerebral hemorrhage)
- Consider Plavix (clopidogrel) for ASA failure or ASA allergy (if no cerebral hemorrhage)
- Aggrenox can be used instead of aspirin or Plavix (clopidogrel)
- Coumadin (warfarin) is most effective if atrial fibrillation

present

- Lower head of bed to flat position to improve cerebral circulation
- Avoid hypotonic IV fluids

Hypertension treatment for TIA and CVA nonthrombolysis candidates

- Consult physician for treatment preferred
 - Treat SBP ≥ 220 mm Hg or MAP ≥ 130 mm Hg carefully (avoid rapid or large decreases in BP $> 15\%$)
 - Labetalol 10–20 mg IV over 1–2 minutes — may repeat q10min and double as needed to maximum dose of 150 mg
- or
- Nicardipine 5mg/hr IV and titrate as needed
- Avoid treating SBP < 220 mm Hg or MAP < 130 mm Hg
 - Unless AMI, severe CHF, aortic dissection or hypertensive encephalopathy or ICH (intracranial hemorrhage) is present
- Notify physician promptly if intracranial hemorrhage present
 - SBP > 180 mm Hg is treatable

Admission Criteria

- Acute CVA
- Most TIA's
 - High risk criteria
 - Crescendo/recurrent TIA's
 - Cardiogenic etiology of TIA
 - Recent single TIA's are often offered admission because of the high risk of subsequent stroke and to facilitate rapid work-up
 - Septic emboli diagnosis is possible
 - Likelihood that patient would not return for outpatient work-up

Discharge Criteria

- Not surgical or anticoagulation candidate
- Patient declines admission for evaluation
- Fully worked up in recent past

- Neurologically stable

Discharge instructions

- TIA aftercare instructions
- Discharge instructions should include early follow-up along with what signs and symptoms to watch for, and to return immediately for further symptoms

Consult Criteria

- All TIA or CVA patients
- CT brain scan with acute findings
- Unclear diagnosis
- Refer to [General Patient Criteria Protocol](#)

Lab and x-ray consult criteria

- New onset renal insufficiency or worsening renal insufficiency
- WBC $\geq 15,000$ or $< 3,000$; Neutrophil count $< 1,000$
- Bandemia
- Acute thrombocytopenia
- Increased anion gap
- Metabolic acidosis
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Pleural effusion
- New onset renal insufficiency or worsening renal insufficiency

Current inclusion guidelines for the administration of t-PA are:

- Diagnosis of ischemic stroke causing measurable neurologic deficit
- Neurologic signs should not be clearing
- Neurologic signs not be minor and isolated
- Caution should be exercised in treating patients with major deficits (higher risk of hemorrhagic conversion)
- Symptoms not be suggestive of subarachnoid hemorrhage
- Onset of symptoms < 4.5 hours before beginning

treatment

- No head trauma or prior stroke in past 3 months
- No MI in prior 3 months
- No GI/GU hemorrhage in previous 21 days
- No arterial puncture in noncompressible site during prior 7 days
- No major surgery in prior 14 days
- No history of prior intracranial bleed
- SBP < 185 mm Hg and DBP < 110 mm Hg
- No evidence of acute trauma or bleeding
- Not taking an oral anticoagulant, or if so INR < 1.7
- If taking heparin within 48 hours must have a normal activated prothrombin time (aPT)
- Platelet count > 100,000 μ L
- Blood glucose level greater than 50 mg/dL (2.7 mmol)
- No seizure with residual postictal impairments
- CT scan does not show evidence of multilobar infarction (hypodensity > 1/3 hemisphere) — increased risk of hemorrhagic conversion
- The patient and family understand the potential risks and benefits of therapy

References:

- Stroke. May 2007;38(5):1655-711
- Stroke. 2010;41;2108

NIH stroke scale

Do not augment or interpret patient's responses on what you think the patient can do. Only record what the patient exactly does.

1a – Level of consciousness (LOC)

- 0 = **Alert**; keenly responsive
- 1 = **Not alert**; arousable by minor stimulation to obey, answer, or respond
- 2 = **Not alert**; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped)
- 3 = **Responds only** with reflex motor or autonomic effects or is totally unresponsive, flaccid, and areflexic

1b – LOC questions – asked month and age (must be exact)

- 0 = **Answers** both questions correctly
- 1 = **Answers** one question correctly
- 2 = **Answers** neither question correctly

1c – LOC commands — asked to open and close eyes and then to grip and release non-paretic hand

- 0 = **Performs** both tasks correctly
- 1 = **Performs** one task correctly
- 2 = **Performs** neither task correctly

2 – Best gaze

- 0 = **Normal**
- 1 = **Partial gaze palsy**; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present
- 2 = **Forced deviation**, or total gaze paresis not overcome by the oculoccephalic (doll's eyes) maneuver

3 – Visual

- 0 = **No visual loss**
- 1 = **Partial hemianopsia**
- 2 = **Complete hemianopsia**
- 3 = **Bilateral hemianopsia** (blind including cortical blindness)

4 – Facial palsy

- 0 = **Normal symmetrical movements**
- 1 = **Minor paralysis** (flattened nasolabial fold, asymmetry on smiling)
- 2 = **Partial paralysis** (total or near-total paralysis of lower face)
- 3 = **Complete paralysis** of one or both sides (absence of facial movement in the upper and lower face)

5 – Motor arm (score for each arm)

- 0 = **No drift**; limb holds 90 (or 45) degrees for full 10 seconds
- 1 = **Drift**; limb hold 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support
- 2 = **Some effort against gravity**; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity
- 3 = **No effort against gravity**; limb falls

- 4 = **No movement**
 - UN = **Amputation** or joint fusion, explain:
-

6 – Motor leg (score for each leg)

- 0 = **No drift**; leg holds 30-degree position for full 5 seconds
 - 1 = **Drift**; leg falls by the end of the 5-second period but does not hit bed
 - 2 = **Some effort against gravity**; leg falls to bed by 5 seconds, but has some effort against gravity
 - 3 = **No effort against gravity**; leg falls to bed immediately
 - 4 = **No movement**
 - UN = **Amputation** or joint fusion, explain:
-

7 – Limb ataxia

- 0 = Absent
 - 1 = Present in one limb
 - 2 = Present in two limbs
 - UN = **Amputation** or joint fusion, explain:
-

8 – Sensory

- 0 = **Normal**; no sensory loss
- 1 = **Mild-to-moderate sensory loss**; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched.
- 2 = **Severe to total sensory loss**; patient is not aware of being touched in the face, arm, and leg

9 – Best Language

- 0 = **No aphasia**; normal
- 1 = **Mild-to-moderate aphasia**; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension; however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient's response.
- 2 = **Severe aphasia**; all communication is through fragmentary expression; great need for inference,

questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response.

- 3 = **Mute, global aphasia**; no usable speech or auditory comprehension

10 – Dysarthria

- 0 = **Normal**
- 1 = **Mild-to-moderate dysarthria**; patient slurs at least some words and, at worst, can be understood with some difficulty.
- 2 = **Severe dysarthria**; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute.
- UN = **Intubated** or other physical barrier, explain: _____

11 – Extinction and Inattention (Neglect)

- 0 = **No abnormality**
- 1 = **Visual, tactile, auditory, spatial, or personal inattention** or extinction to bilateral simultaneous stimulation in one of the sensory modalities.
- 2 = **Profound hemi-inattention or extinction to more than one modality**; does not recognize own hand or orients to only one side of space.

NOTE: If the patient in 1a has a score of 3, then the rest of the exams usually are scored a 3 for each category

Reference:

http://www.ninds.nih.gov/doctors/NIH_Stroke_Scale.pdf

BELL'S PALSY PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Dysfunction or paralysis of the 7th cranial nerve unilaterally of acute onset and usually idiopathic etiology

Differential Diagnosis

- Vascular
 - TIA
 - CVA
 - Aneurysm
- Infectious
 - Lyme disease
 - Herpes zoster
 - Mononucleosis
- Neoplastic
 - Tumor of pons or cerebellopontine angle or acoustic nerve
 - Skull based tumor, cholesteatoma
- Multiple sclerosis

Considerations

- 7th cranial nerve dysfunction
- Affects 1 in 65 persons in a lifetime
- Complete recovery in 65% of patients at 3 months and 85% at 9 months
- Steroids and Valtrex (valacyclovir) or acyclovir recommended only in the initial 72 hours of symptoms with complete or nearly complete paralysis — not useful otherwise
- Slowly progressive facial paralysis suggestive of cancer
- Recurrent paralysis can be seen with Bell's palsy or more commonly with tumor
- Bilateral 7th nerve weakness excludes Bell's palsy and is suggestive of infectious causes such as Lyme disease or VZV (varicella zoster virus)
- Forehead sparing of motor function usually indicates

upper motor neuron lesion (CVA)

- Lyme disease should be considered as a cause in endemic areas
- Bell's palsy can be mimicked by pontine brainstem lesion
- Other associated signs and symptoms:
 - Vestibular signs
 - Diabetes and hypertension higher risk for pontine lesions

Signs and Symptoms

- Typical presentation is subacute weakness of one side of the face
- Often associated with pain near the ear
- No sensory loss although patient may complain of vague sensation on the face
- Hyperacusis due to paralysis of the stapedius sometimes occurs
- Distortion of taste sometimes occurs although this is seldom a presenting complaint
- Weakness of eye closure is helpful to differentiate from stroke where eye opening may be impaired
- Asymmetry of mouth movement is most obvious with grimacing and smiling
- Maximal defect is 5 days from onset
- Forehead and lower facial muscles both weak
 - If forehead spared of weakness, suspect central lesion (CVA, tumor)
- Increased tear flow
- Dry eyes
- Rash or vesicles around ear on affected side suggests herpes zoster (Ramsey-Hunt syndrome). Usually significant pain near the ear

Causes

- Idiopathic usually
- Infectious causes
 - Most cases of Bell's palsy are thought to be due to virus infections
 - HSV 1 or 2
 - VZV
 - EBV
 - Lyme disease is a rare cause of Bell's palsy

- Sarcoidosis can present with facial palsy
- Other infections such as osteomyelitis, primary ear infections, and meningitis are less likely
- Neoplasm of local tissues near the ear and skull base or neoplastic meningitis
- Pontine (brainstem) lesion, including cerebellopontine angle lesion
- Aneurysm of the basilar artery or branch with resultant neural compression

Evaluation Options

- Usually no testing except history and physical exam
- Testing driven by suspected processes
 - CBC
 - ESR or C-reactive
 - Lyme titer
 - HIV test
 - Serum glucose
 - CT brain if suspected central lesion (usually not needed)

Treatment Options

- Artificial tears
- Tape eyelids closed on affected side at night only
- Steroids are commonly used unless specifically contraindicated
 - Prednisone 1 mg/kg/day up to 60 mg/day × 7 days without rapid taper
- Antivirals are commonly used although data are conflicting
 - Valtrex (valacyclovir) 1000 mg PO tid × 5 days
OR
 - Acyclovir 400 mg PO 5 ×/day × 7–10 days
OR
 - Famciclovir 500 mg tid × 5–10 days
- Physical therapy may be used for patients with moderate to severe deficits

Discharge Criteria

- Isolated 7th nerve palsy

Discharge instructions

- Bell's palsy aftercare instructions
- Follow up with primary care provider or neurologist within 7 days
- Discharge precautions noted:
 - Return if additional symptoms or significant worsening
 - Complete administration of medications
- Ensure follow-up after discharge

Consult Criteria

- Suspected other causes of palsy
- Central nervous system findings or complaints
- Refer to [General Patient Criteria Protocol](#) as needed

ADULT SEIZURE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Focal or generalized electrical depolarizations of the brain resulting in focal or generalized neurologic and motor findings with or without loss of consciousness

Differential Diagnosis

- Pseudoseizures
- Migraines
- Encephalitis
- Meningitis
- Transient global amnesia (TGA)
- Psychogenic unresponsiveness
- TIA (rare TIA's can present with focal motor activity or unresponsiveness)
- Syncope
- Hypoglycemia
- Conversion reaction

Considerations

Generalized seizures (most common)

Classic tonic-clonic (grand mal)

- Sustained generalized muscle contractions followed by loss of consciousness

Absence seizures (petit mal)

- Brief episodes of sudden immobility and blank stares

Partial seizures

Simple

- Brief sensory or motor symptoms without loss of consciousness
 - Focal motor seizures is an example

Complex

- Mental or psychiatric symptoms
- Affect changes
- Confusion
- Automatism
- Hallucinations
- Impaired consciousness

Status epilepticus (SE)

- Newly defined as seizure > 5 minutes or 2 or more seizures in which patient does not recover consciousness
- Older definition > 30 minutes or 2 or more seizures in which patient does not recover consciousness (controversy exists about definition)
- Mortality of 10–12%
- Failure to recognize nonconvulsive SE increases poor outcomes
- Prolonged SE leads to electromechanical dissociation
 - Exhibit minor movements: twitching of eyes, face, hands, feet; coma

Prolactin level

- Helpful if drawn within 10–20 minutes of seizure and elevated 2 times normal
 - Syncope can also elevate prolactin levels
- Normal prolactin level favors pseudoseizure but cannot differentiate seizure from syncope
- Normal prolactin does not rule out seizure however

Pseudoseizures

- Closed eyes during seizure: 96% sensitive; 98% specific in indicating pseudoseizure
- Open eyes during seizure: 98% sensitive; 96% specific in indicating true seizure

First time seizure has 25% recurrence in 2 years

Epilepsy defined as 2 of more seizures not provoked by other illness or causations

Causes

- Idiopathic
- Genetic

- Hypoglycemia or hyperglycemia
- Hyponatremia and hyponatremia
- CVA
- Cerebral mass
- Intracranial hemorrhage — especially subarachnoid or intraparenchymal
- Traumatic brain injury
- Cocaine
- Meningitis
- Encephalitis
- Eclampsia
- Fever
- Prescribed drugs (lowered seizure threshold especially with some antibiotics and analgesics)
- Withdrawal syndromes (drugs and alcohol)

Evaluation

- Assess airway and breathing
- Cardiac and O₂ saturation monitoring
- Complete history and physical
- Obtain seizure history and treatment
- Obtain history of associated symptoms
- Drug abuse history

Patients with chronic seizures and no change in typical seizure pattern, without comorbid findings or symptoms

- BMP
- Seizure drug levels if acutely measurable

All other seizures with comorbid considerations and new onset seizures

- CMP, Mg⁺⁺, prolactin level in select patients
- Pregnancy test in childbearing age women
- Consider lumbar puncture (LP) in immunocompromised patient or with meningitis signs
- Consider LP in patients with seizure and fever
- CBC; U/A; chest x-ray as indicated by associated symptoms or findings
- Blood alcohol and drug screen as indicated
- Serum anticonvulsant levels for anticonvulsant

therapy that are acutely measurable

- CT brain scan on first time seizures if available
- CT brain scan on elderly or patients taking Coumadin
- CT brain scan for head trauma
- Consider stat EEG for suspected nonconvulsive SE

Treatment Options

- Notify physician promptly of seizures occurring in the department or clinic
- Intubation if airway not secure
- IV NS KVO
- Nasal oxygen

Initial treatment

- Lorazepam 2–6 mg IV if actively seizing
 - May repeat q10–15 minutes for recurrent seizures prn (NMT 10 mg)

Adjunctive treatments as needed

- Thiamine 100 mg IM/IV for alcoholism history (or if not known)
- Glucose D50W 1 amp if hypoglycemic
- Prophylactic lorazepam can be given in the first 12 hours of alcoholic withdrawal
- Magnesium sulfate 4 gms IV over 5–10 minutes for eclampsia

Status epilepticus (beware of “too slow and too low” treatment)

- Lorazepam 0.1 mg/kg IV (NMT 10 mg)
- Cerebyx (fosphenytoin) 15–20 mg/kg IV at 100 mg/minute if no response in 5 minutes to lorazepam

Drugs that can be used if lorazepam and Cerebyx (fosphenytoin) fail

- Propofol per physician (intubate patient)
- Lidocaine 1 mg/kg up to 100 mg; may be repeated (NMT 3 mg/kg)
- Valproic acid 15 mg/kg over 1–5 minutes; (NMT 40 mg/kg)
 - 5 mg/kg/hr drip
- Phenobarbital 10 mg/kg IV at 100 mg/hr per

physician (seldom used in adults)

- Pentobarbital or thiopental per physician (rarely used)

Management of refractory status epilepticus (consult physician immediately)

- Referral to an intensive care unit
- Anesthetic agents such as midazolam, propofol or barbiturates (thiopental, pentobarbital) for generalized convulsive status epilepticus
- Non-anesthetic anticonvulsants such as phenobarbital or valproic acid for nonconvulsive status epilepticus

Discharge Criteria

- Patient with normal neurologic exam and no concerning comorbidities
- No known structural brain disease
- Patients usually do not need to be started on seizure outpatient treatment at that time if patient had single brief seizure without previous seizure history, and has a normal exam, normal imaging and no further seizures
- With treatment, after oral or parenteral load with anticonvulsant
- Without treatment if risk of recurrent seizure is judged to be low

Discharge instructions

- Seizure aftercare instructions
- Advise of seizure precautions/safety issues prior to discharge (for example – no driving)

Consult Criteria

- Notify physician promptly on all actively seizing patients
- Discuss all seizure patients with prior to discharge
- Notify physician of any other neurologic abnormalities
- Abnormal imaging studies
- Significant abnormal lab tests
- Abnormal vital signs and O2 saturation < 95% on room air (<92% O2 saturation in COPD patients)

PEDIATRIC SEIZURE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Focal or generalized electrical depolarizations of the brain resulting in focal or generalized neurologic and motor findings with or without loss of consciousness

Differential Diagnosis

- Pseudoseizures
- Migraines
- Encephalitis
- Meningitis

Considerations

Generalized seizures (most common)

Classic tonic-clonic (grand mal)

- Sustained generalized muscle contractions followed by loss of consciousness

Absence seizures (petit mal)

- Brief episodes of sudden immobility and blank stares

Partial seizures

Simple

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- Automatism
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 - Exhibit minor movements: twitching of eyes, face, hands, feet; coma

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- Normal prolactin does not rule out seizure however

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- Closed eyes during seizure: 96% sensitive; 98% specific in indicating pseudoseizure
- Open eyes during seizure: 98% sensitive; 96% specific in indicating true seizure

First time seizure has 25% recurrence in 2 years

Epilepsy defined as 2 or more seizures not provoked by other illness or causations

Causes of Seizures Amenable to Treatment

- Hypoglycemia
- Hyponatremia
- Hypocalcemia
- Hypomagnesemia
- Isoniazid ingestion treated with pyridoxine
- Hypertension

Evaluation

- Assess airway and breathing
- Cardiac and O₂ saturation monitoring
- Complete history and physical
- Obtain seizure history and treatment
- Obtain associated symptoms
- Drug abuse history

Patients with chronic seizures and no change in typical seizure pattern, without comorbid findings or symptoms

- BMP
- Seizure drug levels if acutely measurable

All other seizures with comorbid considerations and new onset seizures

- CMP, prolactin level in select patients
- Pregnancy test in childbearing age females
- Consider lumbar puncture on the immunocompromised patient or patient that has meningitis signs
- Consider LP in patients with seizure and fever
- CBC; U/A; chest x-ray as indicated by associated symptoms or findings
- Blood alcohol and drug screen as indicated
- Serum anticonvulsant levels for anticonvulsant therapy that are acutely measurable
- CT brain scan on first time seizures if available
- CT brain scan for head trauma
- Consider stat EEG if no resolution of post-ictal lethargy and for suspected nonconvulsive SE

Treatment Options

- Intubation if airway not secure
- IV NS KVO
- Nasal oxygen

Initial treatment options

- Lorazepam 0.05–0.1 mg/kg IV; may repeat q10–15 minutes prn
- Diastat (diazepam rectal gel) if no IV available

- Age up to 5 years: 0.5 mg/kg
- Age 6–11 years: 0.3 mg/kg
- Age > 12 years: 0.2 mg/kg
- Round up to available dose: 2.5, 5, 7.5, 10, 12.5, 15, 17.5, 20 mg/dose
- Midazolam IV/IM/PR/ET/intranasal 0.1–0.2 mg/kg/dose; not to exceed a cumulative dose of 10 mg

Adjunctive treatments as needed

- Dextrose: 0.25–0.5 g/kg/dose (1–2 cc of 25% dextrose) intravenously for hypoglycemia; not to exceed 25 gm/dose
- Naloxone (Narcan): 0.1 mg/kg/dose intravenously preferable (if needed may administer intramuscularly or subcutaneously) for narcotic overdose (do not exceed 2 mg)
- Thiamine: 100 mg intramuscularly for possible deficiency
- Pyridoxine (vitamin B6): 50–100 mg intravenously/intramuscularly for possible deficiency
- Rocephin (ceftriaxone) 50–100 mg/kg IV or IM not to exceed 2 grams if meningitis suspected (may use Sanford Guide), initiate treatment with antibiotics prior to cerebrospinal fluid (CSF) analysis or brain imaging
 - Give Decadron (dexamethasone) 15 minutes before antibiotics or with antibiotics

Status epilepticus (beware of “too slow and too low” treatment)

- Lorazepam 0.1 mg/kg IV (NMT 10 mg)
- Cerebyx (fosphenytoin) 15–20 mg/kg IV at 100 mg/minute if no response in 5 minutes to lorazepam or midazolam (Versed)
- Keppra (Levetiracetam) 20 mg/kg IV

Drugs that can be used if above medications fail

- Pentobarbital 1 mg/kg boluses IV to maximum 5 mg/kg per physician
- Valproic acid 15 mg/kg over 1–5 minutes (NMT 40 mg/kg)
 - 5 mg/kg/hr drip
- Phenobarbital 20 mg/kg IV at 100 mg/hr per

Management of refractory status epilepticus (consult physician immediately)

- Referral to an intensive care unit
- Anesthetic agents such as midazolam, propofol or barbiturates (thiopental, pentobarbital) for generalized convulsive status epilepticus
- Non-anesthetic anticonvulsants such as phenobarbital or valproic acid for nonconvulsive status epilepticus

Discharge Criteria

- Patient with normal neurologic exam and no concerning comorbidities
- No known structural brain disease
- Most patients usually do not need to be started on seizure outpatient treatment at time of discharge
- No further seizures
- With treatment, after oral or parenteral load with anticonvulsant
- Without treatment if risk of recurrent seizure is judged to be low

Discharge instructions

- Seizure aftercare instructions
- Advise of seizure precautions/safety issues prior to discharge (for example – no driving)
- Contact primary care physician or provider to alert of ED visit and arrange follow up

Consult Criteria

- Notify physician promptly on all actively seizing patients
- Discuss all seizure patients with prior to discharge
- Notify physician of any neurologic abnormalities
- Abnormal imaging studies
- Significant abnormal lab tests
- Abnormal vital signs and O2 saturation < 95% on room air

DELIRIUM PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Acute organic brain syndrome manifested by impaired thinking, confusion, deficits in attention, fluctuating course, impaired speech and other symptoms and signs of impaired cognition

Causes of delirium

Medications and substances

- Ethanol
- Anticholinergics
- Antihistamines
- Sedatives
- Narcotics
- Antidepressants
- Lithium
- Neuroleptics
- Tagamet (cimetidine)

Withdrawal

- Ethanol
- Benzodiazepines
- Narcotics

Metabolic

- Electrolyte abnormalities (Na and Ca)
- Hypoglycemia and hyperglycemia
- Acid-base disturbance
- Dehydration
- Hypoxia
- End organ insufficiency – liver, kidney and lungs
- Vitamin deficiency – thiamine, folate
- Fever or hypothermia

Infectious

- Urinary tract infection – especially in elderly

- Encephalitis or meningitis
- Pneumonia
- Sepsis
- Influenza

Neurologic

- Brain tumor
- Subdural hematoma
- Intracerebral hemorrhage
- Seizure disorder
- CVA

Endocrine

- Hyperthyroidism
- Hypothyroidism
- Parathyroid – hyper and hypoparathyroidism

Cardiovascular

- Congestive heart failure
- Arrhythmia
- Acute myocardial infarction

Conditions that mimic delirium

- Dementia
- Depression
- Schizophrenia
- Mania
- Wernicke's aphasia

Evaluation of delirium

Mental status examination

OMI HAT (OMI = organic disease; HAT = psychiatric or functional)

- O – Orientation
- M – Memory
- I – Intellect
- H – Hallucinations
- A – Affect disorder
- T – Thought disorder

Functional Disorder

- Age 15–40 years old
- Onset gradual
- Not confused
- Appears depressed

Organic disorder

- Middle age or elderly
- Non-adolescent children
- Labile course
- Confused
- Visual hallucinations
- Vital signs frequently abnormal

Testing Options

- CBC
- BMP
- LFT's
- U/A
- Chest x-ray
- EKG

Tested as indicated

- Drug levels
- Thyroid studies
- Urine drug screen
- Blood alcohol
- Blood cultures
- CT brain
- Lumbar puncture for CSF analysis
- Urine culture

Treatment of delirium

- Treat underlying illness
- Restore any fluid or electrolyte imbalances
- Discontinue any unnecessary medication that is contributing to delirium (discuss with physician)

Consult criteria for delirium

- Discuss all cases with physician
- Physician should examine all delirium or acute altered mental status patients unless from ethanol or drug abuse

[Back](#)

Section Contents

Back Pain Protocol

Flank Pain Protocol

BACK PAIN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Differential Diagnosis

- Muscular pain
- Aortic aneurysm
- Vertebral infection
- Epidural hematoma
- Epidural abscess
- Herniated nucleus pulposus (HNP)
- Renal colic
- Pyelonephritis
- Cancer

Considerations

- Most back pain is benign
- Usually is without acute neurologic signs
- Radiculopathy is frequently an associated complaint or finding
- Fever may be harbinger of spinal or vertebral infection in patients with IV drug abuse or recent instrumentation
- Elderly have increased risk of vertebral fractures with or without injury

Spinal cord compression signs

- Urinary retention with overflow incontinence or voiding
- Fecal incontinence
- Decreased rectal tone
- Decreased perineal sensation
- Cauda equina syndrome
 - Urinary retention is most common finding in cauda equina syndrome
 - Patients without urinary retention have an approximately 1/10,000 chance of having cauda equina syndrome

Warning flags in back pain

- Cancer history (Pain not relieved by rest)

- Chronic infections or fever history
- Night pain
- Prolonged pain
- Depression
- HIV history
- Unexplained weight loss
- Substance abuse
- Disability pursuit
- Urinary retention

Evaluation

- Complete history and physical examination
- Check reflexes, SLR, and neurovascular exam
- Check rectal tone; perineal sensation; urinary bladder retention in suspected cauda equina syndrome
- Healthy non-elderly patients without direct blunt trauma usually need no tests
- Elderly frequently need spine films due to higher incidence of vertebral fractures
- Plain back/pelvic films may be needed in falls, MVC's, direct blunt trauma, depending on severity of injury mechanism
- U/A if renal disease suspected or significant injury mechanism
- D-dimer if aortic dissection considered
- CBC, C-RP (or ESR) for fever with vertebral back pain as only other symptom or finding

CT spine

- Acute neurologic complaints or findings
- Compression fracture > 30%
- Burst fracture (goes through entire vertebral body — unstable)
- Posterior vertebral involvement
- Traumatic back pain out of proportion to expectation

MRI for spinal cord findings or symptoms

Treatment Options

- NSAID's
- Short narcotic course prn for severe pain
- Avoid Demerol (meperidine)

- Preferably no prolonged bed rest unless fracture present
- Limit bed rest to no more than 1–2 days if possible (unless compression fracture)
- Muscle relaxants of questionable usefulness
- Salmon calcitonin for compression fractures that can be discharged

Discharge Criteria

- Uncomplicated presentation and findings
- Ability to control pain and ambulate
- Orthopedic referral for fractures

Discharge instructions

- Refer to primary care provider within 10 days as needed
- If HNP suspected refer to neurosurgeon or orthopedic surgeon within 10 days
- Back pain aftercare instructions

Consult Criteria

- Severe pain with inability to ambulate
- Progressive neurologic deficits
- Signs of cauda equina syndrome
- Signs of spinal cord compression or injury
- Evidence of infectious, vascular, or neoplastic etiologies
- Nontraumatic pediatric back pain
- Fracture
- Suspected aortic disease as cause of pain

Lab and x-ray consult criteria

- New onset renal insufficiency or worsening renal insufficiency
- WBC > 15,000 or < 3,000; Neutrophil count < 1,000
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Metabolic acidosis
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Pleural effusion

- New onset renal insufficiency or worsening renal insufficiency
- Refer to [General Patient Criteria Protocol](#).

FLANK PAIN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Differential Diagnosis

- Renal colic
- Biliary colic
- Aortic aneurysm
- Mechanical back pain
- Herpes zoster
- Pyelonephritis
- Renal vein thrombosis
- Retroperitoneal bleeding
- Appendicitis

Considerations

- Renal colic is most common misdiagnosis of ruptured abdominal aortic aneurysm
- Aortic disease cause more frequent in elderly
- No hematuria on U/A with 10–15% of kidney stones
- Flank ecchymosis indicative of intra-abdominal bleeding

Evaluation

- Detailed abdomen, back, flank, and neurovascular exam

Musculoskeletal suspected as cause

- No tests unless blunt injury occurred
- Blunt trauma consider x-ray
- CBC and U/A as indicated

Kidney stone suspected

- KUB
- UA

CT abdominal/pelvis scan considered

- In elderly
- Unclear diagnosis
- Aortic cause suspected

- Inadequate response to pain medications

D-dimer

- Can be used as screening test to rule out aortic disease if negative (98% specific)
- Coumadin (warfarin) can cause false negative D-dimer
- Elderly have a positive D-dimer > 50% of the time without acute process

U/A

- UTI symptoms
- Obtain urine C&S if pyelonephritis suspected or a diabetic with UTI

Treatment Options

- Toradol (ketorolac) 30 mg IV with or without Dilaudid (hydromorphone) 0.5–1 mg IV (or other equipotent narcotic) and Phenergan (promethazine) 6.25 mg or Zofran (ondansetron) 4 mg IV for suspected renal colic
 - Do not use Toradol (ketorolac) if creatinine is elevated
- Musculoskeletal can be treated with Tylenol, OTC medication, NSAID or short narcotic course
- Narcotic short course prn on discharge for renal colic pain, with or without Toradol (ketorolac)
- Phenergan (promethazine) prn
- Flomax (tamsulosin) 0.4 mg PO every day for 2-4 weeks to pass ureteral calculus
- Simple UTI: Septra DS, cephalosporin or quinolone for 3 days — consider single dose therapy
- Pyridium: 200 mg TID prn urinary symptoms — do not dispense more than 6 for acute cystitis
- Pyelonephritis: 10–14 days of simple UTI antibiotic regimen
 - IV Rocephin (ceftriaxone) or Levaquin (levofloxacin) × 1 can be given initially
- Herpes zoster Rx as indicated

Discharge Criteria

- Renal colic controlled
- Simple cystitis
- Pyelonephritis in nontoxic patient and able to hold down medication at home
- Benign musculoskeletal disorder

Discharge instructions

- Flank pain aftercare instructions
- Refer to primary care provider or urologist as indicated within 1–7 days

Consult Criteria

- Unknown cause of moderate to severe flank pain
- Unable to hold oral fluids down at home
- Heart rate ≥ 110 , hypotension or relative hypotension (SBP < 105 with history of hypertension)
- Suspected vascular cause of flank pain
- Toxic UTI patient
- Unable to hold down medications at home
- WBC $\geq 14,000$
- New onset anemia
- Inadequate renal colic relief
- Age ≥ 60 without firm diagnosis
- New onset renal insufficiency or worsening renal insufficiency
- Solitary kidney with ureteral calculus
- Pyelonephritis with ureteral calculus

Gastrointestinal

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ABDOMINAL PAIN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Differential Diagnosis

- See below locations of pain

Considerations

- Appendicitis may have normal WBC
 - WBC $\geq 10,000$ with left shift in 80–90% of patients
- WBC is a poor predictor of surgical disease
- Consider EKG in epigastric pain with CAD risk factors and a benign exam
- Constitutional history important

Diagnostic pitfall

- Diagnosing UTI with mildly elevated WBC's in the general range of 7–15 WBC's on U/A as the cause of moderate to severe abdominal pain and/or tenderness, especially in females and those without infectious urinary complaints

Locations of pain

RUQ

- Gallbladder disease
- Liver disease
- Peptic ulcer disease

Epigastric

- Peptic ulcer
- Cardiac ischemia
- Gallbladder disease
- Pancreatitis
- Aortic aneurysm
- Mesenteric ischemia
- Small bowel disorder

LUQ

- Colon disorder

- Spleen disorder
- Liver disease
- Constipation

Right and left flanks

- Renal colic
- Pyelonephritis
- Aortic aneurysm

Periumbilical

- Pancreatitis
- Peptic ulcer
- Mesenteric ischemia
- Aortic aneurysm
- Intussusception

RLQ

- Appendicitis
- Mesenteric adenitis
- Diverticulitis
- Renal colic
- Ectopic pregnancy
- Ovarian cyst rupture
- Colitis
- Constipation
- Intussusception

LLQ

- Diverticulitis (most common area)
- Renal colic
- Ectopic pregnancy
- Ovarian cyst rupture
- Colitis
- Intussusception
- Constipation

Suprapubic

- Cystitis
- Prostatitis
- Proctitis
- Perirectal abscess

Groin

- Inguinal hernia
- Femoral hernia
- Inguinal ligament strain
- Femoral pseudoaneurysm post cardiac catheterization

Appendicitis

- See Appendicitis Protocol

Diverticulitis

- Prevalence increases with age
- Usually pain and tenderness in LLQ of abdomen
- Fever may occur
- WBC may not be elevated in 60% of patients
- CT abdominal/pelvis imaging study of choice
- Patients with mild to moderate diverticulitis without systemic signs of infection or peritoneal signs may be discharged home on antibiotics and a clear liquid diet for 2–3 days and advanced as tolerated
 - Flagyl (metronidazole) 500 mg PO qid for 10 days
 - Cipro (ciprofloxacin) 500 mg PO bid or Levaquin (levofloxacin) 500–750 mg PO qday with Flagyl (metronidazole) for 10 days
 - Septra DS PO bid can be used instead of Cipro (ciprofloxacin) or Levofloxacin if needed
 - May use Sanford guide also

Biliary colic and cholecystitis

- See Gallbladder Disease Protocol

Pancreatitis

- Major causes are gallstones lodged in pancreas and ethanol consumption
- Severe pain usually in central abdomen and vomiting very common
- Chronic pancreatitis may develop
- Fever may occur
- Obtain CBC, amylase, lipase, LFT's and U/A
- Ultrasound if cholecystitis suspected
- Treatment options
 - IV fluids 100–1,000 cc/hour for adults as clinically indicated
 - Phenergan (promethazine) 6.25 mg IV or 25–50 mg

IM

OR

- Zofran (ondansetron) 4–8 mg IM or IV
- Stadol (butorphanol) 0.25–1 mg IV or 2 mg IM

OR

- Dilaudid (hydromorphone) 0.25–1 mg IV or 1–2 mg IM
- Small narcotic doses for very elderly

Mesenteric ischemia

- Mortality high – 70–90%, especially with low flow circulatory states such as CHF
- Order CBC, BMP, lactate level, amylase, lipase and CT abdomen/pelvis
- Severe pain with less than expected tenderness on exam (may only have mild tenderness)
- Vomiting and diarrhea frequently present
- Risk factors are CHF, atrial fibrillation, and atherosclerotic disease
- May have metabolic acidosis secondary to bowel infarction
- Intestinal angina may occur after a meal

Small bowel obstruction (SBO)

- Usually from postsurgical adhesions
- Pain is usually severe if obstruction is complete
- Vomiting is very common
- Hyperactive bowels sounds seen early in process
- Abdominal distension common
- Check for hernias
- Order CBC, amylase, lipase and BMP
- Obtain flat and upright plain abdominal films — may be negative in 30%
 - Consider CT abdomen/pelvis if SBO suspected and plain films nondiagnostic

Large bowel obstruction

- 60% from malignancy, 20% from diverticulitis and 5% from cecal volvulus
- Abdominal distension is significant
- Abdomen is hyperresonant on percussion
- Fever, rebound tenderness and rigidity suggest perforation

- Order CBC, BMP, lactate level if acidotic, and flat and upright abdominal films
- Ogilvie syndrome is acute colonic pseudoobstruction
 - Needs to be decompressed to avoid perforation

Hernia

Differential diagnosis

- Epididymitis
- Hydrocele
- Lymphogranuloma Venereum
- Testicular torsion
- Pseudoaneurysm of femoral artery
- Varicocele
- Groin abscess

Considerations

- Reducible hernia can have contents returned to abdominal cavity
- Incarcerated hernia cannot be reduced
 - Not strangulated
 - Bowel obstruction not uncommon
 - Painful
- Strangulated hernia
 - Blood flow compromised with possible necrosis of bowel
 - Significant pain and tenderness
 - If reduced, pain and tenderness persists

Types of hernia

- Umbilical
 - Through umbilical ring
 - Common in childhood
 - Usually resolves by age 2 years
- Inguinal
 - Indirect inguinal hernia
 - Through inguinal ring into the inguinal canal following spermatic cord to scrotum
 - Direct inguinal hernia
 - Through Hasselbach's triangle (above inguinal ligament)
- Femoral
 - Through femoral canal

- Frequently become incarcerated or strangulated
- Ventral or incisional hernia
 - Post surgical complication
 - Usually without pain or incarceration

Gastroenteritis

- See Gastroenteritis Protocols for adults and pediatrics

Flank pain or kidney stone pain (renal colic) see respective protocols

Elderly abdominal pain

- Pain perception and abdominal exam altered in elderly
- Admissions and surgery rates are higher in elderly
- Consider mesenteric and cardiac ischemia in elderly
- Elderly may have normal WBC with serious disease
- Appendicitis missed 50% of the time
- CT abdominal/pelvis commonly used as serious organic disease is more prevalent
- Diverticulitis: WBC is normal 50% of the time
- Consider ruptured aortic aneurysm especially with flank pain thought to be renal colic
- Polypharmacy and medication side effects can be a cause of abdominal complaints

Pediatric abdominal pain

- Peritonitis patient is immobile
- Colic patient is writhing
- Absence of fever does not rule out serious illness
- Discuss with physician prior to ordering CT abdomen/pelvis in children

Pediatric appendicitis

- Frequently missed age < 2 years
- With abdominal pain, fever is most useful sign in appendicitis
- CBC may be normal
- Absolute neutrophil count < 6750 significantly decreases the likelihood of appendicitis
- Less than 50% have classic presentation
- Missed appendicitis is second most common reason for pediatric malpractice suits in the emergency

department

- Perforation occurs in majority of patients < 4 years of age with appendicitis
- Treatment delayed > 36 hours increases rate of perforations up to 65% of appendicitis cases
- C-reactive protein is nonspecific and not helpful if positive in determining cause of inflammation or abdominal pain
- U/A can have pyuria, bacteriuria or hematuria in 20–40% of patients

General Evaluation

History

- Pain onset and duration
- Location and migration
- Appetite
- Exacerbating factors
- Prior surgical, medical and medication history
- Vomiting and fever history
- Bowel and urinary history
- Constitutional history
- Melena or bleeding
- Last normal menstrual cycle
- Menstrual abnormalities

Physical examination

- Observe for distension
- Auscultation for bowel sounds and arterial bruits
- Gently palpate entire abdomen
- Percuss for liver size; and for ascites if present
- Perform rectal exam for masses; tenderness; prostate disease; gross blood; occult blood when indicated
- Palpation of entire abdomen and document any findings of:
 - Tenderness location and severity
 - Rebound tenderness
 - Voluntary and involuntary guarding
 - Pulsatile masses
 - Abdominal masses

Objective testing

Benign findings and complaints in nonelderly healthy patient

- Consider no tests

Moderate complaints and findings, or if diabetic

- CBC and BMP

Urine or renal disease

- U/A
- CBC and BMP if pyelonephritis suspected
- Urine culture as indicated (complicated UTI)

Pancreatitis

- Amylase and lipase
- CBC and BMP

Gallbladder disease

- Gallbladder ultrasound as needed
- CBC and BMP
- Amylase, lipase and LFT's

Hepatic or metastatic malignant disease

- Liver function tests
- CBC and BMP

Fertile female

- UCG

Constipation or obstruction

- KUB or flat/upright films

Consider CT scan in adults for

- Suspected appendicitis or diverticulitis
- Flank pain of unknown etiology
- Rebound tenderness in adults
- Suspected bowel obstruction not seen on plain flat and upright abdominal films
- Elderly with moderate to severe pain

Discuss pediatric CT scans with physician prior to ordering – ultrasound can be used for appendicitis evaluation

Outpatient Treatment Considerations

- OTC medications
- Hydrocodone, synthetic codeine derivatives as needed
- Avoid Demerol (meperidine)
- Phenergan (promethazine) or Zofran (ondansetron) prn nausea or vomiting

Parenteral Treatment Considerations

- IV NS 100–1,000 cc/hour for adults as clinically indicated
- IV NS 1–2 times maintenance in children if stable, otherwise discuss with physician
- Nausea or vomiting (adjust for children)
 - Phenergan (promethazine) 6.25 mg IV (adult or pediatrics) or 25–50 mg IM adult or 0.5 mg/kg IM for children

OR

- Zofran (ondansetron) 4 mg IM or IV (adults and pediatrics)
- Pain control (adjust for children)
 - Stadol (butorphanol) 0.25–1 mg IV or 1–2 mg IM for adults

OR

- Dilaudid (hydromorphone) 0.25–1 mg IV or 1–2 mg IM for adult or 0.015 mg/Kg IV or IM for pediatrics
- Small narcotic and Phenergan (promethazine) doses for the very elderly

Discharge Criteria

- Mild pain and tenderness in nonelderly healthy patient with normal vital signs consider symptomatic treatment if benign disease process suspected
- Biliary colic with normal vital signs and exam that resolves with treatment may not require labs and may be discharged
- Acute and self-limited process suspected such as gastroenteritis in stable nontoxic patient
- Reducible hernia

Discharge instructions

- To primary care provider or surgeon for follow-up in 1 day if pain is moderate to severe, otherwise in 5–7

days

- To primary care provider for abnormal lab within 1 week unless chronic in nature
- Abdominal pain aftercare instructions

Consult Criteria

- Moderate pain in age ≥ 60 years
- Abdominal pain that develops hypotension or relative hypotension (SBP < 105 with history of hypertension)
- Toxic appearance
- Dehydration
- Significant GI blood loss or melena
- Acute surgical abdomen or rebound tenderness
- Moderate to severe pain of uncertain cause
- Severe pain with any diagnosis
- Intractable vomiting
- Return ED visit within 14 days for same acute abdominal pain complaint

Discuss with physician if following suspected or diagnosed

- Appendicitis
- Cholecystitis
- Pancreatitis
- Diverticulitis
- Aortic aneurysm
- Bowel obstruction
- Ectopic pregnancy
- Intra-abdominal abscess
- Mesenteric ischemia
- Incarcerated or strangulated hernia

Lab consult criteria (if checked)

- Hemoglobin decrease > 1 gm or creatinine increase > 0.5 from baseline
- Hemoglobin < 10 gms
- Elevated LFT's
- Elevated amylase or lipase
- WBC $\geq 14,000$
- Bacteremia
- Increased anion gap

- Metabolic acidosis
- Significant electrolyte abnormally
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Acute thrombocytopenia

Vital sign and age consult criteria

- Any abdominal pain age ≥ 70 years
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

CT ABDOMINAL SCAN ISSUES

When using any protocol, always follow the [Guidelines of Proper Use](#).

Cancer Risk from One CT Estimated

- Adults: 1/1500–2000
- Children under 1 year of age: 1/500
- Decreasing risk with increasing age

Oral contrast considerations

- Adds little if anything to interpretation
- Some radiologists uncomfortable without it
- Appendicitis diagnosed without and with contrast
 - Sensitivity 95% vs. 92%
 - Specificity 97% vs. 94%
 - Accuracy 97% vs. 89%
- Message: Non-oral contrast CT is better in diagnosing appendicitis

IV contrast considerations

- Does not improve accuracy of noncontrast studies
- In very thin patients without much body fat IV contrast is needed

There is no connection between seafood and/or shellfish allergy and IV contrast allergy

Treatment of Allergy to IV Contrast

- Benadryl (diphenhydramine) 50 mg in adult or weight based in children
- Decadron (dexamethasone) 10 mg IV in adult or 0.6 mg/kg IV in children (not to exceed 10 mg)
- May not be effective since steroid dosing should be done 12 hours before IV contrast

Prior History of Asthma

- 1/1000 chance of severe reaction to IV contrast
- No reason to withhold contrast study

Creatinine Considerations

- Majority of patients do not need a creatinine measurement
- Needed with history of risk factors
 - Renal insufficiency
 - Elderly
 - Diabetes
 - Multiple myeloma
 - Volume depletion
 - Diuretic therapy
 - NSAID's use
 - ACE inhibitor use
 - CHF
 - Anemia

Prevention of Contrast-induced Nephropathy (CIN)

- There is a lack of good data
- Considerations for 0 or 1 risk factor above
 - Before procedure: 1 liter of D5W mixed with 3 amps of NaHCO₃ at 3 cc/kg for 1 hour
 - During procedure: low volume iso-osmolar contrast
 - After procedure: 1 liter of D5W mixed with 3 amps NaHCO₃ at 1 cc/kg for 6 hours
- Considerations for 2 or more risk factors — do above

Plus

- N-acetylcysteine 150 mg/kg IV 30 minutes before procedure and 600–1200 mg PO bid × 2 doses after procedure

OR

- Vitamin C 3 gms PO 2 hours before procedure and bid PO after procedure for 1 day

Metformin and IV contrast

- No increase in lactic acidosis if creatinine normal

ADULT GASTROENTERITIS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Acute inflammatory or infectious process of the stomach and intestines
- Rheumatoid Colitis
- Appendicitis
- Cholecystitis
- Pancreatitis
- Mesenteric ischemia
- Aortic aneurysm
- Peptic ulcer disease
- GERD
- Biliary colic
- Renal colic
- Bowel obstruction
- Inflammatory bowel disease

Definitions

- Diarrhea > 3 loose bowel movements (BM's) per day
- Dysentery
 - Disorders with intestinal inflammation (usually colon)
 - Abdominal pain
 - Tenesmus
 - Frequent BM's with blood and mucus in stool
- Enteritis — small bowel inflammation
- Gastritis — stomach inflammation
- Gastroenteritis symptoms
 - Acute inflammation of stomach and intestines with abdominal pain
 - Weakness
 - Nausea
 - Diarrhea
 - Anorexia
 - Fever

Considerations

- Diarrhea most common manifestation (virus most common cause)
- Enteritis — often with bloating, periumbilical pain, nausea/vomiting (viral most common cause)
- Colitis — can have localized left sided pain, rectal bleeding
- Antibiotics can cause diarrhea — *C. difficile* (antibiotic-associated or “pseudomembranous” colitis)
- Association between antibiotic use, enterohemorrhagic *Escherichia coli* and hemolytic-uremic syndrome remains unproven

Invasive bacteria — frequently with occult or gross blood

- *Campylobacter*
- *Salmonella*
- *Shigella*
- *Vibrio*
- *Yersinia*

Food-borne disease

- *Staph aureus* most common: 1–6 hours post food ingestion
- *Bacillus cereus*: 1–36 hours post food ingestion
- Cholera: profuse rice water stools
- Ciguatera: Fish; 5 minutes–30 hours
- Traveler’s diarrhea: *E. coli* usually
- Camping: *Giardia*, water ingestion, beavers

Evaluation

- Travel, food and antibiotic history
- Healthy patient without toxicity and with acute onset of symptoms and mild to no tenderness and normal vital signs may not require further testing
- Consider CBC, BMP if vital signs abnormal or with significant tenderness
- Consider stool WBC, RBC, cultures for fever; blood in stool
- Consider rectal exam
- Imaging usually not necessary unless
 - Obstruction suspected

- Abdominal flat and upright films
- Consider CT abdomen/pelvis if bowel obstruction suspected and plain films negative
- Consider CT abdomen/pelvis for elderly with abnormal vital signs and significant tenderness or pain

Treatment Options

Dehydration

Oral Rehydration Therapy (ORT) for mild to moderate dehydration

- Oral rehydration formula (WHO, Rehydralyte or Pedialyte) for mild to moderate dehydration or serum CO₂ 13–18 mEq/L or Na⁺ 146–152 mEq/L — if able to take PO fluids
- Zofran (ondansetron) 8 mg chewable tablet if vomiting or 4–8 mg IM
- 15–30 cc every 1–2 minutes for 1–4 hours for age > 12 — start 20 minutes after Zofran (ondansetron) given
- Hold ORT 10 minutes if vomiting occurs then resume
- Re-assess for urine production, improved heart rate, and absence of severe vomiting
- Recheck serum CO₂ if initially < 17 mEq/L
- Mild dehydration give 20 cc/kg in < 4 hours
- Moderate dehydration give 20–40 cc/kg in 1–4 hours
- Severe dehydration give IV NS 200–500 cc/hour over 2–4 hours or 1000 cc/hour for 1 hour (notify physician)
 - Hypotension or signs of poor organ perfusion (lactic acid > 2) give NS at 500–1,000 cc/hour up to 2 liters or IV 500–1,000 cc bolus (consult physician promptly)

Diarrhea

- Nontoxic, non-dehydrated healthy patients with mild abdominal tenderness, benign vital signs and diarrhea may be discharged without further testing
- Pepto-Bismol — good for traveler's diarrhea
- Quinolone 1, 3 or 5 day course, especially with traveler's diarrhea
- If *C. difficile* colitis suspected from recent antibiotic

use:

- Mild to moderate symptoms
 - Flagyl (metronidazole) 500 mg PO tid × 10 days
 - Floristor PO bid × 10 days (OTC)
- Severe symptoms consult physician
- Stop offending antibiotic
- See primary care provider within 1–2 days for follow-up

Antimotility agents

- Loperamide (most preferred due to safety profile)
- Diphenoxylate (heme negative stools only)

Vomiting

- Phenergan (promethazine) PO/PR/IM (if IV give no more than 6.25 mg/dose as single dose)
- Zofran (ondansetron) 4–8 mg PO/IM/IV

Abdominal pain treatment outpatient considerations

- OTC medications
- Hydrocodone, synthetic codeine derivatives prn
- Avoid Demerol (meperidine)

Abdominal pain parenteral treatment considerations

- Stadol (butorphanol), Nubain (nalbuphine) or Dilaudid (hydromorphone): IV or IM — avoid Demerol (meperidine)
- Give Phenergan (promethazine) 6.25 mg (if IV) or Zofran (ondansetron) as needed for nausea
- Adjust doses for weight in pediatrics

Discharge Criteria

- Healthy nontoxic patient with stable vital signs

Discharge instructions

- Gastroenteritis aftercare instructions
- Resume regular diet as soon as possible
- To primary care provider for follow-up in 1–2 days if symptoms are moderate to severe if discharged,

otherwise within 5–7 days if symptoms persist

- To primary care provider for abnormal lab within 1 week unless chronic in nature
- Return within 3 days if symptoms not improving

Consult Criteria

- Toxic appearance
- Dehydration > 5%
- Significant blood loss or melena
- Suspected or diagnosed appendicitis, cholecystitis, pancreatitis, diverticulitis, aortic aneurysm, bowel obstruction
- Acute surgical abdomen
- Moderate pain of uncertain cause
- Severe pain
- Narcotic IM/IV dosing that is given acutely
- Intractable vomiting
- Return ED visit within 14 days for same acute abdominal pain complaint

Lab consult criteria (if checked)

- Metabolic acidosis (increased anion gap)
- Hemoglobin decrease > 1 gm or creatinine increase > 0.5 from baseline
- Elevated LFT's
- Elevated amylase or lipase
- WBC \geq 15,000
- Bandemia
- Significant electrolyte abnormality
- Glucose \geq 400 mg/dL in diabetic patient
- Glucose \geq 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Acute thrombocytopenia

Vital sign and age consult criteria

- Age \geq 70
- Adult heart rate > 100 post-treatment
- Hypotension or relative hypotension (SBP < 105 with history of hypertension)
- Orthostatic vital signs

IRRITABLE BOWEL SYNDROME PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- A functional disorder without specific pathology of abdominal pain and altered bowel habits

Differential Diagnosis

- Anxiety disorder
- Biliary colic
- Inflammatory bowel disease
- Ischemic colitis
- Antibiotic-associated colitis
- Endometriosis
- Gastroenteritis
- Food allergies
- Malabsorption
- Porphyria
- Colon carcinoma
- Thyroid disease

Considerations

- Is a disorder of exclusion of other disease processes
- Hypersensitivity to pain and symptoms
- Association with psychopathology common
- Is a chronic relapsing disorder
- Females 2–3 times more likely to have the disorder than males

Common Symptoms and Findings

- Abdominal pain
- Diarrhea
- Constipation
- Mucus in stool
- Abdominal distension

- Stress related commonly
- Fibromyalgia is frequently present

Symptoms not consistent with IBS

- Middle age or later onset
- New symptom presentations
- Fever
- Weight loss
- Nocturnal symptoms
- Progressive symptoms
- Rectal bleeding
- Painless diarrhea

Evaluation

- History and physical examination
 - Rectal examination for occult blood as indicated

Lab test options

- CBC
- BMP
- Thyroid panel as indicated
- Plain flat and upright x-rays as indicated
- Amylase and lipase as indicated
- CT abdominal and pelvis scan as indicated (usually not needed)

Treatment Options

- Add fiber to diet
- Reassurance regarding symptoms and diagnosis
- Stress management suggestions
- Consider psychiatric referral

Antispasmodic agents

- Bentyl (dicyclomine) 10–40 mg PO qid ac (before meals) or with pain onset
- Levsin (hyoscyamine) 0.125– 0.25 mg q4hr and or prn (NMT 1.5 pills/day) for adults
- Levsin (hyoscyamine) 1/2–1 pill qid PO q4hr or prn (NMT 6 tabs/day) for age 2–12 years

Antidiarrheal agents

Lomotil (diphenoxylate/atropine)

- Age > 12 years: 1–2 tabs PO qid ac prn
- Age 8–12 years: 2 mg PO 5 times qday prn
- Age 5–7 years: 2 mg PO qid prn
- Age 2–4 years: 2 mg PO tid prn

Imodium (loperamide)

- Adult: 4 mg PO after 1st loose stool, then 2 mg PO after each following loose stool prn (NMT 16 mg/day)
- Pediatric: 0.1 mg/kg PO after each loose stool not to exceed adult total daily dose

Other agents

- SSRI's
- Elavil 10–100 mg PO qday prn (start low dose)

Discharge Criteria

- No other concerning disease process diagnosed

Discharge instructions

- Irritable bowel syndrome aftercare instructions
- Follow up with PCP within 10 days or as needed

Consult Criteria

- WBC \geq 14,000
- Severe pain
- Age \geq 60 years
- Heart rate > 100
- Dehydration
- Patient appears toxic
- Fever
- Weight loss
- Progressive symptoms
- Rectal bleeding
- See [General Patient Criteria Protocol](#) for items not covered in this protocol

APPENDICITIS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Inflammation of the appendix secondary to luminal obstruction

Differential Diagnosis

- Pelvic inflammatory disease
- Ruptured ovarian cyst
- Endometriosis
- Mesenteric adenitis
- Inflammatory bowel disease
- Colon carcinoma
- Mesenteric ischemia
- Ureteral colic
- Pyelonephritis
- Biliary colic
- Abdominal abscess
- Diverticulitis
- Ectopic pregnancy
- Ovarian torsion
- Constipation

Considerations

- Appendicitis missed 50% of the time in elderly

Presentations

- Migration of pain from periumbilical area to RLQ has sensitivity and specificity of 80%
- Nausea present in 61–92% of patients
- Anorexia present in 74–78% of patients
- Diarrhea or constipation noted in around 18% of patients
- Duration of symptoms less than 48 hours in 80% of adults, but may be longer in elderly and with perforation
- History of previous similar pain noted in 23% of

patients and should not be used to rule out appendicitis

- Common to have low-grade fever or no fever
- High fever develops with abscess formation secondary to appendiceal rupture
- Fecaliths and lymphoid hyperplasia most common causes secondary to luminal obstruction

Physical findings

- 96% of patients with RLQ tenderness — most specific sign
- The most specific exam findings are guarding, percussion tenderness, rebound tenderness and rigidity
- Rosving, Obturator, Psoas signs present in minority of patients and their absence should not be used to rule out appendicitis

Lab findings

- Normal C-reactive protein after abdominal pain for 24 hours has a high negative predictive value ruling out appendicitis
- U/A showing WBC's and urinary complaints not uncommon in appendicitis

Pregnancy and appendicitis

- First trimester pain in RLQ
- Second trimester pain at level of umbilicus
- Third trimester pain in RUQ
- Anorexia in one-third to two-thirds of patients
- Nausea usually present

Pediatric appendicitis

- Frequently missed age < 2 years
- With abdominal pain, fever is most useful sign in appendicitis
- CBC may be normal
- Absolute neutrophil count < 6750 significantly decreases the likelihood of appendicitis
- Less than 50% have classic presentation
- Missed appendicitis is second most common reason for pediatric malpractice suits in the emergency department
- Perforation occurs in majority of patients < 4 years of

age with appendicitis

- Treatment delayed > 36 hours increases rate of perforations up to 65% of appendicitis cases
- C-reactive protein is nonspecific and not helpful if positive in determining cause of inflammation or abdominal pain
- Appendicitis: U/A can have pyuria, bacteriuria or hematuria in 20–40%

Evaluation

- History and physical examination
 - Specific attention to onset and progression of symptoms

Testing

- CBC
- BMP
- U/A
- UCG in fertile females (includes those with bilateral tubal ligations)
- LFT's as indicated
- Amylase and lipase as indicated
- Plain flat and upright if obstruction suspected
- CT abdominal and pelvic scan in adults as needed
- CT abdominal and pelvic scans in pediatrics needs serious consideration of the risk potential for later cancer development — discuss with physician before ordering
 - Ultrasound has usefulness in pediatric appendicitis

Discharge Criteria

- None

Consult Criteria

- All appendicitis or suspected appendicitis patients

ANTIBIOTIC-ASSOCIATED COLITIS

PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Inflammation of the bowel secondary to *Clostridium difficile* and recent antibiotic use or hospitalization

Differential Diagnosis

- Crohn's disease
- Ulcerative colitis
- Irritable bowel syndrome
- Gastroenteritis
- Toxic megacolon
- Diverticulitis

Considerations

- 20% of hospitalized patients acquire the infection
 - Diarrhea develop in 30% of these
- Colitis is caused by a toxin produced by *C. difficile*
- Should be considered with antibiotic use past 2 months or hospitalization in past 3 days
- Asymptomatic colonization occurs in 1–3% of the healthy population
- A brief exposure to an antibiotic can cause *C. difficile* colitis
 - Symptoms usually start 3–9 days after antibiotic initiation
- Age ≥ 60 years is a risk factor
- Relapse after treatment is common
- Elevated WBC is found in 50–60% of patients

Symptoms and Findings

- Mild to moderate watery diarrhea
 - Usually not bloody
- Crampy abdominal pain
- Loss of appetite

- Fever usually in severe cases
- Lower abdominal tenderness
 - Rebound tenderness suggests bowel perforation

Evaluation

- History and physical examination
- Lab test options
 - CBC
 - BMP
 - U/A
 - Stool cultures for *C. difficile* and other pathogens
 - Enzyme immunoassay for *C. difficile* A and B toxins
 - Available in 2.5 hours
 - Sensitivity 75–80%
- Imaging options
 - Plain upright and flat x-rays if toxic megacolon suspected
 - CT abdominal and pelvis scan may be needed

Treatment Options

- Stop antibiotics (consult physician if antibiotic treatment crucial in treating previous condition)
 - May be all that is needed in mild cases without fever, abdominal pain and elevated WBC
- Mild to moderate diarrhea or colitis
 - Flagyl (metronidazole) 500 mg PO tid for 10–14 days
 - Floristor PO bid for 10–14 days (over the counter)
- More severe cases
 - Vancomycin 125 mg PO qid for 10 days
 - Floristor PO bid for 10–14 days (over the counter)
- Antidiarrheal agents should be avoided
- Analgesics
- Symptoms improve usually in 3 days on above antibiotics

Discharge Criteria

- Mild to moderate *C. difficile* or antibiotic-associated colitis
- See [General Patient Criteria Protocol](#)

Discharge instructions

- Antibiotic-associated colitis aftercare instructions
- Stop current antibiotics
- Follow up with primary care provider within 3–5 days
- Return if symptoms worsen or do not improve
- Wash hands frequently with soap and water

Consult Criteria

- Fever
- WBC \geq 15,000
- Severe pain
- Rebound tenderness
- CT scan shows colitis
- Dehydration
- See [General Patient Criteria Protocol](#)

INFLAMMATORY BOWEL DISEASE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Inflammatory disorder of unknown cause from ulcerative colitis or Crohn's disease

Differential Diagnosis

- Appendicitis
- Diverticulitis
- Endometriosis
- Pelvic inflammatory disease
- Colon carcinoma
- Antibiotic-associated colitis
- Irritable bowel syndrome
- Ischemic colitis

Considerations

- Ulcerative colitis is limited to the large intestine
- Crohn's disease can be anywhere in the gastrointestinal tract
- Kidney stone incidence is increased in Crohn's disease

Ulcerative colitis presentations and findings

- Bloody diarrhea
- Abdominal pain and cramping
- Fever in more severe cases
- Rectal tenesmus or urgency
- Nausea and vomiting
- Dehydration
- Anemia
- Total colectomy is curative

Crohn's disease

- Insidious onset
- Usually nonbloody diarrhea

- Half of cases have perianal fistulas or abscesses
- Weight loss
- Skip regions of intestinal involvement
- Fever
- Arthritis
- Uveitis
- Hepatitis
- Anemia

Evaluation

- History and physical examination
- Lab test options
 - CBC
 - BMP
 - LFT's
 - Amylase and lipase
 - U/A
- Imaging options
 - Plain upright and flat x-rays if toxic megacolon suspected
 - CT abdominal and pelvis scan

Treatment

Crohn's disease

Mild disease

- Antidiarrheal medications qid for diarrhea without active colitis
 - Imodium (loperamide) 2 mg PO qid prn
 - Lomotil (diphenoxylate/atropine) 5 mg PO qid prn

Moderate disease

- Prednisone 30–60 mg PO qday 7–10 days
- Sulfasalazine 0.5–1.5 gms PO 2–4 times a day for mild to moderate disease
- Flagyl (metronidazole) 250–500 mg PO qid for fistula complications for 1 month

Ulcerative colitis

Mild disease

- Antidiarrheal medications qid for diarrhea without active colitis

- Imodium (loperamide) 2 mg PO qid prn
- Lomotil (diphenoxylate/atropine) 5 mg PO qid prn

Moderate disease

- Prednisone 30–60 mg PO for 7–14 days followed by taper of 5 mg/week (should see PCP within 1–3 days after discharge)

Discharge Criteria

- Mild to moderate disease
- Prior history of Crohn's disease or ulcerative colitis
- Heart rate ≤ 100 for age ≥ 14 years

Discharge instructions

- Crohn's disease or ulcerative colitis aftercare instructions
- Follow up with PCP within 1–3 days
- Refer perianal disease to surgeon within 7–10 days

Consult Criteria

- Severe pain
- Fever
- Heart rate > 110 /minute for age ≥ 14 years
- WBC $\geq 13,000$
- Dehydration
- Hypotension
- Appears toxic
- Toxic megacolon
- Unable to self hydrate
- Vomiting
- Progressive anemia
- Hemoglobin < 10 gms
- See [General Patient Criteria Protocol](#) for items not in this protocol

GASTROESOPHAGEAL REFLUX

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- When the amount of gastric juice that refluxes into the esophagus exceeds the normal limit, causing symptoms with or without associated esophageal mucosal injury

Differential Diagnosis

- Acute coronary syndrome
- Biliary colic
- Peptic ulcer disease
- Esophagitis
- Esophageal spasm
- Achalasia
- Irritable bowel syndrome
- Asthma from aspiration

Considerations

- 40% of the population experience GERD monthly
- Most patients with hiatal hernias do not experience clinically significant reflux
- Acid secretion is the same with or without GERD

Causes and effects

- Obesity
- Smoking
- Decrease in lower esophageal sphincter (LES) tone or function (most common cause)
- Erosive gastritis
- Esophageal stricture
- UGI bleeding
- Recurrent pneumonia
- Asthma

Medications that can cause:

- Calcium channel blockers
- Nitrates

- Beta-blockers
- Theophylline

Foods and beverages that can cause:

- Coffee
- Chocolate
- Tea
- Alcohol
- Tomato products
- Citrus products

Signs and Symptoms

- Heartburn (burning from epigastric up through chest to neck at times)
- Dysphagia
- Odynophagia
- Regurgitation
- Belching
- Worse bending over or lying down
- Usually transiently relieved with antacids

Evaluation

- Consider high risk differential diagnoses and test as indicated

Treatment Options

- Antacids
- Analgesics (excluding NSAID's or aspirin)
- Avoid late night or heavy meals
- Stop smoking and alcohol intake
- Avoid drugs and foods/beverages that decrease LES
- Reglan (metoclopramide) — caution with long term usage — tardive dyskinesia)
- H2 blockers prn
- Proton pump inhibitors prn
- Elevate head of bed 6–8 inches
- Fundoplication (refer to surgery as outpatient)

Discharge Criteria

- Uncomplicated GERD
- Refer to primary care provider or gastroenterologist

within 1–3 weeks

Discharge instructions

- GERD aftercare instructions

Consult Criteria

- UGI bleeding
- Esophageal obstruction
- Dehydration
- Toxic appearing patients
- Uncertain diagnosis as cause of patient complaints
- Refer to [General Patient Criteria Protocol](#) as needed

PEPTIC ULCER DISEASE AND GASTRITIS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Inflammatory changes in the gastric mucosa or discrete mucosal defect in the stomach or duodenum

Differential Diagnosis

- GERD
- Gastroenteritis
- Acute coronary syndrome
- Biliary colic
- Peptic ulcer disease
- Esophagitis
- Esophageal spasm
- Irritable bowel syndrome
- Abdominal aortic aneurysm
- Mesenteric ischemia
- Hepatitis
- Inflammatory bowel disease
- Pancreatitis
- Pulmonary embolism

Considerations

- Consider high risk differential diagnoses and test as indicated

Causes

- H. pylori responsible for 90–95% of duodenal ulcers and 80% of gastric ulcers
- NSAID's interfere with prostaglandin synthesis and lead to breakdown in mucosa
- Smoking
- Alcohol intake
- Aspirin
- Steroids

Signs and Symptoms

- Epigastric pain and burning 80–90%
- Epigastric tenderness
- Gastric ulcer pain worsened by food
- Duodenal ulcer pain improved by food
- Nausea
- Vomiting
- UGI bleeding
- Hematemesis
- Melena
- Peritonitis with perforation
- Anemia

Evaluation Options

- Mild symptoms and findings with normal vital signs treat symptomatically
- Moderate or severe symptoms or tenderness
 - CBC
 - BMP
 - Amylase
 - Lipase
 - Consider LFT's
- Peritonitis findings
 - Upright chest x-ray and abdominal films to evaluate for free air
 - CT abdominal and pelvis if diagnosis is uncertain or age ≥ 65 years
- EKG
 - Age ≥ 60 years with unimpressive abdominal exam and no cardiac risk factors
 - Age < 60 years with cardiac risk factors for coronary artery disease with unimpressive abdominal exam
 - Consider CT abdominal/pelvis scan with age ≥ 70 if diagnosis not reasonably certain

Treatment Options

- Unstable patient notify physician immediately
- Stable nonacute patient
 - Antacids prn
 - H2 blockers
 - Proton pump inhibitors \times 1–2 months

Antibiotics with PPI only if H. pylori documented with testing

- Biaxin (clarithromycin) 500 mg PO × 14 days
 - Flagyl (metronidazole) 500 mg PO × 14 days
- OR
- Biaxin (clarithromycin) 500 mg PO bid × 14 days
 - Amoxicillin 1,000 mg bid × 14 days

Discharge Criteria

- Uncomplicated exam and findings consistent with gastritis or peptic ulcer disease

Discharge instructions

- Peptic ulcer or gastritis aftercare instructions
- To primary care provider for follow-up in 1 day if pain is moderate to severe, otherwise in 5–7 days
- To primary care provider for abnormal lab within 1 week unless chronic in nature
- Return within 3 days if not improving

Consult Criteria

- GI bleeding
- Moderate pain age ≥ 65 years
- Abdominal pain that develops hypotension or relative hypotension (SBP < 105 with history of hypertension)
- Toxic appearance
- Dehydration
- Significant blood loss or melena
- Suspected or diagnosed appendicitis, cholecystitis, pancreatitis, diverticulitis, aortic aneurysm, bowel obstruction
- Acute surgical abdomen or rebound tenderness
- Moderate to severe pain of uncertain cause
- Severe pain with any diagnosis
- Intractable vomiting
- Return ED visit within 14 days for same acute abdominal pain complaint

Lab consult criteria (if checked)

- Hemoglobin decrease > 1 gm or creatinine increase > 0.5 from baseline

- Elevated LFT's
- Elevated amylase or lipase
- WBC $\geq 14,000$
- Bandemia
- Increased anion gap
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Acute thrombocytopenia

Vital sign and age consult criteria

- Age ≥ 70 years
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

GALLBLADDER DISEASE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Disease of gallbladder from gallstone obstruction of cystic duct or infection and inflammation of the gallbladder without gallstones

Differential Diagnosis

- Peptic ulcer disease
- Acute myocardial infarction
- Angina
- Right-sided pulmonary embolism
- Right pneumonia
- Right renal colic
- Hepatitis
- Mesenteric ischemia
- Cholangitis
- Pyelonephritis
- Gastroenteritis
- Aortic aneurysm
- Pancreatitis

Considerations

- Common in females age ≥ 40 years
- Moderate to severe pain and tenderness RUQ of abdomen
- Nausea and vomiting very common
- Charcot's triad: (1) Jaundice, (2) Fever, (3) RUQ abdominal pain
- Fever occurs with advanced disease
- Increased morbidity and mortality in diabetes
- Ascending cholangitis is a life threatening infection of common bile duct
- May increase LFT's, amylase, lipase and bilirubin with common duct gallstones
- Acalculous cholecystitis has a higher mortality than cholecystitis with gallstones

- Seen more in elderly and diabetic patients

Evaluation

- History for
 - Onset
 - Severity
 - Duration
 - Associated symptoms
 - Previous episodes
- Abdominal exam for
 - Tenderness
 - Guarding
 - Rebound tenderness
 - Distension

Testing options

- CBC
- U/A
- UCG if fertile female
- LFT's
- Amylase
- Lipase
- Gallbladder ultrasound may be needed with elevated WBC and if amylase or lipase elevated
- If pain, tenderness and vomiting resolve with treatment, testing may not be needed

Treatment Options

- IV NS 1 liter bolus if hypotensive (notify physician promptly)
- Pain and vomiting treatment
- Dilaudid (hydromorphone) prn
- Stadol (butorphanol) prn
- Nubain (nalbuphine) prn
- Phenergan (promethazine) or Zofran (ondansetron) prn

Discharge Criteria

- Resolution of pain, tenderness, vomiting
- Gallbladder ultrasound without findings of cholecystitis or choledocholithiasis (if performed)
- No fever or chills

- Diagnosis reasonable certain for biliary colic

Discharge instructions

- Gallbladder disease aftercare instructions
- Return within 1 day if pain persists or worsens
- Refer to general surgeon or primary care provider within 7 days

Consult Criteria

- WBC $\geq 13,000$
- Bandemia $\geq 15\%$
- Rebound tenderness
- Intractable nausea or vomiting
- Pain not resolved with treatment
- Cholecystitis
- Choledocholithiasis
- Cholangitis

Lab consult criteria

- Hemoglobin decrease > 1 gm or creatinine increase > 0.5 from baseline
- Elevated LFT's
- Elevated amylase or lipase
- Increased anion gap
- Acute thrombocytopenia
- Significant electrolyte abnormally
- Glucose ≥ 300 mg/dL in diabetic patient
- Glucose ≥ 200 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)

Vital sign and age consult criteria

- Age ≥ 60
- Adult HR ≥ 110 post treatment
- Hypotension or orthostatic vital signs

HEPATITIS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Inflammation of the liver

Differential Diagnosis

- Biliary colic
- Cholecystitis
- Cholangitis
- Peptic ulcer disease
- Gastritis
- Gastroenteritis
- Aortic aneurysm
- Pancreatitis

Considerations

- Frequently asymptomatic
- Ranges from asymptomatic to fulminate hepatitis and liver failure
- Misdiagnosed frequently as nonspecific viral syndrome
- Viral causes are most frequent: hepatitis A – 40%, hepatitis B – 30%, hepatitis C – 20%
 - Hepatitis A: fecal-oral transmission most common cause
 - Hepatitis B: exposure to infected blood or body fluids most common cause
 - Hepatitis C: percutaneous exposures most common cause
- Autoimmune disorders can cause hepatitis
- Toxic causes
- Acetaminophen is frequent worldwide cause (can cause liver failure)
- Ethanol (causes 50% of end-stage liver disease in U.S.)
- Isoniazid
- Ecstasy (MDMA)
- Industrial solvents and cleaning solutions
- Iron

Viral hepatitis

Risk factors

- Male homosexuality
- Hemodialysis
- IV drug abuse
- Raw seafood
- Blood product transfusion
- Tattoos or body piercing
- Foreign travel
- Sexual exposure to hepatitis B carrier

Preicteric phase

- Flu-like illness with fever, chills and malaise
- Nausea, vomiting, anorexia

Icteric phase

- Dark urine
- Light stools
- Pruritus
- Right upper quadrant tenderness
- Tender hepatomegaly

Nonalcoholic fatty liver most common cause of elevated LFT's in U.S. (ALT > AST frequently)

- Associated with obesity; Type-II DM; hyperlipidemia
- Most patients asymptomatic
- Bilirubin rarely elevated
- Can lead to hepatic cirrhosis
- Treatment is weight loss
- Usually a benign course

Evaluation

- Complete history and physical exam
- Alcohol and drug history
- Special attention to acetaminophen or acetaminophen containing medicines
- Check acetaminophen level if ALT elevated with possible history of acetaminophen containing medication usage
- CBC
- BMP
- LFT's (SGOT/AST is commonly 2 times > SGPT/ALT in

alcoholic hepatitis)

- PT/PTT/INR
- Ammonia level if encephalopathic
- Rectal exam if encephalopathic for stool blood or BUN elevated out of proportion to creatinine level
- U/A
- Consider viral serology
- Monospot if pharyngitis present
- Acetaminophen level if suspected usage

Treatment Options

- IV D50W 1 amp if hypoglycemic
- Hypotension give 250–500 cc NS bolus and notify physician
- Treat ongoing hypoglycemia with D5 1/2NS drip of 100–150 cc/hour
- Usually supportive
- Acetadote for acetaminophen toxicity as indicated
 - May need treatment if ALT elevated with history of recent acetaminophen containing medication usage, even if acetaminophen level is 0
- Cessation of ethanol use
- No acetaminophen

Discharge Criteria

- Stable patient
- PT < 3 seconds elevation
- INR < 1.5
- See [General Patient Criteria Protocol](#)

Discharge instructions

- Hepatitis aftercare instructions
- Primary care provider within 1–2 days
- Gastroenterology within 1–2 days unless chronic liver disease without acute exacerbation

Consult Criteria

- Toxic acetaminophen level on nomogram or elevated ALT regardless of level if acetaminophen containing medication usage is suspected
- Hypoglycemia
- Altered mental status

- PT prolonged > 3 seconds
- INR > 1.5
- Bilirubin > 5
- Intractable vomiting
- Significant comorbid conditions
- Significant electrolyte or fluid disturbances
- Age \geq 70
- Ascites
- GI bleeding
- Immunosuppression
- Fever
- LFT's > 5 times normal

GASTROINTESTINAL BLEEDING PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Differential Diagnosis

- Peptic ulcer disease
- Esophagitis
- Mallory-Weiss tear
- Esophageal varices
- Diverticular disease
- Colon cancer
- Colon polyps
- Arteriovenous malformation
- Aortoenteric fistula
- Hemorrhoids

Considerations

- Upper gastrointestinal (UGI) bleeding can cause melena
- UGI bleeding
 - Rapid transit can cause gross blood per rectum
 - Elevates BUN out of proportion to creatinine
 - Can lead to hepatic encephalopathy in hepatic cirrhosis patients
- Lower gastrointestinal (LGI) bleeding
 - Bright or dark red gross blood
 - Frequently painless
 - Frequently a diverticular source in elderly
- Hemorrhoidal bleeding usually bright red and not mixed with stools
- Can present with dyspnea, chest pain; syncope, altered mental status

Evaluation

- Complete history and physical exam (including rectal exam for hemoccult testing or gross bleeding)
- Medication history
- Prior GI history

- CBC
- BMP
- PT/INR
- PTT if on heparin
- Ammonia and LFT's if mental status altered
- Type and screen for history of significant bleeding
- Type and cross if
 - Hypotensive
 - Adult heart rate ≥ 120
 - Orthostatic vital signs
- Hemorrhoidal bleeding with benign bleeding history and normal vital signs may not need lab tests

Treatment Options

- IV NS 500–1000 cc bolus if hypotensive adult (notify physician promptly)
- Pediatric: 20 cc/kg IV NS bolus, may repeat $\times 2$ prn if hypotensive (notify physician promptly)
- Proton pump inhibitors (PPI) for upper GI bleeding or peptic ulcer disease/gastritis/esophagitis
- Transfusion with PRBC's/FFP/platelets 2:1:1 ratio if hypotension persists or significant acute anemia (consult physician promptly first)
- Avoid > 2 liters of isotonic fluids for acute blood loss before transfusion of blood products started if possible
- Consider N-G tube for UGI bleeding (consult physician)

Hemorrhoids

External hemorrhoids

Medical treatment for mild to moderate painful thrombosed hemorrhoids

- Warm soaks (sitz baths) or hot towel applied in lateral decubitus position
- Stool softeners
- Anusol, Anusol HC or Protofoam HC topical preparations
- Tuck's pads prn (witch hazel)
- Analgesics
- Avoid exacerbating activities

Excisional treatment for severe painful acute thrombosed hemorrhoids (usually within 72 hours of

symptoms)

- Prep area with betadine
- Spread buttocks with assistant's help or use tape
- Infiltrate base of hemorrhoid with 2–5 cc of 1% lidocaine with epinephrine (use plain lidocaine in coronary artery disease patients)
- Infiltrate into the hemorrhoid with 1–2 cc of lidocaine with epinephrine (use plain lidocaine in coronary artery disease patients)
- Elliptical incision (preferred) in roof/top of hemorrhoid 2–3 mm wide radially in line from anus
 - Avoid deeper anal verge and sphincter
- Remove clots(s) by expressing or with forceps
- May be packed with 0.25 gauze (removed in 6 hours) or have gelfoam applied as needed
- Analgesics

Internal hemorrhoids

Medical treatment similar to external hemorrhoid treatment

Discharge Criteria

- Healthy patient
- Normal vital signs
- Stable CBC if checked
- Normal coagulation studies if checked
- Good follow up
- Negative or insignificant blood on rectal exam

Discharge instructions

- GI bleeding or hemorrhoid aftercare instructions
- Refer to primary care provider or GI physician within 5–7 days

Consult Criteria

- Significant blood loss or melena present
- Hematemesis
- Suspected or diagnosed aortic aneurysm
- Acute surgical abdomen
- Moderate to severe pain of uncertain cause
- Severe pain with any diagnosis

- Return ED visit within 14 days for same complaint

Vital signs and age consult criteria

- Age ≥ 70
- SBP < 90 or relative hypotension (SBP < 110 with history of hypertension)
- Adult heart rate > 100
- Orthostatic vital signs
- Pediatric heart
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Lab consult criteria

- Hemoglobin < 12 gms unless chronic
- Hemoglobin decrease > 1 gm
- Bandemia $\geq 15\%$
- Metabolic acidosis
- Significant electrolyte abnormally
- Glucose ≥ 400 mg/dL in diabetic patient or > 200 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Acute thrombocytopenia (common in alcoholics)
- Elevated coagulation studies
- Creatinine increase > 0.5 from baseline
- Elevated LFT's

GASTROINTESTINAL FOREIGN BODY PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Ingestion of a foreign body that may or may not be impacted

Considerations

- Most pass without assistance or danger once past the pylorus
- Sharp objects > 5 cm or multiple in number may need endoscopic removal

Esophageal foreign body

Symptoms

- Foreign body sensation
- Dysphagia

Areas of narrowing

- Cricopharyngeus muscle (most common)
 - C6
- Aortic arch and tracheal carina
 - T4
 - T6
- Lower esophageal sphincter (GE junction)
 - T11

Evaluation options

Chest x-ray findings

- Coins
 - Tracheal foreign body
 - Oriented anterior–posterior
 - Esophageal foreign body
 - Oriented transversely
- Bones may be seen on chest x-ray

Gastrograffin or barium swallow

- For nonopaque foreign bodies

CT scan

- For nonopaque foreign bodies
- Superior to gastrograffin or barium swallow

Button battery

- Must be removed immediately if lodged in esophagus
 - If passed esophagus does not need immediate removal
 - If passed pylorus in 48 hours does not need removal
- Rapid burns occur within 6 hours if impacted
- Lithium batteries have worse outcomes
- Consult physician immediately for retained esophageal button battery
 - **Intranasal button batteries need immediate removal**

Esophageal food impaction

- Esophageal disease present usually
 - Esophageal stricture from GERD common
- Complete obstruction patient cannot hold saliva down

Treatment options

- Endoscopic removal
- Glucagon (not too successful)
 - Adult 1–2 mg IV may repeat in 10–20 minutes if needed
 - Pediatric 0.02–0.03 mg/kg IV (NMT 0.5 mg)
- Foley catheter removal
 - Performed by physician if available
 - Do not use
 - If esophageal disease present
 - Foreign body present more than 72 hours

Discharge Criteria

- Resolved foreign body impaction
- Benign foreign body that will likely pass
- Button battery
 - If passed esophagus
 - If passed pylorus in 48 hours

Discharge instructions

- Esophageal or gastrointestinal foreign body aftercare instructions
- Refer to GI or PCP within 48 hours to assess foreign body evacuation

Consult Criteria

- Retained esophageal foreign bodies
- Sharp foreign bodies
- Button battery in esophagus
- Unresolved esophageal food impaction
- Continued symptoms of foreign body
- Continued dysphagia
- Foreign bodies unlikely to spontaneously pass

ANORECTAL DISORDER PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Conditions

- Hemorrhoids
- Anal Fissure
- Perianal/perirectal abscess
- Rectal prolapse
- Pruritus ani
- Pilonidal cyst/abscess

Hemorrhoids

Definition

- Pathologic swelling of veins in the rectum

Differential diagnosis

- Rectal prolapse
- Proctitis
- Crohn's disease and ulcerative colitis
- Condyloma acuminata
- Pregnancy related vein engorgement

Considerations

- Symptoms range from none to severe pain
- External hemorrhoids develop distal to the dentate line
 - Are bluish-purplish in color
- Internal hemorrhoids are above the dentate line
 - No sensory innervation and usually painless
 - Usually cannot be felt when not prolapsed
- Bright blood that drips into toilet or as streaks on stool is commonly from internal hemorrhoids
- Commonly thought to be from constipation or straining, but this is controversial
- Blood is not mixed inside stool

Internal hemorrhoid grading

- 1st degree = projects into canal
- 2nd degree = protrudes with defecation then retracts
- 3rd degree = protrudes with straining but only retracts by manual manipulation
- 4th degree = prolapsed and cannot be reduced

Evaluation options

- Usually history and physical examination with rectal exam is all that is needed
- CBC for tachycardia or history of moderate to severe bleeding
- PT/INR if on Coumadin (warfarin)

Treatment options

External hemorrhoids

Medical treatment for mild to moderately painful thrombosed hemorrhoids

- Warm soaks (sitz baths) or hot towel applied in lateral decubitus position
- Stool softeners
- Anusol, Anusol HC or Proctofoam HC topical preparations
- Tuck's pads prn (witch hazel)
- Analgesics
- Avoid exacerbating activities

Excisional treatment for severe painful acute thrombosed hemorrhoids (usually within 72 hours of symptoms)

- Prep area with betadine
- Spread buttocks with assistant's help or use tape
- Infiltrate base of hemorrhoid with 2–5 cc of 1% lidocaine with epinephrine
- Infiltrate into the hemorrhoid with 1–2 cc of lidocaine with epinephrine
- Elliptical incision (preferred) in roof/top of hemorrhoid 2–3 mm wide radially in line from anus
 - Avoid the deeper anal verge and sphincter
- Remove clots(s) by expressing or with forceps
- May be packed with 0.25 inch gauze (removed in 6 hours) or have gelfoam applied as needed

- Analgesics

Internal hemorrhoids

Medical treatment similar to external hemorrhoid treatment

Surgical referral and treatment

- Failure of conservative treatment
- Excessive and/or prolonged bleeding
- Gangrenous 4th degree hemorrhoid (emergency)
- Concurrent anal fistula or fissure
- 3rd and 4th degree internal hemorrhoids with severe symptoms
- Patient requests referral

Discharge criteria

- Uncomplicated internal and external hemorrhoids

Discharge instructions

- Warm soaks (sitz baths) or hot towel applied in lateral decubitus position
- Stool softeners and bulk laxatives (psyllium fiber)
- Anusol, Anusol HC or Proctofoam HC topical preparations
- Hemorrhoid aftercare instructions

Consult criteria

- See surgical referral above

Anal fissure

Definition

- Superficial linear tear of the anus

Differential diagnosis

- Crohn's disease
- Ulcerative colitis
- Carcinoma
- Syphilis, gonorrhea and other STD
- HIV and AIDS
- Herpes simplex
- Rectal foreign bodies (as a cause)

- Pilonidal cyst or sinus
- Proctitis

Considerations

- Most common cause of painful rectal bleeding
- Distal to the dentate line
- Usually occur in posterior anal midline (90%) or anterior anal midline (10%)
 - If not in midline consider other diseases
- Most resolve in 2–4 weeks (may last several months)
- Refractory cases may require surgery
- Causes increased anal sphincter pressures

Evaluation

- Usually only need history and rectal exam

Treatment options

- WASH regimen
 - Warm water, shower or sitz bath after bowel movement
 - Analgesics
 - Stool softener
 - High-fiber diet
- Intra-anal nitroglycerin ointment 0.4% bid topically applied for 2 weeks if failure of WASH regimen
- Botulinum toxin injection locally
- Topical application of clove oil cream for chronic anal fissure
- Topical 0.5% nifedipine ointment

Discharge criteria

- Uncomplicated anal fissure

Discharge instructions

- Anal fissure aftercare instructions
- WASH regimen

Consult criteria

- Refractory anal fissure
- Other disease process suspected
- Anal fistula

Perianal abscess

Definition

- Infection and collection of pus just outside the anus

Differential diagnosis

- Perirectal abscess
- Squamous cell carcinoma
- Crohn's disease

Considerations

- May be associated with a fistula tract into rectum
- Peak incidence is third to fourth decade of life
- Males affected more than females
- Common in infants
- Arises from obstruction of the anal crypts
- Usually patient is afebrile

Evaluation

- Usually history and physical exam is all that is needed

Treatment

- Incision and drainage of abscess avoiding anal verge
 - Pack abscess for 1–2 days (patient removes pack or return visit for removal)
- Antibiotics usually are not necessary
- Analgesics prn

Discharge criteria

- Uncomplicated perianal abscess

Discharge instructions

- Sitz baths 3 times a day and after bowel movements for 3–4 days
- Stool softeners
- Perianal abscess aftercare instructions

Consult criteria

- Perirectal abscess suspected
- Anal fistula
- Other disease process suspected
- Fever

- Immunocompromised patient

Perirectal abscess

Definition

- Abscess in the deeper perirectal spaces

Differential diagnosis

- Perianal abscess
- Crohn's disease
- Inflammatory bowel disease
- Rectal carcinoma
- Foreign body
- Sexually transmitted disease
- Proctitis
- Hemorrhoids
- Necrotizing fasciitis

Considerations

- Caused by obstruction of the anal crypts
- Fever and leukocytosis common (WBC can be normal)
- Severe pain present
- Sepsis can occur
- Increased pain with sitting, coughing or bowel movement
- Rectal or perirectal drainage in $\frac{1}{4}$ of patients
- Severe tenderness in rectum on digital examination
- May or may not be palpable
- Results in fistula in 25–50% of patients
- Urinary retention in 5% of patients

Evaluation options

- History and physical examination including rectal exam
- CBC
- BMP if diabetic
- Blood cultures if toxic appearing or immunocompromised
- CT abdomen/pelvis scan if diagnosis is in doubt on history and physical examination
- If in doubt and CT not performed, an 18 or 20 gauge needle aspiration of the most tender and/or swollen

area after sterile skin prep can be used to help diagnose abscess (not to be used for definitive treatment)

Treatment

- Per physician and/or surgeon
- Analgesics parentally prn

Discharge criteria

- Do not discharge

Consult criteria

- All perirectal abscess patients

Rectal prolapse

Definition

- Mucosal or full thickness prolapse of rectal tissue through anus

Differential diagnosis

- Hemorrhoids
- Proctitis
- Intussusception

Considerations

- Fecal incontinence and constipation commonly develop after prolapse
- Ulceration of rectal tissue may occur
- May be caused by staining and constipation
- 90% of children with rectal prolapse will spontaneously resolve
- Peak incidence is the 4th and 7th decades of life
- Much more common in females (80–90% of total)
- Children peak incidence less 1 year of age
 - Cystitis fibrosis associated with prolapse

Findings

- Protruding rectal mucosa
- Thick concentric mucosal ring
- Gap noted between anal canal and rectum
- Decreased anal sphincter tone

Evaluation

- History and physical examination including rectal exam
- Barium enema (preferred) or colonoscopy
- Tests for any associated conditions as needed

Treatment

- Adults are treated surgically
- Children usually treated nonsurgically and underlying condition is treated
- Attempt gentle digital reduction of rectum
 - Granulated table sugar applied to the rectal tissue causes an osmotic shift of fluid out of the mucosa decreasing the swelling in a few minutes that facilitates reduction of the prolapse
- Stool softeners

Discharge criteria

- Reducible mucosal or rectal prolapse

Discharge instructions

- Rectal prolapse aftercare instructions if available
- Stool softeners

Consult criteria

- All patients should be referred to surgeon
- Emergency consultation if incarcerated, ischemic or perforated rectal tissue

Pruritus ani

Definition

- Chronic anal itching

Differential diagnosis

- Eczema
- Psoriasis
- Pinworm infestation
- Scabies
- Urticaria
- Contact dermatitis
- Hemorrhoids

Considerations

- Worse at night usually
- Can be caused by increased moisture around anus or fecal leakage
- May be from certain foods, clothing, poor rectal hygiene, or medications

Evaluation options

- Cellophane tape when waking up in morning for pinworms if suspected
- 10% KOH skin scraping for fungus

Treatment options

- Diphenhydramine or hydroxyzine prn for itching
- Hydrocortisone cream 1% course bid prn for 5–10 days
- Avoid offending foods, clothing or agents
- Treat underlying condition if known
- Clean anus completely post-defecation
- Corn starch powder to dry skin

Discharge criteria

- Uncomplicated cases

Discharge instructions

- Pruritus ani aftercare instructions

Consult criteria

- Refractory cases refer to gastroenterologist

Pilonidal cyst/abscess

Definition

- A cyst that develops in the skin of the sacrococcygeal region 4–5 cm posterior to the anus

Differential diagnosis

- Anal fistula
- Perirectal abscess
- Hidradenitis suppurativa

Considerations

- Thought to be an acquired condition for folliculitis from hair that gets impacted into the skin
- More common in males
- Affects 26 out of 100,000 persons in the U.S.
- Occurs most commonly in late teens and early twenties
- Painful when acutely infected

Evaluation

- History and physical examination is usually all that is needed

Treatment

- For abscess perform I&D off midline, angulating into abscess cavity
 - See Soft Tissue Abscess section in book
- Remove any hair and granulation tissue
- Pack with gauze (medicated ribbon gauze has no added benefit)
 - Remove packing in 1–2 days
- No I&D for asymptomatic patients without significant symptoms
- Phenol injection into cyst by experience Providers

Discharge criteria

- Uncomplicated pilonidal cyst or abscess after procedural I&D
- Asymptomatic patients

Discharge instructions

- Pilonidal cyst aftercare instructions
- Return if pain returns or fever develops
- Refer to surgeon for definitive treatment

Consult criteria

- Pilonidal abscess near anus
- Patient toxicity
- Fever $\geq 101^{\circ}\text{F}$ (38.3°C)

CONSTIPATION PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- A gastrointestinal motility disorder resulting in 2 of the following
 - Less than 3 bowels movements per week
 - Hard lumpy stools
 - Straining
 - Incomplete defecation sensation
 - Anorectal obstruction sensation
 - Manually assisting defecation

Differential diagnosis

- Large bowel obstruction

Considerations

- Most common digestive complaint
- Affects 15% of the U.S. population
- Usually treated medically with improvement in symptoms
- 30% higher incidence in nonwhite population
- May be asymptomatic or have pain with above definition symptoms

Red flag symptoms

- Unexplained weight loss
- Vomiting
- Inability to pass flatus
- Abdominal pain
- Rectal bleeding

Types

Primary or idiopathic constipation

- Normal transit constipation
- Slow transit constipation
 - Infrequent stools and decreased urgency

- Impaired phasic colon activity
- Pelvic floor dysfunction
 - Dysfunction of pelvic floor or anal sphincter

Secondary constipation

- Caused by
 - Low fiber diet
 - Decreased fluid intake
 - Lack of exercise
 - Anal fissures
 - Diabetes mellitus, hypothyroidism
 - Stroke, spinal cord injuries, multiple sclerosis
 - Parkinson's disease
 - Antidepressants
 - Anticholinergics
 - Narcotics
 - Calcium channel blockers
 - Antacids
 - NSAIDs
 - Depression

Evaluation options

- Usually history and examination is all that is needed
- CBC for weight loss, fever or bleeding
- BMP for diabetes mellitus or vomiting
- Abdominal flat and upright films for vomiting
- CT abdominal/pelvic scan for vomiting, weight loss or unusually severe pain

Treatment options

Prevention

- Good fluid intake
- Exercise
- High fiber diet
- Avoid constipating medications

Acute ED or office treatment

- Fleet's mineral oil enema
 - Adult 1 bottle
 - Pediatric 30–60 ml (Age 2–11 years)
- Fleet bisacodyl enema

- Adult 30 ml (1 bottle)
- Pediatric (2–12 years) 15 ml
- Fleet enema
 - Adult 118 ml (1 bottle)
 - Pediatric 5–12 years Pedia-Lax 1 bottle 59 ml
 - Pediatric 2–5 years Pedia-Lax ½ bottle
 - Do not use in megacolon, CHF, ascites, renal failure or intestinal obstruction
- Glycerin suppository
 - Age > 6 years 1 suppository
 - Age 2–6 years Fleet's BabyLax applicator (4 ml)
- Digital disimpaction

Acute home treatment

- Dulcolax suppository or tablet
- Colace
- Fleet's enema
- Prune juice

Chronic home treatment

- High fiber diet
- Psyllium (Metamucil)
 - < 6 years 1 gm PO qday-tid in water or juice
 - Age 6–11 years 1.7 gm (powder) in water or juice PO qday-tid or 1 oral wafer, increase slowly as needed
 - > 12 years 2–6 caps qday-tid or 2 wafers PO qday increasing as needed
- Magnesium hydroxide (Milk of magnesia)
 - Age 6–11 years 15–30 ml PO qday prn
 - Age > 12 years 30–60 ml PO qday prn
- Polyethylene glycol (MiraLax)
 - Age < 17 years – 0.8 gm/kg in 8 oz. of liquid PO qday prn up to 4 days
 - Age ≥ 17 years – 1 capful in 8 oz. liquid PO qday prn up to 4 days

Constipation induced by opioids with advanced illness

- Methylnaltrexone (Relistor) weight-base dosing

Discharge criteria

- Uncomplicated findings
- Normal vital signs

Discharge instructions

- Constipation aftercare instructions
- See Gastroenterologist referral criteria

Consult criteria

- Red flag symptoms
- Fever
- Vomiting
- Tachycardia
- Metabolic acidosis
- Significant gross rectal bleeding
- Melena
- Rebound abdominal tenderness
- Moderate to severe tenderness

Referral to gastroenterologist criteria

- Recent onset
- Rectal bleeding
- Weight loss
- Recent bowel habit changes

Urinary and Male Genitourinary

Section Contents

Kidney Stone Protocol

Urinary Tract Infection Protocol

Chronic Renal Failure Protocol

Male Genitourinary Protocol

KIDNEY STONE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Ureteral colic produced by passage of renal calculus from kidney into the ureter

Differential Diagnosis

- Renal colic
- Biliary colic
- Aortic aneurysm
- Mechanical back pain
- Herpes zoster
- Pyelonephritis
- Renal vein thrombosis
- Retroperitoneal bleeding
- Appendicitis

Considerations

- Sudden severe pain onset located in the lateral mid to lower back or lower quadrant with occasional radiation to the groin
- Nausea or vomiting usually occurs
- Fever usually absent
- Groin pain felt when kidney stone at ureterovesicular junction (UVJ)
 - Most common location of impaction
- Aortic aneurysm can mimic ureteral colic
 - Renal colic is most common misdiagnosis of ruptured abdominal aortic aneurysm
- Retained kidney stones in the renal calyces rarely cause pain
- Hematuria on U/A absent 10–15% of the time
- KUB reveals approximately 30% of the kidney stones
- Pelvic calcifications commonly are phleboliths (benign)
- Abdominal exam frequently benign
- Abdominal tenderness can occur with high grade ureteral obstruction

- Flomax (tamsulosin) 0.4 mg qday Rx outpatient allows larger kidney stones to pass frequently — up to 1 cm
 - Flomax may be given for 2-4 weeks to pass the ureteral calculus
- Most kidney stones pass given time
- CT abdomen/pelvis 97% accurate
- Thrombocytosis can occur with ureteral obstruction in pyelonephritis patients

Evaluation Options

U/A and KUB

- May be all that is needed on healthy patients with typical presentation

UCG in sexually active fertile females

BMP

- Diabetic patient
- Tachycardia present
- Hypotension present
- SBP < 105 with history of hypertension

CBC

- Fever present
- Tachycardia present
- Hypotension present
- SBP < 105 with history of hypertension

Consider CT abdomen and pelvis without contrast

- Uncertain diagnosis
- Age \geq 60
- Abdominal pulsatile mass
- Possibility of aortic aneurysm considered
- Where CT scanning is the usual evaluation

Urine culture if fever or pyuria present

Treatment Options

Acute treatment

- Toradol (ketorolac) 30 mg IV with or without Dilaudid (hydromorphone) 0.5– 1 mg (or equipotent narcotic IV) and Phenergan (promethazine) 6.25 mg IV or Zofran (ondansetron) 4 mg IV; may repeat narcotics × 2 prn if stable vital signs and no significant altered mental status or respiratory depression
- Toradol (ketorolac) 60 mg IM with or without Dilaudid (hydromorphone) 1–2 mg IM (or equipotent narcotic) and Phenergan (promethazine) 25 mg IM or Zofran (ondansetron) 4 mg IM if IV access not readily available
 - Do not use Toradol (ketorolac) if creatinine is elevated
- Do not give increased IV fluids except as needed for dehydration or hypotension

Discharge treatments

- Flomax (tamsulosin) 0.4 mg PO each day for 2-4 weeks if discharged home (can cause passage of larger stones) — **evidence-based**
- UTI antibiotics if lower urinary tract infection present without pyelonephritis or fever

Discharge symptom treatment options

- Toradol (ketorolac) 10 mg PO QID prn up to 7 days
 - Do not use Toradol (ketorolac) if creatinine is elevated
- Hydrocodone or oxycodone 5–10 mg PO QID prn up to 7 days
- Phenergan (promethazine) 25–50 mg QID PO/PR prn nausea or vomiting

Discharge Criteria

- Pain resolved or tolerable by patient and the patient is agreeable to go home
- No upper tract urinary infection
- No solitary kidney

Discharge instructions

- Kidney stone aftercare instructions
- Follow up within 7–10 days with urologist
- Urine strainer and turn in any stone for analysis

Consult Criteria

- Ureteral stone larger than 6 mm
- Pain and/or vomiting not controlled to clinician or patient's satisfaction
- Uncertain diagnosis
- Concurrent upper tract urinary infection (pyelonephritis)
- Solitary kidney with ureteral calculus
- Pyelonephritis

Vital sign and age consult criteria

- Age ≥ 70
- Fever
- Adult heart rate ≥ 110
- Developing hypotension or relative hypotension (SBP < 105 with history of hypertension)

Lab consult criteria

- WBC $\geq 14,000$
- Bandemia
- Metabolic acidosis
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)
- Hemoglobin decrease > 1 gm
- Creatinine increase > 0.5 from baseline
- Renal insufficiency
- Acute thrombocytosis
- Acute thrombocytopenia

URINARY TRACT INFECTION PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Bacteriuria with the presence of symptoms

Differential Diagnosis

- Cystitis
- PID
- Ovarian cyst pain
- Gonococcal urethritis
- Nonspecific urethritis (chlamydia or ureaplasma)
- Renal colic
- Bladder outlet obstruction
- Neurogenic bladder
- Pelvic pain disorder
- Endometriosis
- Vaginitis
- Orchitis
- Epididymitis

Considerations

- Female > male incidence until age 50 or in neonates
- 0–3 months of age associated with 30% incidence of sepsis (80% of time the U/A may be normal in neonates with UTI)
- E. coli most common cause
- Sexually active males frequently have prostatitis or urethritis as cause of urinary symptoms (frequently gonorrhea or chlamydia)
- Asymptomatic bacteriuria present in 20% women > 65 years of age
- Elderly often have atypical presentation
 - Altered mental status
 - Confusion
 - Acute incontinence
 - GI symptoms
 - Urinary retention

- Fever and/or vomiting suggest upper tract urinary infection
- Gross hematuria usually present in lower tract infection
- Acute thrombocytosis with upper tract infection (pyelonephritis) may indicate obstruction from ureteral calculus

High risk

- Diabetes
- **Pregnancy**
 - Higher incidence of premature rupture of membranes and fetal demise with UTI (even if asymptomatic)
- Renal failure
- Sickle cell anemia
- Immunocompromise

Complicated UTI

- High risk criteria listed above
- Structural abnormalities
- Mechanical (catheter, stones, stents, instrumentation)
- Functional (reflux or neurogenic bladder)
- Males
- Resistant pathogens

Acute urethral syndrome

- Dysuria without pyuria
- Empiric treatment for STD

Differential of acute urethral syndrome

- Chlamydia
- Gonorrhea
- Herpes
- Vaginitis

Evaluation

- Complete history and physical exam
- Abdominal and costovertebral exam
- Pelvic exam in females and genital exam in males if STD suspected
- U/A – clean catch; catheter specimen if contamination suspected

- CBC if vomiting, fever or tachycardia present
- BMP if diabetic or for dehydration/tachycardia if present
- Prostate and urethral meatus exam in males at risk for STI

Urine culture

- For high risk patient or complicated UTI
- Symptoms after > 2 days of treatment or relapse
- Pyelonephritis

Treatment Options

Asymptomatic bacteriurias do not treat unless

- Pregnant
- Neutropenic
- Abnormal renal functions
- Transplant patient
- Undergoing urologic procedure

Uncomplicated UTI options

- 3 days of one choice below
 - Quinolone
 - Septra (trimethoprim/sulfamethoxazole)
 - Augmentin (amoxicillin/clavulanate)
 - Macrobid (nitrofurantoin) × 7 days
 - 3rd generation cephalosporin
- May use Sanford Guide

Complicated UTI

- Cystitis same as uncomplicated UTI but for 5–7 days of antibiotics

Pyelonephritis

- Antibiotics for 10–14 days
- Consider IM or IV antibiotic first dose if discharged — Rocephin (ceftriaxone) 1–2 gms IV/IM in adults, 50 mg/kg in children – not to exceed adult dose)
- Antibiotics same as for uncomplicated UTI except for parentally dosing

Sexually transmitted diseases

- See Sexually Transmitted Disease Protocol

Pain and nausea medication prn

- Narcotics short course
- OTC medications
- Pyridium 100–200 mg TID (NMT 6 pills)
- Phenergan (promethazine) — may need suppository if actively vomiting)
- Zofran (ondansetron)

Discharge Criteria

- Uncomplicated UTI without toxicity
- Able to hold PO intake and medications down
- Healthy patients with uncomplicated pyelonephritis

Discharge instructions

- UTI aftercare instructions
- Refer to primary care provider or urologist within 7 days as needed

Consult Criteria

- Complicated UTI
- Toxic appearance
- Failed outpatient treatment
- Immunocompromise
- Persistent vomiting
- Unable to hold PO meds down
- Unable to self hydrate
- Pregnancy
- Progressive renal insufficiency
- Poor follow-up
- Male children with first UTI

Vital signs and age consult criteria

- Age ≥ 70
- Age < 24 months
- Adult heart rate ≥ 110
- Hypotension (or relative hypotension: SBP < 105 in patient with hypertension history)
- Pediatric heart rate — see [General Patient Criteria Protocol](#)

Lab consult criteria

- WBC $\geq 15,000$ or $< 3,000$; neutropenia $< 1,000$
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Acute thrombocytosis
- Creatinine increase > 0.5 from baseline
- Renal insufficiency
- Increased anion gap
- Significant electrolyte abnormality
- Glucose ≥ 400 mg/dL in diabetic patient
- Glucose ≥ 300 mg/dL in non-diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)

CHRONIC RENAL FAILURE PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Decreased kidney glomerular filtration rate (GFR) of less than 60 mL/min

Differential Diagnosis

- Acute renal failure

Considerations

- Normal glomerular filtration rate (GFR) in healthy adult is 120 cc/minute
- Uremia occurs when GFR is 10–20 cc/minute

Main causes

- Diabetes
- Hypertension
- Polycystic kidney disease (inherited)

Signs, Symptoms and Associated Disorders

- Malaise; weakness; fatigue
- Anorexia; nausea; vomiting
- Peptic ulcer disease
- Peripheral neuropathy
- Anemia; thrombocytopenia
- Pruritus
- Volume overload
- CHF
- Hypocalcemia
- Increased infections
- Dialysis catheter infections
- Pericarditis
- Peritonitis in peritoneal dialysis (CAPD) patients

Dialysis disequilibrium syndrome

- Weakness
- Dizziness
- Headache
- Mental status changes in severe cases

Hyperkalemia

- EKG cannot reliably predict K⁺ level

K⁺ level

- 5.0–6.5 mEq/L — T wave peaking; shortening QTc interval
- 6.5–8.0 mEq/L — PR interval prolongation; loss of P waves; QRS widening
- Greater than 8.0 mEq/L — IVCD; bundle branch blocks; sine wave complex

Evaluation

- Complete history and physical exam
- Last dialysis noted if currently being treated
- BMP

Testing options

- CBC
- Troponin (frequently elevated due to volume overload and CHF only)
- BNP (commonly very elevated and of questionable utility)
- U/A if producing urine (cath urine sample for fever or lower abdominal pain)
- Chest x-ray if volume overload suspected
- EKG if K⁺ elevated
- If IV contrast imaging studies desired, discuss with physician

Treatment Options

Emergent hypertension (consult physician promptly)

- Treat with nitroglycerin SL (NTG) up to 3 doses prn
- NTG paste 1–2 inches prn
- Nitroprusside drip IV
- Dialysis if due to volume overload

Asymptomatic hypertension

- Per Hypertension Protocol (usually no treatment needed)

Hyperkalemia > 5.5 mEq/L (consult physician)

- EKG with peaked T waves or widened QRS complex may or may not be seen
- EKG may not reflect degree of hyperkalemia

Calcium gluconate (safer peripheral IV than CaCl) or calcium chloride up to 1 amp IV over 2–3 minutes with patient on monitor

- Calcium chloride 3 three times more potent than calcium gluconate
 - Give 10 ml of calcium gluconate or 5 ml of calcium chloride initially — may repeat as needed per physician
- Duration of action 30–60 minutes
- May be repeated in 5–10 minutes if EKG not improved
- Does not lower serum potassium levels
- Stabilizes cardiac membranes from effects of high potassium
- Controversial whether dangerous or not in Digoxin (digitalis) toxic patients — give Digibind

D50W 1 amp (if patient not hyperglycemic) followed by regular insulin 10 units IV

- Starts to lower K⁺ by 0.5–1.5 mEq/L in 15 minutes
- Peak effect in 60 minutes
- Effect lasts 4–6 hours
- Recheck blood glucose in 60–75 minutes for hypoglycemia
- If initial blood glucose is ≥ 250 , then D50W is not given

Albuterol aerosol inhalation

- 10–20 mg of Albuterol in chamber with a few cc's of NS
- Onset of action within 20–30 minutes
- Peak effect in 90 minutes

Sodium bicarbonate not acutely effective in treating

hyperkalemia in renal failure patients

Kayexalate

- 30–60 gms in 20% sorbitol PO
 - Onset of action 1–3 hours
- 60 gms without sorbitol PR
 - Longer onset of action than PO

Dialysis

CHF and volume overload (consult physician prior to treatment)

- BNP usually elevated even in asymptomatic patients

Hypertension treatment options

- NTG SL
- NTG paste 1–2 inches
- NTG drip IV
- Dialysis best treatment

Hypotension

- Rule out sepsis
- IV NS 200 bolus
- Notify physician promptly

Bleeding

- Direct pressure
- DDAVP

CAPD peritonitis

- Consult physician

Discharge Criteria

- Chronic renal failure patient who is stable and at baseline without acute significant electrolyte abnormalities

Discharge instructions

- Chronic renal failure aftercare instructions
- See Hyperkalemia Protocol

Consult Criteria

- Hyperkalemia
- Volume overload
- Heart failure
- Significant electrolyte abnormalities or active comorbidities
- Abnormal vital signs or O2 saturation

MALE GENITOURINARY PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Urethritis and Epididymoorchitis

Definition

- Infection or inflammation of the urethra, epididymis or testicle

Differential diagnosis for epididymoorchitis

- Testicular torsion
- Mumps
- Trauma
- Hernia
- Tumor — usually painless

Considerations

- Gonorrhea and chlamydia are the main causes and coexist 25–50% of the time
- Urethral discharge
- Tender and swollen epididymis and/or testicle

Gonorrhea

- Dysuria
- Thick purulent discharge from urethra
- Gram negative intracellular diplococci

Chlamydia

- Thinner discharge from urethra
- Little to no discomfort

Evaluation

- Sexual history
- Genital exam
- Smear with intracellular gram negative diplococci can be performed
- Culture
- RPR prn

Treatment options

- Follow CDC guidelines
 - May use Sanford Guide
 - Analgesics prn
 - Rocephin (ceftriaxone) 125 mg IM
- +
- Doxycycline 100 mg PO bid × 7 days to cover chlamydia

Discharge criteria

- Nontoxic patient

Discharge instructions

- Epididymo-orchitis aftercare instructions
- Return if worse
- Follow up with PCP or urologist in 3–7 days

Consult criteria

- Systemic toxicity
- Refer to [General Patient Criteria Protocol](#)

Testicular Torsion

Definition

- Torsion of the testicle and spermatic cord with subsequent loss of blood flow to the testicle causing loss of testicular function and eventual testicular death and necrosis

Differential diagnosis

- Torsion of testicular or epididymal appendage (blue dot sign in light skinned patients may be present) — can be discharged home if diagnosed
- Epididymitis
- Epididymo-orchitis
- Orchitis
- Hydrocele
- Testicular tumor or carcinoma
- Scrotal edema
- Inguinal hernia
- Fournier gangrene
- Testicular trauma

- Henoch-Schonlein Purpura
- Varicocele
- Appendicitis

Considerations

- True urologic emergency
- Complete torsion occurs with $\geq 360^\circ$ rotation
- Partial torsion occurs with $< 360^\circ$ rotation
- Testicular salvage rate 90–100% with detorsion within 6 hours of pain onset
- Testicular viability 20–50% after 12 hours
- Peak age is 14 years of age, with second peak in first year of life
- Most torsions rotate inward and toward midline

Signs and symptoms

- Usually rapid onset of unilateral severe testicular pain
- Can occur from activity or trauma
- Can occur during sleep
- High-riding testicle occurs on affected side
- Scrotal swelling
- Nausea and/or vomiting
- Abdominal pain around 20–30%
- Fever not very common
- Cremasteric reflex absent on affected side

Evaluation

- Clinical diagnosis if classic history and findings
- Ultrasound color flow Doppler if unsure of diagnosis
 - 94% sensitive
 - 96% specific

Lab tests not usually very useful (used to evaluate for inflammatory processes with low suspicion of torsion)

- CBC – can be normal or elevated in torsion
- U/A – can have WBC's in 30% of torsions
- C-reactive protein – not too helpful

Treatment

- Pain control
- Manual rotation of testicles outward like opening a book

- May need to be repeated 2–3 times to obtain relief
- Emergent surgery if unable to detorse testicle
- Urgent surgery if testicle detorsed
- All testicular torsion patients should have surgery and not be discharged

Consult criteria

- Discuss suspected testicular torsion with physician or urologist immediately

Prostatitis

Definition

- Infection or inflammation of the prostate gland

Differential diagnosis

- Prostate cancer
- Urethritis
- Mechanical back pain
- UTI

Considerations

- Gonorrhea and chlamydia are the main causes in men age < 35 years and coexist 25–50% of the time
- Prostate tender (caution with vigorous palpation if fever or toxicity present)
- Age > 35 years usual cause is bacterial
- Nonbacterial prostatitis is an inflammatory condition without infection
- Chronic prostatitis
 - Increases risk of UTI and BPH

Acute bacterial prostatitis age > 35 years

- Fever
- Chills
- Perineal prostatic pain
- Dysuria
- Obstructive bladder symptoms
- Low back pain
- Low abdominal pain
- Spontaneous urethral discharge

Evaluation options

- U/A
- CBC

Treatment options

Age < 35 years

- Follow CDC guidelines
- May use Sanford Guide
- Analgesics prn
- Rocephin (ceftriaxone) 125 mg IM
+
 - Doxycycline 100 mg PO bid × 10–14 days
 - Treatment for sexual partners or refer for treatment for STD

Age > 35 years

- May use Sanford Guide
- Septra DS 1 PO bid × 14–28 days
- Quinolone 14–28 days
- NSAID's and/or narcotics prn

Discharge criteria

- Nontoxic patient
- Refer to [General Patient Criteria Protocol](#)

Discharge instructions

- Prostatitis aftercare instructions
- Return if worse
- Follow up with PCP or urologist in 3–7 days

Consult criteria

- Systemic toxicity
- Urinary retention

Priapism

Definition

- Persistent erection unrelated to sexual desire that is usually painful

Differential considerations

- Penile implant
- Urethral foreign body
- Peyronie disease
- Erection from sexual arousal

Causes

- Idiopathic 35–50% of the time
- Sick cell anemia
- Leukemia
- Trauma
- Spinal cord injury
- Vasoactive drugs

Low-flow priapism

- Painful
- Ischemia and impotence can occur
- From venous obstruction

High-flow priapism

- From arterial high flow state in penis
- Not usually painful
- Less common than low-flow priapism
- Trauma most frequent cause

Evaluation of priapism

- CBC
- Sick cell prep or screen if suspected as a cause
- Color flow ultrasound if not sure if high or low-flow priapism

Treatment options

Low-flow priapism

- Analgesia
- Sick cell patients may need exchange transfusion
- Terbutaline 0.25 mg SQ may help
- Pseudoephedrine 30–60 mg PO may help
- 1–2 ml of 1% lidocaine with epinephrine 1/100,000 premix injected into proximal corpora cavernosa on lateral penile shaft (one side only) post betadine and alcohol prep — use 27 gauge needle or smaller if possible
 - Aspirate some blood to ensure corpora cavernosa

has been entered before injection

- Caution with coronary artery disease history
- Hold pressure 30–60 seconds post injection
- Phenylephrine 250–500 mcg can be used instead of 1% lidocaine with epinephrine
- Corpora cavernosa injections usually resolve priapism in 5–15 minutes

High-flow priapism

- Analgesia prn
- Ice packs

Discuss with physician and consult urology immediately

Paraphimosis

Definition

- Entrapment and inability of foreskin to be pulled back over the glans penis in uncircumcised or partially uncircumcised males

Differential diagnosis

- Anasarca
- Balanitis
- Cellulitis
- Insect bite
- Carcinoma
- Penile fracture
- Penile hematoma
- Contact dermatitis
- Hair tourniquet

Considerations

- True emergency
- Can result in penile necrosis

Treatment

- Manual reduction after 5 minutes of ice in exam glove — pushing glans penis under foreskin while holding foreskin in place successful up to 90% of the time
- Dorsal slit of foreskin (consult physician)

Discharge criteria

- Successful reduction of paraphimosis
- No ischemic tissue damage

Discharge instructions

- Referral to urology for circumcision within 7–14 days

Consult criteria

- Inability to reduce the paraphimosis
- Penile tissue ischemic injury

Phimosis

Definition

- Inability to retract foreskin over glans penis

Considerations

- Can lead to venous congestion and eventually tissue damage
- Can lead to paraphimosis

Treatment

- Small hemostat can be passed into foreskin orifice to dilate it and deliver glans penis

Discharge criteria

- Usually can be discharged

Discharge instructions

- Refer to urology

Consult criteria

- Tissue ischemia
- Cellulitis

Hydrocele

Definition

- Collection of serous fluid in scrotum in up to 1% of males

Differential diagnosis

- Orchitis
- Testicular torsion
- Indirect inguinal hernia
- Epididymitis
- Trauma

Considerations

- Usually asymptomatic or subclinical
- Located anterior and superior to testicles
- A light shines through the hydrocele
- Most pediatric cases are congenital
- Can be from trauma, orchitis, or epididymitis

Evaluation options

- History and physical examination only (transillumination)
- CBC
- U/A
- Ultrasound can be used in diagnosis uncertain

Treatment

- Usually no acute treatment needed

Discharge criteria

- Nonpainful, non-inflamed scrotal hydrocele

Discharge instructions

- Hydrocele aftercare instructions
- Refer to urology

Consult criteria

- Painful scrotum
- Scrotal cellulitis
- Fever

Electrolyte and Acid/Base Disturbances

Section Contents

Hyperkalemia Protocol

Hypokalemia Protocol

Hypernatremia Protocol

Hyponatremia Protocol

Metabolic Acidosis Protocol

HYPERKALEMIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Elevated serum potassium levels

Differential Diagnosis

- Hypocalcemia

Considerations

- EKG cannot reliably predict K⁺ level
 - K⁺ level
 - 5.0–6.5 mEq/L — T wave peaking; shortening QTc interval
 - 6.5–8.0 mEq/L — PR interval prolongation; loss of P waves; QRS widening
 - Greater than 8.0 mEq/L — IVCD; bundle branch blocks; sine wave complex

Causes

- Renal failure
- K⁺ supplementation
- Hemolysis from blood draw
- Hemolysis
- DIC
- Tissue injury or ischemia

Evaluation

- Complete history and physical exam
- Last dialysis noted if being currently treated
- BMP
- Chest x-ray
- EKG

Testing options

- CBC
- Troponin (frequently elevated due to volume overload)

and CHF only)

- BNP (commonly very elevated and of questionable utility)
- U/A if producing urine (cath urine sample for fever or lower abdominal pain)
- If IV contrast imaging studies desired, discuss with supervising physician if history of renal disease

Treatment Options

Hyperkalemia > 5.5 mEq/L (consult physician)

- EKG with peaked T waves or widened QRS complex may or may not be seen
- EKG may not reflect the degree of hyperkalemia

Calcium gluconate (safer peripheral IV than CaCl) or calcium chloride (CaCl) up to 1 amp IV over 2–3 minutes with patient on monitor

- Calcium chloride 3 three times more potent than calcium gluconate
 - Give 10 ml of calcium gluconate or 5 ml of calcium chloride initially — may repeat as needed per physician
- Duration of action 30–60 minutes
- May be repeated in 5–10 minutes if EKG not improved
- Does not lower serum potassium levels
- Stabilizes cardiac membranes from effects of high potassium
- Controversial if dangerous in digoxin toxic patients — give Digibind

D50W ½–1 amp (if patient not hyperglycemic) followed by regular insulin 10 units IV

- Starts to lower K⁺ by 0.5–1.5 mEq/L in 15 minutes
- Peak effect in 60 minutes
- Effect lasts 4–6 hours
- Recheck blood glucose in 60–75 minutes for hypoglycemia
- If initial blood glucose is ≥ 250 , then D50W is not given

Albuterol aerosol inhalation

- 10–20 mg of Albuterol in chamber with a few cc's of

NS

- Onset of action within 20–30 minutes
- Peak effect in 90 minutes

Sodium bicarbonate not acutely effective in treating hyperkalemia in renal failure patients

Kayexalate

- 30–60 gms in 20% sorbitol PO
 - Onset of action 1–3 hours
- 60 gms without sorbitol PR
 - Longer onset of action than PO

Dialysis

Discharge Criteria

- Mild hyperkalemia < 6.0 mEq/L
- Acceptable treatment response
- Further potassium rises not anticipated

Discharge instructions

- Close follow up
- Hyperkalemia aftercare instructions
- Chronic renal failure aftercare instructions if indicated

Consult Criteria

- Discuss with physician if potassium > 5.5 mEq/L
- End-stage renal disease with abnormal vital signs or O₂ saturation
- Significant comorbidities

HYPOKALEMIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#)).

Definition

- Serum potassium level < 3.5 mEq/L

Differential Diagnosis

- Cushing syndrome
- Hypocalcemia
- Hypomagnesemia

Considerations

- Very common
- Increases dysrhythmias
- Increases Digoxin (digitalis) toxicity effects
- Mild 3.0–3.4 mEq/L
- Moderate 2.5–2.9 mEq/L
- Severe < 2.5 mEq/L

Causes

- Diuretics
- Hyperventilation
- Hypomagnesemia
- Poor nutrition
- Diarrhea
- Metabolic alkalosis
- Renal tubular acidosis
- Adrenal conditions
- Hyperaldosteronism
- Gastrointestinal losses (vomiting, diarrhea, NG suction)
- Familial Periodic Hypokalemia Paralysis

Signs and Symptoms

- Severe weakness $K^+ < 2.5$ mEq/L
- Paralysis can occur with rapid development of $K^+ < 2.0$ mEq/L
- Paresthesias

- Muscle weakness
- Muscle cramps
- Constipation
- Cardiac dysrhythmias
- EKG changes
 - Low voltage T waves
 - ST segment depression
 - U waves
 - Small P waves
 - PAC's
 - PVC's

Evaluation

- BMP
- EKG if potassium < 2.5 mEq/L
- Magnesium level not needed usually

Treatment Options

- Oral replacement preferred when indicated
- Oral potassium 40–60 mEq can raise serum potassium 1–1.5 mEq/L; 135–160 mEq PO raises serum potassium 2.5–3.5 mEq/L
- Potassium level < 2.5 mEq/L give IV replacement no faster than 10 mEq per hour
- MgSO₄ (magnesium sulfate) replacement can improve potassium replacement
 - 2–4 gms IV over 30 minutes if needed
 - Mg gluconate 200–400 mg PO TID prn if asymptomatic for adults

Discharge Criteria

- Asymptomatic patient
- Able to replenish potassium orally
- Potassium level > 2.5 mEq/L

Discharge instructions

- Hypokalemia aftercare instructions
- Follow up with primary care provider within 5–10 days

Consult Criteria

- Potassium \leq 2.5 mEq/L

- Symptomatic patient
- EKG changes

HYPERNATREMIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Serum Na⁺ level > 145 mEq/L

Differential Diagnosis

- Hyperglycemic hyperosmolar state
- Diabetes insipidus
- Salt ingestion
- Hypertonic dehydration

Considerations

Dehydration

- Secondary to volume depletion
- Poor oral intake of fluids
- Commonly seen in nursing home patients
- PEG tube feeding patients
- Bedridden patients
- Stroke patients
- Patients unable to care for self
- Medication induced diuresis
- Accompanied by metabolic acidosis frequently
- High risk condition for mortality in elderly
- Usually in patients with significant comorbidities

Diabetes insipidus

Decreased urine concentration ability of kidneys

- Lithium
- Sickle cell anemia
- Postobstructive diuresis after treatment of bladder outlet obstruction

Decreased secretion of ADH (antidiuretic hormone)

- Brain tumors
- Brain injury
- Cerebral infectious processes

Signs and symptoms

- Altered mental status
- Decreased responsiveness
- Tachycardia
- Hypotension may occur
- Tachypnea
- Poor skin turgor
- Decreased capillary refill
- Dry mucous membranes
- Decreased urine output
- Hard stools

Evaluation Options

- BMP
- CBC
- U/A
- Chest x-ray usually performed to rule out concurrent process
- CT brain if central process suspected
- Urine for spot Na and osmolality if serum sodium > 170 mEq/L

Treatment Options

- Restore plasma volume first
- Oral rehydration therapy (ORT) preferred over IV in mild to moderate dehydration if appropriate to patient's condition and ability to self-hydrate

Serum Na correction no more than 1 mEq/L per hour

- Too rapid correction may cause cerebral edema

Adult dehydration

Oral Rehydration Therapy (ORT) for mild to moderate dehydration if able to self-hydrate

- Oral rehydration formula (WHO formula, Rehydralyte or Pedialyte) for mild to moderate dehydration or serum CO₂ is 14–18 mEq/L or NA+ 146–152 mEq/L
- Zofran (ondansetron) 8 mg chewable tablet if vomiting or 4–8 mg IM

- 15–30 cc every 1–2 minutes for adults (age > 12) for 1–4 hours — start 20 minutes after Zofran (ondansetron) given
- Hold ORT 10 minutes if vomiting occurs then resume
- Reassess for urine production, improved heart rate, and absence of severe vomiting
- Recheck serum CO₂ if initially < 17 mEq/L
- Mild dehydration give 50 cc/kg in < 4 hours
- Moderate dehydration give 50–100 cc/kg in 1–4 hours

IV rehydration

- Moderate to severe dehydration ($\text{Na}^+ > 152 \text{ mEq/L}$), give IV NS 150–300 cc/hour over 2–4 hours
- Hypotension or signs of poor organ perfusion (lactic acid > 2), give NS at 500–1000 cc/hour up to 2 liters (consult physician promptly) — caution if CHF history

Pediatric dehydration

Dehydration assessment

Mild $\leq 5\%$

- Alert
- Mucous membranes variable dry
- Skin turgor normal
- Fontanel flat
- Blood pressure normal
- Heart rate normal
- Capillary refill < 2 seconds
- Urine output decreased

Moderate 6–9%

- Irritable
- Mucous membranes dry
- Skin turgor variably reduced
- Fontanel depressed
- Blood pressure variably orthostatic
- Heart rate tachycardic
- Capillary refill 2–3 seconds
- Urine output decreased — oliguria

Severe $\geq 10\%$

- Lethargic
- Mucous membranes dry
- Skin turgor reduced
- Fontanel depressed
- Blood pressure orthostatic or hypotensive
- Heart rate markedly tachycardic
- Capillary refill ≥ 4 seconds
- Urine output decreased – oliguria/anuria

Oral Rehydration Therapy (ORT) for mild to moderate dehydration

- Zofran (ondansetron) oral chewable tablet in ED for frequent vomiting
 - 2 mg for 8–15 kg; 4 mg for 15–30 kg; 8 mg for > 30 kg
- Zofran (ondansetron) 2–4 doses can be prescribed for home if indicated

Oral rehydration formula for mild to moderate dehydration; serum CO₂ 14–18 mEq/L or serum Na 146–155 mEq/L

- 5 cc every 1–2 minutes for small children by caretaker for < 4 hours — start 20 minutes after Zofran (ondansetron) given
- 5–10 cc every 1–2 minutes for larger children by caretaker for 1–4 hours
- Hold ORT 10 minutes if vomiting occurs then resume
- Reassess for urine production, weight gain, improved HR and alertness, and absence of severe vomiting
- Recheck serum CO₂ if initially < 17
- Mild dehydration give 50 cc/kg in < 4 hours
- Moderate dehydration give 50–100 cc/kg over 1–4 hours

Severe dehydration give IV NS bolus 20 cc/kg; may repeat $\times 2$

Exclusion Criteria for Oral Rehydration Therapy

- Age < 6 months of age
- Hematemesis
- Bilious vomiting

- Bloody diarrhea
- VP shunt
- Head trauma
- Focal RLQ tenderness (possible appendicitis)
- Severe dehydration
- Patient vomits 3 or more times after starting ORT

IV therapy criteria and treatment for moderate to severe dehydration

- IV NS hydration for $\text{CO}_2 < 14 \text{ mEq/L}$ or $\text{Na} > 155 \text{ mEq/L}$
- ORT failure
- IV NS 20 cc/kg bolus, may repeat $\times 2$
- Consult physician
- Maintenance IV with D5NS (dextrose decreases return visits)

Discharge Criteria

- Patient responds to rehydration
- Healthy without significant comorbid conditions
- Good social support systems
- Unlikely to acutely become hypernatremic post discharge

Discharge instructions

- Dehydration or hypernatremia aftercare instructions
- Follow up with primary care providers within 1–3 days

Consult Criteria

Discuss with physician

- Patients with significant comorbid conditions or findings
- Serum $\text{Na} > 150 \text{ mEq/L}$
- Age > 60
- Age < 6 months

Vital signs consult criteria

- Adult heart rate > 100 post treatment
- Hypotension or relative hypotension ($\text{SBP} < 105$ with history of hypertension)

- Orthostatic vital signs
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

HYPONATREMIA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Serum sodium level < 135 mEq/L

Differential Diagnosis

- SIADH
- Hepatitis cirrhosis
- Adrenal insufficiency
- Adrenal crisis
- CHF
- Water intoxication
- Gastroenteritis
- Renal failure
- Hypothyroidism
- Nephrotic syndrome

Considerations

- Acute hyponatremia is more symptomatic
- Chronic hyponatremia can be asymptomatic
- Central pontine myelinolysis can occur from too rapid correction of hyponatremia
 - Dysarthria
 - Dysphagia
 - Seizures
 - Altered mental status
 - Quadriplegia
 - Hypotension
- Correction of severe symptomatic hyponatremia should not raise serum sodium level more than 4 mEq/L acutely
- Chronic hyponatremia usually does not need rapid correction (can be dangerous to do so)
- Chronic hyponatremia is much more common than acute hyponatremia
- Serum Na⁺ is lowered 1.6 mEq/L for every blood glucose level increase of 100 mg% over normal
 - Will correct with correction of hyperglycemia alone

- Children more prone to iatrogenic water intoxication by parents giving excessive water to replace GI fluid losses

Signs and symptoms

- Mild or none in some chronic hyponatremic patients with $\text{Na}^+ > 120 \text{ mEq/L}$

Acute hyponatremia

- Serum sodium $> 120 \text{ mEq/L}$
 - Headache
 - Nausea; vomiting
 - Muscle cramps
 - Weakness
 - Anorexia
 - Rhabdomyolysis
- Serum sodium $110\text{--}120 \text{ mEq/L}$
 - Hyperventilation
 - Decreased responsiveness
 - Hallucinations
 - Behavior disturbances
 - Incontinence
 - Ataxia
- Serum sodium $< 110 \text{ mEq/L}$
 - Posturing
 - Hypertension
 - Bradycardia
 - Impaired temperature regulation
 - Seizures
 - Coma
 - Respiratory arrest

Causes

Hypovolemic

- Excess fluid losses replaced with hypotonic solutions by patient
 - Vomiting
 - Diarrhea
 - Third spacing of fluids
 - Burns
 - Excessive sweating
 - Diuretics

Hypervolemic

- Excessive water intake (water intoxication)
- Hepatic cirrhosis
- CHF
- Nephrotic syndrome
- Renal insufficiency

Euvolemic

- Hypothyroidism
- Adrenal insufficiency
- SIADH
- Psychogenic polydipsia

Medications

- Diuretics
- NSAID's
- Oral hypoglycemic agents
- ACE inhibitors
- ARB's
- PPI's

Sodium Requirement (mEq/L)

- Na^+ deficit is total body water ($\text{Kg} \times 0.6$) times (desired Na – Serum Na)

Hypertonic saline

- 513 mEq/L of NaCl

Normal saline

- 154 mEq/L of NaCl

Lactated ringers

- 130 mEq/L of Na^+

Evaluation

- BMP
- Urine spot Na^+ level (consider if SIADH suspected)
- Urine osmolarity (if SIADH suspected, which has inappropriately concentrated urine)
- Serum cortisol level if adrenal insufficiency suspected
- TSH and thyroid function tests if hypothyroidism suspected

Treatment Options

Chronic hyponatremia with mild to moderately severe symptoms

(Do not increase serum Na⁺ by more than 10–12 mEq/L in first 24 hours)

- Hypovolemia: IV NS
- Hypervolemia: restrict free water and sodium
- Euvolemia: restrict free water — may add Lasix (furosemide) short term

Acute hyponatremia — Na⁺ < 120 mEq/L with severe symptoms (or chronic hyponatremia with severe symptoms such as seizures, coma, severe altered mental status) consult physician

- 3% saline at 100 cc/hr × 2 hours and recheck serum sodium for adults
- Pediatric calculation of TBW (kg × 0.6) × 4 mEq/L = acute Na⁺ deficit to be replenished over 2 hours
- Do not raise Na⁺ acutely more than 4 mEq/L

Discharge Criteria

- Asymptomatic serum sodium > 125 mEq/L without comorbid conditions

Discharge instructions

- Follow up within 1–3 days for serum sodium < 130 mEq/L with primary care provider
- Hyponatremia aftercare instructions

Consult Criteria

- Serum sodium ≤ 125
- Comorbid conditions or symptoms
- Refer to [General Patient Criteria Protocol](#)

METABOLIC ACIDOSIS PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Disease process with an increase in plasma acidity

Differential Diagnosis

- See A CAT MUDPILES below

Considerations

Nonanion gap acidosis

- Diarrhea
- Renal tubular acidosis
- Carbonic anhydrase inhibitors — Diamox (acetazolamide)
- Hypoaldosteronism

Anion gap calculation

- Na^+ minus (HCO_3^- – Chloride)
- Normal range $5-12 \pm 3$ mEq/L

Respiratory compensation

- Expected pCO_2 is $1.5[\text{HCO}_3^-] + 8$
- If higher, then primary respiratory acidosis exists and there is inadequate respiratory compensation
- Death can result from intubation and ventilation that does not compensate for metabolic acidosis (or maintains sufficient respiratory compensation with hyperventilation if intubated)

Respiratory acidosis

- Acute: HCO_3^- increased by 1 mEq/L for each 10 mm Hg increase in pCO_2
- Chronic: HCO_3^- increased by 4 mEq/L for each mm Hg increase in pCO_2

Anion gap mnemonic — A CAT MUDPILES

A – Alcoholic ketoacidosis

C – Cyanide; carbon monoxide

A – Aspirin; other salicylates

T – Toluene

M – Methanol; metformin

U – Uremia

D – DKA

P – Paraldehyde; phenformin

I – Iron; INH

L – Lactic acidosis (dehydration or tissue ischemia commonly)

E – Ethylene glycol

S – Starvation

Osmolol gap > 10–20 suspect substance ingestion (Normal < 10)

- Gap = Osmolality measured – Osmolality calculated (calculation equation: $2(\text{Na}+\text{K}) + \text{glucose}/18 + \text{BUN}/2.8$; normal 280–300 mOsm/L)
- Ethanol mg%/4.6 is added to osmolol gap equation if present
- Gap > 50 carries high specificity for toxic alcohol such as methanol, ethylene glycol, or isopropyl alcohol
- Normal gap < 10
- Refer to Toxicology Protocol

Signs and Symptoms

- Tachypnea or Kussmaul respirations
- Tachycardia
- Confusion

Evaluation

- Complete history and physical examination
- CBC
- BMP
- ABG for
 - Severe acidosis
 - Altered mental status
 - Significant tachycardia
- Chest x-ray if indicated
- EKG if indicated

Treatment Options

- Treat underlying process
- $\text{pH} < 7.0$ can consider IV HCO_3^- (some controversy over degree of acidosis needing this treatment) — consult physician immediately
- See Adult and Pediatric Gastroenteritis Protocols

Discharge Criteria

- Resolving metabolic acidosis with treatable outpatient process
- $\text{HCO}_3^- > 17$
- Anion gap ≤ 18
- No significant comorbidities

Discharge instructions

- Aftercare instructions relevant to cause of acidosis
- Follow up with primary care provider within 1 day

Consult Criteria

- $\text{HCO}_3^- < 18$
- Anion gap ≥ 19
- Age ≥ 60
- Condition not likely to improve as outpatient
- Respiratory acidosis
- Hypotension or relative hypotension ($\text{SBP} < 105$ with history of hypertension)
- Toxic appearance
- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Head Trauma and Neck Pain

Section Contents

Adult Minor Head Trauma Protocol

Pediatric Minor Head Trauma Protocol

Neck Pain Protocol

ADULT MINOR HEAD TRAUMA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Head trauma with Glasgow coma scale ≥ 14 and no focal neurologic deficits or complaints

Differential Diagnosis

- Subarachnoid hemorrhage
- Subdural hematoma
- Epidural hematoma
- Cerebral contusion
- Skull fracture

Considerations

- Loss of consciousness (LOC), amnesia, headache, vomiting and seizures have low sensitivity and specificity for detecting intracranial injury
- Cervical spine exam and evaluation important
- Skull films mainly replaced by CT evaluation of adult head trauma — may consider skull films for laceration > 5 cm or that extends deep to the skull
 - Violent mechanism of injury
- Significant maxillofacial injuries can coexist

Concussion Definitions

Grade 1 concussion

- Transient confusion
- No LOC
- Duration of mental status abnormalities < 15 minutes

Grade 2 concussion

- Transient confusion
- No LOC
- Duration of mental status abnormalities > 15 minutes

Grade 3 concussion

- Loss of consciousness

Postconcussion Syndrome

- Symptoms of headache, dizziness, trouble concentrating days to weeks following a concussion and can persist for months
- Anxiety and depression reported by patients
- Issues of compensation and litigation associated at times with persistent symptoms
- Disequilibrium and vertigo from vestibular concussion
- Reassurance decreases incidence and duration of symptoms
- Avoid narcotics
- Can use mild analgesics
- Can use meclizine or Phenergan (promethazine) for vestibular symptoms
- Rarely seen in young children
- Countries with low litigation have low postconcussion syndrome disability

Evaluation

- CT brain scan for concussion with loss of consciousness
- CT brain scan for patients on Coumadin (warfarin) or Plavix (clopidogrel) with more than trivial injury
- Evaluate for other injuries, especially C-spine
- Retinal exam: hemorrhages present in 65–90% with abuse inflicted head injury
- Detailed neurologic exam
- INR if on Coumadin (warfarin)
- Suspected intracranial injury
- Glasgow coma scale < 15
- Evaluate for other injuries, especially C-spine
- Retinal exam: hemorrhages present in 65–90% with abuse inflicted head injury
- Detailed neurologic exam
- INR if on Coumadin (warfarin)

ENT exam

- Check for hemotympanum
- CSF rhinorrhea
- Battle's sign

- Cranial nerve palsy

New Orleans CT brain criteria (for ordering noncontrast CT brain) — EVIDENCE-BASED

- Normal neurologic exam and one of the following
 - Headache
 - Vomiting
 - Age > 60
 - Persistent anterograde amnesia
 - Drug or alcohol intoxication
 - Visible trauma above the clavicle
 - Seizure

Noncontrast CT brain scan for acute brain injury

(From ACEP/CDC Clinical Policy)

Order noncontrast CT brain scan

- Loss of consciousness
- No loss of consciousness with one of the following:
 - Headache
 - Vomiting
 - Age > 60 years
 - Persistent anterograde amnesia
 - Focal neurologic deficit
 - Coagulopathy
 - Drug or alcohol intoxication
 - Visible trauma above the clavicle
 - Posttraumatic Seizure
 - GCS < 15

Consider noncontrast CT brain scan with no LOC and one of following

- Signs of basilar skull fracture
- Age > 65 years
- Dangerous mechanism of injury (includes)
 - Motor vehicle ejection
 - Pedestrian struck by motor vehicle
 - Fall from > 3 feet or 5 stairs

Patients on warfarin

- Minor head trauma patients on warfarin with a normal initial CT brain, it is recommended that 24 hours observation and repeat CT brain scan be performed
- Higher risk with INR > 3.0 for delayed intracranial bleeding

Treatment Options

- Tylenol (no ASA or NSAID's for 36 hours)
- Avoid more potent analgesics so progression of symptoms can be detected
- Head injury instruction sheet
- Return for any neurologic changes
- Follow up with primary care provider or neurologist/neurosurgeon

Discharge Criteria

- Stable condition
- Normal neurologic exam
- No other significant trauma
- No radiologic abnormalities

Discharge instructions

- Head injury aftercare instructions

Consult Criteria

- Age > 65
- Bleeding potential from medications or preexisting disease processes
- Concussions with loss of consciousness should be discussed with physician
- Dementia
- Persistent vomiting
- Severe persistent headache
- Focal neurologic deficits
- Inadequate home observation

Reference:

Ann of Emergency Medicine, June 2012 (Vol. 59 | No. 6 | Pages 451-455)

PEDIATRIC MINOR HEAD TRAUMA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Head trauma with Glasgow coma scale ≥ 14 and no focal neurologic deficits or complaints

Differential Diagnosis

- Subarachnoid hemorrhage
- Subdural hematoma
- Epidural hematoma
- Cerebral contusion
- Skull fracture

Considerations

- Loss of consciousness (LOC), amnesia, headache, vomiting and seizures have low sensitivity and specificity for detecting intracranial injury
- Children < 2 years have a higher risk of skull fracture and intracranial injury after minor mechanisms of injury
 - Skull fracture associated with a 20-fold increase in intracranial injury
 - Most skull fractures are associated with scalp hematomas
- Scalp hematomas indicative of skull fractures is the most sensitive predictor of intracranial injury of the clinical signs of brain injury
- Infant's clinical signs of brain injury less reliable

Postconcussion Syndrome

- Symptoms of headache, dizziness, trouble concentrating days to weeks following a concussion and can persist for months
- Anxiety and depression reported by patients
- Issues of compensation and litigation associated at times with persistent symptoms

- Disequilibrium and vertigo from vestibular concussion
- Reassurance decreases incidence and duration of symptoms
- Avoid narcotics
- Can use mild analgesics
- Can use meclizine or Phenergan (promethazine) for vestibular symptoms
- Rarely seen in young children
- Countries with low litigation have low postconcussion syndrome disability

Evaluation

- Evaluate for other injuries besides head
- Retinal exam: hemorrhages present in 65–90% with abuse inflicted head injury
- ENT exam for:
 - Hemotympanum
 - CSF rhinorrhea
 - Battle's sign
 - Cranial nerve palsy
- Awake, alert and asymptomatic children without LOC usually do not require imaging

CT brain scan

- With loss of consciousness > 30 seconds
- Vomiting
- Severe headache
- Seizure
- Disorientation
- Glasgow coma scale < 15
- Irritability
- Acute focal neurologic deficits
- Slurred speech
- Abnormal gait
- Drowsiness
- Suspected intracranial structural injury
- Have a lower imaging threshold for age < 1–2 years
- Consider CT for asymptomatic infants age < 2–3 months if mechanism more than trivial or a scalp hematoma is present

Treatment Options

- Tylenol (no ASA or NSAID's for 36 hours)
- Avoid more potent analgesics so progression of symptoms can be detected
- Quiet play or activities can be resumed if no significant symptoms
- Head injury instruction sheet
- Return for any neurologic changes
- Follow up with primary care provider or neurologist

Discharge Criteria

- Stable condition
- Normal neurologic exam
- No other significant trauma
- No radiologic abnormalities

Discharge instructions

- Head injury aftercare instructions
- Refer or arrange for follow-up with primary care physician or provider for concussion

Consult Criteria

- Concussion
- Skull fracture
- CT findings of intracranial injury
- Acute neurologic abnormalities
- Intracranial bleeding potential
- Persistent vomiting
- Severe persistent headache
- Focal neurologic deficits
- Inadequate home observation
- Serial visits for head injury symptoms

Concussion Definitions and Return-to-sports Recommendations

Grade 1 concussion

- Transient confusion
- No loss of consciousness (LOC)
- Duration of mental status abnormalities < 15 minutes
- Return to sports activities same day if all symptoms resolve within 15 minutes

- If second grade 1 concussion occurs then no sports activities until asymptomatic for 1 week

Grade 2 concussion

- Transient confusion
- No LOC
- Duration of mental status abnormalities > 15 minutes
- No sports activities until asymptomatic for 1 week
- If grade 2 concussion occurs same day as a grade 1 concussion then no sports activities until asymptomatic for 2 weeks

Grade 3 concussion

- Loss of consciousness
- No sport activities until asymptomatic for 1 week if LOC was for seconds
- No sports activities until asymptomatic for 2 weeks if LOC minutes or longer

Second grade 3 concussion

- No sport activities until asymptomatic for 1 month
- If intracranial pathology detected on CT, then no sports activities for the remainder of the season and discouraged from any future contact sports ever

NECK PAIN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Various disorders causing neck pain

Differential Diagnosis

- Muscle strain
- “Whiplash” injury
- Cervical fracture
- HNP
- Soft tissue infection
- Retropharyngeal abscess
- Cervical lymphadenitis
- Spinal stenosis
- Rheumatoid arthritis
- Endocarditis
- Thoracic outlet syndrome

Considerations

- Common neck pain causes
 - Torticollis (“wry neck”) from muscle spasm
 - Cervical disc disease
 - Soft tissue disorder
 - Cervical spine injury
 - Muscular and ligament strain
 - Ankylosing spondylitis
 - Can have cranial–cervical disassociation
 - Put in Philadelphia or rigid cervical collar
 - Exercise caution with patient’s neck

Torticollis

- Discomfort caused by cervical spine motion
- May be secondary to:
 - C-spine injury
 - Muscle injury
 - Ligamentous injury

- Usually acute in children and of muscular etiology
- Infectious causes
 - URI
 - Cervical adenitis
 - Pharyngitis
 - Retropharyngeal abscess
 - Measurements of retropharyngeal space:
 - At C2: < 7 mm
 - At C6: < 22 mm in adults; < 14 mm in children
 - Epiglottitis
 - Upper lobe pneumonia
 - Meningitis

Evaluation

- Neurologic and neck exam
- If fever present order
 - CBC
 - Soft tissue neck films
 - C-reactive protein if diagnosis not evident
 - CT neck for severe pain and possible deep space infection
- No fever
 - C-spine plain films if injured
 - CT C-spine scan if
 - Significant pain and mechanism of injury
 - Neurologic deficit or complaint

Treatment options

- Benign infectious processes treat per Protocols
- Benign muscular etiology treat with NSAID's and heat or ice
- I&D superficial neck abscess

Discharge criteria

- Benign process
- Chronic stable condition
- Cervical radiculopathy controlled with analgesics

Consult criteria

- Fever
- Meningitis concerns
- Airway concerns

- Severe pain
- Epiglottitis
- Retropharyngeal abscess
- Neurologic deficit

Neck Trauma

Penetrating neck trauma

- Consult physician unless very superficial laceration
- Do not explore Zone 2 penetrating deep neck injuries
 - Angle of mandible to cricoid cartilage
 - Consult physician/surgeon

Cervical spine trauma

- Leave cervical collar on until patient examined and cleared
- Plain C-spine x-ray 3 views

Exclusionary criteria for C-spine films

- No neurologic deficit
- No distracting injuries
- No evidence of intoxication
- Normal mentation
- No posterior midline tenderness

CT C-spine indications

- Moderate to high risk of cervical fracture
- Significant mechanism of injury
- Fracture on plain C-spine films
- Neurologic deficit or complaint
- Inadequate plain C-spine films
- Severe neck pain with normal plain C-spine films
- Patient will not move neck actively (on their own) without external support of patient's hands ("head in hand sign")
- Obtunded patients

Flexion-extension plain films

- Significant pain with negative plain and CT imaging
- Evaluates for ligamentous instability

Treatment options

- If C-spine cleared: analgesics and ice packs prn

Discharge criteria

- Benign neck injury
- No fracture

Discharge instructions

- Neck pain or injury aftercare instructions
- Refer to primary care provider or neurosurgeon within 3 days if not improving
- Avoid discharging with cervical collar if possible

Consult criteria

- Cervical fracture or dislocation/subluxation
- Neurologic deficit or complaint
- Significant pain
- Significant mechanism of injury

HEENT

Section Contents

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Dental Pain Protocol

SORE THROAT PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Pain located or perceived in the throat or anterior neck region

Differential Diagnosis

- GABHS (Group A beta-hemolytic streptococcus)
- Mononucleosis
- Gonococcal pharyngitis
- Peritonsillar abscess
- Epiglottitis
- Retropharyngeal abscess
- Diphtheria (rare)
- Cervical lymphadenitis
- Thyrotoxicosis
- Gastroesophageal reflux

Considerations

- Viral 40%
- Bacterial 30%
- Strep throat – Group A beta-hemolytic Strep (GABHS)
 - 15–30% childhood pharyngitis
 - 5–10% of adult pharyngitis
 - Peak ages 4–11 years
 - Peak months January – May
 - Associated symptoms and findings
 - Sudden onset
 - Odynophagia
 - Fever
 - Headache
 - Abdominal pain
 - Nausea and vomiting;
- Viral pharyngitis
 - Cough
 - Rhinorrhea

- Lack of cervical adenopathy

Viral Pharyngitis

URI

- Treat symptomatically

Mononucleosis

Findings

- Exudative tonsillitis
- Fever
- Posterior cervical chain lymphadenopathy considered diagnostic
- Monospot
 - 90% sensitive age > 5 years
 - 75% sensitive age 2–4 years
 - Less than 30% sensitive age < 2 years
- CBC: 50% lymphocytes, 10% atypical lymphocytes
- Liver function tests elevated in 80–85% of patients up to 3 times normal
- Splenomegaly
- Hepatomegaly
- Encephalitis
- Meningitis

Treatment options

- Treat symptomatically
- No contact sports or gym for 4 weeks after onset of illness
 - Follow up with primary care provider before resuming sports or gym
- Ampicillin or amoxicillin rash can occur if prescribed
- Steroids may decrease symptoms and swelling but may also delay recovery and there is a concern for association with development chronic EBV syndrome
- Steroid dosing if used:
 - Adult or patients heavier than 40 kg: prednisone 40 mg PO daily for 4 days
 - Pediatrics: prednisone 1 mg/kg PO daily for 4 days (NMT 40 mg)

Strep throat — GABHS

- Rheumatic fever can be prevented if antibiotic

treatment started within 9 days of onset

- Glomerulonephritis cannot be prevented with antibiotic treatment

Evaluation

Centor criteria

- Tonsillar exudates
- Tender anterior cervical lymphadenopathy
- Fever by history
- Absence of cough
 - If 3 present: 40–60% have GABHS
 - If 3 or 4 absent: 80% negative predictive value
 - None or one criterion present: No testing or treatment needed for GABHS

Consider Rapid Strep Tests

- Sensitivity 85–95%
- Specificity 96–99%
- May be positive with carriage state and another cause of acute pharyngitis besides GABHS may exist

Treatment options

- Per Sanford Guide
- Pen VK
- Cephalexin
- Erythromycin or Zithromax (azithromycin) if penicillin allergic (increasing resistance has occurred to macrolides such as azithromycin)
- Steroids one dose
 - Prednisone 40–60 mg PO > 40 kg
 - Prednisone or prednisolone 1 mg/kg PO (NMT 60 mg)
 - Decadron (dexamethasone) 10 mg IM if unable to take PO
 - Decadron (dexamethasone) 0.06 mg/kg IM (NMT 10 mg) if unable to take PO

Epiglottitis or suspected epiglottitis

- Now more common in adults than children
- Constitutes an airway emergency — consult anesthesia
- Do not agitate or aggressively exam

- If patient is in distress
- Drooling present
- Tripod position or sniff position present
- Pain on moving thyroid cartilage
- Lateral neck films findings — only obtain in stable patient
 - Thumb sign
 - Vallecula sign — loss of vallecula
 - Review or listen to radiology report
- Notify physician promptly before x-ray if epiglottitis suspected or patient in distress

Peritonsillar abscess

- Sore throat 100%
- Fever 26–97%
- Voice change
- Dysphagia
- Drooling
- Headache
- Trismus
- Uvular deviation and peritonsillar bulge
- Neck CT scan may be required to delineate abscess from necrotic lymph node
- Notify physician if diagnosed or suspected

Retropharyngeal abscess

- Usually age 3–5 years

Complications

- Airway compromise
- Aspiration pneumonia
- Internal jugular vein thrombosis
- Carotid artery erosion
- Cranial nerve palsies

History and findings

- Fever
- Dysphagia
- Decreased oral intake
- Stridor or dyspnea
- Neck swelling
- Neck motion pain

- Ill appearing
- Duck-like voice

X-ray findings

- Neck CT scan much more sensitive than lateral neck plain films
- Lateral soft-tissue neck films (neck flexion may cause false positive reading)
- Retropharyngeal space anterior to C2 > 7 mm or > half the width of vertebral body
- Space anterior to C6 > 14 mm in preschool children or > 22 mm in adults

Treatment

- Supplemental oxygen (avoid patient agitation)
- Keep child calm
- Notify physician promptly

Discharge Criteria for Sore throat

- Nontoxic
- No airway obstruction concerns
- Can tolerate oral intake
- Benign diagnosis

Discharge instructions

- Sore throat or pharyngitis aftercare instructions
- Follow up with primary care provider or ENT surgeon within 5 days as needed

Consult Criteria for Sore throat

- Airway compromise
- Toxic
- Dehydration > 5%
- Suspected epiglottitis
- Peritonsillar or retropharyngeal abscess
- Unable to tolerate oral intake
- Immunosuppression

Vital signs consult criteria

- Adult heart rate ≥ 110
- Pediatric heart rate
 - 0–4 months ≥ 180

- 5–7 months ≥ 175
- 6–12 months ≥ 170
- 1–3 years ≥ 160
- 4–5 years ≥ 145
- 6–8 years ≥ 130
- 7–12 years ≥ 125
- 12–15 years ≥ 120
- 16 years or older ≥ 115
- Hypotension
- O₂ saturation < 95% on room air

Lab consult criteria

- WBC $\geq 18,000$ or $< 3,000$
- Bandemia $\geq 15\%$
- Acute thrombocytopenia
- Metabolic acidosis

OTITIS EXTERNA PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Inflammation of the external auditory canal

Differential Diagnosis

- Auditory canal foreign body
- Otitis media
- Chondroma
- Herpes zoster

Considerations

- Caused by breakdown in protective barrier of ear canal
 - Pseudomonas; staph; strep species; fungi
- Pain increased with movement of external ear or touching external ear canal
- Discharge common
- Fever uncommon

Malignant Otitis Externa

- Elderly
- Diabetes
- Immunocompromise (pseudomonas frequent concern)
- Marked swelling
- Headache
- Possible cranial nerve deficit

Evaluation

- Usually none except otoscope and external ear exam
- Serum glucose if diabetic
- Suspected malignant otitis externa
 - CBC
 - C-reactive protein
 - Cultures

CT scan indications

- Neurologic abnormalities
- Toxic appearing patient
- Malignant otitis externa
- Fever

Treatment Options

- Clean ear canal (most important aspect of treatment)
- Irrigate or ear loop curettage (may be difficult due to pain)
 - Use ½ peroxide and ½ water (or water only) — if TM (tympanic membrane) visible and intact (keep liquid near body temperature)
- Can use ear wick if canal markedly swollen — remove in 3 days; replace if canal still very swollen
- NSAID's or narcotics prn

Antibiotic choices

- Acetic acid 2% (Domeboro otic) 4–6 drops q4–6h for 7–10 days or until ear canal normal for 2 days
- Cortisporin otic suspension or solution (has neomycin which can cause allergy) 4 drops qid for 7–10 days or until ear canal normal for 2 days (use suspension if tympanic membrane (TM) perforated)
- Ofloxin 5 drops bid for 7–10 days or until ear canal normal for 2 days (drug of choice for TM perforation)
- Oral antibiotics for facial or neck cellulitis, significant edema of ear canal, or when TM (tympanic membrane) cannot be visualized
- Diabetics may be treated also with ciprofloxacin PO for 10–14 days
- May use Sanford Guide

Discharge Criteria

- Benign otitis externa

Discharge instructions

- Otitis externa aftercare instructions
- Keep ear dry for 3 weeks (no swimming)
- Prophylaxis for future OE after swimming with rubbing alcohol or acetic acid 2% if no TM (tympanic membrane) perforation
- Follow up with primary care provider or ENT surgeon within 7–10 days if needed

Consult Criteria

- Malignant external otitis (needs ENT consultation and IV antibiotics only — no topical antibiotics)
- Fever
- Return visit for same episode
- Glucose ≥ 400 mg/dL in diabetic patient
- Hyperglycemia with metabolic acidosis (decreased serum CO₂ or elevated anion gap)

EYE PROTOCOLS

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

- Most conjunctival infections are viral
- Allergic manifestations common
- Contact lens keratitis can be bacterial or from oxygen deficit of cornea

Evaluation

- Visual acuity if complaints of decreased vision
- Examination of
 - Conjunctiva
 - Cornea
 - Pupils
 - Extraocular motion
 - Any discharge
 - For consensual photophobia (light shined in unaffected eye causes pain in affected eye — have affected eye closed during exam)
 - Periorbital tissues
 - Anterior and posterior chambers
 - Visual fields examination as indicated
- See specific conditions below

Conjunctivitis

Allergic

- Itching and redness; watery
- Papillary hypertrophy

Treatment options

- Systemic antihistamine
- Remove offending agent if known
- Choices:
 - Naphcon-A ophthalmic 1–2 drops qid prn
 - Ketorolac ophthalmic 1 drop qid prn
 - Low dose steroid eye drops prn — short course

- Dexamethasone ophthalmic 1–2 drops tid-qid prn or similar ophthalmic steroid
- Contraindications:
 - Herpes simplex infection (corneal dendrite)
 - Glaucoma
 - Fungal infection

Discharge criteria

- Benign presentation and findings

Consult criteria

- Photophobia
- Visual changes

Viral

- Adenovirus most common
- Watery mucus discharge
- Gritty or foreign body sensation
- HSV: vesicles eyelid margins or periorbital skin; corneal dendrites

Treatment options

- Usually no specific therapy
- Artificial tears prn
- HSV
 - Viroptic ophthalmic drops 1 gtt q2h not to exceed 9 gtts qday
 - Consult physician for herpes infection
 - Ophthalmology referral within 1 day for HSV infection

Bacterial

- Purulent discharge
- Staph most common
- Gonorrhea: profuse purulent discharge
- Chlamydial: mucopurulent discharge; photophobia occasionally
- Contact lens: pseudomonas possible

Treatment options

Common drugs

- Erythromycin eye ointment
- Sulfa eye drops

- Gentamicin eye drops
- All medications given for 7 days

Contact lens complications

- Remove lens until eye normal for 2 days
- Ciloxan 1–2 drops QID × 7 days
- Consult physician

Chlamydia

- Doxycycline 100 BID × 3 weeks
OR
- Erythromycin 500 mg QID PO × 3 weeks
(erythromycin pediatric dose 50 mg/kg PO divided into 4 doses × 14 days — NMT 500 mg per dose)
- Mother of children and other close contacts at risk — treat with doxycycline 100 mg BID × 7 days in age > 8 years, otherwise erythromycin treatment

Gonococcal

- Doxycycline 100 BID × 3 weeks or erythromycin 500 mg QID PO × 3 weeks
- Rocephin (ceftriaxone) 1000 mg IM (can be given daily for 3 days)
- Neonates: Rocephin (ceftriaxone) 50 mg/kg IV daily for 7 days; erythromycin eye ointment QID × 14 days
- May use Sanford Guide

Discharge criteria

- Benign, non-herpetic conjunctivitis

Discharge instructions

- Conjunctivitis aftercare instructions
- Follow up with primary care provider or ophthalmology within 1 day for contact lens complications, gonococcal or chlamydial infections
- Consult criteria
- Visual change
- Photophobia
- Suspected gonococcal or chlamydial infection
- Significant pain
- Contact lens complications

Infectious Keratitis

Causes

- HSV
- Staph
- Herpes zoster

Evaluation

- Direct visualization
- Fluorescein staining and wood's lamp
- Look for dendritic lesions

Treatment options

HSV

- Viroptic 1 drop q2hr while awake (NMT 9 drops qday)
- Follow up with ophthalmologist within 24 hours

Bacterial (all treatments for 7 days)

- Erythromycin eye ointment
- Sulfa eye drops
- Gentamicin eye drops

Discharge instructions

- Appropriate keratitis aftercare instructions if discharged

Consult criteria

- All infectious keratitis

Blepharitis, Hordeolum (Stye) and Chalazion

Stye

- Painful, swollen, tender and red on eyelid
- Staph 90–95% of the time
- Usually will drain spontaneously

Treatment options

- Warm soaks 3–4 days a day until resolved
- Erythromycin eye ointment or sulfa eye drops or gentamicin eye drops (all for 7–10 days)

- Clean eyelid margins with baby shampoo
- Refer to ophthalmologist in 10–14 days if not resolved

Chalazion

- Treatment similar to Sty

Blepharitis

- Treatment similar to Sty

Discharge instructions

- Appropriate aftercare instructions

Periorbital (Preseptal) Cellulitis

- Usually from *S. aureus*
- More common in children
- Age < 3 years can progress to bacteremia
- Is anterior to orbital septum

Signs

- Red swollen eyelid
- No vision changes
- Ocular mobility normal
- Conjunctival discharge may be present
- May have minimal pain
 - More severe with orbital cellulitis and helps to differentiate between the two
- Chemosis (conjunctival swelling)
- Fever

Evaluation

- Detailed ocular exam
 - Anterior and posterior chambers
 - Extraocular motion
 - Pupillary examination
 - CT scan may be needed if unable to differentiate from orbital cellulitis
- CBC and blood culture if age < 5 years
- Culture of eye discharge if present

Treatment options

- Augmentin (amoxicillin/clavulanate) 45 mg/kg/day divided bid PO for 10–14 days
- Vancomycin
- Rocephin (ceftriaxone)
- May use Sanford Guide

Discharge instructions

- Periorbital or preseptal cellulitis aftercare instructions
- Follow up in 24 hours with PCP or ophthalmologist

Orbital Cellulitis

- Most commonly from ethmoid sinusitis spread

Findings and symptoms

- May have toxic appearance
- Proptosis
- Limited extraocular motion
- Diplopia
- Significant pain
- Dark red eyelids
- Decreased vision
- Increased intraocular pressure

Complications

- Meningitis
- Cavernous sinus thrombosis
- Vision loss

Evaluation

- Detailed ocular exam
 - Anterior and posterior chambers
 - Extraocular motion
 - Pupillary examination
 - CT scan may be needed if unable to differentiate from orbital cellulitis
- CBC and blood culture if age < 5 years
- Culture of eye discharge if present

Treatment

- Ceftin (cefuroxime) IV and/or per Sanford Guide
- Admission to hospital

Consult criteria

- All suspected or diagnosed orbital cellulitis patients

Corneal Ulcer or Lesions

- Consult physician

Discharge instructions

- Corneal ulcer aftercare instructions

Iritis

- Photophobia — is consensual (light shined into opened normal eye causes pain in closed affected eye due to pupillary reflex)
- Ciliary flush (red injection at edge of cornea circumferentially)
- Cells and flare in anterior chamber; hypopyon more rare
- Miosis
- 50% associated with systemic disease
- Slit lamp exam helpful

Treatment

- Homatropine eye drops 2–5% 1 drop TID
- Steroid eye drops per ophthalmologist
- Consult physician

Discharge instructions

- Iritis aftercare instructions
- Close ophthalmology follow-up

Corneal Abrasion

- Can detect with direct ophthalmoscopy or fluorescein staining
- No consensual photophobia unless iritis present
- Heals in 24–48 hours
- If corneal pain recurs in 2–3 days, it may indicate sloughing of corneal epithelium

Treatment

- No patching
- Can use local anesthetic eye drops at time of exam only (do not prescribe for home pain control since it is

mildly cytotoxic and will prevent healing)

- Narcotics PO prn × 2–3 days

Extensive corneal abrasion

- Homatropine 2% sol 1–2 gtt to achieve cycloplegia (pupil dilation) — may repeat q15 min. × 2 prn
- Can prescribe 1–2 gtt QID up to 3 days

Discharge instructions

- Corneal abrasion aftercare instructions
- Follow up in 2–3 days for recheck with primary care provider or ophthalmologist

Ultraviolet Keratitis (Band Keratitis)

- Usually from welding or tanning beds
- Acular (ketorolac) or Voltaren (diclofenac) eye drops 1 gtt QID for several days until eye corneal pain resolved (not longer than 2 weeks)
- Similar evaluation and treatment as corneal abrasion

Discharge instructions

- Ultraviolet (flash burn) keratitis aftercare instructions

Eye Foreign Body

- Usually a foreign body sensation is the chief complaint
- Anesthetic eye drops with proparacaine or tetracaine immediately relieves symptoms for 15 minutes or so
- Patient may or may not be able to localize the foreign body

Examination

- Evert eyelids as needed to locate the foreign body
- If foreign body is not identified, flush under eyelids with eye irrigation fluids to see if symptoms can be resolved
- If foreign body persists after eye flush, use moistened sterile cotton swab to gently swab under eyelids to see if any foreign bodies are found or the patient's symptoms of foreign body sensation resolve
- Check lacrimal duct opening for retained eyelash

Discharge criteria

- Foreign body removed
- No visual changes or significant residual discomfort

Discharge instructions

- Eye foreign body aftercare instructions

Consult criteria

- Retained intraocular foreign body, discuss with physician
- Significant residual pain post foreign body removal
- Acute visual changes or complaints

Corneal Foreign Bodies

- If an iron containing metallic foreign body is present, a rust ring may develop in a few hours
- Examine anterior and posterior ocular chambers — if abnormal discuss with physician or ophthalmologist
- Fluorescein staining can be used as needed to locate foreign bodies and abrasions
- The Provider may opt to not remove small residual rust rings outside of visual axis, and refer to an ophthalmologist for further treatment in 1–3 days

Removal instructions

- After 3–4 drops of eye anesthetic over 1 minute are instilled into the affected eye and the patient has no further complaints of a foreign body sensation or pain, a sterile moistened cotton swab is used to swab across the foreign body to effect removal
- If the cotton swab does not remove the corneal foreign body, an experienced Provider may use a blunt eye spud or eye burr to remove the foreign body
- Consult a physician if not experienced with using a blunt eye spud or eye burr
- If a metallic foreign body has rusted, a residual rust ring will be left after the majority of the central rust area has been removed with the cotton swab
 - A blunt eye spud or eye burr can be used to remove some of the residual rust left, although it is not unusual to not be able to remove it all
- Fresh rust rings are more difficult to remove and after sterile cotton swabbing the residual rust ring can be left to mature in 1–3 days and the patient can then be referred to an ophthalmologist for follow-up

Discharge instructions

- Corneal foreign body aftercare instructions
- Refer to ophthalmology within 3 days
- Return if pain worsens, or photophobia or visual changes develops

Consult criteria

- Discuss with the physician if the residual rust is in the visual axis

Corneal Laceration

- Protective rigid eye shield
- Consult physician and ophthalmologist immediately
- Analgesia and vomiting control IM or IV prn to decrease valsalva

Eyelid Lacerations

Findings to discuss with physician (usually needs referral treatment)

- Tarsal plate involvement
- Eyelid margin
- Tear duct injury
- Orbital septum injury
 - Fat can protrude
- Tissue loss

Globe Injury

- History is important of what patient was doing at time of injury
- Globe injury can be obvious with uveal tissue prolapsing from a wound or pupil, or the eye or papillary shape can be grossly abnormal, or the injury may be subtle
- Small eyelid lacerations can cover or mask perforations of globe
 - Do not close laceration until globe injury is ruled out
- Assess eye motion and visual acuity
 - Visual acuity can be counting fingers at 18 inches or light perception if necessary
 - Critical to avoid pressure on the eye
 - Palpate orbital rims for deformity and crepitus
 - Do not remove any foreign bodies that have

penetrated the globe

- Conjunctival hemorrhage covering 360 degrees of the bulbar conjunctiva can indicate globe rupture
- Assess pupils for size, shape, afferent defect, direct and indirect pupillary light reflex and the red reflex
- Examine anterior chamber
- CT orbital scans are the preferred imaging to evaluate for occult globe injury

Treatment

- Place protective rigid eye shield immediately after assessment

Disposition

- Consult physician and ophthalmologist immediately
- Analgesia and vomiting control IM or IV prn to decrease valsalva and minimize intraocular pressure increases

Chemical Eye Injuries

Alkali burns most serious

- Causes immediate liquefaction necrosis if the pH is very high
- Penetrates the tissue deeply
- Immediate eye lavage with NS for one hour (Morgan lens)
- Exam after lavage
- Notify physician promptly

Acid burns

- Cause coagulation of proteins which can limit depth of injury
- Can use fluorescein to evaluate cornea (exam after lavage if needed)
- Weak acids burns usually managed as outpatient

Evaluation

- Inspection
- After lavage if strong alkali: fluorescein or slit lamp
- Check visual acuity

Treatment

- Significant burns flush with NS using Morgan lens for 30–60 minutes
- Check pH at 5 and 30 minutes of eye lavage to achieve pH 7.3–7.5
- Mild burns with weak acids can be lavaged less (with or without Morgan lens) depending on symptoms
- Use topical eye anesthetic for pain of examination and treatment as needed
- Gentamicin plus erythromycin or bacitracin ophthalmic ointment tid × 5–10 days or until healed for significant chemical burns
- Mild burns without significant damage can be managed with one topical eye antibiotic ointment
- Narcotics or NSAID's PO prn pain

Discharge criteria

- Mild conjunctivitis and keratitis from weak acid chemical burns
- Discuss with physician all chemical eye injuries

Discharge instructions

- Chemical eye injury aftercare instructions
- Refer to ophthalmologist within 1 day if indicated

Consult criteria

- Alkali burns
- Acid burns of moderate or worse severity
- Visual acuity changes

Glaucoma

- Severe pain, ipsilateral visual defects and may see halos around objects
- Nausea and vomiting common with acute closed angle glaucoma
- Steamy and cloudy cornea
- Increase IOP (normal IOP 10–22 mm Hg)
- Mid-dilated pupil and firm globe
- Consult physician promptly

Orbital Blowout Isolated Fracture

- Orbital wall composed of 7 bones
- Occurs usually with larger object than the orbit (baseball;

fist)

- Can result in diplopia

Evaluation

- Neurologic exam
- Extraocular motor exam
- Evaluate for associated ocular injuries (present 20–40% of the time)
- Plain facial (water's view best) or CT orbital films
- CT brain scan as per head injury protocols
- Ocular anterior and posterior chamber exam
- TM's (tympanic membrane) exam for hemotympanum
- Grasp upper teeth and palate and pull to assess for Lefort fractures (movement noted)
- Dental exam
- C-spine films prn (see Neck Pain Protocol)

Treatment

- Most patients can be followed as outpatient with plastic surgeon or ophthalmologist in a timeframe determined by the surgeon
- Discuss with physician
- No nose blowing
- Augmentin (amoxicillin/clavulanate) 500 mg TID PO × 10 days or Levaquin (levofloxacin) 750 mg qday PO × 10 days
- Pediatric Augmentin (amoxicillin/clavulanate) dose — 12.5 mg/kg PO bid × 10 days
- Analgesics PO prn
- Ice prn for swelling
- Tetanus if not up to date (see [Tetanus Protocol](#))

Discharge criteria

- Uncomplicated inferior blowout fracture without extraocular muscle entrapment or other facial fractures or associated conditions

Discharge instructions

- Head injury aftercare instructions
- Orbital blowout fracture aftercare instructions
- Referral to Ophthalmology or plastic surgeon within 7 days

Consult criteria

- Discuss all facial fractures except nasal with physician

Subconjunctival Hemorrhage

- No treatment
- Check PT/INR if on Coumadin (warfarin)
- CBC if constitutional symptoms present

Retinal Detachment

Causes

- Tear in retina

Risk factors

- Near sighted
- Advanced age
- Diabetes
- Sick cell anemia
- Prior retinal detachment history

Findings and symptoms

- Painless
- Light flashes
- Decreased peripheral vision
- Floaters
- Lowering of curtain over vision in affected eye

Examination includes

- Direct ophthalmoscopy (may need pupils dilated)
- Bedside ultrasound with vascular probe can detect retinal detachment

Treatment

- Elevate head of bed for inferior detachment
- Lay flat for superior detachment

Consult criteria

- Consult physician and ophthalmologist promptly

Central Retinal Artery Occlusion

- True emergency

- Usually from emboli
- 90 minutes to restore vision before irreversible damage
- Evaluate for sickle cell anemia and temporal arteritis

Findings

- Sudden loss of vision in one eye
- Pupil reacts consensually
- Afferent defect to light in affected eye (pupil does not constrict)
- Increased intraocular pressure
- Pale fundus
- Dilated pupil
- Retinal artery may have “box cars” appearance
- Macula has enhanced cherry red appearance (different blood supply)

Treatment

- Gentle massage on globe to attempt dislodging emboli
- Rebreathing bag or mask to increase CO₂

IOP treatment

- Timoptic (timolol)
- Diamox (acetazolamide)
- Ophthalmology paracentesis of anterior chamber

Consult criteria

- Notify physician immediately
- Ophthalmologist consult immediately

Central Retinal Vein Occlusion

- Rapid and painless vision loss of one eye
 - Slower onset than retinal artery occlusion
 - From thrombosis of central retinal vein

Findings

- Retinal hemorrhages
- Impressive appearance of fundus with bloody engorgement
 - Optic disc edema

Treatment

- Aspirin

Consult criteria

- All central retinal vein occlusion patients
- All patients with acute vision loss

Hyphema and Hypopyon (Blood or Pus in Anterior Chamber)

- Consult physician

NOSEBLEED PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Definition

- Bleeding from nostril, nasal cavity or nasopharynx

Differential Diagnosis

- Nasal foreign body
- Sinusitis
- Barotrauma
- Thrombocytopenia
- Leukemia
- Anticoagulation therapy
- Cocaine abuse
- NSAID use
- ASA use
- Hemophilia
- Von Willebrand's disease
- Trauma

Considerations

- 90% of nosebleeds are anterior
- Most common cause is nose picking
- Hypertension common
- Look for foreign body in young children (suspect if foul smell or discharge present)
- Posterior Epistaxis
 - Less common than anterior Epistaxis
 - Associated with
 - Elderly
 - Hypertension
 - Atherosclerosis

Evaluation

- Attempt visualization of bleeding
- Use nosebleed tray equipment or otoscope
- Have patient clear blood by forcefully blowing nose

- Use suction prn
- Cocaine intranasally can be used for hemostasis and pain control
- If bleeding has stopped and site unknown, take moistened cotton swab and gently stroke suspected area to elicit bleeding
- CBC if suspected significant blood loss or patient is tachycardic or orthostatic
- PT/INR if on Coumadin (warfarin). PTT if on heparin or has Von Willebrand's disease or hemophilia

Treatment Options

- Control anterior nosebleed by pinching all of nose below nasal bone up to 2–4 minutes
- May treat hypertension if $> \text{SBP } 180$ or $\text{DBP } > 110$
 - Repeat BP 10–15 minutes initially, before treatment, to see if BP decreases sufficiently without medication
 - Treat initial $\text{SBP } > 210$ or $\text{DBP } > 120$ if actively bleeding
- IV NS if vital signs or CBC reflect significant bleeding (notify physician promptly)

Silver nitrate

- Silver nitrate stick cautery directly on bleeding site for 5–7 seconds, and then in a circle around bleeding site, holding 5–7 seconds each spot, to form a solid eschar
 - Then hold 2 dry cotton swabs side by side for 60 seconds over cauterized area with enough pressure to stop any bleeding (usually mild pressure is all that is needed)
 - May repeat in places that continue bleeding with more cautery and cotton swabs pressure until bleeding stops

Additional treatments

- Use Rapid Rhino anterior or posterior balloons (or similar intranasal balloons) if silver nitrate cautery not used or ineffective
- Can also use Merocel packing
- Afrin type nasal spray can be used for hemostasis
- Epistaxis thrombin kit for intranasal application
- Septra DS or sinusitis medication Rx per Sanford Guide for 5–7 days if packing or balloon used

Discharge Criteria

- Successful treatment of bleeding
- Anterior nosebleed
- Hemodynamically stable
- No respiratory distress

Discharge instructions

- Nosebleed or epistaxis aftercare instructions
- Packing removal in 2–3 days
- Refer to ENT or primary care provider in 2–3 days
- Antibiotic ointment twice a day for 7–10 days for cautery or after packing removed — gently applied

Consult Criteria

- Unable to stop bleeding
- Posterior nasal bleeding or packing
- Significant blood loss per CBC or vital signs abnormalities
- Tachycardia or orthostatic vital signs
- Coagulopathy secondary to Coumadin (warfarin) or other causes
- Bleeding site not identified or not known whether anterior or posterior

Vital signs and age consult criteria

- Adult HR > 105
- SBP < 90 or relative hypotension (SBP < 105 with history of hypertension)
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Lab consult criteria

- Acute hemoglobin decrease of > 1 gm

- Hemoglobin < 10 gm
- Thrombocytopenia
- INR > 1.2
- PTT > 1.2 times normal

ENT EMERGENCY PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Ludwig's Angina

Definition

- Cellulitis (occasionally abscess) involving submandibular and sublingual spaces

Considerations

- Mortality has declined to < 10% since penicillin was introduced
- Can result in elevation of tongue to obstruct airway
- Increased association with diabetes; SLE; neutropenia; alcoholism
- Polymicrobial infection is usual
- Infection of 2nd and 3rd molars most common cause — 80% of cases
- Is a clinical diagnosis
- Assess airway status — may need anesthesia or ENT if difficult intubation likely
- Ability of tongue to be protruded beyond vermillion border excludes sublingual space infection

Signs

- Bilateral submandibular swelling – All
- Elevated or protruding tongue – 19/20
- Fever – 9/10
- Increased WBC – 17/20
- Recent dental extraction or toothache – 8/10
- Neck swelling – 7/10
- Dysphagia – 5/10
- Trismus – 5/10
- Neck pain – 1/3
- Respiratory (stridor; dyspnea; tachypnea) – 7/20
- Dysphonia and dysarthria – 1/5

Evaluation

- Is a clinical diagnosis

- Airway management takes precedence over testing
- CT scanning best modality if needed
- Soft tissue neck and panorex useful when CT not available
- CBC
- BMP

Treatment options

- Antibiotics effective
 - Penicillin + Flagyl (metronidazole)
 - Unasyn
 - Clindamycin
- Surgery
 - Needed 20–65% of time
 - If abscess identified
- Airway management if needed
 - Endotracheal intubation
 - Cricothyroidotomy by physician
 - Notify physician immediately if suspected airway compromise

Complications

- Aspiration
- Mediastinitis
- Pneumonia
- Empyema
- Bacteremia
- Septic emboli
- Pericarditis
- Cavernous sinus thrombosis
- Cerebral abscess

Consult criteria

- All Ludwig's angina cases
- If imminent airway concern, notify physician immediately

Angioedema of Oropharyngeal Area

Considerations

- Affects deeper tissues
- Localized non-pitting edema

- 25% of population experiences urticaria or angioedema during lifetime
- Localized swelling resolves in several days
- Typically involves face and upper lip
- GI tract involvement causes
 - Nausea
 - Vomiting
 - Diarrhea
 - Abdominal pain
 - Esophageal involvement can cause chest pain
- Neurologic involvement rare
- Upper respiratory involvement responsible for mortality

Predictors of need for airway intervention

- Increased age
- Tongue swelling
- Oropharynx swelling
- Odynophagia

Signs

- Respiratory distress
- Stridor
- Voice changes
- Dysphagia

Causes

- Hereditary angioedema (HAE)
- Angiotension converting enzyme inhibitors (ACE) around 70% of patients
 - Increased incidence in African-Americans and women
 - Most occur in first week of therapy
 - But can occur anytime

Treatment options

- Medical management usually suffices
- Stop offending agent if known
- Less responsive to treatment than urticaria
 - Most can be treated with
 - Benadryl (diphenhydramine) 50 mg PO or IM adult; continue for 5–7 days PO
 - Benadryl (diphenhydramine) 1–2 mg/kg PO or IM

pediatrics; continue for 5–7 days PO

- Additional treatment if needed
 - Pepcid (famotidine) 20–40 mg IV/PO for adult
 - Pepcid (famotidine) 0.25 mg/kg IV/PO for pediatric (NMT 40 mg)
- Consider steroids
 - Prednisone 40–60 mg PO qday for 5–7 days (> 40 kg)
 - Prednisone/prednisolone 1 mg/kg PO qday (children < 40 kg) for 5–7 days
- Airway compromise or significant oropharyngeal swelling (notify physician immediately)
 - Epinephrine
 - Caution if coronary artery disease history present
 - Adult: 0.3 mg SQ; (notify physician promptly)
 - Pediatrics: 0.01 mg/kg SQ – do not exceed adult dose (notify physician promptly)
 - Oxygen prn
 - Responds to fresh frozen plasma (jumbo unit) or C1 esterase inhibitor concentrate
- Consult physician promptly for posterior oropharyngeal angioedema
- Stop ACE inhibitors if currently taking

Discharge criteria

- Observation for 4–6 hours
- Discharge mild lip or non-oropharyngeal angioedema with normal vital signs and no distress

Discharge instructions

- Angioedema aftercare instructions
- Refer to primary care provider within 1 day if not improving, otherwise 3–4 days if improving

Consult criteria

- Discuss all patients with physician

Barotitis Media and Barosinusitis

- Caused by relative negative pressures from descent during flying usually with a coexistent URI or positive pressures from ascent during diving
- Findings that may be seen
 - Loss of TM (tympanic membrane) landmarks,

congestion around umbo, hemorrhage into middle ear

Valsalva maneuver

- On airplane descent can be used to prevent occurrence (nostrils pinched and patient blows against a closed mouth forcing air into Eustachian tubes with tympanic membranes feeling the pressure and subsequently moving – do not perform if vertigo present)

Treatment options

- For tympanic membrane congestion only
 - Nasal and oral decongestants
- For hemorrhage into middle ear
 - Adult: prednisone 60 mg PO qday for 6 days then taper over 7–10 days
 - Children: prednisone 1 mg/kg PO for 6 days then taper over 7–10 days (do not exceed adult dose)
- Otitis media antibiotics are prescribed if tympanic membrane perforation or discharge noted
 - Keep ear dry
- Narcotics and/or NSAID's prn for pain

Discharge instructions

- Barotitis or barosinusitis aftercare instructions
- Refer to ENT surgeon if perforation or vertigo present – refer to PCP otherwise
- No altitude traveling till symptoms and findings resolve

Consult criteria

- Discuss with physician immediately any patient with joint pain or swelling, chest pain or dyspnea (order chest x-ray), dizziness, headache, altered mental status or hypotension after diving

Nosebleeds

Considerations

- 90% of nosebleeds are anterior
- Most common cause is nose picking
- Hypertension common
- Look for foreign body in young children (suspect if foul smell or discharge)

Evaluation

- Attempt visualization of bleeding
- Use nosebleed tray equipment or otoscope
- Have patient clear blood by forcefully blowing nose
- Use suction prn to clear blood clots or active bleeding as needed
- If bleeding has stopped and site unknown, take moistened cotton swab and gently stroke suspected area to elicit bleeding
- CBC if suspected significant blood loss or tachycardic or orthostatic
- PT/INR if on Coumadin (warfarin). PTT if on heparin or has Von Willebrand's disease or hemophilia

Treatment options

- Control anterior nosebleed by pinching all of nose below nasal bone up to 2–4 minutes
- May treat hypertension if $> \text{SBP } 170$ or $\text{DBP} > 110$
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- Can also use Merocel packing
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 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Lab consult criteria

- Acute hemoglobin decrease of > 1 gm
- Hemoglobin < 10 gm
- Thrombocytopenia
- INR > 1.2
- PTT > 1.2 times normal

NASAL AND FACIAL FRACTURES

PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Nasal Fractures

- Most common fracture
- X-rays may miss around 50%

Complications

- Septal hematoma
- Associated orbital wall blowout fractures
- Facial fractures with CSF (cerebrospinal fluid) leak — cribriform plate fracture
- Hyphema
- Retinal detachment
- Subconjunctival hemorrhage

CSF rhinorrhea

- Cribriform plate fracture
- Increased by leaning forward
- Increased with jugular compression
- Ring sign (2 rings formed when CSF placed on filter paper)
- Dipstick findings — CSF glucose > 30mg%

Evaluation options

- Physical examination
- Clear nares of blood
- Evaluate for septal hematoma
- CT facial bones if suspected facial fractures
- CT head injury protocols
- C-spine films prn (see Neck Pain Protocol)
- Plain nasal films not usually needed but can be ordered
- CBC if significant blood loss suspected or tachycardia/hypotension
- Tympanic membranes for hemotympanum
- Eye exam of anterior and posterior chambers if

suspected eye injury or complaints

- Excessive tearing may indicate nasolacrimal duct injury — if suspected instill fluorescein in eye and exam posterior pharynx (with Wood's light if needed) to see if dye flows into pharynx through intact duct

Treatment options

- Epistaxis controlled with pinching nares together for 2–5 minutes
- Septal hematoma needs immediate drainage
 - Can be drained with 18 gauge needle after cocaine topical anesthesia
 - Rolled cotton swab can help decompress hematoma
 - Packing after drainage for 3–5 days
 - Antibiotics to prevent sinusitis (same as otitis media antibiotics)
- Analgesics prn
- Tetanus if not up to date (see [Tetanus Protocol](#))

Discharge criteria

- Simple nasal fractures

Discharge instructions

- Nasal fracture aftercare instructions
- Refer to ENT within 7–10 days
- Head injury instructions

Consult criteria

- Septal hematoma
- Associated facial fractures
- Other associated injuries
- Significant blood loss

Orbital Blowout Fractures

- Orbital wall composed of 7 bones
- Occurs usually with larger object than the orbit (baseball; fist)
- Can result in diplopia

Evaluation

- Neurologic exam
- Extraocular motor exam

- Plain facial (water's view best) or CT orbital films
- CT head injury protocols
- Ocular anterior and posterior chamber exam
- TM's (tympanic membrane) for hemotympanum
- Grasp upper teeth and palate and pull to assess for Lefort fractures (movement noted)
- Dental exam
- C-spine films prn (see Neck Pain Protocol)

Treatment

- Antibiotics (same as sinusitis treatment)
- Analgesics prn
- Tetanus if not up to date (see [Tetanus Protocol](#))

Discharge criteria

- Uncomplicated inferior blowout fracture without extraocular muscle entrapment or other facial fractures or associated conditions
- Head injury instructions should be given to competent alert patient or family member or similar person

Discharge instructions

- Head injury aftercare instructions
- Orbital blowout fracture aftercare instructions
- Referral to Ophthalmology or plastic surgeon within 7 days

Consult criteria

- Discuss all facial fractures except uncomplicated nasal fracture with physician
- Referral to Ophthalmology within 7 days

Mandible Fracture

- Third most common facial fracture
- 20–40% of mandibular fracture patients have associated injuries
- Children age 4–11 years at risk for facial growth disturbance if fracture missed

Findings

- Facial asymmetry
- Malocclusion of teeth

- Paresthesia to lower lip or gums indicate inferior alveolar nerve damage
- Blood in mouth suggests open fracture
- Jaw may deviate to side of fracture

Evaluation

- Airway exam — notify physician immediately if any airway concerns
- Dental exam
- Neurologic exam
- Plain mandible films or panorex
- CT mandible if the plain films not helpful in suspected fracture
- CT head if per head injury protocols or abnormal neurologic exam
- Chest x-ray if missing teeth cannot be located
- C-spine films prn (see Neck Pain Protocol)

Treatment

- Dental antibiotics choices
 - Pen VK 500 mg PO qid × 7–10 days
 - Cleocin (clindamycin) 300 mg PO qid × 7–10 days
 - Erythromycin 250 mg PO qid × 7–10 days
- Tetanus if not up to date (see [Tetanus Protocol](#))
- See Dental Injury Protocol

Discharge criteria

- Simple nondisplaced mandible fractures
- Soft diet
- Analgesics prn

Discharge instructions

- Mandible fracture aftercare instructions
- Referral to oral surgeon within 1–4 days
- Head injury instructions

Consult criteria

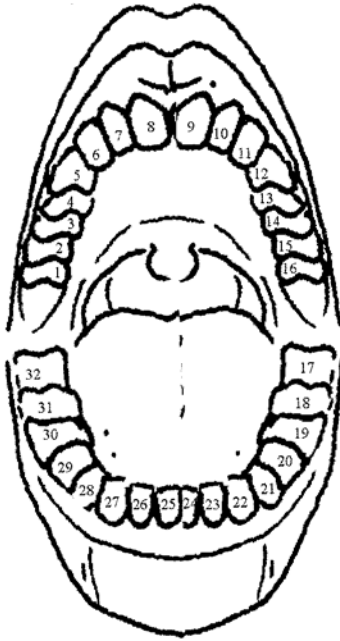
- Discuss all mandible fractures with physician or oral surgeon

DENTAL INJURY PROTOCOLS

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

- Injury to primary teeth common in toddlers
- Older children dental injuries commonly from sports
- Assess for other injuries
- Primary tooth eruption from 7 months to 2–3 years of age
- Malocclusion of teeth is a mandible or maxilla fracture until proven otherwise



Tooth Fractures

- Ellis class 1: enamel injured only
- Ellis class 2: dentin involved
- Ellis class 3: pulp involved (bloody dental tissue seen)

Dental Avulsions of Permanent Teeth

- 1% loss of successive reimplantation of avulsed per minute that tooth is not replaced in socket

- More than 15 minutes out of socket has poor salvage rate
- After 60 minutes of being out of socket there usually is no salvage rate
- Avulsed teeth should be handled by crown only
- Put in either Hank's solution, milk, or normal saline as a temporizing measure
- Put tooth back immediately after aspirating any clot and irrigating the socket
- Apply a mouth guard (sports mouth guard acceptable)
- Antibiotics: Pen VK 500 mg PO qid for 10 days and see dentist or oral surgeon within one day for further treatment
- It is preferable to discuss with dentist at time of injury

Dental Avulsions of Primary Teeth

- Leave out of mouth

Gingival Lacerations

- Heal well
- Reapproximate with chromic or Vicryl sutures
- Antibiotics of penicillin or erythromycin for 7–10 days or Clindamycin weight or age adjusted tid × 10 days

Lip and Intraoral Lacerations

- Repair from inside out then close skin
- Use absorbable sutures intraorally
- Line up vermillion border if involved
- Antibiotics
 - Pen VK 500 mg PO qid for 7–10 days (weight adjusted for pediatrics)
 - Erythromycin PO tid for 7–10 days if penicillin allergic
 - Clindamycin 300 mg PO tid × 10 days (weight adjusted for pediatrics)
- Refer to Laceration Protocol

Evaluation

- Dental history important to know to determine if teeth worth saving
- Time of injury important

- Palpate and lightly percuss teeth (should be a ping sound normally)
- Remove blood clots
- Check for intraoral lacerations and any through and through involvement
- Check facial bones for looseness (Lefort fractures) but pulling forward on palate or upper maxillary rim
- Plain x-rays for
 - Bony abnormalities
 - Aspirated teeth
 - Foreign bodies (tooth fragments) in lacerations
- Panorex films if available
- Refer to Head Injury Protocols

Treatment

- Enamel fractures do not require immediate treatment
- Class 2 fractures
 - Cover with Dycal (calcium hydroxide paste)
- Class 3 fractures
 - Anesthetize tooth
 - Immediate covering with Dycal
 - Antibiotics
 - Adult
 - Pen VK 500 mg PO qid × 10 days
 - Clindamycin 300 mg PO tid × 10 days
 - Amoxicillin 500 mg PO tid × 10 days
 - Weight adjustment of above antibiotics for pediatrics
- Analgesics prn
- Loose teeth referred to dentist and prescribe a soft diet
- Can use mouth guard to splint very loose teeth
- Move displaced teeth into position post local anesthesia
- Tetanus prophylaxis: (High risk = every 5 years; Low risk = every 10 years)
 - Tetanus IG 250–500 units if high risk and less than 3 tetanus or unknown history of immunizations previously in life — usually with the elderly
- Refer to health department or primary care provider to complete tetanus primary vaccination series if < 2 vaccines given in past
 - See [Tetanus Protocol](#)

Discharge Criteria

- Ellis class 1 and 2 fractures
- Primary tooth avulsions
- Mildly loose teeth
- Refer to dentist or oral surgeon
 - Ellis class 2 fractures within 24 hours for primary dental avulsions and loose teeth
 - Ellis class 3 fractures dental referral ASAP, no more than next day if possible
- Give avulsed teeth that are not reimplanted to patient to take to dentist

Consult Criteria

- Displaced teeth
- Avulsed permanent teeth
- It is preferable to discuss with dentist at time of injury
- Discuss with physician or dentist Ellis class 2 and 3 fractures

DENTAL PAIN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Differential diagnosis

- Periapical abscess
- Trigeminal neuralgia
- Masticator space infection
- Ludwig's angina
- Retropharyngeal space infection
- Infection after a root canal
- Dental caries

Considerations

- Dental abscess is rare in children
- Abscess can spread more deeply to
 - Bone (osteomyelitis)
 - Cavernous sinus (thrombosis)
 - Maxillary sinus
 - Floor of mouth (Ludwig's angina)
 - Adjacent facial spaces and planes
- Advanced dental disease in children could indicate diabetes mellitus or HIV infection

Evaluation

- Usually history and physical exam only
- Percussion tenderness present
- CBC when patient is toxic appearing
- BMP for tachycardia or history of diabetes or suspicion of undiagnosed diabetes
- Plain films of neck if deeper infections considered
- CT face or neck for suspected deeper infections

Periapical abscess

- Most common dental infection
- Very painful

Treatment options

- I&D with needle if abscess seen
 - Tap water as effective as normal saline for irrigation
- Antibiotics if no pus found or no aspiration performed (choose one below)
 - Pen VK 250 mg PO qid for 7–10 days
 - Clindamycin 150–450 mg PO qid for 7–10 days
 - Metronidazole 500 mg PO bid for 7–10 days
 - Azithromycin 5 day dose pak
 - Erythromycin 250 mg PO qid for 7–10 days
- NSAID's prn
- Hydrocodone prn up to 5–10 days

Discharge criteria

- Nontoxic patient
- Most dental pain patients

Discharge instructions

- Warm salt water rinses very frequently for 1–5 days. Hold in mouth for several minutes as tolerated
- Warm compresses to painful area several times a day
- Follow up with dentist within 48 hours

Consult criteria

- Deep space infection diagnosed or suspected
- Fever
- Potential for airway compromise

Trauma

Section Contents

Motor Vehicle Accident Protocol

Laceration and Cutaneous Wound Protocol

Bleeding Protocol

Burn Protocol

MOTOR VEHICLE ACCIDENT PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

- Leading cause of death ages 1–37 years
- Complete exam important even when single isolated injury suspected
- Initial assessment critical in determining life threatening processes
- Comorbidities should be addressed
- Liver and spleen most common intra-abdominal injuries followed by small and large intestine in blunt abdominal trauma
- Cervical and lumbar strains common in minor MVA
- Seatbelt marks may indicate deeper injuries

Evaluation

- Patients seen by the practitioner should have minor injuries only
- Alert patients on spine boards can be moved carefully if no suspicion of spine or acute neurologic deficits or significant bony trauma (fractures/dislocations)
- Notify physician immediately for Glasgow scale < 15

Primary survey

- Airway
 - Breathing
 - Circulation/bleeding
 - Disability (neurologic exam)
 - Exposure/environment (expose patient and hypothermia evaluation)
-
- Contact physician immediately if any serious findings found on primary survey
 - Significant hemorrhagic vital sign findings, contact physician immediately
 - IV NS 500–1000 cc bolus if hypotensive adult (consult physician immediately)
 - Pediatrics 20 cc/kg IV NS bolus, may repeat × 2 prn

(consult physician immediately)

Secondary survey

- Complete physical exam
- Palpate and inspect all body areas
- Complete neurovascular exam

AMPLE mnemonic for historical key elements

A – Allergies

M – Medications

P – Past history

L – Last meal

E – Events leading to presentation

Estimated Blood and Fluid losses (adults)				
	Class I	Class II	Class III	Class IV
Blood loss (cc)	Up to 750	750–1000	1500–2000	> 2000
Blood loss %	Up to 15%	15–30%	30–40%	> 40%
Pulse rate	< 100	> 100	> 120	> 140
Blood pressure	Normal	Normal	SBP < 90	SBP < 70
Capillary refill	Normal	Normal	Delayed	Absent
Pulse pressure	Normal/incr	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	> 35
Urine output (cc/hr)	> 30	20–30	5–15	Negligible
Mental status	Anxious	Anxious	Confused	Lethargic

(Derived from Advanced Trauma Life Support)

Lethal triad for bleeding (each contributes to the others)

- Hypothermia
- Acidosis
- Coagulopathy (frequently too much crystalloid without blood product replacement)

Imaging and Lab Tests (As indicated by exam, history, and mechanism of injury)

- C-spine
- Extremities
- Chest x-ray
 - Deep sulcus sign may indicate pneumothorax when one is not seen in periphery
 - Costophrenic angle deeper than normal

- CT head
- CT abdomen/pelvis; chest if indicated (physician should be involved)

Lab if indicated

- CBC
- BMP
- LFT's
- U/A
- Type and screen or cross

Treatment Options

- Analgesics prn
 - Dilaudid (hydromorphone) 0.5 mg IV or 1–2 mg IM
 - Stadol (butorphanol) 0.5–1 mg IV or 1–2 mg IM
 - Toradol (ketorolac) 30 mg IV or 60 mg IM (if no bleeding possibility present)
 - Do not use Toradol (ketorolac) if creatinine is elevated
- NSAID's or PO narcotics prn (outpatient treatment)
- Tetanus prophylaxis: (High risk = every 5 years; Low risk = every 10 years) Tetanus IG 250–500 units at different site if high risk and less than 3 tetanus or unknown history of immunizations previously in life — usually with the elderly
- Refer to health department or primary care provider to complete tetanus primary vaccination series if < 2 vaccines given in past
 - See [Tetanus Protocol](#)

Blood/fluid replacement for hemorrhage

- PRBC's/FFP/platelets 2:1:1 ratio
- Avoid > 2 liters of isotonic fluids for acute blood loss before blood products transfusion started
- Avoid hypertension (mean arterial pressure: MAP target of 65) when giving blood or fluids
- Use blood warmer

Head Trauma

Considerations

- Loss of consciousness (LOC), amnesia, headache, vomiting and seizures have low sensitivity and

specificity for detecting intracranial injury

- Cervical spine exam and evaluation important
- Skull films mainly replaced by CT evaluation of head trauma
- Evaluate for significant maxillofacial injuries

Concussion definitions

Grade 1 concussion

- Transient confusion
- No LOC
- Duration of mental status abnormalities < 15 minutes

Grade 2 concussion

- Transient confusion
- No LOC
- Duration of mental status abnormalities > 15 minutes

Grade 3 concussion

- Loss of consciousness

Evaluation

- CT per head injury protocols
- Evaluate for other injuries, especially C-spine
- Retinal exam: for hemorrhages
- Detailed neurologic exam

ENT exam

- Check for hemotympanum
- CSF rhinorrhea
- Battle's sign
- Cranial nerve palsy

New Orleans CT criteria (for ordering CT brain)

- Normal neurologic exam and one of the following
 - Headache
 - Vomiting
 - Age > 60
 - Persistent anterograde amnesia
 - Drug-alcohol intoxication
 - Visible trauma above the clavicle
 - Seizure

Discharge criteria

- Stable condition
- Normal neurologic exam
- No other significant trauma
- No radiologic abnormalities

Discharge instructions

- Head injury aftercare instructions
- Tylenol (no ASA or NSAID's for 36 hours)
- Avoid more potent analgesics so progression of symptoms can be detected
- Return for any neurologic changes
- Follow up with primary care provider or neurologist

Consult criteria

- Age ≥ 70 or < 2 years of age
- Bleeding potential
- Concussions
- Dementia
- Persistent vomiting
- Severe persistent headache
- Focal neurologic deficits
- Inadequate home observation

Neck Trauma

Penetrating neck trauma

- Consult physician unless very superficial laceration
- Do not explore Zone 2 penetrating deep injuries
 - Angle of mandible to cricoid cartilage
- Consult physician

Cervical spine trauma

- Leave cervical collar on until patient examined and cleared
- Plain C-spine x-ray 3 views

Exclusionary criteria for C-spine films

- No neurologic deficit
- No distracting injuries
- No evidence of intoxication
- Normal mentation

- No posterior midline tenderness

CT C-spine indications

- Moderate to high risk of cervical fracture
- Significant mechanism of injury
- Fracture on plain C-spine films
- Neurologic deficit or complaint
- Inadequate plain C-spine films
- Severe neck pain with normal plain C-spine films
- Patient will not move neck actively (on their own) without external support of patient's hands ("head in hand sign")
- Obtunded patients

Flexion-extension plain films

- Significant pain with negative plain and CT imaging
- Evaluation for ligamentous instability

Treatment

- C-spine cleared: analgesics and ice packs

Discharge criteria

- Benign cause of neck pain

Discharge instructions

- Neck injury aftercare instructions
- Refer to primary care provider or neurosurgeon within 3 days if not improving
- Avoid discharging with cervical collar if possible

Consult criteria

- Cervical fracture or dislocation/subluxation
- Neurologic deficit or complaint
- Significant pain
- Significant mechanism of injury

Extremity Trauma

- Refer to specific protocols

Lacerations and Cutaneous Wounds

- Refer to Laceration and Cutaneous Wound Protocol

Discharge Criteria for MVA

- No significant injury that needs admission or acute consultation

Discharge Instructions for MVA

- MVA aftercare instructions
- Refer to appropriate physician specialty within 7–10 days as needed

Consult Criteria for MVA

- As in above sections
- Notify physician immediately for suspected severe trauma
- Significant injuries or mechanism of injury should be seen by physician initially and throughout length of stay
- Severe pain
- Moderate abdominal pain
- Refer to [General Patient Criteria Protocol](#)
- Hemorrhage from more than minor simple laceration
- Fractures
- Dislocations
- Neurovascular injuries
- Tendon injuries

LACERATION AND CUTANEOUS WOUND PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

- Scalp lacerations with arterial bleeding can cause shock
 - Suture initially instead of pressure dressings with significant arterial bleeding

Anesthetics

- There are two major types of local anesthetics: amides and esters — little cross reactivity
- Maximum safe doses of local anesthetics
 - Lidocaine plain — 4.5 mg/kg
 - Lidocaine with epinephrine — 7 mg/kg
 - Marcaine plain — 2 mg/kg
 - Marcaine with epinephrine — 3 mg/kg

Duration of anesthesia

- Lidocaine without epinephrine lasts 15 minutes locally
 - Regional block lasts longer
- Lidocaine with epinephrine lasts 2–3 hours (avoid in end-circulation areas: fingers, toes, etc.)
- Marcaine lasts 90 minutes to 12 hours

Local anesthetic tips

- If lidocaine mixed with NaHCO_3 in 9:1 ratio (90% lidocaine and 10% NaHCO_3) it will yield a pH closer to body pH that will not burn with injection
- Warming local anesthetic to body temperature decreases pain of injection
- Topical tetracaine in wound for 20–30 minutes decreases pain of injection

Increased infection risk with

- Foreign body
- Crush injury
- Human or animal bite

Lacerations

Sutures

Nonabsorbable (nylon; polypropylene)

- Retains strength > 60 days; low tissue reactivity
- Use 6'0 on face
- Use 4'0 on rest of body
- May use 3'0 on very high tension areas except on face

Absorbable

- Synthetic is less reactive
- Synthetic has increased strength vs. cat gut
- Wound retains 50% of strength in < 1 week to 2 months
- Plain 5'0–6'0 gut sutures can be used to close the skin margins on children's facial lacerations
 - Avoid using plain gut in high tension areas
 - Vicryl retains strength to 21 days which is too long for external skin closure on facial lacerations
- Plain gut retains strength for 4–5 days

Deep sutures

- Helps relieve skin tension
- Decreases dead space and hematoma formation
- May improve cosmetic outcomes
- Recommend liberal use of deep sutures to approximate skin edges before closure with either skin sutures or tissue adhesives

Staples

- Considered for scalp; trunk; extremity lacerations
- When saving time is essential

Tissue adhesives (Dermabond)

- Reduces the need of suturing in up to 1/3 of lacerations
- Sloughs in 7–10 days
- Not to use if skin margins cannot be manually approximated or held together without a lot of tension
- Use 3–4 coats
- Keep out of laceration

- Caution: too much applied can cause too much heat to be released from the exothermic reaction
- Can be removed with bathing, petroleum or antibiotic gel, or acetone if rapid removal necessary
- May take shower after 24 hours, but avoid bathing or swimming until the adhesive sloughs — usually within 7 days

Evaluation

- Assess for other injuries
- X-ray for foreign bodies or fractures as indicated by history and exam
- Ultrasound may be used to detect foreign bodies depending on level of experience
- Record neurovascular exam prior to anesthesia
- Examine and document any deeper structures involvement
- Tendon involvement or injuries, consult physician
- High pressure injection injuries, consult physician promptly

Treatment Options

Sutures

- On face use 6'0 nylon or equivalent
- Use nylon 4'0 or equivalent on rest of body
- Nylon 3'0 can be used for high tension body lacerations (not on face)
- Vicryl or equivalent absorbable sutures used for deeper layers or intraoral
- Plain 5'0–6'0 gut can be used on children's facial lacerations to avoid later suture removal

Wound preparation

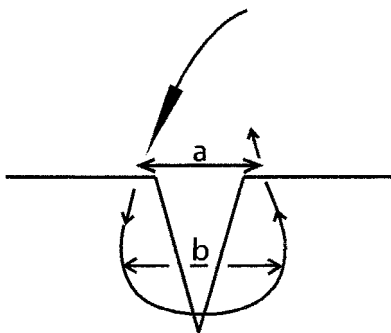
- All foreign material needs to be removed as much as possible
- Flush lacerations deeply with 1% betadine sol. (mix betadine 10% 1:10 with NS) or flush with NS
 - Use 18 gauge IV catheter on syringe after disposing of needle and flush with 20 cc to several hundred cc depending on contamination of laceration
- Superficial lacerations < 0.5 cm deep can be cleaned with betadine (etc.) scrubbing
- Hemostasis by direct pressure

- Elevation of extremity helpful with point pressure to stop persistent extremity bleeding

Closure techniques

- Keep wound margins flat or everted with the closure
- Avoid wound margin inversion
- Partial muscle injury can be closed by using fascia of muscle
- Lacerations with high risk of infection may need to be left partially or fully open
- Steri-strips or tissue adhesive can be used as indicated

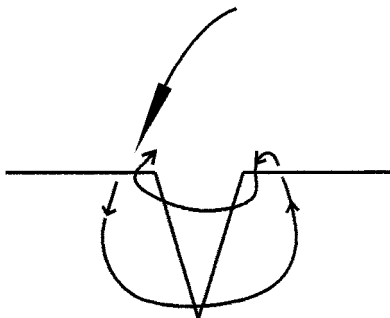
Simple Suture



The distance of line (a), the skin entry and exit points, is less than line (b) at the base of the laceration.

- This creates wound eversion which is cosmetically desirable.
- Wound inversion creates a shadow in the laceration site after healing.

Vertical Mattress Suture



Vertical mattress is used for high tension wounds and when laceration margin eversion is needed.

Antibiotics for

- Tendon or bone involvement
- Septic contamination
- Intraoral lacerations
- Animal/human bites

Aftercare

- Laceration aftercare instructions
- Sutured or stapled lacerations keep clean and gently cleansed after 24–48 hours
- Sutured or stapled lacerations should be protected with nonadherent dressing for 48 hours
- Air dry lacerations after 48 hours of dressing (cover dressing when in contaminated environment)
- Sutured or stapled laceration infection incidence may be reduced with topical antibiotic ointments
- Splint if there is a fracture or tendon injury and prn otherwise
- No antibiotics for clean, simple lacerations that are not animal or human bites

Suture and Staple Removal

- Face 3–5 days
- Neck 4–6 days
- Scalp and trunk 7–10 days
- Upper extremity 10–14 days
- Lower extremity 14–21 days
- Joints 10–21 days

Consult criteria

- Wounds beyond the practitioner's ability to treat
- See General Consult Criteria below

Skin tears

- Common among elderly and long term steroid therapy
- Skin tears can be closed with tissue adhesive if within 8 hours

Class 1 skin tear

- No tissue loss

- Close with surgical tape
- Cover with nonadherent dressing

Class 2 skin tear

- Partial tissue loss
- Manage with absorbent dressings (petroleum based, hydrogels, foams, or hydrocolloids, etc.) for 5–7 days
 - Change daily if needed
 - Use elastic tubular nets to hold in place

Class 3 skin tear

- Complete tissue loss
- Manage same as Class 2 skin tear

Discharge instructions

- Skin tear aftercare instructions
- Follow up with primary care provider or surgeon within 2–5 days as needed

Consult criteria

- Large amount of tissue loss

Plantar puncture wounds

- Rate of cellulitis 2–10%
 - Usually staph or strep
 - Use dicloxicillin or Sanford Guide
- Cleaning alone may be effective
- If foreign body suspected, use plain x-rays if radiopaque, or CT or ultrasound scan otherwise if needed
- Punctures through sweaty moist tennis shoes carries risk of pseudomonas osteomyelitis
 - May prescribe antipseudomonal antibiotic such as Cipro (ciprofloxacin)
- Frequent cleansing and topical antibiotic as treatment at home
- Do not core out puncture wound

Discharge instructions

- Puncture wound aftercare instructions
- Close follow-up within 2–3 days for suspected deep punctures

Consult criteria

- Neurovascular or bone injury

Subungual hematomas

- Treat with nail trephination (burr hole)
- Nail may be removed for disruption of nail or surrounding nail folds

Discharge instructions

- Subungual hematoma aftercare instructions

General Consult Criteria

- Open fracture
- Neurovascular or tendon injuries or deficits
- Muscle bundle totally severed
- Practitioner is uncomfortable repairing laceration
- Human or animal bites

Vital signs and age consult criteria

- Adult heart rate > 100
- SBP < 90 or relative hypotension (SBP < 105 with history of hypertension)
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 100

Lab consult criteria

- Acute hemoglobin decrease of > 1 gm
- Hemoglobin < 10 gm
- Thrombocytopenia
- INR > 1.5 if checked

BLEEDING PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

- Active hemorrhage may be apparent or unsuspected
- Scalp lacerations with arterial bleeding can cause shock
 - Suture initially instead of pressure dressings with significant arterial bleeding
- Medical therapy can precipitate or worsen bleeding

Estimated Blood and Fluid losses (adults)

	Class I	Class II	Class III	Class IV
Blood loss (cc)	Up to 750	750–1000	1500–2000	> 2000
Blood loss %	Up to 15%	15–30%	30–40%	> 40%
Pulse rate	< 100	> 100	> 120	> 140
Blood pressure	Normal	Normal	SBP < 90	SBP < 70
Capillary refill	Normal	Normal	Delayed	Absent
Pulse pressure	Normal/incr	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	> 35
Urine output (cc/hr)	> 30	20–30	5–15	Negligible
Mental status	Anxious	Anxious	Confused	Lethargic

(Derived from Advanced Trauma Life Support)

Lethal triad for bleeding (each contributes to the others)

- Hypothermia
- Acidosis
- Coagulopathy (frequently too much crystalloid without blood product replacement)

Evaluation

- CBC
- PT/INR/PTT if on anticoagulant or have comorbid conditions contributing to bleeding
- Type and screen or cross depending on level of hemorrhage

Treatment

- Direct pressure of bleeding site for 2–5 minutes if actively bleeding when possible
- Exsanguination from extremities where direct pressure ineffective may try tourniquet up to 5 minutes off and on prn (notify physician immediately)

Blood/fluid replacement for hemorrhage

- PRBC's/FFP/platelets 2: 1: 1 ratio
- Avoid > 2 liters of isotonic fluids for acute blood loss before blood products transfusion started
- Avoid hypertension (mean arterial pressure: MAP target of 65) when giving blood or fluids
- Use blood warmer
- Vitamin K 10 mg IV over 10 minutes (not faster than 1 mg/minute) or IM/SQ/PO prn Coumadin (warfarin) therapy — may take 24–48 hours to affect INR
- FFP can be given to reverse Coumadin (warfarin) effects
- Protamine 1 mg IV for each 100 units of heparin given to reverse anticoagulation prn

Discharge Criteria

- Bleeding without effect on vital signs or hemoglobin level
- Further significant bleeding unlikely
- No coagulopathy

Consult Criteria

- Refer to [General Patient Criteria Protocol](#)
- Adult tachycardia
- SBP < 90 or relative hypotension (SBP < 110 with history of hypertension)
- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 120
 - 12–15 years ≥ 115

- 16 years or older ≥ 100

BURN PROTOCOL

When using any protocol, always follow the [Guidelines of Proper Use](#).

Considerations

- In children consider child abuse
- Electrical burns may be much worse than suspected
- Evaluate airway and pulmonary system with enclosed building fire or with facial burns
- Consider possible carbon monoxide poisoning in enclosed areas
- Difficult to tell difference between deep second degree burn and third degree burn
- Second degree deep partial thickness burn can become a third degree burn
- Body surface area (BSA) of burn use rule of 9's or the palmer surface of patient is approximately 1% BSA
- Rule of nines for BSA burned is for patients ≥ 10 years of age
- Depth of burn frequently underestimated
- Size of burn frequently overestimated

Burn depth

First degree

- Epidermis only; no blisters
- Sensation — painful
- Bleeding on pinprick — brisk
- Appearance — light red and dry
- Blanching to pressure — brisk

Second degree superficial partial thickness

- Dermis involved with blisters
- Sensation — painful
- Bleeding on pinprick — brisk
- Appearance — moist and pink
- Blanching to pressure — slow return

Second degree deep partial thickness

- Dermis involved with blisters
- Sensation — dull

- Bleeding on pinprick — delayed
- Appearance — mottled pink or red; waxy white
- Blanching to pressure — none

Third degree full thickness

- Sensation — none
- No bleeding on pinprick
- Appearance — white, charred and dry
- Blanching to pressure — none

Fourth degree

- Involves muscle, fascia or bone

Thermal Burns

Evaluation

Enclosed space fire with smoke

- Airway evaluation
- O₂ saturation
- CO (carbon monoxide) level
- CBC
- BMP
- Chest x-ray
- Notify physician promptly

BSA burn < 10%

- Physical exam usually all that is needed if no smoke inhalation history or findings

Treatment options

- Clean with soap and water
- Cool burn with cold tap water
 - Decreases pain
 - Decreases depth and extent of injury
 - Do not use ice or ice water

Blister management

- Leave blisters intact \leq 3 cm in size
 - Heals faster
- Totally debride any ruptured blisters
- May sterilely aspirate blisters > 3 cm

First degree burns

- Aloe vera and NSAIDs can be used for 1st burns

Superficial 2nd degree burns

- Topical antibiotic or absorptive occlusive dressing
 - Absorptive occlusive dressing is less painful and results in faster healing than antibiotic ointment

Deep 2nd and 3rd degree burns

- Topical antibiotic and refer to surgeon
- Silvadene (silver sulfadiazine) ointment qday for 5–7 days (not on face)
- Aquacel dressing superior to plain Silvadene in healing burns and reducing pain and may be used instead (releases silver sulfadiazine slowly)

Tetanus prophylaxis

- Tetanus toxoid (ADT) 0.5 cc IM if last dose > 5 years
- Tetanus immune globulin 250–500 units IM at different site if < 3 or unknown previous tetanus immunizations
- Refer to health department or primary care provider to complete tetanus primary vaccination series if < 2 vaccines given in past
 - See [Tetanus Protocol](#)

Discharge criteria

- First degree burns
- Second degree superficial burns < 15% in adults and < 10% in children age 10 or less

Discharge instructions for burns

- Burn aftercare instructions
- Wash burn with soap and water qday and change dressing qday for 5–7 days
- Facial burns use triple antibiotic ointment or polysporin ointment 5–7 days
- Antibiotic PO or IM not usually needed
- Pain treatment with NSAID's and/or narcotics prn (hydrocodone, oxycodone)

Consult criteria

- Second degree superficial burns \geq 10% in adults and 5% or greater in children

- Deep second degree and third degree burns unless extremely small (< 2 cm)
- Burns involving hand; joints; perineum; genitalia; face; eyes; ears
- Comorbid conditions such diabetes, immunosuppression
- Circumferential burns
- Age < 12 months
- All inhalation injuries

Electrical Burns

Considerations

- Household electrical injury can be lethal
- Difficult to estimate degree of injury
- Causes tetany of muscles
- Traumatic injuries common (falls)

Compartment syndrome

- From increased pressure in a muscle or other internal compartment
- Not all signs and symptoms are needed to make diagnosis
- High pressures > 8 hours leads to tissue damage
- Normal tissue pressure is < 10 mm Hg
- Capillary blood flow is compromised at > 20 mm Hg
- Intracompartmental pressures > 30 mm Hg or within 10–30 mm Hg of DBP

Signs and symptoms (not diagnostic)

- Pain
 - Out of proportion to injury
 - On passive stretch of muscles
- Pallor
- Paresthesias
- Paralysis
 - Sensory and motor findings are late signs
- Poikilothermia — decreased temperature
- Pulselessness
 - Usually not lost until muscle necrosis has occurred
 - Last sign to develop
- Tense muscle compartment on palpation

Treatment

- Consult physician if suspected
- Keep extremity at level of heart
- Do not use ice if suspected
- Remove cast and padding
- Surgery fasciotomy is usually necessary

Evaluation

- Complete history and physical exam
- Degree of burn and voltage
- Length of time of electrical injury
- Neurologic exam
- EKG and monitor
- CBC
- BMP
- CPK
- U/A for myoglobin if hemoglobin dipstick positive
- Serum myoglobin if U/A positive for hemoglobin

Treatment options

- Treat skin burns same as thermal
- IV NS 200 cc/hr if significant burn injury or suspicion for significant injury for adults and 2 times maintenance rate for pediatrics
- Tetanus toxoid (ADT) 0.5 cc IM if last dose > 5 years
- Tetanus immune globulin 250–500 units IM different site if < 3 or unknown history of previous tetanus immunizations
- Refer to health department or primary care provider to complete tetanus primary vaccination series if < 2 vaccines given in past
 - See [Tetanus Protocol](#)
- Pain treatment with NSAID's and/or narcotics prn

Discharge criteria

- Low voltage superficial injury
- Normal lab, EKG and vital signs
- Small burn area
- Follow up with primary care provider or plastic surgeon within 2–3 days

Discharge instructions for burns

- Wash burn with soap and water qday and change

dressing qday for 5–7 days

- Burn aftercare instructions
- Facial burns use triple antibiotic ointment or polysporin ointment 5–7 days
- Antibiotic PO or IM not usually needed
- Pain treatment with NSAID's and/or narcotics prn (hydrocodone, oxycodone)

Consult criteria

- Loss of consciousness
- Neurologic abnormalities
- High voltage burns
- Abnormal lab, EKG or vital signs
- Large burns or suspected deep tissue injury
- Uncertainty of the extent of injury
- Suspected compartment syndrome

Chemical Burns

Considerations

- Alkali cause deeper injury
- Acids cause more superficial injury usually, depending on pH

Evaluation

- Usually all that is needed is history and physical exam for minor chemical burns

Treatment

- Remove chemical from skin
- Clean with soap and water
- Flush or soak with NS if alkali burn
- Pain treatment with NSAID's and/or narcotics prn

Hydrofluoric acid (HFI) burns

- Intense pain and tissue damage
- Use copious irrigation followed by calcium gluconate gel
- Subcutaneous calcium gluconate may be needed to relieve pain
- TBSA (total body surface area) burn > 5% needs admission to monitor for the development of hypocalcemia

- If HFI concentration > 50% then 1% TBSA burn needs admission

Tetanus prophylaxis

- Tetanus toxoid (ADT) 0.5 cc IM if last dose > 5 years
- Tetanus immune globulin 250–500 units IM different site if < 3 or unknown history of previous tetanus immunizations
- Refer to health department or primary care provider to complete tetanus primary vaccination series if < 2 vaccines given in past
- See [Tetanus Protocol](#)

Discharge criteria

- Minor chemical burns

Discharge instructions for burns

- Wash burn with soap and water qday and change dressing qday for 5–7 days
- Burn aftercare instructions
- Facial burns use triple antibiotic ointment or polysporin ointment 5–7 days
- Antibiotic PO or IM not usually needed
- Pain treatment with NSAID's and/or narcotics prn (hydrocodone, oxycodone)

Consult criteria

- Hydrofluoric acid burns
- Abnormal vital signs
- Diabetes or immunosuppression
- Second degree superficial burns $\geq 10\%$ in adults and 5% or greater in children
- Second degree deep and third degree burns
- Burns involving hand, joints, perineum, genitalia
- Comorbid conditions such diabetes, immunosuppression

Vital sign and age consult criteria for all burn types

- Hypotension or relative hypotension (SBP < 105 with history of hypertension)
- Adult heart rate ≥ 110

- Pediatric heart rate
 - 0–4 months ≥ 180
 - 5–7 months ≥ 175
 - 6–12 months ≥ 170
 - 1–3 years ≥ 160
 - 4–5 years ≥ 145
 - 6–8 years ≥ 130
 - 7–12 years ≥ 125
 - 12–15 years ≥ 115
 - 16 years or older ≥ 110

Disease Management Guidelines

Section Contents

Hypertension Management

Coronary Artery Disease Management

Heart Failure Management

Type 1 Diabetes Mellitus Management

Type 2 Diabetes Mellitus Management

Cholesterol Management

Stroke Prevention Management

Obesity Management

Asthma Management

COPD Management

Adult Septic Shock Management

Depression Management

Headache Management

Seizure Management

Arthritis Management

HYPERTENSION MANAGEMENT

When using any management guideline, always follow the [Guidelines of Proper Use](#).

Definitions

- In adults ≥ 18 years of age, hypertension classifications are the following with 2 or more averaged seated BP measurements over 2 or more office visits (initial BP may be elevated due to anxiety)
 - Normal
 - SBP < 120 mm Hg
 - DBP < 80 mm Hg
 - Prehypertension
 - SBP 120–139 mm Hg
 - DBP 80–89 mm Hg
 - Some controversy exists if this label should be given to patients without diabetic, cardiac or stroke histories
 - Stage 1 hypertension
 - SBP 140–159 mm Hg
 - DBP 90–99 mm Hg
 - Stage 2 hypertension
 - SBP ≥ 160 mm Hg
 - DBP ≥ 100 mm Hg

Considerations

- SBP > 140 mm Hg in age > 50 years is more important cardiovascular disease (CVD) risk factor than diastolic pressure
- Risk doubles for CVD for each SBP/DBP increase of 20/10 mm Hg starting at 115/75 mm Hg blood pressure (BP)
- Thiazide diuretics should be used initially or in combination with other antihypertensive medications in uncomplicated hypertension
- Most patients will require 2 or more antihypertensive medications to achieve target blood pressure of $< 140/90$ mm Hg in patients without diabetes or chronic renal disease, or $< 130/80$ mm Hg for diabetic or chronic renal disease patients

- If blood pressure is $> 20/10$ mm Hg over target BP, consideration should be given to initiating 2 antihypertensive drugs, one of which should be a thiazide diuretic usually
- Clinician's judgment remains paramount in using guidelines
- Self-measured averaged blood pressures at home $> 135/85$ mm Hg are considered hypertensive

High risk conditions that have indications for initiation of other antihypertensive medications besides a diuretic

- Heart failure
- Postmyocardial infarction
- High coronary disease risk
- Diabetes
- Chronic renal disease
- Recurrent stroke prevention in patients with history of stroke

Evaluation

- U/A
- CBC
- BMP and calcium level
- EKG
- Lipid profile
- Bilateral arm blood pressures
- Optic fundus examination
- Body mass index (BMI) calculation
- Auscultation for carotid, abdominal and femoral bruits
- Thyroid gland palpation
- Heart and lung examination
- Abdominal examination for masses and abdominal aortic pulsation
- Check legs for edema and arterial pulses
- Neurologic examination

Goals of Therapy

- Target blood pressure of $< 140/90$ mm Hg in patients without diabetes or chronic renal disease, or $< 130/80$ mm Hg for diabetic or chronic renal disease patients with focus on lowering SBP in both groups

Treatment Options without High Risk Conditions

Prehypertension

- Lifestyle modification with
 - Weight loss diet rich in potassium and calcium (DASH eating plan)
 - 2400 mg sodium diet
 - Increased physical activity
 - Moderation of alcohol consumption

Stage 1 hypertension

- Lifestyle modification
- Thiazide diuretic for most patients
- May also consider
 - Angiotensin converting enzyme inhibitor (ACEI)
 - Angiotensin receptor blocker (ARB)
 - Beta-blocker (BB)
 - Calcium channel blocker (CCB)
- OR
- Combination of above medications

Stage 2 hypertension

- Lifestyle modification
- Two drug combination of stage 1 hypertension medications usually (caution if risk of orthostatic hypotension—usually elderly)

Treatment Options with High Risk Conditions

Prehypertension

- Lifestyle modification
- Drugs as applicable in conditions below

Heart failure

- If asymptomatic give ≥ 1 medication
 - Angiotensin converting enzyme inhibitor
 - Beta-blocker
- If symptomatic give ≥ 1 medication with a loop diuretic — Lasix (furosemide) or Bumex (bumetanide)

- Angiotensin converting enzyme inhibitor
- Beta-blocker
- Angiotensin receptor blocker
- Aldosterone antagonist

Ischemic heart disease (stable angina)

- Beta-blocker

OR

- Long acting calcium channel blocker such as Norvasc (amlodipine)

Post myocardial infarction options

- Beta-blocker
- ACEI
- Aldosterone antagonist
- Lipid management
- Low dose aspirin 160–325 mg PO qday

High risk for coronary disease options

- Thiazide diuretic
- Beta-blocker
- ACEI
- CCB
- Lipid management
- Low dose aspirin 160–325 mg PO qday

Diabetic hypertension options

Combination of ≥ 2 drugs usually needed

- Thiazide diuretic
- Beta-blocker
- ACEI or ARB (reduces diabetic nephropathy)
- CCB

Chronic renal disease options

Definition of chronic renal disease

- Glomerular filtration rate (GFR) < 60 cc/min
- Creatinine > 1.5 mg/dL in men and creatinine > 1.3 mg/dL in women
- Albuminuria > 300 mg/day or 200 mg of albumin/gm creatinine

Medications

- ACEI
- ARB
- Loop diuretic such as Lasix (furosemide) may be needed with creatinine > 2.5 mg/dL
- Target BP is < 130/80 mm Hg
- Limited rise of up to 35% of creatinine with ACEI or ARB therapy is acceptable as long as hyperkalemia does not develop

Recurrent stroke prevention options

- Thiazide diuretic
- ACEI
- Lipid management
- Low dose aspirin (160–325 mg PO qday) if hypertension reasonably controlled

African Americans

- Thiazide diuretics or CCB more effective than beta-blockers, ACEIs or ARBs
- ACEI induced angioedema occurs 2–4 times more frequently than in other groups

Elderly patients

- Initial lower drug doses may be needed, though standard doses and multiple drugs are needed eventually in the majority to achieve BP control
- They are at risk of postural hypotension due to the frequent use of multiple medications

Follow Up and Achieving Blood Pressure Control

- Monthly follow up till blood pressure control is achieved
- Follow up every 3–6 months when blood control is achieved
- Serum creatinine and potassium should be checked 1–2 times per year
- Heart failure, diabetes and other comorbidities influence frequency of visits and tests needed
- Addition of a second drug should be in a different class if a single drug regimen was started initially and failed to achieve control

- Do not use 2 drugs in the same class at the same time (exception is Maxzide or Dyazide which are combination diuretic drugs)

Consult Criteria

- Unable to achieve target blood pressure reductions over several visits
- Blood pressure $\geq 180/110$ mm Hg on 2 or more medications
- Symptomatic high risk conditions or comorbidities (CHF, progressive renal insufficiency, hyperkalemia, angina, stroke, etc.)

Antihypertensive Medications (refer to PDR or medication inserts)

Thiazide diuretics

- Chlorthalidone (Diuril) 125–250 mg PO qday-bid
- Chorthalidone 12.5–25 mg PO qday
- Hydrochlorothiazide (HCTZ) 12.5–50 mg PO qday

Loop diuretics

- Lasix (furosemide) 20–40 mg PO bid
- Bumex (bumetanide) 0.5–1 mg PO bid
- Torsemide 2.5–10 mg PO qday

Potassium sparing diuretics

- Triamterene 25–50 mg PO qday-bid
- Amiloride 5 mg PO qday-bid

Aldosterone receptor blockers

- Aldactone 25–50 mg PO qday

Beta-blockers

- Atenolol 25–100 mg PO qday
- Metoprolol 50–100 mg PO qday-bid
- Corgard (Nadolol) 40–120 mg PO qday
- Toprol XL (metoprolol) 50–100 mg PO qday
- Propranolol 20–80 mg PO bid

Beta-blockers with intrinsic sympathomimetic

activity

- Sectral (acebutolol) 200–400 mg PO bid
- Pindolol 5–10 mg PO bid

Combined alpha and beta-blockers

- Coreg (carvedilol) 6.25–25 mg PO bid increase every 1–2 weeks as tolerated and needed up to 25 mg bid
- Labetalol 100–400 mg PO bid

Angiotensin converting enzyme inhibitors (ACEI)

- Lisinopril 5–40 mg PO qday
- Captopril 12.5–50 mg PO bid
- Accupril (quinapril) 10–80 mg PO qday

Angiotensin receptor blockers

- Atacand (candesartan) 8–32 mg PO qday
- Cozaar (losartan) 25–50 mg PO qday-bid
- Diovan (valsartan) 80–320 mg PO qday

Calcium channel blockers—non-Dihydropyridines

- Cardizem CD (diltiazem) 180–420 mg PO qday
- Cardizem LA (diltiazem) 120–540 mg PO qday
- Calan (verapamil) SR 120–240 mg PO qday-bid

Calcium channel blockers—dihydropyridines

- Norvasc (amlodipine) 2.5–10 mg PO qday
- Procardia XL (nifedipine) 30–60 mg PO qday

Alpha-1 blockers (not first line drugs)

- Cardura (doxazosin) 1–16 mg PO qday
- Cardura (doxazosin) XL 4–8 mg PO qday
- Minipres (prazosin) 1–5 mg PO bid-tid
- Caution for orthostatic hypotension — give first dose and any increases at bedtime

Central alpha-2 agonists

- Clonidine 0.1–0.3 mg PO bid-tid
- Catapres –TTS (clonidine) patch 0.1–0.3 mg qweek

Combination drugs

- ACEI+CCB (Lotrel) amlodipine and benazepril
2.5/10–10/20 mg PO qday
- ACEI+HCTZ (Zestoretic) Lisinopril and HCTZ
10/12.5–20/25 mg PO qday
- ARBs+diuretic (Diovan-HCT) valsartan and HCTZ
80/12.5–160/50 mg PO qday
- Beta-blocker+diuretic (Tenoretic) atenolol and HCTZ
50/25 to 100/25 PO qday
- Diuretic and diuretic (Aldactazide) 25/25 to 50/50 mg
PO qday-bid

Reference:

<http://www.nhlbi.nih.gov/guidelines/hypertension/express.pdf>

JNC 7 — The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure

ASTHMA MANAGEMENT

When using any management guideline, always follow the [Guidelines of Proper Use](#).

Definition

- A disorder of variable and recurring symptoms, airflow obstruction, and bronchial hyper-responsiveness with an underlying bronchial inflammation

Differential diagnosis

- Bronchiolitis
- Bronchitis
- COPD
- Airway foreign body
- Vocal cord dysfunction
- Heart failure
- URI
- Pulmonary embolism
- Cystic fibrosis
- Bronchopulmonary dysplasia (premature birth history)

Considerations

- Reversible airway constriction
 - May not be completely reversible over time
- Persistent changes in airways occur
- May be seasonal or perennial
- GERD, OSA (obstructive sleep apnea) and sinusitis may exacerbate asthma

Causes

- Innate immunity changes
- Genetic predisposition
- Environmental factors
 - Allergens and infectious causes (viral URI most common infectious cause)

Signs and symptoms

- Cough (worse at night) — may be only symptom in children

- Wheezing
- Dyspnea
- Chest tightness
- Sputum production

Principles of asthma management

- Assess severity initially
- Assess control of symptoms with treatment to adjust therapy
- Assess severity once control with treatment is achieved
- Identify precipitating factors
- Identify comorbid conditions such as GERD, OSA (obstructive sleep apnea), sinusitis, obesity, emotional stress etc.
- Assess patient's knowledge and ability to self-manage
- Patient instruction for self-monitoring
- Periodic clinic visits to monitor asthma
 - Every 2–6 weeks at start of therapy
 - Every 1–6 months after control is achieved to monitor therapy
- Spirometry — initially, and then after therapy has started, and during periods of exacerbation and every 1–2 years otherwise
- Provide a written asthma plan to patient
- Patient education

Classification of asthma severity

Well controlled

- Symptoms \leq 2 days/week
- Nighttime awakening \leq 2 times/month
- No interference with activity
- Short-acting beta-agonist (SABA) use \leq 2 days/week (excludes exercise-induced asthma)
- FEV1 or peak flow $>$ 80% of predicted or personal best

Not well controlled

- Symptoms $>$ 2 days/week
- Nighttime awakening 1–3 times/week
- Some limitation of normal activity
- SABA use $>$ 2 days/week (excludes exercise-induced asthma)

- FEV1 or peak flow 60–80% of predicted or personal best

Very poorly controlled

- Symptoms throughout the day
- Nighttime awakenings ≥ 4 times/week
- Extremely limited activity
- SABA use several times a day (excludes exercise-induced asthma)
- FEV1 or peak flow $< 60\%$ of predicted or personal best

Severe exacerbation

- Dyspnea at rest and interferes with conversation
- Peak expiratory flow (PEF) $< 40\%$ of predicted or personal best

Acute treatment

- Inhaled short-acting beta-agonist (albuterol) and ipratropium (if available) — repeat q15minutes $\times 3$ prn or continuous nebulizer awaiting EMS
- Send to emergency department (by ambulance preferentially)

Life threatening exacerbation

- Too dyspneic to speak; diaphoretic
- PEF $< 25\%$ of predicted or personal best

Treatment

- Inhaled short-acting beta-agonist (albuterol) and ipratropium (if available) — repeat q15minutes $\times 3$ prn or continuous nebulizer awaiting EMS
- Send by ambulance to emergency department and call emergency department with report

Stepwise approach to asthma management ≥ 12 years of age

- To assist but not replace clinical decision making on individual patients

Step-up as needed

- First check medication adherence, environmental control and comorbid conditions
- Assess control

- Step down when possible and when asthma is controlled for 3 months
- Step up treatment when SABA used > 2 days/week
- Short course oral corticosteroid may be needed for exacerbations

Intermittent asthma

Step 1

Preferred:

- Inhaled short-acting beta-agonist (SABA) prn therapy

Persistent asthma: Daily medication

- Consider SQ immunotherapy for Step 2–4 in patients with allergic asthma

Step 2

- SABA prn

Preferred:

- Low-dose inhaled corticosteroid (ICS)

Alternatives to ICS

- Cromolyn
- Leukotriene receptor antagonist (LTRA)
- Nedocromil
- Theophylline

Step 3

- SABA prn

Preferred:

- Low-dose ICS + long-acting inhaled beta-agonist (LABA)

OR

- Medium-dose ICS

Alternatives:

- Low-dose ICS + either LTRA, theophylline or zileuton

Step 4 (consult specialist)

- SABA prn

Preferred:

- Medium-dose ICS + LABA

Alternative:

- Medium-dose ICS + either LTRA, theophylline or zileuton

Step 5 (consult specialist)

- SABA prn

Preferred:

- High-dose ICS + LABA
AND
- Consider omalizumab in allergic asthma patients

Step 6 (consult specialist)

- SABA prn

Preferred:

- High-dose ICS + LABA + oral steroid
AND
- Consider omalizumab in allergic asthma patients

Stepwise approach to asthma management age 0–4 years of age

- To assist but not replace clinical decision making on individual patients

Step-up as needed

- First check medication adherence, environmental control and comorbid conditions
- Assess control
- Step down when possible and when asthma is controlled for 3 months
- Step up treatment when SABA used > 2 days/week
- Short course oral corticosteroid may be needed for exacerbations

Intermittent asthma

Step 1

Preferred:

- Inhaled short-acting beta-agonist (SABA) prn therapy

Persistent asthma: Daily medication

Step 2 (consider consultation with specialist)

- SABA prn

Preferred:

- Low-dose inhaled corticosteroid (ICS)

Alternatives to ICS

- Cromolyn or montelukast (Singulair)

Step 3 (consult specialist)

- SABA prn

Preferred:

- Medium-dose ICS

Step 4 (consult specialist)

- SABA prn

Preferred:

- Medium-dose ICS + LABA or montelukast (Singulair)

Step 5 (consult specialist)

- SABA prn

Preferred:

- High-dose ICS + LABA or montelukast (Singulair)

Step 6 (consult specialist)

- SABA prn

Preferred:

- High-dose ICS + LABA or montelukast (Singulair)
+ oral corticosteroid and ICS

Stepwise approach to asthma management age 5–11 years of age

- To assist but not replace clinical decision making on individual patients

Step-up as needed

- First check medication adherence, environmental control and comorbid conditions
- Assess control
- Step down when possible and when asthma is

controlled for 3 months

- Step up treatment when SABA used > 2 days/week
- Short course oral corticosteroid may be needed for exacerbations

Intermittent asthma

Step 1

Preferred:

- Inhaled short-acting beta-agonist (SABA) prn therapy

Persistent asthma: Daily medication

- Consider SQ immunotherapy for Step 2–4 in patients with allergic asthma

Step 2

- SABA prn

Preferred:

- Low-dose inhaled corticosteroid (ICS)

Alternatives to ICS

- Cromolyn, LTRA, nedocromil or theophylline

Step 3 (consider consultation with specialist)

SABA prn

Preferred:

- Low-dose ICS + LABA, LTRA or theophylline
OR
- Medium-dose ICS

Step 4 (consult specialist)

- SABA prn

Preferred:

- Medium-dose ICS + LABA

Alternative:

- Medium-dose ICS + LTRA or theophylline

Step 5 (consult specialist)

- SABA prn

Preferred:

- High-dose ICS + LABA

Alternative:

- High-dose ICS + LTRA or theophylline

Step 6 (consult specialist)

- SABA prn

Preferred:

- High-dose ICS + LABA + oral corticosteroid

Alternative:

- High-dose ICS + LTRA or theophylline + oral corticosteroids

Medications

Short-acting beta-agonist (SABA)

Albuterol HFA inhaler

All ages

- 2 puffs q4–6hr prn
- Spacer recommended

Nebulized albuterol

Age < 5 years

- 0.63–2.5 mg in 3 ml NS q4–8hr prn

Age ≥ 5 years

- 1.25–5 mg in 3 ml NS q4–6hr prn

Inhaled corticosteroid (ICS)

Fluticasone HFA/MDI (Flovent)

Low daily dose

Age < 5 years

- 176 mcg

Age ≥ 5 years

- 88–176 mcg

Medium daily dose

0–11 years

- > 176–352 mcg

Age ≥ 12 years

- > 264–440 mcg

High daily dose

Age \leq 11 years

- > 352 mcg

Age \geq 12 years

- > 440 mcg

Short term oral corticosteroids

- Course 3–10 days (no taper needed)

Methylprednisolone, prednisolone and prednisone

Age \leq 11 years

- 1–2 mg PO qday (NMT 60 mg)

Age \geq 12 years

- 40–60 mg PO qday

Long-acting beta-agonists (LABA)

Salmeterol DFI 50 mcg/blister

Age \geq 5 years

- 1 blister q12hr

Formeterol

Age \geq 5 years

- 1 capsule q12hr

Combination ICS/LABA

Budesonide/formoterol HFA/MDI (Symbicort)

Age \geq 5 years

- 2 puffs bid (depends on level of control)

Cromolyn

MDI

Age \geq 5 years

- 2 puffs qid

Nebulizer 20 mg/ampule

Age \geq 2 years

- 1 ampule qid

Nedocromil MDI

Age \geq 6 years

- 2 puffs qid

Leukotriene receptor antagonist (LTRA)

Montelukast (Singulair) chewable tablet

Age 1–5 years

- 4 mg qhs

Age 6–14 years

- 5 mg qhs

Age \geq 15 years

- 10 mg qhs

Zileuton 600 mg tablet

Age \geq 12 years

- 600 mg qid

Theophylline

Age < 1 year

- Starting dose 10 mg/kg/day
- Usual maximum dose $0.2 \times \text{age in weeks} + 5 =$ mg/kg/day — full term up to 26 weeks divided q8hr and divided q6hr for age 26–52 weeks

Age 1–11 year

- Starting dose 10 mg/kg/day
- Usual maximum 16 mg/kg/day

Age \geq 12 years

- Starting dose 10 mg/kg/day up to 300 mg/day
- Usual maximum 800 mg/day

Consult criteria

- As noted in the Stepwise approach above
- Usually Step 3 or higher
- Consider consultation for subspecialty evaluation for:

- Life-threatening asthma exacerbations or intubation
- Recurrent hospitalizations or ED visits in patients felt to be adherent to the written action plan — i.e., unresponsive to therapy
- Atypical features to the patient presentation raising questions as to other problems that mimic asthma such as vocal cord dysfunction syndrome, allergic bronchopulmonary aspergillosis, etc.

Reference:

Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma - Summary Report 2007

COPD MANAGEMENT

When using any management guideline, always follow the [Guidelines of Proper Use](#).

Definition

- Disease state with chronic airflow obstruction that is not fully reversible, and is progressive — and includes chronic bronchitis and/or emphysema and/or fixed asthmatic bronchitis and many patients will have substantial overlapping conditions

Differential diagnosis

- Acute bronchitis
- Pulmonary embolism
- Heart failure with bronchospasm
- Bronchiectasis
- Pneumonia
- Chronic asthma

Considerations

- 4th leading cause of death in the U.S.
- Chronic bronchitis defined as 3 months of chronic productive cough each of the past 2 years (other causes of cough excluded)
- Emphysema has permanent enlargement of the airways distal to the terminal bronchioles
- Asthma — see Asthma Management
- Cigarette smoke is leading cause of COPD
- Increase in lung volume occurs

Signs and symptoms

- Productive cough
- Acute chest illness
- Wheezing
- Rhonchi
- Inspiratory crackles
- Dyspnea
- Use of respiratory accessory muscles
- Cor pulmonale (right heart failure and edema)

- Occasional left heart failure
- Barrel chest (emphysema)
- Heart tones distant
- Obesity (more in chronic bronchitis patients)
- Prolonged expiration
- pCO₂ retention
- Metabolic alkalosis compensating for chronic respiratory acidosis
- Respiratory failure (end-stage)

Evaluation options

- History and physical examination
- Chest x-ray
- CBC
- Spirometry
 - Forced expiratory volume in 1 second over forced vital capacity (FEV₁/FVC) is less than 70% of predicted commonly
- ABG (pH should be normal; less than 7.30 indicates significant respiratory compromise)
 - Any decrease in pH below normal (7.35) from increasing pCO₂ is important and needs immediate evaluation and treatment
- Sputum evaluation for acute exacerbations prn
 - Streptococcal pneumonia and hemophilus influenza and moraxella catarrhalis most common bacterial organisms
 - Pseudomonas aeruginosa and enterobacteriaceae may occur in severe obstruction
- CT chest scan prn
- Pulse oximetry

Treatment

- Smoking cessation
- Patient education
- Proton pump inhibitor for GERD
- Long term oxygen for pO₂ < 55 mm Hg; or < 59 mm Hg for cor pulmonale or polycythemia

Stage 1 (mild obstruction)

- Influenza vaccine
- Short-acting bronchodilator prn

Stage 2 (moderate obstruction)

- Influenza vaccine
- Short-acting beta-agonist (SABA) prn
- Long-acting bronchodilator
- Cardiopulmonary rehabilitation

Stage 3 (severe obstruction)

- Stage 2 treatment plus inhaled corticosteroids (ICS) for repeated exacerbations
- Consider subspecialty consultation

Stage 4 (very severe obstruction)

- Stage 3 plus oxygen prn
- Surgery options
- Consider subspecialty consultation

Medication options

Short-acting beta-agonist (SABA)

Albuterol HFA inhaler

- 2 puffs q4–6h prn
- Spacer recommended

Long-acting beta-agonists (LABA)

Salmeterol DFI 50 mcg/blister

- 1 blister q12hr

Formeterol

- 1 capsule q12hr

Anticholinergic agents

Ipratropium (Atrovent)

- 2 puffs qid (NMT 12 puffs qday)

Tiotropium (Spiriva)

- 2 inhalations of 1 capsule qday

Inhaled corticosteroid (ICS)

Fluticasone (Flovent)

Low daily dose

- 88–176 mcg

Medium daily dose

- > 264–440 mcg

High daily dose

- > 440 mcg

Short term oral corticosteroids

- Course 3–10 days (no taper needed)

Methylprednisolone, prednisolone and prednisone

- 40–60 mg PO qday

Combination albuterol/ipratropium (Combivent)

MDI

- 2 puffs qid prn (NMT 12 puffs qday)

Combination SABA/ICS

Budesonide/formoterol 160 mcg/4.5 mcg (Symbicort)

- 2 inhalations bid

Fluticasone/salmeterol (Advair diskus) 50 mcg/250 mcg

- 1 inhalation bid

Antibiotic choices for exacerbations

- Azithromycin (Z-pak)
- Doxycycline 100 mg PO bid for 10 days
- Amoxicillin 500 mg PO tid for 10 days
- Septra DS PO bid for 10 days
- Cefuroxime (Zinacef) 250–500 mg PO BID for 10 days

Smoking cessation

- Nicorette
- Zyban
- Chantix

Consult criteria

- Uncontrolled COPD despite maximal medication therapy
- Home oxygen needed
- Respiratory acidosis with a pH < 7.35 (send to emergency department)

- Respiratory fatigue (send to emergency department)
- Progressive weight loss
- Fever $\geq 101.5^{\circ}\text{F}$ (38.6°C) — remember to evaluate for other causes of fever — UTI, prostatitis, viral syndromes (influenza), etc.