

CLINICAL PROTOCOLS

CHEST PAIN

Inclusion Criteria

- Systolic BP >90 or at baseline
- ECG without dynamic ECG changes
- Initial Troponin <0.10 (less than 3x upper limit of normal)
- HEART score ≥ 4 and/or chest pain characteristics concerning for typical angina

Exclusion Criteria

- STEMI
- NSTEMI with positive cardiac biomarkers and persistent chest, arm, jaw, or shoulder pain
- Unstable angina with dynamic ECG changes
- Chest pain with unstable ventricular arrhythmia or decompensated heart failure
- **Discharge Home** – HEART score ≤ 3 , alternate reason for CP that is not cardiac ischemia

Potential Interventions

- Oxygen and cardiac monitoring
- Continue med lock IV
- Serial Troponin I and ECGs at presentation in ED and 3+ hours after symptom onset
- If chest pain returns, repeat Troponin I and ECG
- Medications - Aspirin 325 mg upon ED presentation, nitrates prn chest pain
- NPO after midnight, NO CAFFIENE, HOLD BETA-BLOCKER – if stress test anticipated
- Smoking cessation counseling for all smokers (document counseling)
- If second troponin >0.10, consider starting Heparin gtt and Cardiology consultation
- Risk stratify further with HgbA1c and Lipids if not recently performed within 3 months
- For high risk patients, Cardiology consultation with attending evaluation in early AM for non-invasive testing

Inpatient Appropriate from Unit

- Unstable vital signs
- Positive cardiac markers or ECG evidence of ischemia/infarction
- Positive non-invasive testing – ischemia or reversible perfusion defect?
- Serious alternative diagnosis (Pulmonary Embolism, Aortic Dissection)

Discharge Appropriate from Unit

- Stable vital signs, stable symptoms, no serious cause of symptoms identified
- Normal serial cardiac markers and ECGs
- Negative provocative test or cardiac imaging, if needed – no ischemic or reversible defects identified

References

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SYNCOPE

Inclusion Criteria

- ECG without dynamic changes or evidence of ventricular arrhythmia
- Orthostatic hypotension and both:
 - Sustained drop in BP with sitting or standing
 - Systolic BP drop \geq 20mm Hg, or diastolic drop \geq 10mm Hg

Exclusion Criteria

- Unknown etiology and one of the following:
 - EF $<$ 35%
 - ECG with dynamic changes compared to prior or evidence of ventricular arrhythmia
- New focal neurologic deficits
- History of Aortic Stenosis with valve area $<$ 1.0 cm²
- Pacemaker malfunction requiring temporary pacemaker
- Syncope resulted in significant injury or trauma (i.e. fractures, subdural)

Potential Interventions

- Orthostatic blood pressures upon initial ED evaluation
- Neurologic examination to evaluate focal neurological deficits, and consider imaging
- Cardiac monitoring
- Continue med lock IV
- Falls Risk Screen – if positive, consult physical and occupational therapies
- IV fluids if orthostatic, repeat orthostatic blood pressures in AM
- Order echocardiogram **only if** concerning cardiac history (CAD, valvular disease, cardiomyopathy) or abnormal ECG
- If concern for arrhythmia or cardiac syncope, Cardiology consultation and placement of Ziopatch if indicated
- If syncope occurs with exertion:
 - Serial Troponin I and ECGs at presentation in ED and 3+ hours
 - Cardiology consultation for non-invasive testing

Inpatient Appropriate from Unit

- Unstable vital signs
- Unstable ventricular arrhythmia
- Positive cardiac markers or ECG evidence of ischemia/infarction
- Serious alternative diagnosis (Unstable Pulmonary Embolism, GI Bleeds, Sepsis, Aortic Dissection) and reviewed with UM nurse
- Change in neurologic status

Discharge Appropriate from Unit

- Stable vital signs and no evidence of orthostasis, no serious cause of symptoms identified
- Normal serial cardiac markers and ECGs
- No arrhythmia documented on review of cardiac monitor history screens

References

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- McKesson Interqual Level of Care Criteria 2016 Acute Care, Adult.

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DEHYDRATION/NAUSEA/VOMITING/DIARRHEA

Inclusion Criteria

- Evidence of dehydration – vomiting / diarrhea, high BUN/Cr ratio, orthostatic changes, poor skin turgor, high urine specific gravity >1.030, hemo-concentration
- Failed PO challenge
- Self-limiting or treatable cause not requiring prolonged hospitalization
- Mild to moderate electrolyte abnormalities

Exclusion Criteria

- Dehydration is not clearly present
- Unstable vital signs with hypotension and sustained tachycardia (heart rate greater than 100) that did not respond to initial fluid boluses
- Severe electrolyte abnormalities with sodium <125 or >150
- Acute change in mentation or altered mental status
- Underlying cause not amenable to short-term treatment (i.e. bowel obstruction, pancreatitis, appendicitis, bowel ischemia, DKA, sepsis)
- History of frequent ED visits for abdominal pain or nausea/vomiting, suspecting narcotic abuse or functional abdominal pain

Potential Interventions

- Monitoring of vital signs every 4 hours
- Orthostatic blood pressures upon initial ED evaluation, repeat within 12 hours
- Continue med lock IV
- IV hydration overnight and repeat BMP in AM
- Electrolyte repletion
- Anti-emetics with Zofran and/or Phenergan
- Stool studies if indicated
- Consider imaging if symptoms not improving or resolving

Inpatient Appropriate from Unit

- Unstable vital signs
- Associated cause found requiring hospitalization

Discharge Appropriate from Unit

- Stable vital signs and symptoms appropriate for outpatient management
- Able to tolerate oral fluids
- Normal electrolytes or replaced prior to discharged

References

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- McKesson Interqual Level of Care Criteria 2016 Acute Care, Adult.

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CELLULITIS

Inclusion Criteria

- Serial exams needed to exclude rapidly progressive cellulitis
- Cellulitis which requires >1 dose of IV antibiotics
- Temp < 40°C and WBC between 4,000 and 16,000.
- Cellulitis with drained abscess which requires a brief period of observation and wound care

Exclusion Criteria

- **Septic or toxic patients** (Temp >40°C, SBP < 90, RR > 22, HR > 100 and sustained, acute organ dysfunction, lactate > 4 mmol/L)
- **Immunocompromised patients** – neutropenia, HIV, transplant patients, ESRD/hemodialysis patients, patients on immunosuppressants or chemotherapy, post-splenectomy patients.
- **High-risk infections** – diabetic foot infections requiring broad spectrum IV antibiotics; infections proximate to a prosthesis, percutaneous catheter or indwelling device; orbital or periorbital infections; infections of >10% total body surface area; suspicion of osteomyelitis or deep wound infection; animal or human bite on face or hand.
- **Failed outpatient treatment** - progression after 2 days of antibiotics, no response to ≥ 5 doses or 3 days of antibiotics, or unable to tolerate oral antibiotics

Potential Interventions

- Monitoring of vital signs every 4 hours
- Mark edges of cellulitis with indelible marker to monitor progression
- Initial lab studies with CBC, CMP, and wound cultures if purulent drainage
- Blood cultures if meeting >2 SIRS criteria in the ED
- Continue med lock IV
- Repeat CBC in AM if WBC initially >12,000 and remaining hospitalized >12 hours
- Analgesics as needed for pain or myalgias
- Antibiotics for appropriate coverage as indicated for 5-7 days:
 - *Nonpurulent cellulitis choices should be Cephalosporins (Cefazolin or Ceftriaxone) or Clindamycin*
 - *Purulent cellulitis requires drainage and culture, and likely Vancomycin to start*
 - *Exceptions to using Vancomycin for Nonpurulent cellulitis – severe infections or those associated with penetrating trauma, injection drug use, or prior MRSA colonization or infection*
- If progression or no improvement, imaging studies with ultrasound (or CT scan) and add MRSA coverage with Vancomycin
- Step-down therapy to oral antibiotics:
 - *Nonpurulent cellulitis – oral options include cephalexin, clindamycin, amoxicillin-clavulanate*
 - *Purulent cellulitis – tailor antibiotics to culture results, or community acquired MRSA with clindamycin, doxycycline, or Bactrim*

Inpatient Appropriate from Unit

- Unstable vital signs or clinical condition worsening
- Worsening skin involvement
- Unable to care for wound at home or home care unavailable

Discharge Appropriate from Unit

- Stable vital signs and improving clinical condition
- Improvement or no progression of cellulitis
- Able to perform cellulitis care at home and take oral medications

References

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VIR PROCEDURES

(extended recovery)

Inclusion Criteria

- Chemo- or radio-embolization (TACE or TARE)
- Radio-frequency ablation (RFA)

Exclusion Criteria

- TIPS
- Inpatient status appropriate without bed availability
- Systolic BP <80 or altered mental status after anesthesia

Potential Interventions

- Monitoring of vital signs every 4 hours
- Mild to moderate pain control with PO Oxycodone or Tramadol
- Severe pain control with Dilaudid, Morphine, or Fentanyl via IV bolus or PCA wean
- Antibiotic coverage with Unasyn 3 gm IV q 6 hrs x3 (Levaquin 500 mg if PCN allergic)
 - Antibiotics for 5 days if h/o bilioenteric anastomosis or biliary stent implantation
- Anti-emetics with Zofran and Phenergan
- Transition to oral pain medications

Inpatient Appropriate from Unit

- Unstable vital signs with hypotension (systolic BP <80) or persistent hypoxia

Discharge Appropriate from Unit

- Stable vital signs, stable symptoms, pain controlled

References

- Castells A, Bruix J, Ayuso C, BrúC, MontanyàX, Boix L, Rodès J. Transarterial embolization for hepatocellular carcinoma. Antibiotic prophylaxis and clinical meaning of postembolization fever. *J Hepatol.* 1995;22(4):410.
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 - More often, hepatic decompensation is reversible, but it may be irreversible. In one study of 251 consecutive patients with HCC and synthetic hepatic dysfunction who underwent 443 TACE procedures, reversible hepatotoxicity developed in 78 patients (31 percent), while irreversible hepatotoxicity developed in 37 patients (15 percent). Risk factors for irreversible hepatotoxicity were serum bilirubin ≥ 4 mg/dL, prolonged prothrombin time, serum albumin < 2 g/L, serum creatinine > 2 mg/dL, large ascites, encephalopathy, or a MELD score ≥ 20 .
- Clark TW. Complications of hepatic chemoembolization. *Semin Intervent Radiol.* 2006 Jun;23(2):119-25.
 - A patient who has PES will commonly complain of abdominal pain, either generalized or localized to the right upper quadrant; nausea, vomiting, fevers, chills, and general malaise. Laboratory values may show slight elevations in the alanine aminotransferase/aspartate aminotransferase and bilirubin levels, which are temporary. Patients may start experiencing these symptoms directly after receiving TACE but they are usually resolved with or without treatment after approximately 1 to 2 weeks.
- Blackburn H, West S. Management of Postembolization Syndrome Following Hepatic Transarterial Chemoembolization for Primary or Metastatic Liver Cancer. *Cancer Nurs.* 2016 Sep-Oct;39(5):E1-E18.
 - Interventions identified are intra-arterial lidocaine, oral and intravenous analgesics, steroids, wrist-ankle acupuncture, antibiotics, and 5-HT₃ receptor antagonists. Findings are explicated according to individual symptoms of PES. Intra-arterial lidocaine, **steroids**, and a 5-HT₃ receptor antagonist are found to offer potential benefit in the management of PES symptoms.

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ABDOMINAL PAIN

Inclusion Criteria

- Evidence of dehydration – vomiting / diarrhea, high BUN/Cr ratio, orthostatic changes, poor skin turgor, high urine specific gravity >1.030, hemo-concentration
- Failed PO challenge
- Self-limiting or treatable cause not requiring prolonged hospitalization
- **Initial ED Intervention:** lab studies with CBC, CMP, Lipase, UA (UCx if concerns for UTI), UTtox, Urine Pregnancy +/- Pelvic Exam
 - Imaging studies with CT Abdomen/Pelvis or Abdominal Ultrasound if no clear cause
 - Attempt at IV pain control, if indicated

Exclusion Criteria

- Unstable vital signs with hypotension and sustained tachycardia (heart rate greater than 100) that did not respond to initial ED therapy with IV fluids and pain control
- Bowel obstruction (complete or partial)
- Evidence of cholecystitis or choledocholithiasis, or need for surgical procedure/intervention
- Surgical abdomen with free air, rigidity, or rebound tenderness
- History of frequent ED visits for abdominal pain or nausea/vomiting, suspecting narcotic abuse or functional abdominal pain

Potential Interventions

- Monitoring of vital signs every 4 hours along with abdominal examination
- Continue med lock IV
- Initial studies with CBC, CMP, Lipase, UA (UCx if concerns for UTI), UTtox, Urine Pregnancy +/- Pelvic Exam
- Imaging studies with CT Abdomen/Pelvis or Abdominal Ultrasound if no clear cause
- Stool studies with C diff and GI pathogen panel if indicated
- IV fluids with boluses and then continuous fluids initially if evidence of dehydration
- Start with NPO status and advance to liquid diet if vomiting
- Analgesics, preferably PO; avoid IV pushes of narcotics
- Anti-emetics with Zofran and/or Phenergan
- If constipation considered, provide aggressive bowel regimen
- If pain is epigastric, consider GI cocktail or Pepcid 20 mg daily

Inpatient Appropriate from Unit

- Unstable vital signs
- Associated cause found requiring hospitalization

Discharge Appropriate from Unit

- Stable vital signs and improving symptoms appropriate for outpatient management
- Able to tolerate oral fluids

References

- Gans SL, Pols MA, Stoker J, Boermeester MA. Guideline for the diagnostic pathway in patients with acute abdominal pain. *Dig Surg*. 2015;32(1):23-31.
- Hardy A, Butler B, Crandall M. The Evaluation of the Acute Abdomen. In: L.J. Moore et al. (eds.), *Common Problems in Acute Care Surgery*, Springer Science+Business Media New York 2013.
- Evaluation of the adult with abdominal pain. UpToDate 2017.

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ATRIAL FIBRILLATION

Inclusion Criteria

- Stable blood pressure and heart rate greater than 130, despite rate control
- Persistent symptoms
- High risk AFib category patients

Exclusion Criteria

- Acute concomitant illness - evidence of Acute MI, CHF exacerbation, PE, Sepsis, or CVA
- Recent Comorbidities - Acute MI in past 4 weeks, Stroke/TIA in last 3 months

Potential Interventions

- Monitoring of vital signs every 4 hours
- Oxygen and cardiac monitoring
- Continue med lock IV
- Rate control with oral Metoprolol q 6 hours (preferable) or Diltiazem q 6 hours
- Serial Troponin I and ECGs at presentation in ED and 3+ hours after symptom onset, if concern for ischemia
- If chest pain, obtain Troponin I and ECG
- TSH and Urine Tox Screen if not ordered by ED
- Consider anticoagulation with NOACs if still in AFib (Apixaban preferable):
 - 4 weeks of anticoagulation and follow up in Cardiology clinic (+/- Cardioversion)
 - For long-term anticoagulation, defer to AFib Clinic for further discussions (those at higher risk of stroke have $CHA_2DS_2-VASc \geq 2$ & $HAS-BLED \leq 3$)
- If initial treatment fails within 12-24 hours, consider Cardiology consultation

Inpatient Appropriate from Unit

- Unstable vital signs
- Continued severe symptoms, despite treatment
- Underlying diagnosis or etiology identified for cause of Atrial Fibrillation

Discharge Appropriate from Unit

- Stable vital signs, improving clinical condition, no serious cause of symptoms identified
- Rate control under 130 with improvement in presenting symptoms
- Patient converts and remains in normal sinus rhythm for over one hour
- Negative diagnostic testing
- Schedule appointment with AFib Clinic
- Patient education with more detailed information in AFib Clinic

References

- Dorian P, Cvitkovic SS, Kerr CR, et al. A novel, simple scale for assessing the symptom severity of atrial fibrillation at the bedside: The CCS-SAF Scale. *The Canadian Journal of Cardiology*. 2006;22(5):383-386.
- January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol*. 2014; 64:e1.
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HEART FAILURE

Inclusion Criteria

- Dyspnea at rest and not at baseline after 2 hours of treatment in ED with IV Lasix
- Known diagnosis of systolic or diastolic heart failure
- **Initial ED Intervention:** lab studies with CBC, CMP, pro-BNP, Troponin I, CXR, and EKG along with IV Lasix administered ≥ 1

Exclusion Criteria

- Altered mental status
- Poor response to initial ED treatment after 2 hours with respiratory rate >30
- Need for non-invasive positive pressure ventilation
- Failed outpatient management ≥ 2 visits in past week
- Acute cardiac ischemia (dynamic ECG changes and/or troponin >0.10) or new arrhythmias

Potential Interventions

- Monitoring of vital signs every 4 hours
- Oxygen and cardiac monitoring as needed
- Continue med lock IV
- Strict Intake/Output and weight recorded upon arrival to unit and in morning
- Initial studies with CBC, CMP, pro-BNP, Troponin I, CXR, and EKG in ED
- Serial Troponin I and ECGs at presentation in ED and 3+ hours after symptom onset
- If chest pain, obtain Troponin I and ECG
- Heart Failure Medications – continue or start beta-blocker and ACE-I
- Administer diuretics, greater than home dose, and preferably IV Lasix dosed q 8-12 hours
- Echocardiogram if not done within 6-12 months
- Smoking cessation counseling for all smokers (document counseling)
- Heart failure education – daily weights and home diuresis plan

Inpatient Appropriate from Unit

- Unstable vital signs or clinical condition worsening
- Positive cardiac markers or ECG evidence of new ischemia/infarction/arrhythmia
- Continued dyspnea and hypoxia, or evidence of volume overload on exam, which needs continued IV diuresis
- Poor response to therapy at 24 hours, failure to improve subjectively

Discharge Appropriate from Unit

- Stable vital signs and improved symptoms (no chest pain, orthopnea, or exertional dyspnea)
- Evidence of adequate diuresis – net negative output, decrease in weight, decrease in JVD
- Heart failure discharge checklist (ACEi, β -blocker, education, HH, hospital follow-up)
- Check weight and pro-BNP prior to discharge

References

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- Treatment and prognosis of heart failure with preserved ejection fraction. UpToDate 2017.
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PNEUMONIA

Inclusion Criteria

- Signs, symptoms and CXR consistent with pneumonia
- CURB-65 score <2
- Ability to transition to PO antibiotics and has support at home for discharge in <24 hours

Exclusion Criteria

- **Septic or toxic patients** (Temp <35°C or >40°C, SBP<90, RR>30, HR>120 and sustained, acute organ dysfunction, lactate >4mmol/L)
- **Immunocompromised** (HIV, transplant, chemotherapy, sickle cell disease, asplenic)
- **High Risk patients** (Active cancer, nursing home resident, cirrhosis, ESRD, Grade III or IV COPD)
- Likely to require >24 hours in hospital
- O2 sat <92% on room air (or lower than baseline)
- Empyema
- More than one lobe affected
- CURB-65 ≥2

Potential Interventions

- Monitoring of vital signs every 4 hours with intermittent (or continuous as available) oxygen saturation monitoring
- Supplemental Oxygen and Bronchodilators as needed
- Initial lab studies with CBC and CMP in ED
- Blood cultures if meeting SIRS criteria in ED
- Continue med lock IV
- Smoking cessation counseling for all smokers (document counseling)
- Pneumococcal screening and vaccination if indicated
- Influenza screening and vaccination if influenza season
- Steroids only for those patients with clinical deterioration
- Analgesics as needed for pain, myalgias, or cough/sputum
- Smoking cessation counseling for all smokers (document counseling)
- Antibiotics to cover community acquired pneumonia for 5-7 days:
 - First choice – Combination therapy with an anti-pneumococcal beta-lactam (ceftriaxone or ampicillin-sulbactam) plus a macrolide (azithromycin). Doxycycline may be used as an alternative to a macrolide, especially in patients at high risk of QT prolongation.
 - Second choice – a respiratory fluoroquinolone (levofloxacin 750 mg daily)
- Step-down therapy to oral antibiotics:
 - Amoxicillin 1 g tid or cefdinir 300 mg twice daily plus either azithromycin or doxycycline. Second choice is an oral respiratory fluoroquinolone

Inpatient Appropriate from Unit

- Unstable vital signs or clinical condition worsening
- Increasing CURB-65 score
- Lack of clinical improvement (physician discretion)
- Inability to tolerate PO antibiotics

Discharge Appropriate from Unit

- Stable vital signs and improving clinical condition
- Demonstrates ability to tolerate PO antibiotics

References

- Lim W, van der Eerden MM, Laing R, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. *Thorax*. 2003;58(5):377-382.
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- Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, Dowell SF, File TM Jr, Musher DM, Niederman MS, Torres A, Whitney CG; Infectious Diseases Society of America; American Thoracic Society. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis*. 2007 Mar 1;44 Suppl 2:S27-72.
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UTI/PYELONEPHRITIS

Inclusion Criteria

- Signs and symptoms along with UA evidence supporting diagnosis of pyelonephritis
- Urine culture obtained in Emergency Department

Exclusion Criteria

- **Septic or toxic patients** (Temp <35°C or >40°C, SBP<90, RR>30, HR>120 and sustained, acute organ dysfunction, lactate >4mmol/L)
- **Immunocompromised** (HIV, transplant, chemotherapy, sickle cell disease, asplenic)
- Evidence of Obstruction (urinary retention or kidney stones)
- Complicated UTI (indwelling catheter, stent, nephrostomy tube, or personal history of a MDR UTI)
- Renal Failure
- Uncontrolled DM (versus diabetes alone)
- Another exclusionary primary diagnosis

Potential Interventions

- Monitoring of vital signs every 4 hours
- Initial lab studies with CBC and CMP as well as urinalysis and urine culture in ED
- Blood cultures if meeting SIRS criteria in the ED
- Repeat CBC and BMP in 12 hours
- IV hydration for 12 hours
- IV Antiemetics and Analgesics, consider transition to PO as tolerated
- Imaging if concerns for obstruction or worsening symptoms (ultrasound preferable or CT)
- Antibiotics to cover urinary tract infection or based upon prior urine culture sensitivities:
 - Initially cover with Ceftriaxone 1 gm IV q 24 hours (if allergic, consider Levaquin)
 - If concerns for enterococcus or prior history, consider Ampicillin or Amoxicillin
 - If concerns for pyelonephritis, consider Levaquin 750 mg daily for 7-14 days
- Step-down therapy to oral antibiotics:
 - Depending upon culture results, oral fluoroquinolones are more effective than oral beta-lactams for pyelonephritis

Inpatient Appropriate from Unit

- Unstable vital signs or clinical condition worsening
- Inability to tolerate PO antibiotics
- Positive blood cultures
- Abnormal results on imaging tests

Discharge Appropriate from Unit

- Stable vital signs and improving clinical condition
- Demonstrates ability to tolerate PO antibiotics

References

- Gupta K, Hooton TM, Naber KG, Wullt B, Colgan R, Miller LG, Moran GJ, Nicolle LE, Raz R, Schaeffer AJ, Soper DE; Infectious Diseases Society of America; European Society for Microbiology and Infectious Diseases. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: A 2010 update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis. 2011 Mar 1;52(5):e103-20.
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ELECTROLYTE ABNORMALITIES

Inclusion Criteria

- Self-limiting or treatable cause of electrolyte disturbance not requiring prolonged hospitalization
- No active co-morbidities requiring prolonged hospitalization
- Failed PO challenge
- Mild to moderate electrolyte abnormalities that can be rapidly corrected

Exclusion Criteria

- Unstable vital signs with hypotension and sustained tachycardia (heart rate greater than 100) that did not respond to initial fluid boluses
- Acute change in mentation or altered mental status
- Underlying cause not amenable to short-term treatment (i.e. bowel obstruction, pancreatitis, appendicitis, bowel ischemia, DKA, sepsis)
- Severe dehydration with electrolyte abnormality unlikely to be corrected within 24 hours
- Two or more of the following acute electrolyte abnormalities, or one acute electrolyte abnormality AND associated symptoms and clinical findings:
 - Hyperkalemia – $K > 6$ mEq/L AND ECG changes
 - Hypokalemia – $K < 2.5$ mEq/L AND ECG changes
 - Hypernatremia – $Na > 150$ mEq/L AND mental status changes, muscle weakness, irritability, or hyperreflexia
 - Hyponatremia – $Na < 125$ mEq/L AND headache, mental status changes, muscle weakness, or nausea
 - Hypermagnesemia – $Mg > 3.0$ mg/dL AND mental status changes, muscle weakness, or vomiting
 - Hypomagnesemia – $Mg < 1.5$ AND carpopedal spasm, clonus, hyperreflexia, malaise, nausea, tetany, or weakness
 - Hypercalcemia – $Ca > 11$ mg/dL AND abdominal pain, mental status changes, nausea, nephrolithiasis, or vomiting
 - Hypocalcemia – $Ca < 7.5$ mg/dL (and lower than baseline), AND carpopedal spasm, flaccid paralysis, muscle weakness, paresthesia, perioral numbness, or tetany

Potential Interventions

- Monitoring of vital signs every 4 hours and further clinical exam evaluation if indicated
- IV fluids and/or electrolyte repletion targeting the specific electrolyte abnormality
- Continue med lock IV
- Electrolyte replacement/correction followed by repeat lab studies within 12 hours
- Monitor on telemetry if abnormalities in potassium

Inpatient Appropriate from Unit

- Unstable vital signs
- Associated cause found requiring hospitalization
- No improvement in, or worsening, electrolyte abnormalities requiring ongoing IV repletion

Discharge Appropriate from Unit

- Stable vital signs and symptoms appropriate for outpatient management
- Able to tolerate oral fluids and oral electrolyte repletion
- Improving electrolytes abnormalities

References

- Etiology, clinical manifestations, and diagnosis of volume depletion in adults. UpToDate 2017.
- Evaluation and treatment of hypomagnesemia. UpToDate 2017.
- Clinical manifestations and treatment of hypokalemia in adults. UpToDate 2017.
- Treatment of hypocalcemia. UpToDate 2017.
- McKesson Interqual Level of Care Criteria 2016 Acute Care, Adult.

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HYPERTENSIVE URGENCY/EMERGENCY

Inclusion Criteria

- Blood pressure <240/120 after initial treatment in ED
- No evidence of acute end-organ damage or injury
- Normal mentation, and normal head CT (only if done)
- ECG without dynamic ECG changes
- Initial Troponin <0.10 (less than 3x upper limit of normal)
- **Initial ED Intervention:** 3 doses of IV anti-hypertensive medication within one hour (first choice Labetalol 20 mg, second choice Hydralazine 20 mg)

Exclusion Criteria

- Blood pressure remains >240/120 after initial treatment in ED
- Evidence of acute end-organ injury: acute kidney injury, hypertensive encephalopathy, intracranial hemorrhage, papilledema, focal neurologic abnormalities, CVA, CHF, acute coronary syndromes, aortic dissection
- Continuous infusions required for BP control (as noted in General Exclusion Criteria)

Potential Interventions

- Monitoring of vital signs every 4 hours
- Oxygen and cardiac monitoring as needed
- Continue med lock IV
- Initial studies with CBC, CMP, Troponin, ECG, UA, CXR in ED
- Anti-hypertensive medications as indicated for goal BP <200/110
 - First choice: Labetalol 20 mg IV slow push every hour until SBP <200
 - Second choice: Hydralazine 20 mg IV
- Give clonidine if clonidine withdrawal is suspected
- TSH and Urine Tox Screen if indicated
- Treat secondary causes as indicated (pain, anxiety, dehydration, etc)
- Serial Troponin I and ECGs at presentation in ED and 3+ hours after symptom onset
- If chest pain, obtain Troponin I and ECG and administer Aspirin if not already given

Inpatient Appropriate from Unit

- Blood pressure >200/110 and symptoms persist or worsen
- Positive cardiac markers or ECG evidence of ischemia/infarction
- Development of any exclusion criteria

Discharge Appropriate from Unit

- Blood pressure <200/110 and no new symptoms or improvement of presenting symptoms
- Normal serial cardiac markers and ECGs
- No serious cause of elevated blood pressures identified

References

- Evaluation and treatment of hypertensive emergencies in adults. UpToDate 2017.
- Drugs used for the treatment of hypertensive emergencies. UpToDate 2017.
- McKesson Interqual Level of Care Criteria 2016 Acute Care, Adult.

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SYMPTOMATIC ANEMIA

Inclusion Criteria

- Symptomatic anemia requiring transfusion according to UNCH protocol (fatigue, dyspnea, chest pain, palpitations)
- If guaiac positive and suspicion for GI bleed, please refer to GI bleed protocol.
- Stable vital signs with recent labs verifying need for transfusion

Exclusion Criteria

- Unstable vital signs: RR >20, SBP < 90, HR >110.
- Significant orthostatic changes (\downarrow SBP >20); Increase in pulse >20bpm on standing.
- Altered mental status/lethargy
- Troponin > 0.1, dynamic EKG changes.
- Hgb <5
- Pancytopenia
- Active significant bleeding, excluding GI bleed protocol

Potential Interventions

- Monitoring of vital signs every 4 hours
- IV started, pre-medication and IV hydration as needed
- Consider Anemia workup if indicated: B12, MMA, Retic Count, Iron Panel
- Type and Crossmatch sent if not previously done (note that HBR patients need new Type and Cross at UNCH)
- Transfuse only leukocyte-reduced red cells or platelets per Nursing protocol
- CBC can be repeated at 15 min post-transfusion
- Hematology consultation if needed for follow-up with infusion clinic/IV iron.

Inpatient Appropriate from Unit

- Transfusion reaction
- Lack of response to initial transfusion.
- Unstable vital signs
- Fluid overload, CHF
- Unavailable blood products for 18hours

Discharge Appropriate from Unit

- Stable vital signs
- Symptoms improved
- No evidence of fluid overload or CHF
- No evidence of transfusion reaction per Nursing protocol

References

- Wang JK, Klein HG. Red blood cell transfusion in the treatment and management of anaemia: the search for the elusive transfusion trigger. *Vox Sang* 2010; 98:2.
- Hébert PC, Wells G, Blajchman MA, Marshall J, Martin C, Pagliarello G, Tweeddale M, Schweitzer I, Yetisir E: A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. Transfusion Requirements in Critical Care Investigators, Canadian Critical Care Trials Group. *N Engl J Med* 1999; 340:409–417.
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GI BLEED

Inclusion Criteria

- History of dark stool or bright red blood in last 24-48 hours
- Creatinine at baseline
- Rectal exam for guiac and orthostatics vitals done in the ED

Exclusion Criteria

- Unstable vital signs: Sustained tachycardia despite fluid resuscitation. SBP <90 at any point during ED stay.
- Significant orthostatic changes (\downarrow SBP>20); Increase in pulse >20bpm upon standing.
- Active bleeding = Hgb drop of >2 pts compared to recent baseline, bright red blood on gastric lavage, Greater than 2 episodes of bright red blood in the past 12 hours
- History of end stage liver disease, coagulopathy, portal hypertension, esophageal varices, thrombocytopenia (plt <60K).
- Current use of anticoagulant or dual antiplatelet therapy.
- Altered mental status.
- Prior AAA repair or gastric bypass surgery.
- Known history of occult bleeding.
- ESRD/hemodialysis patients, patients on immunosuppressants or chemotherapy, post-splenectomy patients.

Potential Interventions

- Monitoring of vital signs every 4 hours
- 2 large bore IVs
- Serial Hct / Hgb, every 6 hours X2
- IV Hydration, IV PPI, intermittent boluses
- NPO, monitor I/Os (documentation of GI bleeding), until Hgb stable
- GoLytely Prep (can start in ED). If high suspicion for distal GI bleeding, may pursue enema and flexible sigmoidoscopy.
- GI Consult for possible endoscopy, if evidence of continued bleeding after 12 hours

Inpatient Appropriate from Unit

- Unstable vital signs or clinical condition worsening
- Continued decrease in Hgb and/or continued bleeding at 24 hours.
- Intervention on EGD requiring 72h hospitalization.
- Active bleeding by endoscopy
- Hgb < 8 and transfusion required

Discharge Appropriate from Unit

- Stable vital signs and improving clinical condition
- Normal or stable serial exams
- No deterioration in clinical condition
- If endoscopy - no active bleeding, and follow-up arranged on PPI

References

- Laine L, Jensen DM. Management of patients with ulcer bleeding. *Am J Gastroenterol* 2012; 107:345.
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- Elizalde, JI, et al. Early changes in hemoglobin and hematocrit levels after packed red cell transfusion in patients with acute anemia. *Transfusion* 1997 Jun; 37(6):573-6.

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ASTHMA EXACERBATION

Inclusion Criteria

- Awake, alert, and fully oriented
- Intermediate response to therapy with continued dyspnea and wheezing
- PEF (peak expiratory flow) 40-70% predicted (or personal best) after initial β_2 agonist therapy
- **Initial ED Intervention:** Albuterol 2.5 mg nebulizer therapy hourly x3 treatments or Albuterol 10 mg continuous nebulizer therapy for an hour along with IV/PO steroids
 - Minimum ED treatment time at least 2 hours

Exclusion Criteria

- Altered mental status
- Poor response to initial ED treatment after 2 hours: persistent use of accessory muscles, respiratory rate >30 , or excessive effort
- Inability to take PO
- If ABG performed, elevated pCO₂ (>50) plus decreased pH (<7.30)
- PEF $< 40\%$ predicted (or personal best)

Potential Interventions

- Monitoring of vital signs every 4 hours with intermittent (or continuous as available) oxygen saturation monitoring
- PEF (Peak expiratory flow) in the ED after initial treatment with nebulizers
- Rapid influenza test during influenza season - Influenza vaccination if influenza season
- Supplemental oxygen as needed titrated to maintain oxygen saturation $>92\%$
- Inhaled bronchodilator treatment with scheduled Albuterol 2.5 mg nebulizers every 6 hours and Albuterol PRN every 4 hours; can provide Albuterol metered dose inhaler (MDI) two to four puffs every 6 hours and Albuterol PRN every 4 hours with spacer
- Administer 2 gm of IV Magnesium Sulfate if not administered in the ED and symptoms persist or worsen
- Systemic steroids with Prednisone 40 mg daily for 5 days
- Smoking cessation counseling for all smokers (document counseling)
- Can consider adding Ipratropium nebulizer therapy every 6 hours if symptoms persist
- Can consider, but do not routinely perform, CXR, pro-BNP, and ABG, unless symptoms and clinical condition worsens

Inpatient Appropriate from Unit

- Failure to resolve bronchospasm with therapy in 18-24 hours
- Oxygen saturation $<90\%$ despite therapy (if not documented chronic hypoxia)

Discharge Appropriate from Unit

- Improvement in bronchospasm with oxygen saturation $>92\%$ on RA upon ambulation
- Discharge home with steroid burst (discuss need to start inhaled corticosteroid if not already taking), Albuterol MDI or nebulizer therapy, smoking cessation counseling, and hospital follow-up
- Care management has seen patient prior to discharge for plan and follow-up

- Document room air saturation at rest and exertion
- Nurse to review inhaler technique and provide spacer education if needed – inhaler training on UNC COPD website
- Discuss & educate patient regarding need to complete an Asthma Action Plan with PCP

References

- Asthma Action Plan–https://www.nlm.nih.gov/files/docs/public/lung/asthma_actplan.pdf
- National Heart, Blood, and Lung Institute Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma. NIH Publication no. 08-4051, 2007.
- Global Initiative for Asthma (GINA). GLOBAL STRATEGY FOR ASTHMA MANAGEMENT AND PREVENTION. www.ginasthma.org (Accessed on May 20, 2017).
- Management of acute exacerbations of asthma in adults. UpToDate 2017.
- <https://www.med.unc.edu/pulmonary/specialties/areas-and-programs/chronic-obstructive-pulmonary-disease> – inhaler education at bottom of page from COPD foundation and National Jewish Health Center
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COPD EXACERBATION

Inclusion Criteria

- Awake, alert, and fully oriented
- **Initial ED Intervention:** Albuterol and Ipratropium nebulizer therapy hourly x3 treatments or continuous nebulizer therapy for an hour along with IV/PO steroids

Exclusion Criteria

- **Septic or toxic patients** (Temp <35°C or >40°C, SBP<90, RR>30, HR>120 and sustained, acute organ dysfunction, lactate >4mmol/L)
- Altered mental status
- Poor response to initial ED treatment after 2 hours: persistent use of accessory muscles, respiratory rate >30, excessive effort, or O2 sat <88% on room air (or baseline oxygen level)
- Need for non-invasive positive pressure ventilation

Potential Interventions

- Monitoring of vital signs every 4 hours with intermittent (or continuous as available) oxygen saturation monitoring
- Supplemental oxygen to target an oxygen saturation of 88 to 92%
- Initial studies with CBC and BMP along with CXR and EKG in ED, if condition worsens then consider obtaining troponin, pro-BNP, and initiate telemetry (may also consider performing PE evaluation with either CTA PE protocol versus V/Q scan)
- Sputum culture if frequent exacerbations, severe reduction in FEV1, or prior mechanical ventilation as patient may have increased gram negative resistance
- ABG if persistent or worsening hypoxia; VBG if mental status change, h/o CO2 retention, or h/o prior non-invasive positive pressure ventilation and/or intubation
- Pneumococcal screening and vaccination if indicated
- Rapid influenza test during influenza season - Influenza vaccination if influenza season
- Inhaled bronchodilator therapy:
 - Inhaled beta agonist - Scheduled Albuterol 2.5 mg nebulizer every 6 hours and Albuterol PRN every 4 hours; can provide Albuterol metered dose inhaler (MDI) two to four puffs every 6 hours and Albuterol PRN every 4 hours with spacer
 - Inhaled anticholinergic – Scheduled Ipratropium 500 mg nebulizer/MDI q 6 hours
- Continue maintenance inhalers during exacerbation
- Systemic steroids with Prednisone 40 mg daily for 5 days
- Smoking cessation counseling for all smokers (document counseling)
- Antibiotic coverage for 5 days when signs of bacterial infection are present:
 - First choice –Ceftriaxone 1 gm IV daily
 - Second choice – a respiratory fluoroquinolone (levofloxacin 750 mg daily)
- Step-down therapy to oral antibiotics:
 - Cefdinir 300 mg twice daily or an oral respiratory fluoroquinolone

Inpatient Appropriate from Unit

- Unstable vital signs or clinical condition worsening
- Oxygen saturation <90% on room air (or baseline oxygen level)
- Failure to resolve exacerbation within 18-24 hours
- Uncompensated pCO2 Retention

Discharge Appropriate from Unit

- Stable vital signs and symptoms appropriate for outpatient management
- Oxygen saturation >92% on room air (or baseline oxygen level)
- Discharge home with steroid burst, MDI or nebulizer therapy, antibiotics, smoking cessation counseling, and hospital follow-up
- Care management has seen patient prior to discharge for plan and follow-up
- Document room air saturation at rest and exertion
- Nurse to review inhaler technique and provide spacer education if needed – inhaler training on UNC COPD website

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- <https://www.med.unc.edu/pulmonary/specialties/areas-and-programs/chronic-obstructive-pulmonary-disease> – inhaler education at bottom of page from COPD foundation and National Jewish Health Center
- McKesson Interqual Level of Care Criteria 2016 Acute Care, Adult.

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