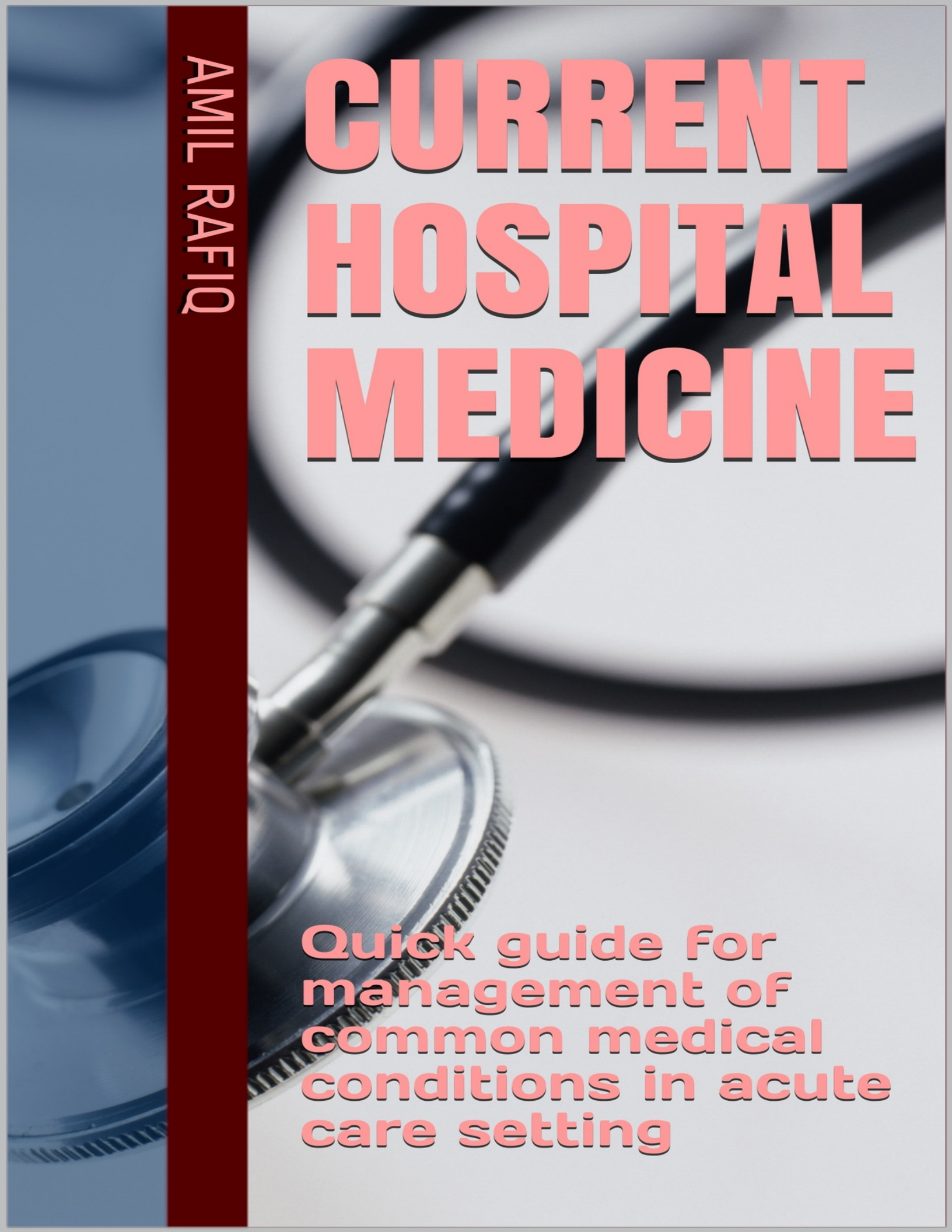
AMIL RAFIQ
CURRENT HOSPITAL MEDICINE
Quick guide for management of common medical conditions in acute care setting

PREFACE

Current Hospital Medicine (CHM) is intended to be a quick reference guide for management of common medical conditions encountered in the inpatient hospital setting. It is envisioned to be a useful resource for medical students, interns, residents, advance practice providers and hospitalists.

CHM includes evidence based information with emphasis on initial treatment and management of patients who are being admitted to the hospital.

Medical students will find CHM useful during clinical rotations and while preparing for various clinical knowledge based exams. I believe this book will also be helpful to residents working under supervision during residency training. By referencing to CHM frequently, residents should be able to understand and follow recommendations from attending physicians easily and quickly, as is expected during busy medical floor rounds.

For hospitalist physicians and advanced practice providers, CHM can serve both as a quick reference and a refresher text. Hospitalists, nurse practitioners and physicians assistants should use this book especially when admitting new patients to make sure all the standard care orders have been placed.

I hope that you find CHM useful throughout the continuous journey of learning medicine and taking care of our patients.

Amil Rafiq, MD
Clinical Assistant Professor
School of Medicine at Oregon Health & Science University

NOTICE

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required. Although every effort has been made to make sure all the information is up to date, readers should still not rely solely on this book for making medical decisions. Medical information in this book is not intended as a substitute for professional care. Any recommendation in the book should be integrated with complete clinical picture.

ACUTE KIDNEY INJURY (AKI)/ACUTE RENAL FAILURE

- Start on IV fluids (NS @ 100-125 mL/hr)

- Send UA, Urine Electrolytes (Sodium, Creatinine), and Check FENa

- Order renal ultrasound
- Strict input and output monitoring.
- Watch for fluid overload

- BMP/ Renal panel daily
- Monitor potassium and phosphate levels closely

- Avoid nephrotoxic agents. No NSAID's. No ACEI/ ARB's. No Diuretics.

- Avoid drastic lowering of blood pressure in order to maintain a good renal perfusion

- Monitor for potentially life-threatening complications of AKI including volume overload, refractory hyperkalemia, severe metabolic acidosis (pH <7.1), and any signs of uremia such as pericarditis, or an otherwise unexplained decline in mental status

- If serum phosphate concentrations is > 6 mg/dL, consider starting on dietary phosphate binders

<u>In addition in severe AKI</u>

- Check pH, if <7.1 and patient not in fluid overload, start on Bicarb drip and consult nephrology.

ATRIAL FIBRILLATION WITH RVR

- Give Metoprolol 5 mg IV or Diltiazem 5 to 10 mg IV (can repeat dose in 15 min's)
- If rate control is achieved, start on scheduled PO Metoprolol or Diltiazem

- Check cardiac enzymes and TSH
- Monitor electrolytes and supplement as indicated. Keep K > 4, Mg > 2
- Start on continuous telemonitoring and order ECHO.

- If rate control is not achieved with IV bolus medications, start on Diltiazem drip
- Closely monitor blood pressure and heart rate while on Diltiazem drip
- Hold the drip if systolic blood pressure < 90 or heart rate is < 60

- Once heart rate is maintained less than 100, begin oral Diltiazem regimen
- Oral Diltiazem is typically started at 30 mg every 6 hours or 60 mg every 8 hours.
- Taper and discontinue infusion 2 hours after second oral dose.

- In patients with advanced HF or significant hypotension, consider digoxin as initial therapy

- In patients who do not respond to or are intolerant of IV Metoprolol, Cardizem and/or Digoxin, consider intravenous amiodarone

- Evaluate all patients for benefits of oral anticoagulation (CHADS2-Vasc score) vs risk of bleeding (HAS- BLED score, recurrent falls)

ALCOHOL WITHDRAWAL

- Start on IV fluids (D5NS @ 100-150 mL/hr)
- Give Banana bag x 1

- Strict input and output monitoring.
- Watch for fluid overload
- Continuous telemonitoring

- Ativan IV/PO as per CIWA protocol.

- Consider Librium 25 mg TID in patients able to take PO (Oxazepam10 mg TID in patients with severe liver disease/advanced cirrhosis).

- Thiamine. Folic acid
- Give IV thiamine 100 mg daily initially, switch to PO in 48 to 72 hrs.

- Monitor electrolytes. Check Magnesium/ Phosphorus.

- Should get CT head in patients with altered mental status or history of fall
- For patients needing frequent or high doses of sedatives, consult ICU

- Counsel patient about the health risks of alcohol and encourage quitting when patient stable and alcohol withdrawal resolved. Social worker referral for alcohol abuse rehab programs.

ALTERED MENTAL STATUS (AMS)

- Check CBG to rule out hypoglycemia
- Send BMP, CBC, Mg, Ph, LFT's
- EKG and Cardiac enzymes
- CXR, UA, ABG

- Start on gentle IV hydration (NS@ 75 mL/hr)
- Give IV thiamine (in alcoholics, malnourished, ESRD and cancer patients)

- TSH, B12, Folate, Cortisol, Ammonia level, Urine drug screen if indicated

- Blood cultures, Lactic acid, PCT if an infectious etiology is suspected.

- CT Head/ MRI brain in selected cases
- Consider EEG and Lumbar Puncture, if above work up is negative.

- Minimize narcotics and other drugs that could potentially cause worsening of mental status.

- Olanzapine/ Ativan PRN for severe agitation.

- Orientation protocols - provision of clocks, calendars, windows with outside views, frequent reassurance, touch, and verbal orientation especially from familiar persons.

ANAPHYLACTIC REACTION/ ANGIOEDEMA

- Epinephrine 0.3 to 0.5 mg IM urgently in patients with lip swelling/ changes in voice. Can repeat dose every 5 to 15 minutes.

- Supplemental oxygen, 8 to 10 L/minute via facemask or 15 L/minute using a nonrebreather mask

- Start on IV fluids, NS @ 100-125 mL/hr.
- In hypotensive patients, treat aggressively with NS boluses

- Consider giving methylprednisolone 125 mg IV and continue on IV steroids, such as solumedrol 40 to 60 mg every 6 to 8 hours.

- Albuterol nebulization as needed for bronchospasm

- IV Pepcid BID. PRN Antihistaminics

- In patients with significant throat or tongue swelling, consider early intubation

- Cricothyroidotomy may be necessary if attempts at intubation fail.

- Prescribe EpiPen and refer to allergist/immunologist, upon discharge

ASTHMA EXACERBATION

- Supplemental O2 as needed to target a SpO2 of > 92%
- CXR, if indicated (patient's with significant cough/sputum production).
- Consult respiratory therapist for bronchodilators – Albuterol 2.5 mg nebulization every 20 minutes for three doses, then 2.5 mg every 4 to 6 hours as needed.
- For patients with severe exacerbations, add Ipratropium 0.5 mg by nebulization every 20 minutes for 3 doses plus one dose of Magnesium sulfate 2 grams IV over 20 minutes.
- Check for influenza/ viral panel during the fall and winter seasons.
- Start on PO steroids, Prednisone 40 to 60 mg daily. Consider IV Steroids (Solumedrol 40-60 mg every 6-8 hours) in very severe exacerbations. Titrate steroids as per clinical response.
- Consult pulmonology for severe/ recurrent exacerbations.

CELLULITIS

- Check PCT, LA, ESR, CRP.
- Send blood cultures.

- Elevate the affected area/limb
- If septic, begin aggressive hydration

- Start on IV antibiotics
    - Vancomycin and Zosyn (Severe infection)
    - Ceftriaxone **OR** Unasyn **OR** Ciprofloxacin plus Clindamycin (Mild to moderate infection)

- In patients with significant swelling/edema get venous duplex to rule out DVT, and consider CT with contrast to rule out abscess or deep infection (especially in patients with hyponatremia, elevated CPK or AST)

- In patients with ulcers or cellulitis of toes, get X-rays to rule out osteomyelitis (OM). Might need MRI if clinical suspicion high and X-ray negative for OM

- Duration of therapy is individualized depending on clinical response, typically ranges between 5 to 14 days.

CHF EXACERBATION

- Supplemental O2 as needed, goal SpO2> 90%
- ABG, BiPAP- If significant hypoxia present
- Elevate head end of bed 30 to 45 degrees

- Start on IV Lasix 40 to 80 mg daily (in divided doses). Patients on chronic diuretics, typical IV doses are usually 2 to 2.5 times the daily oral dose.

- Continuous telemonitoring
- Strict input and output monitoring.
- Fluid restriction and daily weights

- EKG, Serial trop's, CXR, ECHO
- Check BNP, repeat in 48 hrs.
- Monitor renal function and electrolytes. Keep K > 4, Mg > 2

- Patients with aortic stenosis – use diuretics with caution

Approach to refractory heart failure and hypotension

- Start on Dobutamine, run continuously at 2.5 mcg/kg per min to help in diuresis. Can uptitrate to 10 mcg/kg per min to maintain MAP> 65.

Long term management of patients with HFrEF

- Start on low dose ACE inhibitor (such as Enalapril 2.5 mg) and Beta blocker (such as Carvedilol 3.125 mg BID) prior to discharge.

COPD EXACERBATION

- Supplemental O2 as needed to target SpO2 of 88 to 92 percent
- ABG, BiPAP as needed.
- Albuterol 2.5 mg and Ipratropium 0.5 mg nebulization every 4 to 6 hours as needed.
- CXR to rule out concurrent pneumonia
- Check for influenza/ viral panel during the fall and winter seasons.
- Start on PO steroids, Prednisone 40 to 60 mg daily. Consider IV Steroids (Solumedrol 40-60 mg every 6-8 hours) in very severe exacerbations. Titrate steroids as per clinical response.
- Sputum culture if possible.
- Empiric antibiotics (such as Levaquin or Azithromycin)
- Consult respiratory therapist
- Consult pulmonology for severe/ recurrent exacerbations.
- If patient is started on BiPAP, repeat ABG in 2 hours. Consult ICU if repeat ABG worsened or pH <7.25 for possible intubation/ mechanical ventilation.

CYCLICAL VOMITING SYNDROME WITH ACUTE FLARE UP

- Start on IV fluids, 5% dextrose 0.45% saline @ 100-125 mL/hr

- Monitor electrolytes especially potassium, supplement as indicated

- Antiemetics (Zofran/ Reglan) as needed
- Zofran is antiemetic of choice with maximum total dose of 32 mg/24 hours

- Daily EKG to monitor QT interval

- Sedatives (Diphenhydramine/ Lorazepam) as needed to supplement antiemetics.

- Pain management- Tylenol, Toradol
- Minimize narcotic use

- Trial of clears, advance diet as tolerated
- Check urine toxicology for cannabinoids

<u>Outpatient management</u>

- Encourage patients to follow up with PCP to discuss abortive agents (such as Sumatriptan) and prophylactic therapy (such as Amitryptyline) in patients with frequent exacerbations.

CLOSTRIDIOIDES (FORMERLY CLOSTRIDIUM) DIFFICILE COLITIS

- Contact precautions, hand hygiene with soap and water
- Supportive care with IV fluids, correction of electrolyte imbalances
- Clear liquid diet, advance as tolerated.

- Start on PO Vancomycin 125 mg orally 4 times daily x 10 days OR Fidaxomicin 200 mg orally twice daily for 10 days

- For patients with severe colitis (renal failure: creatinine > 1.5 mg/dL, significant leukocytosis: WBC > 15K), start on PO Vancomycin (125 mg four times daily) plus IV Metronidazole (500 mg every 8 hours)

- For patients with fulminant colitis (hypotension, ileus, megacolon) get CT abdomen/ pelvis, start on PO Vancomycin (500 mg four times daily) plus IV Metronidazole (500 mg every 8 hours), consult ID and consider early surgical consultation.

- If unable to take PO, can give Vancomycin via nasogastric tube

- For first recurrence can repeat PO Vancomycin 125 mg orally 4 times daily for 10 days

- For second recurrent use Vancomycin pulsed-tapered regimen: PO Vancomycin 125 mg orally 4 times daily for 14 days, then 125 mg orally twice daily for 7 days, then 125 mg orally once daily for 7 days, then 125 mg orally every other day for 2

weeks

- For patients with multiple recurrences consider fecal microbiota transplantation (FMT)

CHOLECYSTITIS

- Keep NPO except med's and start on IV hydration. Monitor electrolytes.
- Supportive care with pain control (Toradol, Morphine) and antiemetics as needed
- If diagnosis is inconclusive on initial imaging (USG/CT) get HIDA scan
- Send blood cultures and start on empiric IV antibiotics such as Zosyn or Ceftriaxone. Continue antibiotics until gallbladder is removed or cholecystitis resolved.
- Consult surgery team for definitive therapy (cholecystectomy) during same hospitalization.
- If symptoms do not improve with supportive care and risk of cholecystectomy outweighs the potential benefits, then gallbladder drainage (percutaneous cholecystostomy) is indicated

Approach to dilated CBD

- Patients with acute cholangitis (Charcot's triad with elevations in the serum alkaline phosphatase and bilirubin) or with evidence of stone in CBD on imaging studies proceed directly with ERCP. Other patients can consider MRCP or EUS first.

DIVERTICULITIS

- Keep NPO except med's and start on IV hydration. Monitor electrolytes.
- Supportive care with pain control (Toradol, Morphine) and antiemetics as needed
- Send blood cultures and start on empiric IV antibiotics such as Zosyn OR Levofloxacin plus Metronidazole
- Trials of clears in 24 to 48 hrs, advance diet as tolerated
- Once tolerating diet, can switch antibiotics to PO (Augmentin OR Levaquin plus Flagyl) to complete a total of 10 to 14 days course.
- If patient fails to improve within 48 to 72 hrs or shows any signs of worsening get CT abdomen pelvis with contrast to rule out abscess or perforation.

Approach to complications of acute diverticulitis

- In patients with microperforation (contained perforation), continue conservative management with IV antibiotics. Patients with frank perforation (free air under the diaphragm), emergent surgery is indicated. Abscess should undergo CT guided drainage. If abscess is not amenable to percutaneous drainage, can continue with IV antibiotics and monitor closely with serial CT scans. If no improvement in 2 to 3 days, surgery is indicated.

DIABETIC KETOACIDOSIS (DKA)

- ABG, urine ketones by dipstick, serum ketones (beta-hydroxybutyric acid)

- Start on IV fluids, NS @ 150 mL/hr
- Strict input and output monitoring

- Insulin drip as per DKA protocol
- Check BMP every 4 hours.

- Monitor glucose levels, CBG checks every 1 to 2 hours.
- Once CBG is < 250, change IV fluids to D5 1/2 NS and continue at same rate.

- If Potassium falls < 3.3, hold Insulin drip and replace K+ first.

- Once anion gap is closed (<18), start on diet and initiate home (pre-DKA) subcutaneous Insulin regimen. In Insulin-naive patients, start long acting insulin at a dose of 0.5 units/kg per day, plus sliding scale insulin. Continue on IV Insulin for 1 to 2 hours after giving subcutaneous Insulin.

- Monitor blood sugars AC/HS and adjust subcutaneous Insulin regimen as needed.

- Consult dietician/ diabetes education nurse

Of note: Reactive leukocytosis unrelated to infection and elevated serum amylase/ lipase levels without acute pancreatitis can be seen in patients with DKA

DEEP VENOUS THROMBOSIS (DVT)

- Start on IV UFH (Unfractionated Heparin) or SubQ LMWH (Lovenox)

- Typical dosing for UFH is 80 units/kg bolus (maximum dose: 10,000 units), then 18 units/kg/hour (maximum initial infusion: 2,000 units/hour). Dosing adjustment/ monitoring should be guided per pharmacy protocol/ local hospital heparin dosing nomogram

- Typical dosing for LMWH is 1 mg/kg every 12 hours or 1.5 mg/kg once daily. Avoid use or adjust dose to 1 mg/kg once daily in patients with CrCl <30 mL/minute

- Start on oral anticoagulation (OAC), usually after 24 hrs.

- For patients in whom anticoagulation is contraindicated consider IVC filter placement

- In patients with significant hypoxia/ SOB, get ABG and CT angio chest to rule out PE. If unable to get CT angio (due to renal failure, contrast allergy) get V/Q scan. If imaging positive for PE, start on continuous telemonitoring and get ECHO to check RVSP

- For patients with extensive iliofemoral DVT, consult interventional radiology/ vascular surgery for catheter-directed thrombolytic therapy/ surgical thrombectomy.

<u>Transitioning from IV/SubQ to oral anticoagulation:</u>

- Warfarin: Overlap IV Heparin or SubQ Lovenox with Warfarin

until INR is therapeutic x 2

- Eliquis/Xarelto: Start direct-acting oral anticoagulant (DOAC) when heparin infusion is stopped or within 2 hours prior to the next scheduled dose of Lovenox

Duration of therapy

- Provoked DVT/PE: Minimum 3 months
- First unprovoked DVT/PE: 3 months (if significant bleeding risk or patient refuses lifelong anticoagulation) to indefinite treatment (if low bleeding risk and patient agrees)
- First DVT/PE with active cancer: Indefinite treatment
- Second unprovoked DVT/PE: Indefinite treatment

GI BLEED

- CBC, BMP, LFT, PT/INR
- Keep NPO and start on IV fluids
- Continuous telemonitoring

- Start on PPI (proton pump Inhibitor) such as Pantoprazole 40 mg IV BID

- Monitor hemoglobin/hematocrit closely (every 6 to 12 hours depending on severity of bleed)

- For patients with no significant medical history, transfuse PRBCs for hemoglobin <8 g/dL (80 g/L). In elderly patients and those with significant CAD transfuse to keep hemoglobin >9 g/dL (90 g/L). In patients with cirrhosis, hemoglobin > 7 g/dL (70 g/L) is acceptable.

- Give FFP (fresh frozen plasma) for coagulopathy
- Give platelets for thrombocytopenia (platelets <50,000) or platelet dysfunction in patients on chronic aspirin therapy.

- Patients who receive multiple units of PRBCs should also get FFP and platelets (typically after transfusing four units of PRBCs)

- Avoid any NSAID's or Aspirin

- Consult Gastroenterology for EGD+/- Colonoscopy

<u>In addition in variceal bleed</u>

- Give Octreotide 50 mcg bolus, followed by 50 mcg/hour infusion to be continued for 3 to 5 days. Also start on prophylactic antibiotic such as Ceftriaxone 1 g IV daily, can

change to Ciprofloxacin 500 mg PO BID upon discharge to complete a total of 7 days of antibiotic therapy.

HEPATIC ENCEPHALOPATHY

- CBC, BMP, LFT's, PT/INR, UA, Blood cultures, Ammonia and Alcohol level

- Noncontrast CT head in patients with coagulopathy, significant mental status changes or history of fall. Cerebral edema is found in about 80% patients with acute hepatic encephalopathy.

- Lactulose 20 gram every 4 hrs initially. Titrate to achieve 2-3 soft stools per day.
- If no adequate response within 24-48 hrs, add Rifaximin 400 mg TID or 550 mg BID. If patient unable to take PO, can use Lactulose enemas.

- Monitor electrolytes, supplement as indicated
- Consider gentle hydration, avoiding dehydration.

- Evaluate and treat any precipitating factors like infection, sedatives, dehydration, GI bleed, constipation, electrolyte abnormalities, portal or hepatic vein thrombosis.

- Use of restraints for agitation, may be a safer option than pharmacologic treatment. Should medications be required, Haloperidol is a safer option than benzodiazepines.

Approach to patients with ascites

- Abdominal ultrasound and paracentesis is recommended to rule out spontaneous bacterial peritonitis (SBP). In patients with abdominal pain and unremarkable routine workup, consider Doppler ultrasonography/ contrast enhanced CT of abdomen to rule out portal vein thrombosis or hepatic vein thrombosis

(Budd-Chiari syndrome).

HYPERTRIGLYCERIDEMIA INDUCED PANCREATITIS (HTGP)

- Hypertriglyceridemia is suspected as etiology of acute pancreatitis in patients with serum triglyceride levels >1000 mg/dL (11.2 mmol/L)

- Keep NPO and start on aggressive IV hydration (NS@150 mL/hr)
- Strict input and output monitoring
- Monitor serum electrolytes (ionized Ca /Mg), supplement as indicated.
- Supportive care with pain control (Morphine, Fentanyl) and antiemetics as needed

- Start on Insulin drip (0.1 to 0.3 units/kg/hour), monitor CBG's every hour and triglyceride levels/BMP every 12 hours.
- If CBG falls < 200 mg/dL, change IV fluids to D5 (Dextrose 5%)
- If Potassium falls < 3.3 mEq/L, then hold Insulin and replace potassium first.
- Discontinue insulin drip when triglyceride levels are < 500 mg/dL (5.6 mmol/L)

- Start on trial of clears when appropriate and advance to low fat diet as tolerated

- Start Gemfibrozil (600 mg BID) when tolerating diet

<u>Approach to multi drug therapy for hypertriglyceridemia</u>

- For patients who are already on a statin, consider adding

icosapent ethyl (fish oil) 4 g daily. For patients who require combined therapy with a Statin and Fibrate, Fenofibrate (Fenofibric acid 145 mg daily) is preferred over Gemfibrozil due to lesser risk of muscle toxicity.

HYPERKALEMIA

- Pseudohyperkalemia due to hemolysis of the blood specimen is not uncommon and must be excluded first.

- Patients with muscle weakness, ECG changes or potassium > 6.5 mEq/L, start immediately on continuous telemonitoring and give Calcium gluconate 1 ampule (1000 mg) to stabilize cardiac membranes

- Give IV bolus of regular insulin 10 units, followed immediately with 50 mL of a 50% Dextrose solution and check CBGs hourly for up to six hours to monitor for hypoglycemia.

- Give 15 to 30 grams of sodium polystyrene sulfonate (SPS) orally. Do not give SPS to patients with ulcerative colitis, c diff colitis, and ileus, post-operative or renal transplant patients. Can use Patiromer 8.4 g daily as needed or zirconium cyclosilicate 10 g TID for 48 hours instead.

- Repeat BMP to check serum potassium levels in 2 hours. If potassium is still high, can repeat Insulin/Dextrose. Can also give furosemide 20 to 40 mg IV and/or albuterol nebulization.

- Hemodialysis, if conservative measures fail.

- In patients with mild to moderate hyperkalemia, Calcium gluconate is usually not indicated. Insulin/Dextrose is used on a case-by-case basis. Potassium can be reduced gradually with SPS, diuretics and a low-potassium diet.

- Discontinue medications that can contribute to hyperkalemia such as ACE inhibitors, ARBs, aldosterone antagonists, NSAIDs and nonselective beta blockers

HYPERTENSIVE EMERGENCY

- Severe symptomatic hypertension (SBP >180 and/or DBP >120) with headaches, nausea/vomiting, altered mental status, seizures, chest pain, or shortness of breath requires emergent treatment.

- Start on continuous telemonitoring and IV antihypertensive medications such as Labetalol (0.5 to 2 mg/minute) or Nicardipine (5 to 15 mg/hour) drip.

- Serial troponins in patients with chest pain. Monitor renal function closely. If recurrent vomiting develops and/or any acute change in mental status get stat CT head

- Labetalol drip is acceptable in most patients except those with bradycardia, asthma/COPD, pheochromocytoma or cocaine/ methamphetamine overdose.

- Nicardipine drip is preferred if bradycardia present.

- Nitroglycerin drip (5 to 100 mcg/minute) is preferred in patients with acute pulmonary edema.

- Avoid drastic lowering of blood pressure, goal is to lower BP not more than 25 to 30 % in the first 24 hours.

- Once blood pressure is better controlled, wean off IV medications and switch to oral anti hypertensive medications

- In patients with severe but asymptomatic hypertension (hypertensive urgency) blood pressure reduction is considered non emergent, can trial oral agents such as Clonidine.

HYPONATREMIA

- Hyponatremia in patients that develops at home/outside hospital is usually categorized as chronic hyponatremia (been present for more than 48 hours, or duration unclear)
- Start on IV fluids, normal saline @ 100 mL/hr
- Send serum osmolality, TSH, lipid panel, urine sodium and urine osmolality
- Repeat BMP every 4 hours.
- Goal is to increase serum sodium initially by not more than 4 to 6 mEq/L during the first 24 hours (to prevent the risk of osmotic demyelination syndrome)
- In patients with severe hyponatremia (<120 mEq/L) or moderate hyponatremia (120 to 129 mEq/L) with severe symptoms such as seizures, obtundation, coma, or respiratory arrest, start on hypertonic 3% saline immediately at a rate of 15 to 30 mL/hour and consult nephrology urgently. Hypertonic saline can be administered via peripheral vein safely, placement of a central venous catheter is not necessary. Monitor serum sodium hourly while on hypertonic saline. If sodium is correcting too fast, stop hypertonic saline and start on D5W infusion.
- Patients with acute hyponatremia that has developed over a period of less than 48 hours even with mild symptoms should be considered for hypertonic saline after discussion with nephrology.
- In hypervolemic patients, restrict fluids and consider diuretics

- In patients with SIADH, sodium typically worsens with saline, start on fluid restriction, might need salt tablets and diuretics.

SIADH clues

- A low serum osmolality
- An inappropriately elevated urine osmolality (> 100, usually > 300 mosmol/kg)
- A urine sodium concentration usually above 40 meq/L
- Low blood urea nitrogen and serum uric acid concentration
- A relatively normal serum creatinine concentration
- Normal acid-base and potassium balance
- Normal adrenal and thyroid function

MENINGITIS

- Initiate droplet precautions and collect two sets of blood cultures
- Get urgent lumbar puncture, give Dexamethasone (0.15 mg/kg) and start immediately on Ceftriaxone (2 gram IV every 12 hrs), Vancomycin (15 to 20 mg/kg IV every 8 to 12 hours as per pharmacy protocol), and Acyclovir (10 mg/kg of ideal body weight IV every 8 hrs)
- If age > 50 years, add ampicillin (2 gram every 4 hrs) to cover against *Listeria monocytogenes*
- Continue with dexamethasone (0.15 mg/kg every 6 hrs) if *Streptococcus pneumoniae* suspected.
- CT head is indicated prior to lumbar puncture in patients with altered mental status, focal neurologic deficit, new onset seizure, papilledema, history of CNS disease or immunocompromised state. Such patients can be started on empiric therapy immediately after collecting blood cultures.
- In patients with CSF shunt, recent history of neurosurgery, or penetrating head trauma, Ceftriaxone should be replaced with Cefepime (2 g IV every 8 hrs)
- Frequent neurochecks and continuous telemonitoring
- Check lactic acid, PCT and consider gentle IV hydration
- Consult ID and modify treatment based on CSF analysis and culture results.

NON ST ELEVATION MYOCARDIAL INFARCTION (NSTEMI)

- Start on continuous telemonitoring and supplemental O2 as needed to maintain SpO2 >90%
- Give Aspirin 162 to 325 mg to be chewed and swallowed. If unable to take PO give as rectal suppository
- Obtain serial EKG's and trend troponins (every 4 to 6 hrs)
- Give sublingual Nitroglycerin tablets (0.4 mg) every five minutes for maximum of three doses except in patients with hypotension or those using phosphodiesterase inhibitors. In patients with persistent symptoms, start on Nitroglycerin drip at 10 mcg/min and increase the drip rate by 10 mcg/min every 5 minutes until pain resolves or systolic BP falls below 100 mmHg
- Start on high intensity statin therapy such as Atorvastatin 80 mg daily and check lipid panel
- Clopidogrel loading dose of 300 mg once, and then continue with 75 mg daily
- Give IV Heparin (UFH) bolus of 60 units/kg (maximum of 4000 units), followed by a continuous IV infusion of 12 units/kg/hour (maximum 1000 units/hour) adjusted per pharmacy protocol to achieve a goal aPTT of approximately 50 to 70 seconds. Heparin infusion is typically continued for 48 hours
- IV Morphine as needed for persistent chest pain or severe

anxiety related to ischemia

- Order ECHO and consult Cardiology
- Consider beta blockers such as metoprolol 12.5 mg BID after discussion with Cardiology except in patients with hypotension, bradycardia or heart failure

NEUTROPENIC FEVER

- Supplemental O2 as needed to maintain SpO2 >90%

- Initiate neutropenic precautions in patients with severe neutropenia (ANC <500 cells/microL)

- Collect two sets of blood cultures and start on empiric IV antibiotics such as Cefepime 2 g IV every 8 hours, as soon as possible.

- Start on IV fluids, monitor urine output and serum electrolytes.

- Check Lactic acid, PCT, CXR, UA
- Influenza screen/ viral panel during the fall and winter seasons.
- Consider CT chest/abdomen/pelvis if UA/CXR negative

- In patients with sepsis, pneumonia, skin/soft tissue infection, or suspected central venous catheter (CVC) related infections, continue Cefepime and add Vancomycin 15 to 20 mg/kg IV every 8 to 12 hours as per pharmacy protocol.

- Early ID consult recommended to modify antibiotic regimen as needed
- Hem/onc consultant should guide RBC and PLT transfusions

- Serial blood cultures in patients with bacteremia
- If symptoms warrant check stool for C Diff
- Consider CT sinuses and removal of any central venous catheters, if source of infection remains unclear.

- Patients who continue to be febrile with no apparent source of infection despite being on broad spectrum antibiotics for few

days, consider addition of empiric antifungal agents after discussion with ID consultant.

ORTHOSTATIC HYPOTENSION

- Start on IV hydration, NS @ 75-100 mL/hr
- Discontinue any offending medications like diuretics and sedatives
- Continuous telemonitoring
- PT/OT consults

Lifestyle modifications/ Non pharmacological measures:

- Raise the head end of the bed by 20 degrees or so
- Arise slowly in stages, from supine to seated position first and then to standing
- Liberalize salt and fluid intake
- Avoiding alcohol and large meals
- Fitted compression stockings, abdominal binders

Medication trials:

- Midodrine start with 2.5 mg TID, can increase up to 10 mg TID
- Fludrocortisone 0.1 mg OD, can increase 0.1 every week (max effective dose 0.5 mg)

- Treatment of orthostatic hypotension may exacerbate supine hypertension. One strategy suggested is to treat supine hypertension at night with a transdermal nitroglycerin patch (0.025 to 0.1 mg/hour), and remove the patch in the morning prior to getting out of the bed.

PANCREATITIS

- Check serum amylase, lipase, LFT's, lipid panel, and alcohol level.
- Keep NPO and start on aggressive IV hydration (NS@150 mL/hr)
- Strict input and output monitoring
- Monitor serum electrolytes (ionized Ca /Mg), supplement as indicated.
- Supportive care with pain control (Morphine, Fentanyl) and antiemetics as needed
- Ultrasound of abdomen to rule out gallstones, CBD dilation
- Start on trial of clears when appropriate, usually in 24 to 48 hours and advance to low fat diet as tolerated.
- If no significant improvement in 72 hrs or any signs of worsening, get CT abdomen with contrast. Start prophylactic antibiotics such as Imipenem if CT shows evidence of necrosis. If clinical condition continues to deteriorate consult Surgery for debridement of pancreatic necrosis.
- If patient is unable to tolerate orals for 4 to 5 days since admit, consult IR or GI for placement of a jejunal feeding tube to start enteral feedings. If patient cannot tolerate enteral feedings start on parenteral nutrition (TPN)

PNEUMONIA

- Supplemental O2 as needed to maintain SpO2> 92%
- ABG PRN if significant hypoxia or lethargy

- Lactic acid, PCT level, and sputum culture
- Check urine Streptococcal and Legionella antigens
- Respiratory viral panel during the fall and winter season

- Collect two sets of blood cultures and start on IV antibiotics per pneumonia protocol regimens such as
    - Ceftriaxone 1 g IV daily plus Azithromycin 500 mg IV or PO daily.
    - Levofloxacin 750 mg IV daily

- Can use Doxycycline 100 mg BID instead of Azithromycin if concern for QT prolongation.

- Aspiration pneumonia, antibiotic options include
    - Zosyn or Unasyn (1.5 to 3 g IV every 6 hours)
    - Augmentin (875 mg PO BID)
    - Clindamycin (450 mg TID), if allergic to penicillins

- For patients with severe pneumonia and risk factors for *Pseudomonas* (COPD, chronic steroid use, gram negative bacilli in sputum) suggested empiric regimen includes combination therapy with Zosyn (4.5 g every 6 hours) or Cefepime (2 g every 8 hours) **plus** Levofloxacin (750 mg daily).

- For patients with severe pneumonia and risk factors for MRSA (ESRD, IV drug abuse, homelessness, history of MRSA, gram positive cocci in clusters in sputum) suggested empiric regimen

includes combination therapy with Vancomycin (dosing per pharmacy protocol) plus Cefepime (2 g every 8 hours)

Hospital acquired pneumonia (HAP)

- Defined as pneumonia that occurs 48 hours or more after admission and did not appear to be incubating at the time of admission. In patients with HAP and risk factors for increased mortality or resistant organisms suggested empiric regimen includes combination therapy with Vancomycin, Cefepime and Levofloxacin.

PULMONARY EMBOLISM (PE)

- Supplemental oxygen as needed, ABG if significant hypoxia

- Check EKG and start on continuous telemonitoring

- D Dimer, CT angio chest
- V/Q scan (If unable to get CT angio due to renal failure or contrast allergy)

- Start on IV UFH (Unfractionated Heparin) or SubQ LMWH (Lovenox)

- Typical dosing for UFH is 80 units/kg bolus (maximum dose: 10,000 units), then 18 units/kg/hour (maximum initial infusion: 2,000 units/hour). Dosing adjustment/ monitoring should be guided per pharmacy protocol/ local hospital heparin dosing nomogram

- Typical dosing for LMWH is 1 mg/kg every 12 hours or 1.5 mg/kg once daily. Avoid use or adjust dose to 1 mg/kg once daily in patients with CrCl <30 mL/minute

- ECHO to check RVSP
- Venous duplex of bilateral lower extremities to rule out DVT

- Start on oral anticoagulation (OAC), usually after 24 hrs

<u>Transitioning from IV/SubQ to oral anticoagulation:</u>

- Warfarin: Overlap IV Heparin or SubQ Lovenox with Warfarin until INR is therapeutic x 2

- Eliquis/Xarelto: Start direct-acting oral anticoagulant (DOAC) when heparin infusion is stopped or within 2 hours prior to the

next scheduled dose of Lovenox

Duration of therapy

- Provoked DVT/PE: Minimum 3 months
- First unprovoked DVT/PE: 3 months (if significant bleeding risk or patient refuses lifelong anticoagulation) to indefinite treatment (if low bleeding risk and patient agrees)
- First DVT/PE with active cancer: Indefinite treatment
- Second unprovoked DVT/PE: Indefinite treatment

Of note: Patients with high clinical suspicion and low bleeding risk can be started on therapeutic dose anticoagulation empirically even before CT angio chest or V/Q scan is completed.

SEIZURE

- Initiate seizure precautions
- Ativan PRN for seizure activity

- Get ECG and start on continuous telemonitoring
- Supplement O2 as needed, ABG if significant hypoxia
- Frequent neuro checks

- Check CBG, if hypoglycemic give thiamine 100 mg IV and 50 mL of 50% dextrose solution

- CPK, LA, electrolytes including magnesium, calcium levels

- Start on gentle IV hydration
- Send urine toxicology screen

- CT/ MRI and EEG in all patients with first seizure

- Neurology consult for antiseizure drug therapy in patients with second unprovoked seizure. IV Levetiracetam (Keppra) is commonly used in inpatient setting

Status epilepticus

- Defined as seizures lasting longer than 5 to 10 minutes or recurrent seizures with no return to baseline consciousness in between seizures.
- Give loading dose of Lorazepam 0.1 mg/kg IV, infused at a maximum rate of 2 mg/min, can repeat dose in 3 to 5 minutes.
- Also load with Levetiracetam (40 to 60 mg/kg, maximum 4500 mg)
- Urgent Neurology consult and continuous EEG monitoring.
- Patients who are actively seizing despite two initial doses of Lorazepam, intubate and start on continuous Midazolam or

Propofol infusion

SEPSIS

- Supplemental O2 as needed to maintain SpO2 >90%

- CBC, BMP, Lactic acid, PCT, ABG, CXR, UA
- Influenza screen/ viral panel during the fall and winter seasons

- Aggressive IV hydration (30mL/kg) in the form of fluid boluses
- Strict input/out and continuous telemonitoring
- Target MAP > 65 mmHg and urine output ≥0.5 mL/kg/hour

- Collect two sets of blood cultures before initiating antibiotics

- Start on empiric IV antibiotics such as Vancomycin (15 to 20 mg/kg IV every 8 to 12 hours as per pharmacy protocol) **plus** Zosyn (4.5 g IV every 6 hours) or Cefepime (2 g IV every 8 hours), as soon as possible.

- Repeat serum lactic acid every six hours, until it starts trending down

- Consider CT chest/ abdomen/pelvis if UA/CXR negative

- If patient remains hypotensive despite receiving 3 to 4 liters of fluids, start on Norepinephrine (begin 5 mcg/min, titrate to maintain MAP>65) and consult ICU

- Check cortisol, and if low with refractory hypotension consider starting on stress dose IV steroids such as Hydrocortisone 50 to 100 mg every 6 to 8 hours

- Stress ulcer prophylaxis with Pantoprazole 40 mg IV or PO daily is recommended while on stress dose steroids.

STROKE/ ACUTE CEREBROVASCULAR ACCIDENT (CVA)

- CT head without contrast, proceed with MRI if CT negative
- Bedside swallow screen- If fails, Keep NPO until speech therapist evaluation
- Start on Aspirin 81 mg daily and high intensity statin therapy such as Atorvastatin 80 mg daily. If unable to take PO can administer Aspirin rectally.
- Check ECG and start on continuous telemonitoring
- Frequent neuro checks
- Order Carotid duplex, ECHO with bubble study
- Check Lipid panel
- If patient is already on Aspirin 81 mg increase to full strength 325 mg. Patients who have a stroke while on full strength aspirin should be considered for switching to Plavix 75 mg daily or Aggrenox (Dipyridamole extended release 200 mg/Aspirin 25 mg) after discussion with Neurology
- Treat blood pressure only if SBP>220 or DBP>120 with PRN antihypertensives. No scheduled antihypertensive med's for first 48- 72 hrs since admission.
- Neurology consult.
- PT/OT/ST evaluations

Patients eligible for thrombolytic therapy

- Should receive intravenous alteplase within 4.5 hours of symptom onset
- Maintain Blood pressure at or below 180/105 mmHg during the next 24-48 hrs hours

- Anticoagulant and antithrombotic agents (such as heparin, warfarin or antiplatelet drugs) can be resumed 24 hours after the tPA infusion is completed. Follow up noncontrast CT (or MRI) scan should be obtained 24 hours after tPA is initiated before starting treatment with antiplatelet or anticoagulant agents

- Placement of Foley catheters and nasogastric tubes should be avoided for at least 24 hours

SYNCOPE

- Start on gentle IV hydration
- Check ECG and start on continuous telemonitoring
- Check Orthostatic vitals
- Monitor I/O’s and watch for fluid overload

- Check CBG, CBC, BMP, LFTs, UA
- Echocardiogram
- Carotid duplex
- CT head without contrast
- Discontinue offending agents/ medications

- Treat underlying cause such as
    - Carotid endarterectomy for significant carotid artery stenosis,
    - Pacemaker for significant bradyarrhythmia’s
    - Aortic valve replacement for severe aortic stenosis
    - Liberalize salt and fluid intake in orthostatic hypotension

- PT/OT consults in elderly patients

TYLENOL OVERDOSE

- Start on IV fluids, NS @ 125 mL/hour, monitor I/O's
- Check ECG and start on continuous telemonitoring

- Inform poison control and start on N-acetylcysteine (NAC) drip per protocol.
- Consider activated Charcoal if mental status is stable and presentation within 4 hours of ingestion
- If patient develops allergic reaction to NAC, stop the infusion immediately and discuss with poison control center.

- No acetaminophen or other hepatotoxic drugs.
- Check salicylate level and INR
- Monitor LFT's especially ALT

- Monitor for any signs of acute liver injury, abdominal pain, coagulopathy, gastro-intestinal bleeding.
- Monitor mental status closely to evaluate for any signs of encephalopathy. If mental status worsens, check ammonia level and CT head.
- Monitor blood pressure closely.

- Check repeat serum ALT and acetaminophen level approximately 18 hours after starting on NAC. If the serum ALT is elevated or acetaminophen is still detectable, recommendation is to continue treatment with NAC and continue monitoring ALT and acetaminophen levels every 12 hours thereafter. Treatment can be stopped when serum ALT is improving and acetaminophen becomes undetectable

SUPPLEMENT I:

Simplified clinical classification of commonly isolated pathogens

GPC's	GPR's
Staphylococcus	Commensals/ Contaminants (Skin)
Streptococcus	Clostridia (Wound)
Enterococcus	Listeria (CSF)
GNC's	GNR's
Neisseria	Enterobacteriaceae
Moraxella	Pseudomonas
	Legionella
Atypical	
Mycoplasma	
Chlamydia	

Frequently used antibiotics in clinical practice with coverage spectrum

Penicillins
Unasyn (Ampicillin + Sulbactam), Augmentin (Amoxicillin + Clavulanate), Zosyn (Piperacillin + Tazobactam)

- Good coverage: MSSA, streptococci, enterococci, enteric GNR's and anaerobes

Cephalosporins
All cephalosporins have poor coverage against enterococcus and anaerobes

First generation: Ancef (Cefazolin), Keflex (Cephalexin)

- Good coverage: MSSA, streptococci

Third generation: Ceftriaxone

- Good coverage: Streptococci, enteric GNR

Fourth generation: Cefepime

- Good coverage: MSSA, Streptococci and enteric GNR's

Fluoroquinolones
Most fluoroquinolones have poor coverage against enterococcus and anaerobes

Levofloxacin

- Good coverage: Enteric GNR's, Atypicals, Streptococcus pneumoniae, Haemophilus influenzae

Ciprofloxacin

- Good coverage: Enteric GNR's, Haemophilus influenzae

Vancomycin

- Good gram positive coverage (MSSA, MRSA, Streptococci) but poor gram negative coverage.
- PO Vancomycin is effective against Clostridium difficile

SUPPLEMENT II:

Options for oral treatment of Methicillin-Resistant *Staphylococcus Aureus* (MRSA)

Clindamycin 300 to 450 mg PO TID to QID
Trimethoprim-sulfamethoxazole 1 to 2 DS tablets PO BID
Doxycycline 100 mg PO BID
Linezolid 600 mg PO BID

Enterococcus UTI

Oral options
Nitrofurantoin 100 mg BID x 5 days
Amoxicillin 500 mg TID x 5 days
Fosfomycin 3 g single dose

Intravenous options
Ampicillin
Unasyn
Zosyn
Vancomycin
VRE - Linezolid, Daptomycin

H Pylori (HP)

Check HP IgG. No further work-up if HP IgG negative.
If H pylori serology positive, confirm HP infection with HP stool or HP breath test outpatient (Patient needs to be off PPI for atleast a week)
If stool or breath test positive, treat with two antibiotics and PPI for 10-14

days.

Commonly used regimen: Omeprazole 20 mg twice a day, amoxicillin 1 g twice a day, clarithromycin 500 mg twice a day (OAC) for 10 days.

Confirm eradication with stool or breath test after another 6 weeks (again off PPI x 1 week pre-test)
Serum qualitative antibody test remains positive after treatment.
Stool antigen test is useful to detect active infections or monitor response to therapy.

Argatroban therapy in HIT (Heparin induced thrombocytopenia)

Start on Argatroban drip, dosing per pharmacy protocol.
Start on low dose (5 mg) warfarin when platelet count >150K.
Need a minimum of five days of overlapping therapy
When INR is > 4 on combined warfarin and argatroban therapy

- Stop Argatroban drip
- Repeat INR measurement in 4 to 6 hours
- If INR is below therapeutic level, resume argatroban therapy
- Repeat procedure daily until desired INR on warfarin alone is obtained

Common causes of elevated BNP

AFIB (atrial fibrillation)
Burns
CHF (congestive heart failure)
COPD (chronic obstructive pulmonary disease)
Cirrhosis
OSA (obstructive sleep apnea)
PE (pulmonary embolism, acute)
PHT (pulmonary hypertension)
Renal failure

Stroke
Sepsis

Lactic acidosis

Type A lactic acidosis is due to tissue hypoperfusion such as in shock, sepsis, and heart failure
Type B lactic acidosis is due to toxin related impairment of cellular metabolism as seen in DKA, alcoholism, HIV, certain malignancies and drugs like Metformin, Linezolid