TCH/UC Family Medicine

Inpatient Survival Guide

2021-2022

This book belongs to _____

If found, please call _____

TABLE OF CONTENTS

CARDIOLOGY	
Atrial Fibrillation	5
CHADS-VASC Score	7
Cardiac Tamponade	7
Chest Pain/ ACS	8
Stress Tests	9
Hypertension	11
CHF	12
Pre-Op Cardiac Evaluation	16
Outpatient Heart Monitoring	19
19ENDOCRINOLOGY	
Diabetes	19
Insulin	20
Adrenal insufficiency	21
HHS	22
FEN	
Malnutrition	23
Electrolyte Replacement	25
IV Fluids	26
Hyponatremia	27
Hyperkalemia	29
Hypercalcemia	30
GASTROENTEROLOGY	
PPI/GI PPX	31
Pancreatitis	32
Constipation	33
Nausea	33
GI Bleed	33
INFECTIOUS DISEASE	
SIRS/Sepsis	34
Early Goal Directed Therapy	35

MRSA	37
MRSA SSTI	37
MRSA Bacteremia and IE	39
MRSA Osteomyelitis and septic arthritis	40
Meningitis	40
C. Diff	42
Community acquired pna	43
Hospital acquired pna	46
Antibiotic Resistance	47
UTI	47
COVID	48
NEPHROLOGY	
AKI	49
Dialysis	50
Acid-Base	51
Anion Gap	53
NEUROLOGY	
AMS	54
Delirium	55
Seizures	57
Stroke/TIA	59
Syncope	60
Pain Management	61
PULMONOLOGY	
COPD	62
Asthma Exacerbation	65
Pleural Effusion	65
HEMATOLOGY	
Clotting Cascade	66
VTE PPX	67
PE Algorithm	71
VTE Treatment	72
Coagulation Reversal	75

Coumadin Initiation	80
Perioperative Management of a/c in non-valvular afib	80
APPENDIX	
BEERS List	84
ECG Interpretation	85
Neuro Exam	91
CAP Algorithm	93
Opioid Conversion	94
ACLS Algorithms	95
ACLS Meds	97
End of Life Decisions	98
POCUS: CLUE protocol to evaluate for dyspnea	100
Residency Contacts	103
TCH Numbers / logistics / scrub machines/ mental health resources / breastfeeding	104
Consultants	106
Noon conference topics tracker	110

1.1: Atrial Fibrillation

- **Initial management**
  - If hemodynamically unstable (active ischemia, end organ hypoperfusion, severe HF with pulm edema): Emergent cardioversion
  - If hemodynamically stable and in Afib with RVR, and already on oral meds, redose oral med and recheck HR in an hour.
  - If hemodynamically stable and in A fib with RVR but not responding to home meds, proceed with w/u and rate control.
  - Work-up: Evaluate for causes as listed below.
    - **All Patients: EKG, Echo, TSH, BMP, Troponins (if new onset), CXR, consider evaluation for PE, consider sleep study.**

Causes of Afib (APPPLE CRATESS)

Acute MI	**C**ongenital/valvular (ms)
Pulmonary embolism	**R**heumatic HD
Pericarditis	**A**lcohol (Holiday Heart)
Pre-excitation (WPW)	**T**hyroid (hyper)
Lung disease (pulmonary HTN)	**E**lse (HTN, CHF)
Electrolytes (Low K, Mg, Ca)	**S**ick sinus syndrome
	Stroke Risk

- **New Onset Initial Control**: Generally, Diltiazem or metoprolol are the initial drugs of choice. Exception would be a patient in acute decompensated heart failure with a poor EF. Because both have negative inotropic effects, they can both lead to worsening decompensation. If acute decompensated heart failure and poor EF, will need to amiodarone and maybe digoxin (can have cardiology involved).
  - **Diltiazem**: Most often used acutely on service. Safe to use even if relative hypotension (sbp in the 90's) with RVR. Slowing the heart rate will improve the BP.
    - Bolus 0.25mg/kg (often give 15mg IV) x 1. If no initial response, can rebolus 0.35mg/kg IV push 15 minutes after first bolus. If HR goes under 100, start drip at 5-15, titrating up to get HR at goal (goal: truly physician dependent, <100 is fine, but will find range of <85 to <110). Order set available.
      - If over 15mg/hr drip, add digoxin or change to amiodarone (below). At times, can also add metoprolol. Often done with cardiology assistance
    - After 24 hours of control, convert to PO [rate (mg/hr) x 3 +3] x10 = total daily dose.
      - Initially use short acting po (q6 hr). Stop drip 1 hour after first dose administered.
      - After 24 hours of control with po short acting dilt, change to long acting daily (1:1 math: total daily dose = long acting dose)
    - Contraindicated in acuteHFrEF
    - If in A fib with RVR but looking good, do not need to use IV and can start with PO (30mg diltiazem q6 hour, titrate up).
  - **Metoprolol**: Better for long term use if HFrEF, but avoid if in acute HFrEF. Not used as often for acute RVR, would select those patients who are in RVR but not have much symptoms outside of palpitations.
    - Bolus 5mg IV x 1, repeat in 15 minutes if still in RVR (HR over 100). Once under 100, start PO metoprolol at 25mg-50mg po q12 hours (general rule: for every mg of IV given, multiply by 5 to get po dose. Example: pt needed two doses of 5mg IV. Total IV: 10mg x 5 = 50mg po q12hr).

        - Drug of choice if HFrEF (except if acute)
        - If in A fib with RVR but looking good, do not need to use IV and can start with PO (25-50mg metoprolol q12 hour, titrate up).
    - **Amiodarone**: Most used for Afib with RVR in patients with decompensated HF or in new onset post operative afib. Caution with this choice because can lead to cardioversion (risk of thromboembolic event if cardioverted without regard to anticoagulation guidelines with cardioversion). Generally, ensure patient is anticoagulated before using as could chemically cardiovert patient. Will typically have cardiology involved at this point.
        - Bolus 150-300mg IV x 1 then 1mg/min x 6 hours followed by 0.5mg/min. Multiple variations.
        - PO: Variable. General, 400mg po bid x 2-3 weeks, reducing from there down to 100-200mg per day. Very, very long half life. Check LFTs, TSH every 3-6 months, consider baseline PFTs.
        - Poorly tolerated in older adults.
    - **Digoxin**: Rarely used secondary to poor control with activity. Most often used acutely with patients with RVR, acute decompensated HF, and poor EF. Can also use if difficult to control on dilt or metoprolol. Will often have cardiology involved if needing.
        - Bolus: 0.25mg IV x 1 followed by 0.125mg q6 hr x 2.
        - PO: 0.125-0.25mg daily
        - Avoid in CKD
- **Rhythm Control**:
    - **Indications:**
        - Hemodynamically unstable – needs cardioversion
        - Consider if new onset A fib: Although rhythm control has not shown superiority to rate control (and potentially some harm: increased hospitalization), this maybe secondary to poor success with rhythm control and the toxicity of medications. If patient likely to stay in rhythm control, maybe superior. Thing to remember: longer you are in a fib, the less likely cardioversion will work. Times to consider:
            - New onset a fib (longer in a fib, the less likely it will work). This is the time to do it if you are going to do it. Some patients are very uncomfortable by a fib, even when rate controlled.
            - Younger patient
            - Tachy-mediated cardiomyopathy
            - A fib from acute illness
            - Echo reassuring (atrium not enlarged)
            - Difficult to control a fib
            - Symptomatic even when rate-controlled
    - Acute Anticoagulation for cardioversion:
        - A fib <48 hrs: Do not necessarily need anticoagulation. Can perform TEE and cardiovert (often anticoagulation given for 2 weeks afterward due to "atrial stunning" with procedure). If high risk (CKD, high CHADS-VASC, prior VTE/PE), start immediate anticoagulation and cardiovert
        - A fib >48 hrs: Anticoagulate minimum 3 weeks straight (all readings therapeutic). After cardioversion, continue anticoagulation for minimum of 4 weeks.
- **Short Term Anticoagulation**
    - If on diltiazem or metoprolol gtt, calculated CHADS2VASC score and start hep gtt if score is >2.
    - If starting amiodarone, start hep gtt regardless of CHADS2VASC score given risk of chemical cardioversion
- **Long Term Anticoagulation:**

- Calculate CHA_2DS_2-VASc Score:
  - **0:** No anticoagulation
  - **1:** Can consider. If 1 point only for gender, would favor against.
  - **2 or above:** Initiate anticoagulation
  - ***Greater than 4*:** Consider bridging for anticoagulation cessation (surgery, etc) if on Coumadin
- Anticoagulation options:
  - **Valvular disease** (moderate to severe mitral stenosis, mechanical or bioprosthetic heart valve, mitral valve repair): Coumadin
  - **ESRD:** Apixaban is approved for ESRD and preferred over coumadin unless pt is unable to afford apixaban.
  - **CKD 4-5:** *From 2019 guideline update*: for moderate-to-severe CKD (serum creatinine ≥1.5 mg/dL [apixaban], CrCl 15 to 30 mL/min [dabigatran], CrCl 15-50 mL/min [rivaroxaban], or CrCl 15 -50 mL/min [edoxaban]) treatment with reduced doses of direct thrombin or factor Xa inhibitors may be considered
  - Everyone else: DOACs - apixaban, rivaroxaban, edoxaban, dabigatran
    - For new initiation, work with case manager and/or pharmacy to see which drug will be covered by patient's insurance
  - Note: ASA does not really have a role in anticoagulation for a fib.

1.2: CHADS2-VASC Score

CHA_2DS_2-VASc Score

Congestive Heart Failure	1 point
Hypertension	1 point
Age >65	1 point
Age >75	2 points
DMII	1 point
Previous history of CVA/TIA/ thromboembolism	2 points
Vascular Disease history	1 point
Female	1 point

% Chance of Thromboembolic Stroke/year by CHA_2DS_2-VASc Score:

Score	Stroke Risk %
0	0.2
1	0.6
2	2.2
3	3.2
4	4.8
5	7.2
6	9.7
7	11.2
8	10.8
9	12.2

1.3: Cardiac Tamponade:

Definition: accumulation of pericardial fluid under pressure
Diagnosis: Evaluate for pulsus paradoxus and Kussmaul sign.
Pulsus Paradoxus: ↓ in SBP of more than 10mmHg during inspiration. (Normally the SBP decreases less than 10mmHg during inspiration).

- To Detect: pump up the bp cuff until you block sound. Deflate it slowly, paying attention to the patient's respiratory cycle. If you deflate slowly enough, you will notice that you start to hear sounds during expiration only. Note the mmHg at which

you first hear sounds during expiration only. Continue to deflate slowly until you first start to hear sounds during inspiration as well. Record the mmHg at which this happens. If the difference between these numbers is greater than 10mmHg, then you have a positive sign.

- Think of it this way: Normally when a person inspires, intra-thoracic pressure decreases, systemic venous return increases, and the right heart fills more. The left heart in turn fills less. This is because, 1) the pulmonary vasculature also dilates in response to the lower intra-thoracic pressure, pooling blood that would go to the left heart, and 2) the full right ventricle bulges into the intra-ventricular septum, decreasing the size of the LV. Decreased blood in the left heart means decreased stroke volume, which means decreased systolic blood pressure.
- When tamponade is present, there is fluid around the heart, and so when you inspire the pressure on the heart is increased, and so there is even less filling of the left ventricle= less stroke volume = less systolic blood pressure. Don't give diuretics to these folks, because they are majorly pre-load dependent, and you can kill them by diuresing

Kussmaul Sign: this is seeing an increase in JVD on inspiration, which is opposite that which should happen when a person breaths in normally (imagine that instead of the intra-thoracic pressure being decreased by inspiration, there is increased compression on the tamponaded heart, and so there is an increase in JVD.)

Other Physical Findings:

Sinus Tachycardia
Elevated jugular venous pressure (may be detected by venous distention in the forehead or scalp)
Pericardial rub

*Beck's Triad: Muffled heart sounds, JVD, hypotension (with narrow pulse pressure)

1.4 Chest Pain / ACS

Chest pain / MI rule out:

- The first step is to decide if the patient has Acute Coronary Syndrome (Unstable Angina, Acute Myocardial Infarction-NSTEMI or STEMI). The decision is based on history and laboratory data.
  - Historical features that will make you think ACS:
    - CP that is substernal, pressure-like, squeezing, or crushing
    - CP worse with exertion and/or relieved by rest
    - CP associated with SOB and diaphoresis
    - Radiation of pain to arm and/or jaw
    - Personal history of ACS that caused the same type of CP
  - Laboratory Data that will make you think ACS:
    - Positive Cardiac Enzyme
    - EKG changes (New LBBB, ST elevation or depression, T wave changes, new Q-waves)
      - If STEMI: Go directly to cath, Call Ohio Heart acute MI line
      - NSTEMI: Positive cardiac enzymes but no EKG changes (LBBB or ST Elevation).

- **ACS:**
  - **Admit to telemetry**
  - **ASA 325 mg PO** x 1 then daily

- **O_2 only if hypoxic**
- **Nitroglycerin for chest pain** (0.4 mg SL Q5Min x up to 3 or ½" - 1" paste)
- **Morphine** (if CP persists despite nitro) can start with 2 mg IV and repeat if CP persists
- **Metoprolol** 25 mg PO Q12H titrated to HR 55-60 within first 24 hours, unless contraindicated (1) signs of heart failure 2) AV blocks 3) Hypotension)
- **Atorvastatin 80 mg PO**
- **Heparin drip** (Bolus + infusion under the *heparin cardiac protocol* order set)
- Calculate a TIMI Risk Score (In Mediquations)
- **Consult cardiology**: Briefly review the case with the cardiologist. Provide the TIMI Risk score and specifically ask if they would like clopidogrel (Plavix) to be started or G IIb/IIIa inhibitors (ex: integrilin) to be started.
    - Often clopidogrel is not started because if the cath finds the patient needs a CABG the CT-Surgeon will need to wait for 5 days to perform the surgery if the patient was given clopidogrel.
    - If NSTEMI but CP controlled, often can wait to perform a cath.
    - When calling, unless need emergent cath, do not consult the MI line, instead the general inservice line.
- **Labs:** EKG (any questionable finding or concerning patient, repeat every 30 minutes), CXR, serial enzymes (out to 12 hours from onset of CP), BNP, CBC, BMP, Mg, Phos, LFTs, Fasting Lipids, HbA1c, PT/INR
    - Replace K (Keep over 3.5)
    - Replace Mg (goal 1.7)
    - Transfuse for Hg <8.0-10 (controversial)
- NPO, maintenance IV fluids
- Repeat EKG for any new chest pain to evaluate for a STEMI.
- If unable to control the CP and believe ACS, call cardiology to discuss if patient needs a cardiac cath urgently.
- Consider using the Chest Pain App – creates risk scores as assessment and plan based on risk score

- **Do not Suspect ACS**
    - Admit to telemetry
    - ASA 325mg PO x 1 then daily
    - **Labs:** EKG, CXR, serial enzymes (out to 12 hours from onset of CP), CBC, BMP, Mg, Phos, fasting lipids
    - **Consider GI cocktail** – one common recipe below:
        - Maalox (10 – 20 ml) + Viscous Lidocaine (10 – 15 ml) + Donnatal (5 – 10 ml)
        - Relief does not r/o cardiac etiology
    - Order **Stress test**: Use notes below to decide on type.
    - Watch these folks carefully overnight, have strict instructions for when the nurse should call you.

1.5: Stress Tests

Stress Tests: Stress Mechanism and Evaluation Method

- **Assess risk and need for stress test**
    - **Risk Factors for assessment:**
        - Previous MI or known CAD
        - Smoking in the last 5 years
        - Dyslipidemia
        - DM

- HTN
- IVDA
- EtOH use
- Fm Hx of CAD in men < 55y or women < 65y

  - **Duke Chest Pain Score** – Predicts probability of significant coronary artery disease
  - **Grace Score (Mediquations)** – predicts in hospital mortality
  - Framingham Score
  - **HEART Score (Mediquations) –** Risk Stratification for chest pain
- Target Heart Rate = 85% of max HR: (220 – age) x 0.85
- Must always order both a stress method and an imaging method

Stress mechanism:

- Exercise (GXT)
  - Can't Use On: People who can't walk, β-blockers, CCB, A. fib, ACS, HOCM, AS, Left main or 3 vessel CAD
  - Hold β-blockers or CCB for 12-24 hrs prior (except if A fib)
  - ALWAYS the BEST method if the patient is able to tolerate the testing.
  - Inexpensive and readily available AND (unlike pharmacologic stress tests) it provides additional helpful prognostic data to the clinician. This includes the hemodynamic response to stress & functional capacity
- Adenosine (Lexiscan)
  - Dilates cardiac arteries, diseased arteries do not dilate as much and get less blood flow (similar subclavian steal syndrome)
  - Can't Use: Active or Severe Asthma or COPD (causes bronchospasm), caffeine within 24 hours
  - Can Use: Beta-blocker or CCB, patients who can't walk, hypertrophic cardiomyopathy (HCM) or AS
- Dobutamine
  - Beta agonist essentially mimicking exercise by increasing HR and contractility
  - Can't Use On: Same as Exercise except CAN do if can't exercise
  - Don't use if multiple PVC's as it is pro-arrhythmic
  - Hold β-blocker for 12-24 hours prior

Imaging:

1. <u>ECG</u>

   - Positive if > 1 mm ST depression for 3 beats, usually in V2 or V3 or J-point 90
   - Sensitivity: 67%
   - Pros: Cheap, anywhere, shows function, good prognostic sign
   - Cons: No location or severity information, does not correlate with anatomy, be sure lead placement is correct.
   - Don't use: Females (lots of False+), LBBB
   - Okay for young patients, or pts with chronic disease seeking approval for clearance for sports or scuba

2. <u>Nuclear</u> (Myoview)

   - Sensitivity: 80-90%
   - Specificity: False negative if Left Main or 3 Vessel CAD

- MOA: Uses Technesium, dual isotope. Color changes in heart perfusion from rest to exercise, based on having differences in perfusion
- Pros: Can tell info on severity and location, get a computer calculated reproducible EF
- Cons: Slow results if obese patient, False negative if triple vessel disease, FP of inferior wall as artifact from diaphragm/intestine
- Multiple gated cardiac blood pool imaging (MUGA) is isolated nuclear scan that just evaluates for EF

3. Echo

- Sensitivity: 80-90% Specificity: 80-90%
- MOA: subjective read of wall motion abnormalities and EF (should be higher than regular ECHO since exercising)
- Don't Use: Large breasted women, obese, cachectic
- Need Cardiologist to read, very user-dependent

Indications for imaging other than EKG

ALL women (more likely to have 1 vessel disease)
Abnormal EKG at baseline
Pharmacologic test
Prior stenting/ CABG

The right combinations:

Exercise – can use nuclear or echo
Dobutamine – always do echo (could do with EKG)
Adenosine – always do nuclear

Stress tests of choice: (when there are no CONTRAs)

Exercise nuclear
Adenosine nuclear – if can't exercise
Dobutamine echo – if asthma / COPD

1.6: Hypertension

Hypertension:

- *We should NOT admit for hypertensive urgency, only for emergency. That being said, you'll get a lot of admits for hypertensive urgency (admit as an observation).*

Definitions:

- Hypertensive Urgency: SBP ≥ 180 or DBP ≥ 120 with NO signs or symptoms of end-organ damage
- Hypertensive Emergency: Elevated BP (usually but not always SBP ≥ 180 or DBP ≥ 120) WITH signs of end organ damage
    - Signs / Symptoms of end organ damage: Severe HA with nausea and vomiting (mild headache is not always considered HTN emergency), confusion, any localized neurologic S&S, seizures, coma, papilledema, retinal hemorrhage or exudate (signs of cerebral hemorrhage or hypertensive encephalopathy),hematuria, proteinuria (signs of malignant nephrosclerosis), **chest pain**, elevated CE

- CHECK: Cardiac enzymes, UA (urine protein), BMP, good neuro exam with retinal exam

Hypertensive Urgency Treatment:

- If SBP ≥ 180 or DBP ≥ 120 without end organ damage evidence, **go slow and use oral agents**. Rapid reduction in BP can lead to cerebral vascular accident or MI
  - Home meds (may give extra dose) – start with these
  - Start new medication or increase home medication: Approach this as you would any patient with HTN you see outpatient.
  - Place pt in a quiet room, calm setting.
  - Clonidine 0.1-0.2 mg PO prn may be followed by additional doses of 0.1 mg/hr up to total of 0.7 mg, if necessary for extremely resistant BP.
  - If not taking PO:
    - Enalapril (Vasotec) IV: 0.625-1.25 mg IV. IV Vasotec can be administered on non-tele floors unlike IV labetalol and IV hydralazine.
    - Labetalol: 10 - 20 mg IV push over 2 min, may give 40-80 mg at 10-minute intervals, up to 300 mg total dose, only on tele
    - Hydralazine: 10 - 20 mg IV Q4-6H (max 40 mg/dose), only on tele
  - Goal is no more than a 20% reduction of MAP. Remember: this is not an emergency and represents the patient's baseline status.

Hypertensive Emergency Management:

- Decrease BP more rapidly with hypertensive urgency, but still need to be careful because of the risk of cerebral vascular accident or MI. Should go to the ICU for a drip. Medications you can use on the floor or ED:
  - Hydralazine: 10 - 20 mg IV Q4-6H (max 40 mg/dose)
  - Enalapril:
    - 1.25 mg/dose, given over 5 min Q6H
    - If concomitantly receiving diuretic therapy, begin with 0.625 mg I.V. over 5 minutes; if the effect is not adequate after 1 hour, repeat the dose and administer 1.25 mg at 6-hour intervals thereafter
  - Labetalol: 10 - 20 mg IV push over 2 min, may give 40-80 mg at 10-minute intervals, up to 300 mg total dose, only on tele

1.7: CHF

CHF Exacerbation: (Acutely Decompensated Congestive Heart Failure)

- MAP = CO x SVR
  - Blood pressure is equal to the cardiac output times the systemic vascular resistance
- CO = Stroke Volume x HR
- CHF is a SYNDROME composed of the following:
  - Edema
  - JVD / elevated JVP
  - Orthopnea
  - Ascites
  - Weight gain
- **Diagnosis History:** frequency of exacerbations, prior echos with recent EF and any other important details, prior cardiac studies, pacemaker/ defibrillator? Prior vascular/nutrition studies, do they have a cardiologist? Are they on home O2, diuretics,

etc? How many METs can they achieve? (Care for self, self-toilet = 1 mets, 1 flight of stairs = 4 mets, jogging = 7 mets)

- **Physical Exam:**
  - **JVP** (Jugular Venous Pressure): **a number**
    - Method: Measure vertical distance from the sternal notch to where you see the jugular vein pulsating, this should be 3-4 cm vertically above the sternal notch. If it is more – they are likely volume overloaded, if totally flat, they are likely dry
      - RA pressure classically approximated by adding 5 cm to the height of the venous column
      - Nl 1-8 cm H_20 or 1-6 mmHg
    - Elevated in CHF (Right or Left Heart Failure) and renal failure
    - Usually nl in cirrhosis or nephrotic syndrome
  - **JVD** (Jugular Venous Distension at 45 degrees): **present or absent**
  - **Hepatojugular Reflex**: Apply firm, sustained pressure for 10 to 15 seconds over the upper abdomen → ↑ venous return → ↑ > 3 cm in JVP is positive
  - **Rales, LE edema, or sacral edema** if bed-bound, **abdominal distension, hand swelling**?
  - **BP should be elevated** with acute decompensated CHF: MAP = CO (↓) x SVR (↑↑↑↑). In the setting of acute decompensation, the body is under stress which will increase the HR and SVR. Low blood pressure means the patient has a very low C.O. (very far right on the curve) and is likely in cardiogenic shock. The patient likely will need an inotrope (ICU). *If low BP and/or cold extremities STAT ICU evaluation.*

- **Basic orders: Use CHF Order Set.**
  - Admit to Telemetry, Vitals per severity; Strict I/O, daily weights, cardiac diet, foley to gravity if not ambulatory (Female, Males can use urinal), incentive spirometry (IS) to bedside, +/- Duonebs q4-6 while awake
  - **Labs/Imaging to consider**: CBC, coags, BMP, Mg, Phos, EKG, BNP, UA, PA/Lateral, Serial Enzymes, Lipids
  - **2D doppler echo w/ color flow** (if not performed in the past year or if there appears to be a change)
    - Cardiomyopathy
    - Systolic vs Diastolic (grade by E -> A ratio)
      - E = passive LV filling
      - A = atrial contraction kick filling
      - ↓ E + ↑ A with diastolic dysfunction
      - ↓ A kick with atrial fibrillation

- **CHF Assessment:** What class (see below) of CHF do they have (before this acute decompensation)? Why did they have an exacerbation? Was this a new infarct? Valve problems? New or uncontrolled A-fib? Did they salt binge (canned soup)? Did they not take meds? Do they need a defibrillator (EF <35%)
- **Treatment**
  - ↓ Preload → ↑ CO (shift curve to left)
  - <u>Diuresis</u>
    - Lasix (onset 15 minutes) - dosing is "S" curve, dose once hit threshold for diuresis then stop increasing as no added benefit
      - Starting dose: 20-40mg IV furosemide (Lasix) if not previously on diuretic; if poor response, double dose. If on diuretics at baseline,

give either total daily dose or double their total daily dose x 1 and monitor response (typical: Change total daily dose to IV and administer once).
        - Drip may be good if CKD or AKI
        - Give 30 minutes after ACE-I
        - Side Effects: ↓ K, ototoxicity (very high), GI upset,
        - Nephrotoxicity: Not directly nephrotoxic. Jump in cr is secondary to fluid shifts (from peripheral tissue to intravascular space) while diuresing. If diurese too fast, or have bad kidneys, can cause transient intravascular depletion leading to pre-renal azotemia.
        - Check I/O 6 hours after dose and make decision of whether lasix dose is correct or if needs modified
    - Other diuretic equivalents:
        - 20mg torsemide = 20mg IV lasix
        - 1mg bumex=20mg torsemide=20mg IV lasix=40mg po lasix
    - Spironolactone (improves mortality in NY III and IV or if EF <35%, closely monitor potassium (check within 4 days, even on outpt), dose is 12.5-25 mg daily)
    - Can augment dieresis with thiazide (metolazone) once a week or twice a week if refractory or needing high doses of loops.
- Ultrafiltration - Good if lots of fluid not responsive to diuresis or Cr not tolerating lasix (evidence does not support the belief that it is better for Cr)
- Vasodilators
    - Morphine
    - Nitroglycerin - Start with SL then go to either drip (if HTN) or Patch (nl BP)
- Increase Contractility → Ionotropes
- ACE-I → Vasotec IV in the ED if not on already (if Cr normal) thirty minutes prior to lasix.
    - Long term mortality benefit noted with hydralazine + isosorbide dinitrate in African American patients. Use ACE Inh or ARB first line, then add if the pts blood pressure is still not at goal. If angioedema with Ace inh, use this combination.
- Home meds (depending)
- Statin
- Prophylactic Anticoagulation

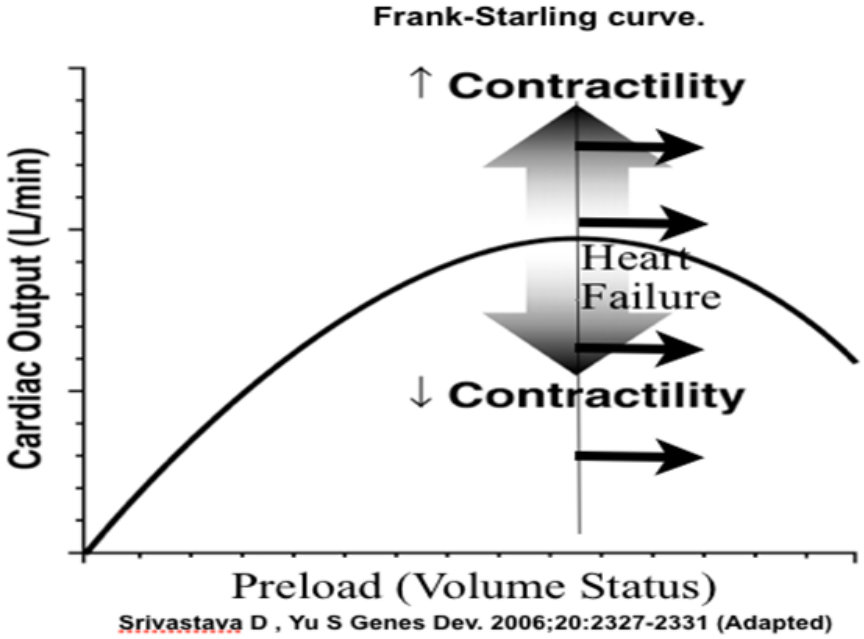
- **Discharge orders**:
    - Review home meds - give weight parameters for the use of any prn diuretics (i.e. gain more than 3 lbs in one day or 5 lbs in one week) If going to ECF give VERY CLEAR DIRECTIONS ON COC
    - Make sure they are on:
        - Either Metoprolol Succinate or Carvedilol if Systolic Heart Failure
            - Comment why if they patient has a dx of CHF and is not going out on a beta blocker
        - ACE Inh or ARB
            - Again, comment why if not.
        - Spironolactone if Class III or IV Heart Failure or EF <35%
        - ASA
        - Statin
        - Diuretic: Dose is based on hospitalization and situation. If you feel the patient is still overloaded, then will need to be on a sufficient dose to diurese. If you feel they are now euvolemic, need to be on a dose to maintain (I=O).
    - Follow-up Labs: Often a renal needs to be checked within 7 days from d/c.

- Follow-up appointment: Requires documented appointment with PMD or heart failure team within 7d (if using the order set the HUC and RN will handle this).

- Additional CHF information

Normal Heart Pressures:

- RA: 0-6
- RV: 20-30/0-6
- PA: 20-30/6-12
- PA mean: 12-18
- PCWP: 6-12
- LA: 4-12
- LV: 100-140/5-14
- Aorta: 100-140/60-80
- MAP: 75-100
- CO: 4-8L/min
- SVR: 800-140



	NYHA functional CHF classification
I	Patients with cardiac disease but without resulting limitations of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain.
II	Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain.
III	Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest.
IV	Patient with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms

1.8 Pre-op Cardiac Evaluation

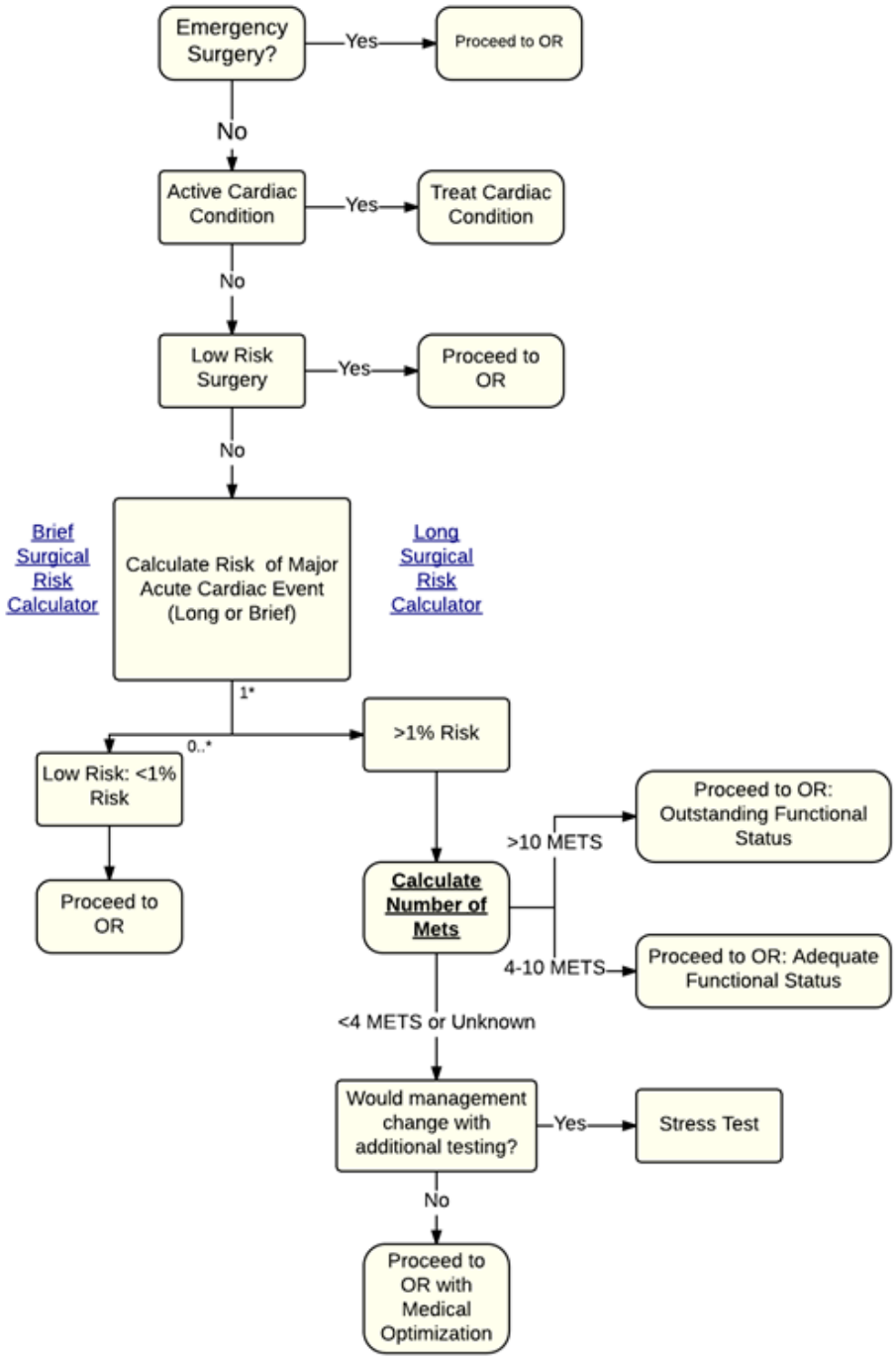


Table 4. Duke Activity Status Index

Activity	Weight
Can you…	
1. take care of yourself, that is, eating, dressing, bathing, or using the toilet?	2.75
2. walk indoors, such as around your house?	1.75
3. walk a block or 2 on level ground?	2.75
4. climb a flight of stairs or walk up a hill?	5.50
5. run a short distance?	8.00
6. do light work around the house like dusting or washing dishes?	2.70
7. do moderate work around the house like vacuuming, sweeping floors, or carrying in groceries?	3.50
8. do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?	8.00
9. do yardwork like raking leaves, weeding, or pushing a power mower?	4.50
10. have sexual relations?	5.25
11. participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?	6.00
12. participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?	7.50

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Estimate of MACE

- http://riskcalculator.facs.org/RiskCalculator/
- http://www.qxmd.com/calculate-online/cardiology/gupta-perioperative-cardiac-risk (Far easier; also can be found in app: https://itunes.apple.com/us/app/calculate-medical-calculator/id361811483?mt=8)

Active Cardiac Disease:

- 1. Acute Coronary Syndrome
- 2. Symptomatic valvular disease
- 3. Symptomatic CHF or EF <40%
- 4. Arrythmias that are not controlled

Beta-Blocker Guidelines

- 1. If on a beta-blocker, then continue.
- 2. If they have 3 or more risk factors (RCRI), can start beta-blocker prior to surgery to reduce preoperative Cardiac events. Start 7 days prior (my recommendation, official rec is 1-7 days).
    - History of ischemic heart disease
    - History of congestive heart failure
    - History of cerebrovascular disease (stroke or transient ischemic attack)
    - History of diabetes
    - Chronic kidney disease (creatinine > 2 mg/dL)
    - Undergoing supra-inguinal vascular, intraperitoneal, or intrathoracic surgery

    Risk for cardiac death, nonfatal myocardial infarction, and nonfatal cardiac arrest:

    0 predictors = 0.4%, 1 predictor = 0.9%, 2 predictors = 6.6%, ≥3 predictors = >11%

- 3. Do not start on the day of surgery: dangerous.

Statin Guidelines

- 1. Continue if already on.
- 2. Start if meets indications for therapy (See this Evernote)
- 3. Start if undergoing a vascular surgery

EKG Recommendations

- 1. If undergoing a low risk surgery, never need to get.
- 2. If patient has known CAD, PAD, h/o CVA/TIA, structural heart disease, h/o arrhythmia: obtain EKG
- 3. Can consider in asymptomatic patients without known disease, unless it is a low risk surgery (eye, egd, colonoscopy, local)

ACE/ARBs Recommendations

- Hold ACE/ARB morning of surgery

After Procedures and Events Recommendations

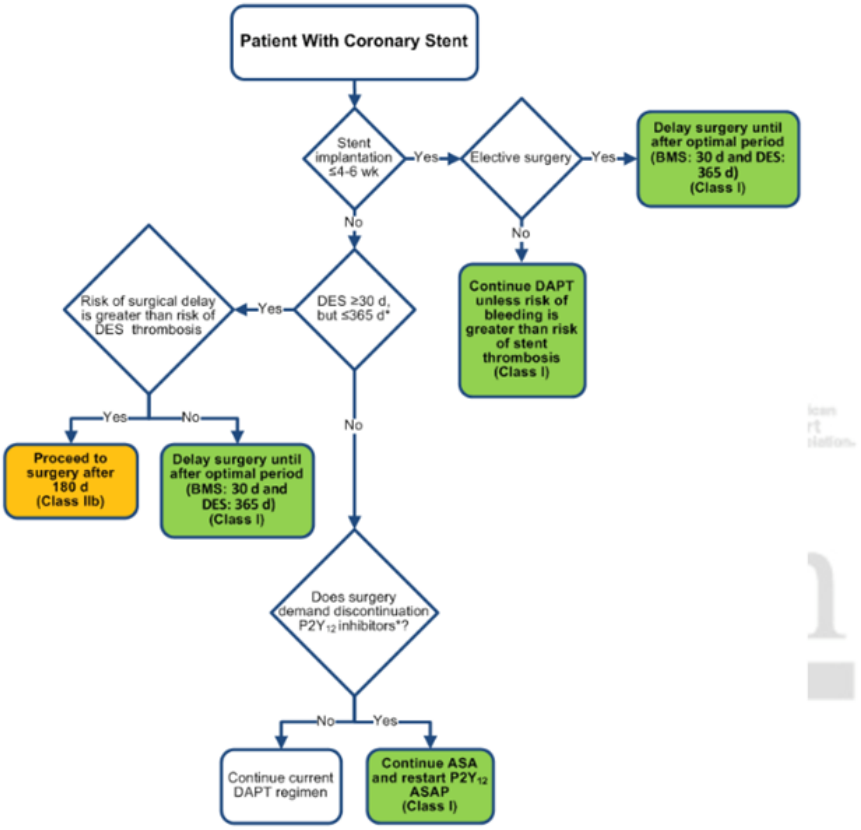
- 1. Delay at least for 14 days following a balloon angioplasty
- 2. Delay at least for 30 days following a Bare Metal Stent
- 3. Delay at least 180 days and preferably 365 days after a Drug Eluting Stent (Newer Guideline: 6 months for DES)
- 4. Delay for at least 60 following an MI and preferably 6 months (length of time from MI to operation: 0 to 30 days =32.8%; 31 to 60 days =18.7%; 61 to 90 days =8.4%; and 91 to 180 days =5.9%; 30-day mortality rate: 0 to 30 days =14.2%; 31 to 60 days =11.5%; 61 to 90 days =10.5%; and 91 to 180 days =9.9%)

ASA and Plavix

- 1. For all patients except patient with stent or recent MI, stop 3 days prior to surgery and restart 7 days following.
- 2. For Bare Metal Stent: Can stop 30 days post-procedure if needed (continue ASA)
- 3. For Drug Eluting Stent: Can stop P2Y12 inhibitor 6 months after (continue ASA)
- 4. Angioplasty: Can stop 14 days post procedure if needed
- 5. Post-MI: as above

Patient with Coronary Stent

- See https://www.evernote.com/l/ABlswEUVNJZDrLbmiOe7lkhSpkqJK-VrRy0 for full DAPT Guidelines



Colors correspond to the Classes of Recommendations in Table 1.

*Assuming patient is currently on DAPT.

ASA indicates aspirin; ASAP, as soon as possible; BMS, bare-metal stent; DAPT, dual antiplatelet therapy; DES, drug-eluting stent; and PCI, percutaneous coronary intervention.

1.9: Outpatient Heart Monitoring

How to order heart monitoring on discharge

- In the discharge order set, order "Event Monitor"
- In the comments, use the smart set ".UCFMECAT" and fill out data accordingly
- sign with rest of discharge orders
- Call the heart monitor contact at the Ohio Heart Cardiology office at 513-206-1144 and leave your name, call back number, and patient's name and MRN number saying you've just ordered a heart monitor and that they should expect to see the order in EPIC. They will call you if there's any issues

2.1: Diabetes

- Stop your patient's oral DM meds on admission – they interact with too many other meds and can cause hypoglycemia. Metformin can cause lactic acidosis.
- Use the Basal/Bolus Insulin Order set. Avoid using only Sliding Scale Insulin.
- Check HgA1c if not checked within 3 months (order set does this).
- Most diabetic patients should be on insulin during hospital stay. Use Lantus and Lispro, never Regular Insulin secondary to concern for insulin stacking leading to hypoglycemia. Exceptions to consider: low or well-controlled A1cs (<7) not on insulin

at home, patients high-risk for hypoglycemia, older adults, prolonged NPO anticipated.

2.2: Insulin

Adjusting Insulin:

- Adjust long acting insulin (Lantus) based on morning blood sugar. Adjust pre-meal (lispro) based on post-prandial sugar.
- If hypoglycemic episode noted, consider checking a 3-hour blood sugar if giving a large correctional dose at night. The check is not for hyperglycemia, but for hypoglycemia.
- Steroids affect post-prandial insulin more than fasting, so increasing premeal insulin often more effective here
- If morning hyperglycemia, consider Finger Stick Blood Sugar at 3 am to rule out SOMGYI Effect.

Estimate of Insulin Need: (Use basal-bolus insulin order set)

- Total daily dose = Wt (Kg) * correction factor: (0.3 elder, thin, new to insulin, 0.5 otherwise)
- 1/2 of TDD long acting Lantus
- Remainder carbohydrate coverage premeal Lispro based on TDD
- Correctional based on TDD (see order set)
- Follow correction daily & divide the same way and add daily
- If patient well-controlled at home on their current regimen can continue you that during hospital stay and adjust as above.

NPO

- Give 5 units of Lantus for every 1 Liter of D5 the patient will receive in a 24-hour period
- Ex: on D5 .45NS with 20meq kcl/l at 100ml/hr. Will receive 2.4 Liters of D5 in 24 hours. Administer 12 units SC Lantus daily.
- Correctional insulin q4 hour with Lispro

Insulin Type	Onset	Peak	Effective for
Rapid Acting			
Aspart (Novolog)	15-30 min	30-90 min	3-5 hrs
Lispro (Humalog) (preferred)	15-30 min	30-90 min	3-5 hrs
Short Acting			
Regular (Novolin-R or Humulin-R):	30-60 min	2-3 hrs	4-6 hrs
Basal Intermediate Acting			
NPH (Novolin-N or Humulin-N)	1-4 hrs	5-10 hrs	10-16 hrs
Basal Long Acting			
Detemir (Levemir)	1-2 hrs	2-12 hrs	12-24 hrs
Glargine (Lantus)	1-2 hrs	None	20-24 hrs

Carb Coverage and Sliding Scale Dosage Levels for use on inpatient

Carb Coverage ("Meal Time -> Humalog" on orderset):
Low dose 1:15 (1-8 TID with meals)
Medium dose 1:10 (1-12 TID with meals)
Medium high dose 1:8 (1-15 with meals)
High dose 1:6 (1-20 TID with meals)
Very high dose 1:4 (1-30 TID with meals)

Carb Coverage ("Snack -> Humalog" on orderset):
Low dose 1:15 (1-8 Snacks)
Medium dose 1:10 (1-12 Snacks)
Medium high dose 1:8 (1-15 Snacks)
High dose 1:6 (1-20 Snacks)
Very high dose 1:4 (1-30 Snacks)

Sliding scale/ correctional ("Correctional -> Humalog" on orderset):
Correctional Low dose (1-6 TID before meals)
Correctional Medium dose (1-9 TID before meals)
Correctional High dose (1-12 TID before meals)
Correctional Very high dose (2-20 TID before meals)

Sliding scale/ correctional ("Correctional -> Humalog" on orderset):
Correctional Low dose (1-5 nightly)
Correctional Medium dose (2-8 nightly)
Correctional High dose (2-10 nightly)
Correctional Very high dose (4-17 nightly)

2.3: Adrenal Insufficiency

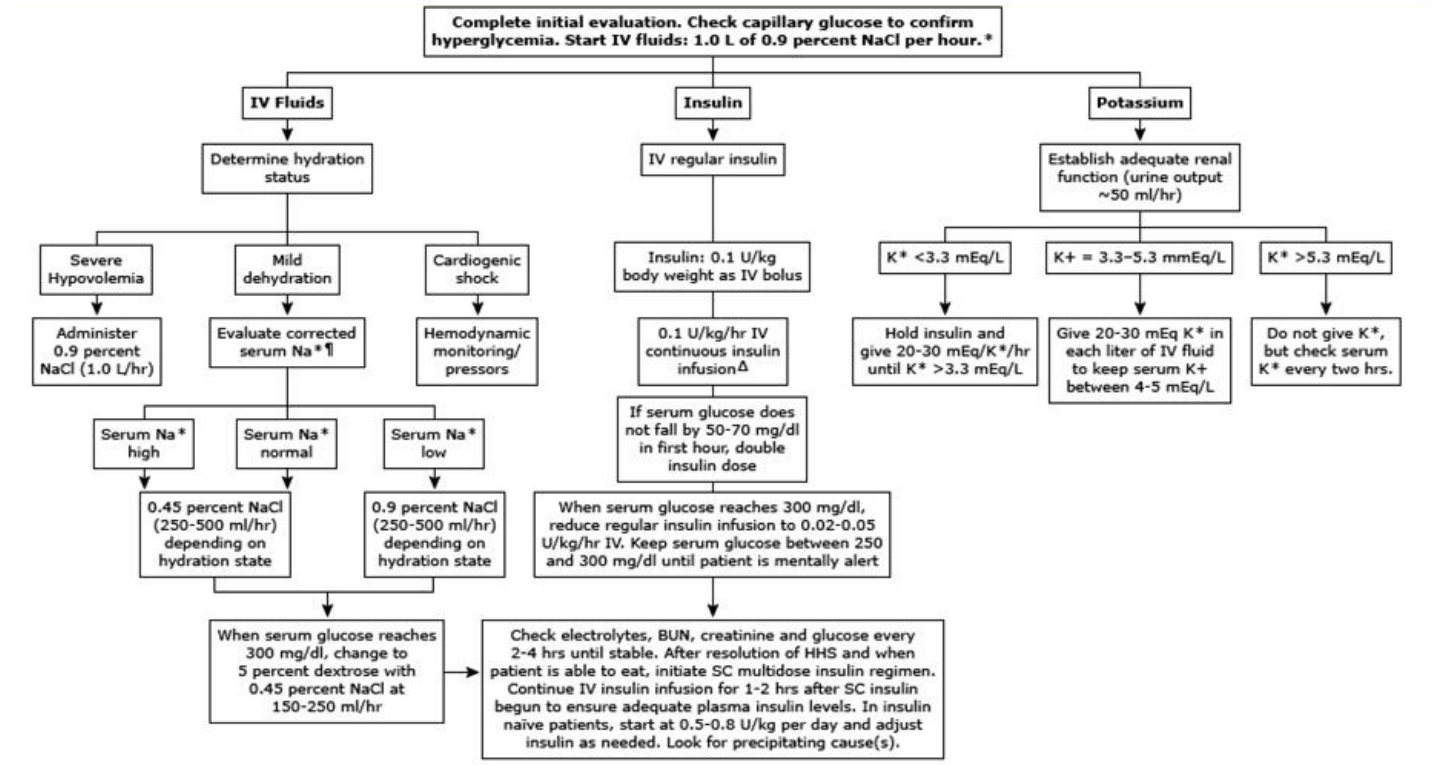
- Septic patient not responding to fluids – check spot cortisol
    - if less then 20 = relative adrenal insufficiency
    - give hydrocortisone 100 mg IV TID and titrate down.
- Patients on chronic steroids:
    - Triple dose for three days during the acute illness
    - Surgery or extreme stress: Hydrocortisone 100mg IV q8 hour x 1 days, then 50mg IV q8 hour x 1 day, then 25mg IV q12 hour x 1 day, then home dose.
- Symptoms / Signs:
    - Orthostatic hypotension
    - unexplained hypoglycemia
    - hyponatremia with hyperkalemia
    - chronic fatigue
    - skin pigment changes
- Diagnosis:
    - 1: 8 AM Cortisol with plasma ATCH:
        - Normal 10-20
        - < 5 strongly suggestive of AI (100% specificity, only 36% sens)
        - >18 effectively rules out
    - 2: Cosyntropin Stimulation Test
        - Order Cosyntropin (synthetic ACTH) 0.25 mg IV at time 0
        - Check cortisol at time 0

        - Check cortisol again 30 and 60 minutes later
        - Cortisol of < 18–20 at 30 and 60 minutes= adrenal insufficiency
        - Prior to starting therapy, check ACTH level (takes a while) to help decide if primary, secondary or tertiar
- AI Treatment:
    - Adrenal crisis: Pt presenting with hypotension, hypovolemia, hyperkalemia and hyponatremia
        - Draw cortisol, ACTH, renin, aldosterone, BMP to confirm diagnosis (ACTH, cortisol) or pursue differential diagnosis (renin, aldosterone)
        - Start Lactated Ringers or D5 with NS if hypoglycemic, 1-3 L in first 12-24 hours based on UOP and volume status
        - Steroids: hydrocortisone (100 mg IV bolus) or dexamethasone (4 mg IV bolus)
            - Dexamethasone not assessed in cortisol level so preferred if no known h/o adrenal insufficiency.
            - Continue hydrocortisone 50 mg IV bolus every 8 hours or Dexamethasone 4 mg IV every 12 hours until vitals stable and patient taking PO meds.
            - IV meds generally tapered over 1-3 days then transition to PO
    - Chronic treatment:
        - Dexamethasone 0.5 mg or prednisone 5 mg orally at bedtime.
        - Alternative: hydrocortisone 15-20 mg in morning and 5-10 mg early afternoon

2.4: HHS

- Like DKA, the main focus is correcting fluid deficiency and electrolyte deficiencies
- Monitor
    - podassium
    - glucose
    - fluid status
- Identify and address precipitating factors
    - infection
    - dehydration
    - discontinuation of inadequate insulin doses
    - acute major illnesses - MI, CVA, sepsis, pancreatitis
    - steroids

Protocol for the management of adult patients with HHS



HHS diagnostic criteria: serum glucose >600 mg/dL, arterial pH >7.3, serum bicarbonate >15 mEq/L, and minimal ketonuria and ketonemia. Normal laboratory values vary; check local lab normal ranges for all electrolytes.

3.1: Malnutrition

Weight loss in older adults:

- **Diagnosis:** Signs of malnutrition: weight loss % over time - >10% indefinite of time or >5% over last 3 months, loss of body fat (temporal wasting, etc), loss of muscle mass, BMI <18, reduced grip strength (AND/ASPEN criteria)
- non-healing wounds, temporal wasting.
- **Workup:** Nutrition-focused history and physical exam. *Pre-albumin/albumin are not helpful due to poor specificity and sensitivity*. Labs should be used to identify underlying causes of weight loss, such as CRP / ESR / TSH / etc to rule out other disease
- **Differential for unexplained weight loss:** Malignancy, chronic infection (Subacute Bacterial Endocarditis, HIV, TB, Hepatitis), chronic rheumatologic or endocrine disease (i.e. severely uncontrolled DM; Hyperthyroidism, PMR, GCA, RA), depression, biliary colic, gastroparesis, PMR, medications (many!), factors affecting ability to eat (see below), alcohol or drug use, Advanced Dementia, Advanced COPD.
- **Treatment:** Consult nutrition and add supplement, address underlying factors.
- **Supplements:** Examples include**:** Ensure, Ensure Enlive, Glucerna (for diabetic paitents), Nepro (for severe CKD) Magic Cups, Beneprotein, Benefiber, Juven (protein). Offer supplements between meals (10a, 2p), not with them—recall, if you don't eat your whole meal, you aren't going to eat your whole meal and then some. **Order using "dietary supplements" order panel.** Then order by indication.

- **Diet:** For older adults, default should be regular diet unless clear indication for fluid restriction (SIADH). Can add carb restrictions for uncontrolled diabetic. Very limited evidence for low sodium and fluid restriction for heart failure patients.
- **Appetite stimulants:** generally not recommended in the elderly who are malnourished—we use these more so for cancer patients and AIDS patients. Options are marinol (benefit in cancer), megace (benefit in AIDS; side effects include VTE, HTN). Consider Mirtazapine in a patient who also has concurrent depression and/or insomnia.

Why aren't your older adult patients eating? Consider:

Lack of availability of food (food insecurity, functional limitations, lack of transportation)	Memory problems	Neglect or elder abuse
Lack of social interaction	Loss of taste	
Cost of food	Fatigue	
	Swallowing problems	
	Dentition/ill-fitting dentures	
	Medication side-effects	

- **Re-feeding syndrome:** Don't re-feed too quickly, and PO is always the best option when feasible. Monitor Phosphorus, Potassium, Magnesium, and Glucose levels closely (at least daily, possibly q12 hour if high risk).
- **PEG and NG**: Aren't fun, so try your best to seek alternatives. Evidence does not support morbidity or mortality benefit in the setting of irreversible disease process (dementia, cancer). Replace electrolytes, and always be willing to get family involved, as well as dietary, home health, home safety evaluation consults on board to find out what they like to eat, and how to help them eat. AGS recommends hand feeding over PEG tube for end-stage dementia.
- Also consider Council on Aging referral to see if patient is eligible for Meals on Wheels or other financial support for meals and nutritional supplements (case manager can help with this).

3.2: Electrolyte replacement

VITAMIN / ELECTROLYTE	PO REPLACEMENT	IV REPLACEMENT
Phosphorus 2.0-2.4 1.5-1.9 1.0-1.4 < 1.0	Kphos or Neutraphos 500 mg q4 hours x 3 doses (each packet or tablet has 8mmol phos) ~30meq K in 6 tablets Kphos IV IV IV	*FYI: every 15mmol of Kphos IV has 20meq of K* 15 mmol K phos 30 mmol K phos 30 mmol K phos and recheck 4 hours after infusion completed and replace as needed.
Magnesium 1.8-1.9 1.6-1.7 1.3-1.5 <1.2	**Will cause diarrhea** Avoid PO	(Preferred)**1 g IV should raise serum by ~0.1* *1g Mag Sulfate IV over 1 hr* 2 g Mag Sulfate IV over 2 hrs 4 gram Mag Sulfate IV over 4 hrs 4 gram Mag Sulfate IV over 4 hrs and recheck for need for continued repletion
Potassium **10meq PO to raise the serum K by 0.1 so calculate it to goal K 4.0 or greater except CKD* *USE HALF DOSE W/RENAL PT! (Cr>2)	(Always Preferred) Examples of calculation using 10mEq raising the serum level by 0.1 K 3.4 = Give 40mEq Kdur q4h x 2 doses (liquid is Kayciel) K 2.9 = Give 40mEq Kdur q4h x 3 doses **Don't give more than 60 at one time because of stomach upset.* **Be sure to check and replace Mg* **Smaller tabs Kdur 10 mEq also an option if pts have difficulty swallowing large pills*	(Only if Can't Take PO) K 3.4 = 60 meq Potassium Chloride IV over 6 hrs K 2.9 = 100 meq Potassium Chloride IV over 10 hours (IV burns; Will lose IV line; Ok if central line)

B-12	Cyanocobalamin 1000 – 2000 mcg once daily	Cyanocobalamin 1000 mcg IM daily x 1 week, then weekly x 1 month, then x1 month for life
Folate	Folic Acid 1 mg tab – 1 daily for 1-4 months or until complete hematologic recovery occurs	Sodium folate 5mg/ml. Take 5mg IV daily.
Ca++ **(corrected)** **6.1-7.5** **5.4-6.0** **3.3-5.3** **Ionized calcium** **3.5-3.9** **3.0-3.4** **2.5-2.9** **<2.5**	Calcium carbonate or calcium citrate 1500 – 2000 mg daily for mild asymptomatic hypocalcemia. *Be sure to check and correct Mg *Use ionized calcium measures if alkalosis exists or severely low to have more accurate value (doesn't vary with albumin)	1g Calcium Gluconate IV over 10 min 2g Calcium Gluconate IV over 10 min 2g Calcium Gluconate IV over 10 min and recheck in 4h 2g IV calcium gluconate 4g IV calcium gluconate 6g IV calcium gluconate 8g IV calcium gluconate *10 mL (1g) calcium gluconate has 93 mg elemental Ca and will raise serum by ~0.5 mg/dL.
Vitamin D	Cholecalciferol or Ergocalciferol 50,000 unit weekly for 6-8 weeks, then 800 – 1,000 unit cholecalciferol daily. Use ergocalciferol in CKD (GFR <30) patients because they may have resistance to converting cholecalciferol to useable Vit D.	
Iron	Ferrous sulfate 325 mg tab – 1 daily or BID (take 2 h before PPI/H2B or 4h past)	(Preferred in ESRD) Venofer 200 mg IV daily x 5 days. *Don't give to patient with an infection.

3.3: IV fluids

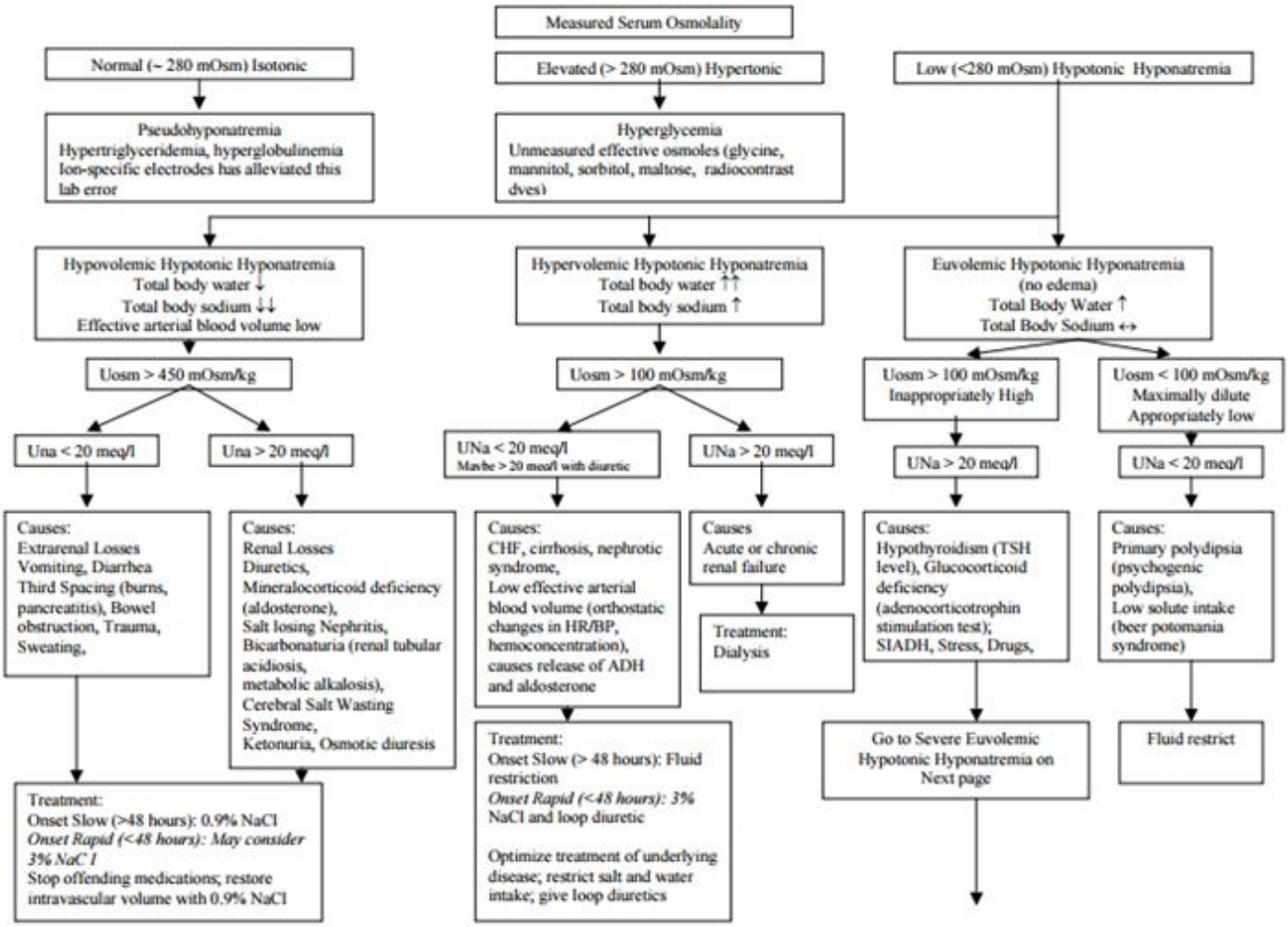
- Maintenance Fluids: If patient taking poor PO or NPO for long periods. In most circumstances do not need to start maintenance IVF if NPO overnight for a procedure.

    - Lactated ringers preferred in most circumstances (does have small amounts of Ca and K)
    - If over 20 Kg: 40ml/hr + mass (kg)
    - Extra 100-150ml/day for each degree of fever
    - If use NS, will cause a non-gap metabolic acidosis (NAGMA) secondary to the negatively charged Cl, leading to bicarb excretion from the kidneys.
- Replacement Fluids:
    - Lactated ringers preferred isotonic fluid in almost all circumstances.
    - Consider a bicarb drip if pH is <7.3 and if bicarb is low
        - if bicarb >14 or greater, order 1/2NS + 75meq of bicarb
        - if bicarb <14,
            - patient NPO or malnourished? order D5 + 150meq bicarb
            - patient hyperglycemic?: sterile water + 150meq bicarb

3.4: Hyponatremia

- Na+ correction for hyperglycemia:
    - For each 100 mg/dL of glucose > 100 mg/dL, add 2.4 meq/L to Na+ (in MedCalc)
- Workup: (Assess fluid status by physical exam and history, order serum osmolality, additional tests if needed: urine osmolarity and urine Na+)
- Make sure hypotonic or specific workup if not (see below) = check serum osm
    - Serum Osmolality
        - NML 280-295 = Isotonic
            - Pseudohyponatremia, Hyperglobulinemia or hyperlipidemia – check lipids
        - High >295 = Hypertonic
            - Hyperglycemia, Mannitol, sorbitol, glycerol, maltose, Radiocontrast agent
        - Low <280 = Hypotonic (MOST)
            - Assess volume status by history and exam!
                - Euvolemic: SIADH (Remember: ADH should only be excreted in the setting of dehydration or hypertonic states, any amount in the setting of hypo-osmolar, euvolemia is abnormal), postop hyponatremia, hypothyroidism, psychogenic polydipsia, Beer potomania, Idiosyncratic drug rxn (Thiazide, ACE-I), Adrenal insufficiency
                    - Check Urine Osmolality, TSH, AM cortisol (if other s/s adrenal insufficiency)
                        - Urine osm > 100 $\rightarrow$ SIADH (from pulmonary pathology, intracranial pathology, drugs, post-operative, pain, narcotics, etc); may be associated with adrenal insufficiency or hypothyroidism
                        - Urine osm <100 $\rightarrow$ Psychogenic polydipsia, Beer Potomania, Marathon or other strenuous activity where the patient replaced with free water only, very low solute
                        - Urine osm variable + chronic low Na $\rightarrow$ reset osmostat
                    - Tx:
                        - SIADH = FLUID RESTRICT!

        - Start 1-1.5L restriction per day, identify and treat cause.
        - Meds that can be used for resistant SIADH (rarely needed – usually with nephrology following if needing these)
            - Tolvaptan (vasopressin receptor antagonists)
            - Demeclocycline 300-600 mg per day
            - Salt tablets
            - Urea 15-60g/day
    - Hypervolemic (Edematous CHF, Liver dz, Nephrotic syndrome, Advanced renal failure) History and exam should clarify. Treat the underlying cause.
        - Treat the underlying cause
    - Hypovolemic
        - UNa<10: Dehydration, Diarrhea, Vomiting,
        - UNa>20: Diuretics, ACE-I, Nephropathies, Minerolcorticoids, Cerebral salt wasting
        - Treatment: Calculate sodium deficit and rate of correction (Medequations or other calculators helpful, math below).
        - Monitor sodium frequently (at least every 4 hours) during correction.
            - Asymptomatic: Increase Na+ at 0.5-1 meq/l/hr
            - Symptomatic: Increase Na+ at 1-2 meq/l/hr for first few hours
            - Goal rate of initial correction is 4-6 mEq/L in a 24-hour period. Do not exceed 8 meq / day to avoid Central Pontine Myelinolysis.
- NOTE: Dehydrated patients may need ADH during treatment (DDAVP), but only if severe and in consultation with nephrology. Once you correct the dehydration, the body will stop producing ADH and will attempt to correct the Na on its own, leading to a quick rise with fluids
    - (wt kg)(.5)(Change in Na desired) = total Na to give in 24hrs
        - 0.9NaCl: 154meq/L
        - 3% NaCl: 513meq/L
        - LR: Na 130, Cl 109, Ca 3, K 4, Lactate 28



3.5: Hyperkalemia

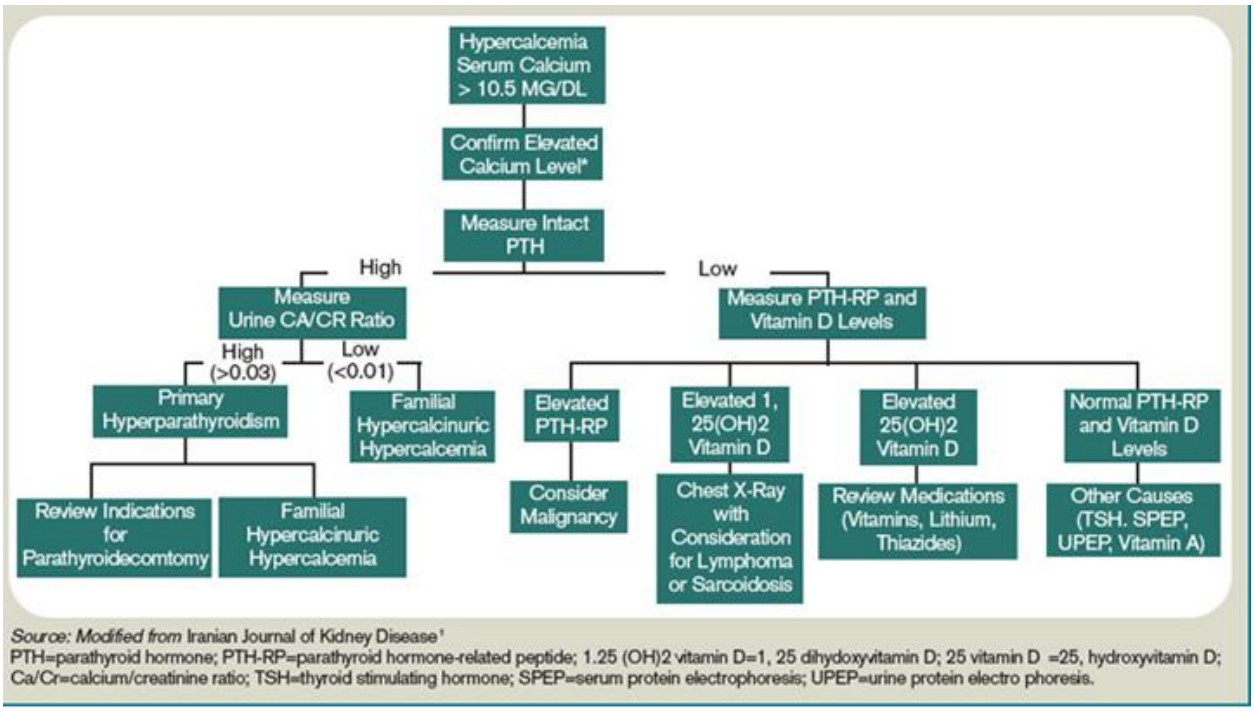
- First, make sure the sample was not hemolyzed
- Symptoms: Weakness, nausea, paresthesias, palpitations
- If greater than 6.0, get a stat EKG to check for peaked T-waves, Widening of QRS or loss of P waves
- Asymptomatic (No EKG Changes)
    - Under 6.0
        - Low Potassium diet
        - Check Medications for potassium supplement, spironolactone, theophylline, heparin
        - Recheck K in 2-4 hours: If still high, proceed to next step.
    - If over 6.0: C BIG Levels DROP (calcium gluconate, bicarb/beta agonists, insulin, glucose, Lokelma, D = diuretics or dialysis)
        - Protect the heart:
            - Calcium gluconate 1000mg to stabilize myocardium. Repeat every 60 minutes if hyperkalemia persists
        - Temporizing: moving extracellular K+ into cells
            - Insulin with glucose (to prevent hypoglycemia) – if given consider FSBS hourly x 6 hours
            - Inhaled albuterol (3 nebs back to back)
            - IVF (NS) if not hypervolemic.

        - Sodium bicarbonate: activates H+/K+ exchange so only effective in metabolic acidotic patients
    - Remove potassium from body
        - Loop diuretics if no severe renal impairment and patient makes urine; more effective if administered with IVF if no contraindication
        - HD for patients chronically on dialysis or with severe renal impairment
    - Lokelma: a cation exchanging med that causes potassium to enter the stool
        - But what about Kayexalate?: We are no longer recommending this use due to its risk of bowel necrosis
    - Repeat K level in 30-60 minutes after initial interventions.
- Symptomatic (EKG Changes)
    - Immediately give calcium gluconate 1000 mg (10 mL of 10 percent solution = 1 amp) – stabilizes myocardium
    - Then give 10 units Insulin-R IV, followed by 100 mL 50% glucose solution (1 amp of D50) – transient effect which drives K into cells.
    - Give 1 amp of bicarbonate (50meq in 50 mL) by IV if acidotic – transient effect, drives K+ into cells.
    - Furosemide 40 mg IV if not contraindicated.
    - Recheck K+ 30-60 minutes after administration of insulin, glucose and bicarbonate.
    - If still high, consider albuterol 10-20 mg inhaled or 0.5 mg by IV – transient effect, drives K+ into cells.
    - Lokelma: cation exchanging med that is safer to use than previously recommended Kayexalate
    - Consider hemodialysis if still elevated, especially in the setting of acute kidney injury.
- Once treatment initiated look for underlying cause. Consider bladder scan to r/o urinary obstruction, especially for males. Review med list for ACE/ARB, diuretics, spironolactone, NSAIDs, beta blockers.

3.6: Hypercalcemia

- 90 % due to hyperparathyroidism and malignancy
- Diagnosis: First, correct for low albumin:
    - Corrected Ca++ = total Ca + (0.8) x (4-albumin)
- Symptoms / Signs – Bones, stones, abdominal groans, and psychiatric overtones
- Labs: Calcium, Ionize Calcium, albumin, PTH, PO4. Based on results, consider PTH related peptide (squamous cell carcinoma of lung), SPEP and UPEP (multiple myeloma), 25-(OH)D, 1,25(OH)2D (vitamin D excess), Urine Ca+/Cr ratio (familial hypocalciuric hypercalcemia)
    - (See Algorithm Next Page)
- D/c all Hypercalcemia inducing medications (Vit D, Ca, Thiazide diuretics)
- If Ca over 14 or 12-14 (with symptoms or is new)
    - Place foley catheter and begin fluids (1 Liter bolus NS) then 250ml/hr to keep UOP 100-150ml/hr.
        - Administer Lasix for signs of fluid overload, but not empirically.
        - Patients often have AKI from dehydration from the osmotic effects of the Ca and needs lots of fluid to not only treat the Ca, but to also treat the AKI.
        - Adjust the above for patients with CHF (Discuss with Senior or Attending: Will need lasix early).
    - Begin Calcitonin 4 units/kg SQ every 12 hours x 48 hours

- Bisphosphonates: Zometa (zoledronic acid) 4mg IV x 1 (over 15 minutes)Hold if Acute Kidney Injury
  - Remember, you cannot calculate a GFR from one single Cr. Must have a stable Cr.
  - If stable and Cr <4.5, can administe
- If Ca <14 and chronic
  - D/c all hypercalcemia inducing medications (vitamin D, Ca, thiazide diuretics
  - Oral or IV hydrations depending on setting
  - Begin W/u.



Source: Modified from Iranian Journal of Kidney Disease[1]
PTH=parathyroid hormone; PTH-RP=parathyroid hormone-related peptide; 1.25 (OH)2 vitamin D=1, 25 dihydoxyvitamin D; 25 vitamin D =25, hydroxyvitamin D; Ca/Cr=calcium/creatinine ratio; TSH=thyroid stimulating hormone; SPEP=serum protein electrophoresis; UPEP=urine protein electro phoresis.

4.1: PPI / GI ppx

PPI: Friend or Foe?
Recent evidence shows that PPIs, despite all of their GERD-squashing magic…

1. Potential increase in risk for developing Hospital Acquired Pneumonia and C. Difficile infection (as related to a reduction in pH of contents making a more hospitable environment for bacteria in the GI tract)
2. Increase risk for hip and other osteoporotic fractures with long-term use (may be related to reduction in B12 absorption with subsequent increase in homocysteine levels)

For these reasons, we are not using them for GI prophylaxis on all of our patients anymore! Patient will only be on GI prophylaxis if they have an indication for it. An H2-blocker is preferred, unless they to use warranting administration of a PPI.
Indications for GI prophylaxis:

1. **ICU patient with:**

a. Coagulopathy (plt < 50, PTT 2x upper nml, INR > 1.5)
b. Ventilation for over 48 hours
c. GI ulceration or bleeding in past year

OR

2. **2 or more of the following risk factors:**

a. Sepsis
b. ICU stay over 1 week
c. Occult bleed lasting over 5 days
d. Steroids

We can and should stop PPIs for patients who come in on or transferred out of the ICU on them without a continued indication.

4.2: Pancreatitis

- Types
  - Acute Pancreatitis is a life-threatening event. Treat it very seriously.
  - Chronic Pancreatitis is painful but not life threatening.
- Workup
  - Symptoms: Epigastric pain radiating to back, N/V
  - Orders: Amylase (low specificity), Lipase (higher sensitivity and specificity), LFT, CRP, LDH, lipids, BMP, Mg, Phos, CBC
  - Imaging
    - RUQ US
    - CT abdomen with contrast IF diagnosis is in question or if severe presentation
    - ERCP may be needed by GI if gallstone pancreatitis, biliary sepsis, cholangitis, worsening jaundice, etc.
  - Stop all medications associated with pancreatitis (check each med in epocrates)
  - Risk for Death – Calculate APACHE II score and check CRP
    - Severe - persistent organ failure > 48 hours. Meets more than 8 criteria of APACHE II = Likely goes to the ICU
- Treatment
  - Lots of Fluids: At least 20ml/kg Bolus LR x 1, then 5-10 ml/kg/hr for 48 hours
  - If CHF or develops sign of fluid overload, decrease rate
  - Reassess fluid requirements: monitor UOP closely- First sign of impending deterioration is a drop in UOP (<0.5ml/kg)
    - All patients with acute pancreatitis must have strict I/O: Foley catheter for most
  - Follow BUN and HCT -- if BUN stable or worsening in first 24 hours increase fluid rate
  - Monitor vital signs
  - ABG if O2 Sat <95%
  - Bowel Rest:
    - Mild pancreatitis: if no ileus, n/v, start low fat, solid diet as soon as pain decreases and inflammatory markers decrease

        - Moderate to severe pancreatitis, ileus, SIRS persistent after 48 hours or if in ICU, or not able to start diet by day 5, start enteral feeding past the ligament of treitz (IR will need to place nasojejunal feeding tube)
    - Opiates for pain control
    - Serial exams: Must be checked every q6 for the first 24 hours.
    - Bad Signs (Must call senior and attending):
        - Drop in UOP
        - Increase in HR
        - Drop in Blood Pressure
        - Increasing abdominal pain (abdominal compartment syndrome)
    - No indication for prophylactic abx. May need abx if develop necrotizing pancreatitis with signs of infection.

4.3: Constipation

- Senokot-s: stimulant and softener, good for most patients. 1-2 tabs BID.
- Miralax: good for most patients. Start BID to QID depending how many days without a bowel movement. Easy to titrate
- All patients on pain medications should have a bowel regimen.

4.4: Nausea

- Zofran (4mg Q4H) - Very expensive - Good for chemotherapy/radiation.
    - Careful with QTc: Avoid if prolonged, mostly IV form
    - Careful with other serotonergic agent
- Phenergan 25mg po Q6H or 12.5-25mg IV/IM Q6H or 25mg suppository Q6H (use lower doses in elderly patients)
    - Should avoid IV unless the patient has a central line
    - Can cause delirium: Avoid in elderly
- Reglan – Good for gastroparesis. Be careful with use, can cause dystonic reactions.
- Ativan – for nausea secondary to anxiety
- Scopolamine – for nausea related to vestibular problems
    - Can cause severe delirium
- Several anti-psychotics are used for nausea:
    - chlorpromazine (25-50mg po Q6H
    - Prochlorperazine (5-10mg Q6-8H)
    - Haldol (OFF LABEL USE - 2mg QHS; good for morphine, hypercalcemia, renal failure)
    - Zyprexa: nausea in palliative pts; ODT form available

4.5: GI bleed

- Based on history determine source upper (hematemesis, coffee ground emesis, hx of ulcer/ GERD) vs. lower (BRBPR, hematochezia, melena)
- Hypotension a late finding. Check orthostatic vitals also to guide resuscitation.

- Labs: CBC (q 6 hr if anemic), BMP, LFT, INR, FIT or hemoccult
    - If severe bleed/significant anemia send type & screen
- Orders: Keep patient NPO overnight if procedure likely
    - Lower:
        - Start bowel prep (Golytely) overnight (order set available)
    - Upper:
        - Pantoprazole 40 mg IV twice daily while NPO
    - Both:
        - IV fluids if hypotensive or AKI
        - SCDs for DVT prophy
        - Consult GI
- Hold all anticoagulation including asa, Plavix, heparin or lovenox prophylactic dosing.
- Unless minor bleed will likely need to reverse Coumadin if INR >2: oral Vit K or 10 mg IV Vit K; if urgent FFP or PCC
- DOAC reversal: for minor bleeding, hold dose of meds. No specific antidote for Factor Xa inhibitor and antidote for pradaxa limited. Study of factor x inhibitors currently at Christ, call pharmacy to see if patient a candidate.

5.1: SIRS / Sepsis

- Systemic Inflammatory Response Syndrome (SIRS): ≥ 2 of the following:
    - Temp > 38.5 or < 35.0
    - HR > 90 bpm
    - RR > 20 or PaCO2 < 32
    - WBC > 12K or < 4K or >10% immature (band) cell
- Sepsis: SIRS in response to documented infection
    - Gram stain or culture positive for pathogenic microorganism
    - Focus of infection identified by visual inspection
    - Identification of infectious source on radiologic imaging

*FYI: There is a new scoring system in sepsis called the SOFA score that may have validity in the future but as of yet has not been fully validated and thus not a part of the recommended guidelines for sepsis management.

- New sepsis definition: Life-threatening organ dysfunction caused by a dysregulated host response to infection
    - Organ Dysfunction- An INCREASE in SOFA score by > or = 2 points
        - #SOFA Score
            - PaO2/FiO2
            - Bilirubin
            - Platelets
            - Creatinine
            - Best Eye Response
            - Best Verbal Response
            - Best Motor Response
            - MAP +/- vasopressors
    - Infection- relies on clinical suspicion based on signs and symptoms along with radiologic and/or microbiologic data
- Severe Sepsis:

    - Sepsis + at least 1 of the following signs of organ hypo-perfusion or organ dysfunction
        - Mottled skin
        - Capillary refilling of ≥ 3 sec
        - UOP < 0.5 mL/kg for at least 1 hr or renal replacement therapy
        - Lactate > 4.0 mmol/L
        - Abrupt MS change or abnl EEG
        - Platelets < 100K or DIC
        - Acute Lung Injury / ARDS
        - Cardiac Dysfunction demonstrated on ECHO
- Septic Shock:
    - Meet definition of sepsis
    - Despite adequate fluid resuscitation require vasopressors to maintain MAP > 65mmHg AND have lactate >2mmol/L
- Sepsis LABS: Check lactate initially and trend as below, blood cx, urine cx. If indicated: sputum cx, stool, CSF
- Sepsis exam pearls: remember skin for signs of infectious nidus and assess for hemodialysis catheters, foley catheters, PICC lines, central lines. Unwrap and examine wounds if present.
- Sepsis Treatment:
    - Assess and monitor respiratory status
    - Assess and monitor perfusion
        - Hypotension (SBP < 90mmHg, MAP < 70mmHg, decrease in SBP >40mmHg)
        - Elevated lactate (>2)
    - Intravenous Fluid Resuscitation with LR- administer in well-defined boluses with goal likely between 3-5L overall; goal within 6 hours of presentation
    - Vasopressors- useful in patients who remain hypotensive despite adequate fluid rehydration
    - Antibiotics- assess the possible infectious etiologies. Initiate broad spectrum regimen within 6 hours when obvious etiology unclear
    - Utilize sepsis order-set, including empiric antibiotics

5.2: Early Goal Directed Therapy

- Early Goal-Directed Therapy Targets
    - MAP > 65mmHg
    - Urine Output >0.5mL/kg/hr
    - Monitor for lactate improvement
- If the patient has lactic acidosis, this is a sign of organ ischemia, and the patient requires MASSIVE fluid resuscitation - (i.e. 5+ liters) until they have good pressure and until lactic acidosis resolved, back off fluids for signs of pulmonary edema. If LA is >4, this implies a significant level of tissue hypo-perfusion. You should initiate early goal directed therapy for sepsis, call the attending, and initiate transfer to the MICU…
    - If Lactic Acid 2-4 and SBP >90: Notify ICU but start treatment on floor.
        - Lactated ringers (Consider at least 1-3 liters, with high rate after)
        - Monitor HR (goal <100)
        - Monitor RR
        - Monitor Orthostatics (after boluses)
        - Monitor for fluid overload
        - Monitor UOP: Goal >0.5ml/kg/hr

        - Monitor BP
    - Recheck Lactic Acid at 2 hours:
        - >4: To the ICU
        - 2-4:
            - Bolus Lactated ringers (1 Liter). Consider ICU for CVP.
            - Recheck after repeat bolus. If still worse, to ICU for CVP.
        - < 2: continue fluids on floor
    - If Lactic Acid >4 or SBP <90: ICU and initiate Early Goal Directed Therapy Protocol
- Early Goal-Directed Therapy Protocol (more for ICU)
    - 500-ml bolus of crystalloid Q30min to achieve a CVP of 8 – 12 mm Hg.
    - If MAP < 65 mm Hg → Vasopressors were given to maintain a MAP of at least 65 mm Hg.
    - If MAP > 90 mm Hg → Vasodilators given until MAP < 90 mm Hg or below.
    - If the central venous oxygen saturation < 70%, transfuse PRBCs to achieve a Hct ≥ 30 percent.
    - After the CVP, MAP and Hct are thus optimized, if the central venous oxygen saturation is <70%, dobutamine administration started at 2.5 μg/kg/min, increase by 2.5 μg/kg/min Q30min until the central venous oxygen saturation is ≥ 70%or until a maximal dose of 20 μg/kg/min was given. Decrease dose or discontinue if the MAP is < 65 mm Hg or HR >120 bpm
    - To decrease oxygen consumption, patients in whom hemodynamic optimization could not be achieved receive mechanical ventilation and sedated

- Initial Abx Choice in SIRS / Sepsis
    - Depends on the infection, but some general comments:
    - Non-pseudomonal coverage (no Pseudomonal risk)
        - Vancomycin + one of the following:
            - Cephalosporin, 3rd or 4th generation (eg ceftriaxone or cefotaxime)
            - B-lactam + B-lactamase inhibitor (eg, piperacillin-tazobactam, ticarcillin-clavulinate, or ampicillin-sulbactam)
            - Carbapenem (eg, imipenem or meropenem)
    - Pseudomonal risk
        - Criteria: More than 4 courses of antibiotics over the last year, 2+ days of hospitalization in the last 90 days, Current Hospitalization >5 days, prior isolation of pseudomonas, diabetic patient, etc)
        - Vancomycin + 2 of the below (avoid choosing 2 from the same class):
            - B-Lactams
                - Antipseudomonal cephalosporin (eg ceftazidime, cefepime)
                - Antipseudomonal carbapenem (eg, imipenem, meropenem)
                - Antipseudomonal B-lactam/B-lactamase inhibitor (eg, piperacillin-tazobactam, ticaracillin-clavulinate,
                - Monobactam (eg. aztreonam)
            - Fluoroquinolone with good anti-pseudomonal activity (eg, ciprofloxacin, levofloxacin), or
            - Aminoglycoside (eg, gentamicin, amikacin).

5.3: MRSA

- HA-MRSA - Has mutated penicillin binding protein, leading to it to be resistant to all B-lactam antibiotics (penicillins, cephalosporins, carbopenems, monobactams)
    - Less Virulent
    - Bactrim will not cover
- CA-MRSA - susceptible to many non–ß-lactam antibiotics. Contain a novel cassette element, SCCmec IV and exotoxin, Panton-Valentine leukocidin (PVL)
    - PBP resistance – PCN, carbapenems, Aztreonam
    - Unlike its relative, hospital acquired MRSA, Ca-MRSA is often sensitive to non-B-lactam antibiotics

- Adult Vancomycin Dosing & Monitoring
    - Recommend discussing dosing with pharmacy: (extension 5-2432)
    - General Guides
        - IV vanc 15–20 mg/kg/dose (actual body wt) Q8–12H, not to exceed 2 g per dose, is rec in patients with normal renal function.
        - In seriously ill patients (eg, those with sepsis, meningitis, pneumonia, or infective endocarditis) with suspected MRSA infection, a loading dose of 25–30 mg/kg (actual body wt) may be considered. (Given the risk of red man syndrome and possible anaphylaxis associated with large doses of vanc – consider 2 hr infusion time and Benadryl prior to loading dose)
    - Trough vanc concentrations – best way to monitor dosing – check at steady state conditions, prior to the fourth dose preferred. Monitoring of peak vancomycin concentrations is not recommended.
    - Rec vanc trough concentrations of 15–20 ug/mL for most invasive infections (Osteo, Endocarditis, HAP, bacteremia, joint infections), otherwise goal trough can be 10-15 ug/mL
    - *If MIC is over 2, consider use of alternative agent other than Vancomycin [Ex: Daptomycin (other than pulmonary use), Linezolid]

5.4: MRSA Skin and Soft Tissue Infection

- Cutaneous Abscess
    - I&D is primary treatment
    - Antibiotics recommended for abscesses associated with the following:
        - Severe or extensive disease (eg, involving multiple sites of infection)
        - Rapid progression in presence of associated cellulitis
        - Signs and symptoms of systemic illness
        - Associated comorbidities or immunosuppression
        - Abscess in an area difficult to drain (eg, face, hand, and genitalia)
        - Associated septic phlebitis
        - Lack of response to incision and drainage alone
        - >5 cm in size
- Outpatient Purulent Cellulitis - cellulitis associated with purulent drainage or exudate in the absence of a drainable abscess
    - Empirical therapy for CA-MRSA is recommended pending culture results (See Number 4)
        - Empiric therapy for infection due to b-hemolytic streptococci is likely to be unnecessary
        - Treat until erythema has resolved + 2 more days

- Outpatient Non-purulent Cellulitis (cellulitis with no purulent drainage or exudate and no associated abscess)
    - Always ask about exposures: Fresh water, Sea Water, Puncture Wounds, Animal Bites or Scratches
        - If yes on any, be sure to look in Sanford or UpToDate for appropriate coverage of specific organisms
    - B-lactam antibiotics as first line
        - Empirical coverage for CA-MRSA is recommended in patients who do not respond to b-lactam therapy and may be considered in those with systemic toxicity or are hospitalized.
        - Treat until erythema has resolved + 2 more days
    - If patient has DM, consider coverage of Gram-negative organisms as well
        - Augmentin if outpatient
- Empiric coverage of CA-MRSA in outpatients
    - First Line: TMP-SMX 1-2 DS tab PO BID (Peds: Trimethoprim 4–6 mg/kg/dose, sulfamethoxazole 20–30 mg/kg/dose PO Q12H)
    - Alternatives:
        - Doxycycline 100 mg PO BID (Peds: <45kg: 2 mg/kg/dose PO Q12H, >45kg: adult dose)
        - Clindamycin 300 - 450 mg PO TID (Peds: 10-13 mg/kg/dose PO Q6-8H, not to exceed 40 mg/kg/day)- Growing resistance
        - Linezolid (Zyvox) 600 mg PO BID (Peds: 10 mg/kg/dose PO every 8 h, not to exceed 600 mg/dose)
- Empiric coverage for both B-hemolytic streptococci and CA-MRSA in outpatients with SSTI:
    - First Line: TMP-SMX in combination with a B-lactam
    - Alternatives:
        - Linezolid alone (Zyvox)
        - Clindamycin alone (Growing resistance for CA-MRSA)
        - Doxycycline + B-lactam
    - The use of rifampin as a single agent or as adjunctive therapy for the treatment of SSTI is not recommended
    - *fluoroquinolones are also not recommended
- Hospitalized patients with complicated SSTI (cSSTI; defined as patients with deeper soft-tissue infections, surgical/traumatic wound infection, major abscesses, cellulitis, and infected ulcers and burns)
    - Vancomycin goal trough 15-20: Call Pharmacy to Dose
    - Linezolid (Zyvox) 600 mg IV/PO BID (A-I)
    - Daptomycin 4 mg/kg/dose IV daily (A-I)
    - Clindamycin 600 mg IV/PO TID (A-III)- Growing resistance
    - A B-lactam antibiotic (eg, cefazolin) may be considered in hospitalized patients with nonpurulent cellulitis with modification to MRSA-active therapy if there is no clinical response (A-II)
    - Duration: Until erythema has resolved plus 2 days.
    - Pediatric considerations
        - For children with minor skin infections (such as impetigo) and secondarily infected skin lesions (such as eczema, ulcers, or lacerations), mupirocin 2% topical ointment can be used
        - *Tetracyclines should not be used in children under 8 years of age
- Recurrent SSTIs - Instructions should be provided to:
    - Keep draining wounds covered with clean, dry bandages
    - Maintain good personal and environmental hygiene techniques
    - Decolonization may be considered in selected cases:
        - Nasal decolonization with mupirocin twice daily for 5–10 days

- Nasal decolonization with mupirocin twice daily for 5–10 days and topical body decolonization regimens with a skin antiseptic solution (eg, chlorhexidine) for 5–14 days or dilute bleach baths. (For dilute bleach baths, 1 tsp per gallon of water [or ¼ cup per ¼ tub or 13 gallons of water] give for 15 min twice weekly for ~ 3 months can be considered)

5.5: MRSA Bacteremia and Infective Endocarditis

MRSA Bacteremia and Infective Endocarditis, Native Valve

1. Adults with Uncomplicated MRSA Bacteremia (defined as + blood cx and the following: exclusion of endocarditis (Negative TEE); no implanted prostheses; follow-up blood cultures performed on specimens obtained 2–4 days after the initial set that do not grow MRSA; defervescence within 72 h of initiating effective therapy; and no evidence of metastatic sites of infection)

- Vancomycin 15-20 mg/kg/dose Q8-12H (A-II)
- Daptomycin 6 mg/kg/dose IV daily (AI)
- ***Duration:*** Minimum 2 weeks

2. Adults with Complicated MRSA Bacteremia (defined as patients with positive blood culture results who do not meet criteria for uncomplicated bacteremia)

- Vancomycin 15-20 mg/kg/dose Q8-12H
- Daptomycin 6mg/kg/dose daily. Some experts recommend higher dosages of daptomycin at 8–10mg/kg/dose IV once daily (B-III)

Duration: 4–6 weeks

3. For adults with MRSA Infective Endocarditis, Native Valve

- Vancomycin IV 15-20 mg/kg/dose Q8-12H (A-II)
- Daptomycin 6 mg/kg/dose IV once daily (A-I) - Some experts recommend higher dosages of daptomycin at 8–10 mg/kg/dose IV once daily (B-III)
- Duration: 6 weeks

- Addition of gentamicin or rifampin to vancomycin is not recommended for bacteremia or native valve infective endocarditis
- Additional blood cultures 2–4 days after initial positive cultures and as needed thereafter are recommended to document clearance of bacteremia
- Echo is recommended for all adult patients with MRSA bacteremia. If TTE is negative, proceed with TEE.
- Evaluation for valve replacement surgery is recommended if large vegetation (10 mm in diameter), occurrence of >1 embolic event during the first 2 weeks of therapy, severe valvular insufficiency, valvular perforation or dehiscence, decompensated heart failure, perivalvular or myocardial abscess, new heart block, or persistent fevers or bacteremia are present (A-II).

4. Infective Endocarditis, Prosthetic Valve

- IV vancomycin plus rifampin 300 mg PO/IV every 8 h for at least 6 weeks plus gentamicin 1 mg/kg/dose IV every 8 h for 2 weeks (B-III)
- Early evaluation for valve replacement surgery is recommended (A-II)

5.6: MRSA Osteomyelitis

MRSA Osteomyelitis

1. Surgical debridement and drainage of associated soft tissue abscesses is the mainstay of therapy and should be performed whenever feasible (A-II)
2. The optimal route of administration of antibiotic therapy has not been established. Parenteral, oral, or initial parenteral therapy followed by oral therapy may be used depending on individual patient circumstances (A-III)
3. Antibiotics available for parenteral administration include:

- Vancomycin 15-20 mg/kg/dose IV Q8-12H(B-II)
- Daptomycin 6 mg/kg/dose IV once daily (B-II)
- TMP-SMX 4 mg/kg/dose (TMP component) twice daily in combination with rifampin 600 mg once daily (B-II)
- Linezolid 600 mg IV/PO BID (B-II)
- Clindamycin 600 mg IV/PO TID (B-III)

4. Some experts recommend the addition of rifampin 600 mg daily or 300–450 mg PO twice daily to the antibiotic chosen above (B-III). For patients with concurrent bacteremia, rifampin should be added after clearance of bacteremia
5. The optimal duration of therapy for MRSA osteomyelitis is unknown. A minimum 8-week course is recommended (A-II).
*Some experts suggest an additional 1–3 months (and possibly longer for chronic infection or if debridement is not performed) of oral rifampin-based combination therapy with TMP-SMX, doxycycline, clindamycin, or a fluoroquinolone, chosen on the basis of susceptibilities (C-III)
6. MRI with gadolinium is the imaging modality of choice, particularly for detection of early osteomyelitis and associated soft-tissue disease (A-II). ESR &/or CRP level monitoring may be helpful to guide response to therapy (B-II).

Septic Arthritis

1. Drainage or debridement of the joint space should always be performed
2. For septic arthritis, refer to antibiotic choices for osteomyelitis (recommendation 37 above). A 3–4-week course of therapy is suggested.

5.7: Meningitis

- Clinical Features:
    - Classic triad of fever (95%), altered mental status (78%), nuchal rigidity (88%)
        - Headache and subjective neck stiffness also common characteristics
        - Nuchal rigidity characterized by inability to touch chin to chest with active or passive flexion of neck
        - Classic Kernig and Brudzinski signs may help but not very sensitive
- Signs and symptoms: 95% of patients with bacterial meningitis have at least 2 of 4: Fever, altered mental status, subjective neck stiffness, nuchal rigidity (ask patient to touch chin to chest, also Kernig's and Brudzinski's signs – but these are not very sensitive).

- **anyone in ED with fever + headache without another obvious source needs to consider LP*
- *Etiologies:*
  - *Neisseria meningitidis*
  - *Strep pneumoniae*
  - *Haemophilus influenza*
  - *Listeria monocytogenes*
  - *Staph aureus (most often with head trauma or neurosurgery)*
  - *Gram negative bacteria (E.coli, Pseudomonas, Klebsiella) rare causes*
- *Labs:* Do LP and obtain CSF culture, gram stain, cell count, glucose, protein, and specific tests as indicated by history and physical such as viral cultures, HSV PCR, India Ink, Cryptococcus Ag, VDRL, fungal, TB, CMV, EBV, HIV, Lyme titer, adenovirus, blood cultures, urine culture
- Laboratory Evaluation:
  - Serum- WBC, blood cultures
  - CSF- protein, glucose, Gram Stain, cell count, bacterial/viral/fungal cultures, HSV PCR
    - Optional: cryptococcal, VDRL, TB, HIV, Lyme, West Nile
- Imaging: CT scan to rule out relative contraindications to LP (specifically mass effect or increased intracranial hemorrhage which can rarely cause herniation when LP preformed). This should be obtained BEFORE lumbar puncture in patients with any of the following – Immunocompromised state, history of CNS disease (mass lesion, stroke or focal infection), new onset seizure (w/in 1 wk of presentation), papilledema (Meaning: Must do a fundoscopic exam and feel confident of result), abnormal level of consciousness, focal neurologic deficit).
- Treatment: Treat all admissions for presumed meningitis as though they are bacterial or may be HSV, which means starting empiric broad-spectrum coverage antibiotics and acyclovir, w/ or w/o IV prednisone at 0.15mg/kg
  - Empiric Antibiotics
    - Ceftriaxone (2g IV Q12H) OR Cefotaxime (2g IV Q4-6H)
      - +
    - Vanc (30-60 mg/kg IV / day divided BID or TID)
      - +
    - Ampicillin (2g IV Q4H) if </= 1 month or ≥ 50 yo or immunosuppressed (on steroids) to cover for listeria
    - Acyclovir (10mg/kg IV q8h) if any MS changes or high suspicion for HSV
    - Dexamethasone (0.15mg/kg q6h x 4 days) if unknown bacterial organism or suspected/confirmed Pneumococcal etiology

Recommendations for empiric antimicrobial therapy for purulent meningitis based on patient age and specific predisposing condition*

Predisposing factor	Common bacterial pathogens	Antimicrobial therapy
Age		
<1 month	*Streptococcus agalactiae*, *Escherichia coli*, *Listeria monocytogenes*	Ampicillin plus cefotaxime; OR ampicillin plus an aminoglycoside
1 to 23 months	*Streptococcus pneumoniae*, *Neisseria meningitidis*, *S. agalactiae*, *Haemophilus influenzae*, *E. coli*	Vancomycin plus a third-generation cephalosporin ¶Δ◇
2 to 50 years	*N. meningitidis*, *S. pneumoniae*	Vancomycin plus a third-generation cephalosporin ¶Δ◇
>50 years	*S. pneumoniae*, *N. meningitidis*, *L. monocytogenes*, aerobic gram-negative bacilli	Vancomycin plus ampicillin plus a third-generation cephalosporin ¶Δ
Head trauma		
Basilar skull fracture	*S. pneumoniae*, *H. influenzae*, group A beta-hemolytic streptococci	Vancomycin plus a third-generation cephalosporin ¶Δ
Penetrating trauma	*Staphylococcus aureus*, coagulase-negative staphylococci (especially *Staphylococcus epidermidis*), aerobic gram-negative bacilli (including *Pseudomonas aeruginosa*)	Vancomycin plus cefepime; OR vancomycin plus ceftazidime; OR vancomycin plus meropenem
Postneurosurgery	Aerobic gram-negative bacilli (including *P. aeruginosa*), *S. aureus*, coagulase-negative staphylococci (especially *S. epidermidis*)	Vancomycin plus cefepime; OR vancomycin plus ceftazidime; OR vancomycin plus meropenem
Immunocompromised state	*S. pneumoniae*, *N. meningitidis*, *L. monocytogenes*, aerobic gram-negative bacilli (including *P. aeruginosa*)	Vancomycin plus ampicillin plus cefepime; OR vancomycin plus ampicillin plus meropenem

5.8: C. diff

- Diagnosis:
  - Testing should be pursued only in patients with clinically significant diarrhea (>3 loose stools in 24h) and moderate clinical suspicion based on risk factors (hospitalization, recent antibiotics use, older age, significant leukocytosis)
  - Two step C. diff testing: both toxin and PCR so if PCR positive but toxin negative they have colonization. If BOTH positive treat as acute/recurrent infection.
    - If concerned for C diff primarily, send C diff stool NOT GI panel.
    - No role for repeated lab testing for cure as stool assays may remain positive after recovery
- *Disease Severity*:
  - Age > 60 (1 point)
  - Temp > 101 (1 point)
  - WBC > 15 (1 point)
  - Albumin < 2.5 (1 point)
  - In ICU (2 points)
  - Pseudomembranous colitis evidence (2 points)
  - >/= 2 points = severe Cdiff
- C. Diff Treatment:
  - Key point: Oral vancomycin first-line in most circumstances

Table 1. Recommendations for the Treatment of *Clostridium difficile* Infection in Adults

Clinical Definition	Supportive Clinical Data	Recommended Treatment[a]	Strength of Recommendation/ Quality of Evidence
Initial episode, non-severe	Leukocytosis with a white blood cell count of ≤15 000 cells/mL and a serum creatinine level <1.5 mg/dL	• VAN 125 mg given 4 times daily for 10 days, OR	Strong/High
		• FDX 200 mg given twice daily for 10 days	Strong/High
		• Alternate if above agents are unavailable: metronidazole, 500 mg 3 times per day by mouth for 10 days	Weak/High
Initial episode, severe[b]	Leukocytosis with a white blood cell count of ≥15 000 cells/mL or a serum creatinine level >1.5 mg/dL	• VAN, 125 mg 4 times per day by mouth for 10 days, OR	Strong/High
		• FDX 200 mg given twice daily for 10 days	Strong/High
Initial episode, fulminant	Hypotension or shock, ileus, megacolon	• VAN, 500 mg 4 times per day by mouth or by nasogastric tube. If ileus, consider adding rectal instillation of VAN. Intravenously administered metronidazole (500 mg every 8 hours) should be administered together with oral or rectal VAN, particularly if ileus is present.	Strong/Moderate (oral VAN); Weak/Low (rectal VAN); Strong/Moderate (intravenous metronidazole)
First recurrence	…	• VAN 125 mg given 4 times daily for 10 days if metronidazole was used for the initial episode, OR	Weak/Low
		• Use a prolonged tapered and pulsed VAN regimen if a standard regimen was used for the initial episode (eg, 125 mg 4 times per day for 10–14 days, 2 times per day for a week, once per day for a week, and then every 2 or 3 days for 2–8 weeks), OR	Weak/Low
		• FDX 200 mg given twice daily for 10 days if VAN was used for the initial episode	Weak/Moderate
Second or subsequent recurrence	…	• VAN in a tapered and pulsed regimen, OR	Weak/Low
		• VAN, 125 mg 4 times per day by mouth for 10 days followed by rifaximin 400 mg 3 times daily for 20 days, OR	Weak/Low
		• FDX 200 mg given twice daily for 10 days, OR	Weak/Low
		• Fecal microbiota transplantation[c]	Strong/Moderate

Abbreviations: FDX, fidaxomicin; VAN, vancomycin.

[a]All randomized trials have compared 10-day treatment courses, but some patients (particularly those treated with metronidazole) may have delayed response to treatment and clinicians should consider extending treatment duration to 14 days in those circumstances.

[b]The criteria proposed for defining severe or fulminant *Clostridium difficile* infection (CDI) are based on expert opinion. These may need to be reviewed in the future upon publication of prospectively validated severity scores for patients with CDI.

[c]The opinion of the panel is that appropriate antibiotic treatments for at least 2 recurrences (ie, 3 CDI episodes) should be tried prior to offering fecal microbiota transplantation.

5.9: Community Acquired Pneumonia

- the following is based of the 2019 IDSA CAP guidelines update.
- After making diagnosis of pneumonia, use CURB 65 score to determine if will treat inpatient vs outpatient

CURB-65 criteria for CAP severity	
Factor	Points
Confusion	1
Uremia (BUN ≥20)	1
Elevated **R**espiratory rate (≥ 30 breaths/min)	1
Low **B**lood pressure (systolic < 90, diastolic ≤ 60)	1
Age ≥ **65** years	1
Scoring: **0-1:** 30 days mortality rate of 0.7 – 2.1%, able to treat in ambulatory setting **2:** 7%, treat patient in hospitalized setting **3 or above:** 14% or higher, treat patient in hospitalized setting, add steroids	

- **Outpatient CAP treatment**

Outpatient CAP treatment

Previously healthy; no risk factors for pseudo/MRSA	Amoxicillin 1g TID (preferred) **OR** Doxycycline 100mg BID (less preferred)		
Comorbidities for DRSP; no risk factors for pseudo/MRSA	[Beta lactam (Augmentin XR 2g-125mg BID **OR** cefuroxime 500mg BID)] + [Macrolide: azithromycin (preferred) 500mg first day, 250mg thereafter **OR** doxycycline 100mg BID (less preferred)]	OR	RFQ alone (Levaquin 750mg q day)
Risk factors for Pseudomonas or MRSA	Patients with risk factors for pseudomonas or MRSA are unlikely to be managed in outpatient setting. If very stable by assessment, would need coverage for these organisms as in inpatient regimens		

Comorbidities for DRSP
cardiac dz
pulmonary dz
liver dz
renal dz
DM
alcoholism
malignancy
asplenia
immunosuppressed

- **Inpatient CAP treatment**
  - Use these criteria to determine if pneumonia is non-severe CAP vs severe CAP

Severe vs Not Severe Pna

Major Criteria

1. Invasive mechanical ventilation
2. Septic shock with the need for vasopressors

Minor Criteria

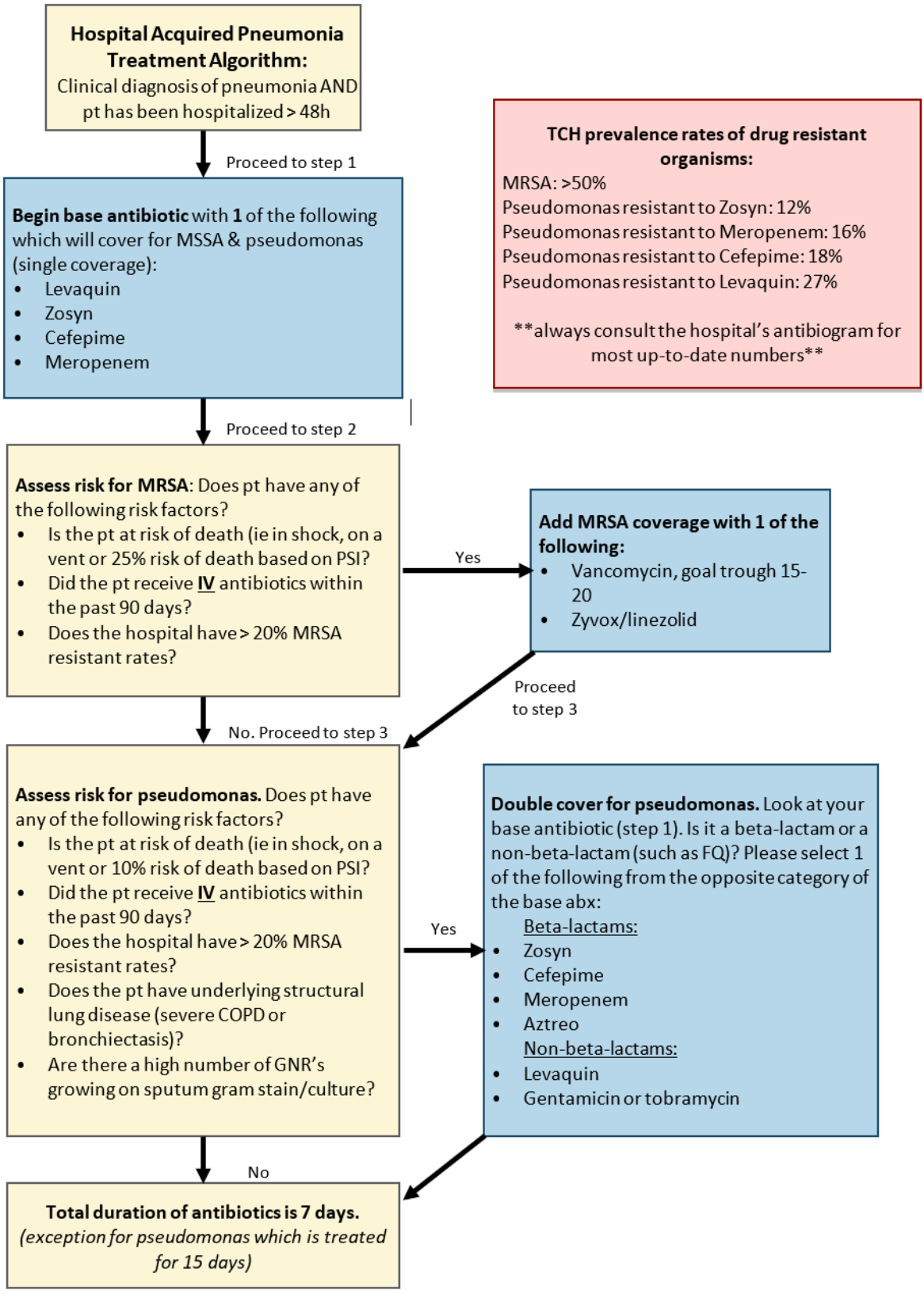
1. RR≥30
2. PaO2 / FiO2 <250
3. Multilobar infiltrates
4. Disorientation
5. BUN ≥20
6. WBC <4,000
7. Plt < 100,000
8. Temp < 36 Celsius
9. Hypotension requiring aggressive fluid resuscitation

Non Severe CAP (No major criteria and <3 minor criteria)				
Standard Regimen	[B-lactam (amp-sulbactam, ceftriaxone) + Azithromycin] Or RFQ alone (Levaquin)			
Prior resp isolation of MRSA in last year	[B-lactam (amp-sulbactam, ceftriaxone) + Azithromycin] Or RFQ alone (Levaquin)	+	MRSA Coverage (vanc or linezolid)	Blood cx, sputum cx, nasal PCR and deescalate if negative
Prior resp isolation of pseudo in last year	Azithromycin Or RFQ	+	Pseudomonas coverage (zosyn or cefepime) **	Blood cx, sputum cx, and deescalate at 48hrs if negative
Hosp in last 90 days with IV abx and NO respiratory MRSA/pseudo isolated	[B-lactam (amp-sulbactam, ceftriaxone) + Azithromycin] Or RFQ alone (Levaquin)			Blood cx, sputum cx, nasal PCR. **Only add pseudo/MRSA coverage if testing positive**

Severe CAP (One major criteria or ≥ 3 minor criteria)				
Standard Regimen	B-lactam (amp+sulbactam, ceftriaxone) + [azithromycin OR RFQ]			Obtain Blood cx, sputum cx, nasal PCR
Prior resp isolation of MRSA in last year	B-lactam (amp+sulbactam, ceftriaxone) + [azithromycin OR RFQ]	+	MRSA coverage (vanc or linezolid)	Blood cx, sputum cx, nasal PCR and deescalate if negative
Prior resp isolation of pseudo in last year	Azithromycin OR RFQ	+	Pseudo coverage (zosyn or cefepime) **	Blood cx, sputum cx, and deescalate at 48hrs if negative
Hosp in last 90 days with IV abx and NO respiratory MRSA/pseudo isolated	Azithromycin OR RFQ	+	MRSA coverage (vanc or linezolid) AND Pseudo coverage (zosyn or cefepime) **	Blood cx, sputum cx, nasal PCR. Deescalate at 48hr if negative. May still deescalate from MRSA PCR + if sputum cx negative.

- Inpatient CAP Treatment Notes
  - If cannot tolerate FQ or Macrolides as the base of pna treatment as above, may use B-lactam + doxy 100mg BID
  - If anaphylactic reaction to PCN previously, can use carbapenem (meropenem 1g q8h; imipenem 500mg q6h) for pseudo coverage instead of zosyn or cefepime
  - *** double coverage (usually adding levaquin to cefepime or zosyn) for pseudomonas if inpatient antibiogram shows >10% resistance to base pseudomonal agent
  - Dosing regimens: amp+sulbactam (1.5-3g q6h); ceftriaxone (1-2g qd); azithromycin (500mg qd); levaquin (750mg PO/IV q day); vanc (15mg/kg q 12, goal trough 15-20); linezolid (600mg q 12); zosyn (4.5g q8h); cefepime (2g q8h)
  - Antibiotic duration
    - continue abs for a minimum of 5 days. After 5 days, abx can be discontinued when afebrile >72 hours and all discharge criteria are met
    - MRSA or pseudomonas pna should be covered for at least 7 days
- Extra CAP info
  - There are now only two categories of pneumonia. Community Acquired Pneumonia and Hospital Acquired Pneumonia. HCAP has been retired with the 2019 IDSA CAP guidelines. Hospital acquired pneumonia (HAP) will be treated according to 2016 IDSA pneumonia guidelines, see previous page
  - Always use CURB-65 to determine severity of CAP. Can be found above or in Mediquations
  - A Pneumonia Severity Index (PSI) can be calculated for HCAP or HAP to determine 30 d risk of mortality. (See Mediquations.)
  - Procalcitonin: should not be used to determine initiation of antibiotics but can be used to justify de-escalation to monotherapy by showing decline in value from admission to 48hrs of treatment.
  - Fluroquinolones now have an FDA black-box warning as they are associated with tendinitis/tendon rupture, peripheral neuropathy, and CNS effects. Pt over 60 yo, on steroids, or s/p organ transplant are at higher risk. Please avoid use when treating sinusitis, COPD exacerbation, or uncomplicated UTI. FQ's can still be used for pneumonia especially if patient is ill, warrants double coverage for pseudomonas, or has no alternative medication option. This is risk vs benefit decision made on an individual basis.

5.10: Hospital Acquired Pneumonia



5.11: Antibiotic resistance

- **Gram negative bacteria** become resistant to B-lactams by producing beta-**lactamases**. Therefore, beta-lactamase inhibitors help to overcome this, making meds such as Augmentin, zosyn, unasyn, etc effective against Gram-negative bacteria.
- **MRSA is resistant to beta-lactams because of a mutation in penicillin binding protein (PBP). beta-lactamases therefore do not help overcome resistance. Another class of antibiotic (vancomycin/linezolid), which do not require binding to PBP to be effective, is needed.**
- **Atypical bacteria (chlamydia, legionella, mycoplasma)** do not have cell walls. Therefore, no antibiotic that acts on the cell wall (beta-lactams) will be effective in fighting them.

5.11 UTI

Uncomplicated UTI

- First line tx
  - Nitrofurantoin (Macrobid): 100mg BID x5 days
    - Considerations: don't use if GFR <60 or if patient with AKI. Could consider use if GFR 30-60 and no other options based on allergies or culture
  - TMP-SMX: one double strength tablet BID x 3 days
    - Considerations: reduced dose if GFR <30. This is a sulfa drug and many patients have allergies to this
  - Fosfomycin: 3g as a single dose
    - Considerations: less preferred than macrobin or TMPSMX given concern for resistance
- Second line
  - B-lactam (preferred)
    - Amox-clav 500mg BID for 5-7 days
    - Cefdinir 300mg BID for 5-7 days
    - Cephalexin 250-500mg q 6 hrs for 5-7 days
  - Fluoroquinolones: (least preferred)
    - Cipro: 250mg BID for 3 days
      - Considerations: higher rates of resistance and adverse sideeffects
- What if male patient?
  - Look for a reason why. Could be STD and need to r/o G/C
  - Same tx as above but usually needs longer course (reference length of courses on Lexicomp)

Complicated UTI

- What is a complicated UTI?
  - Fever, systemic illness, CVA/flank tenderness, pelvic or peroneal pain in men (prostatitis)
  - PO regimens exist for outpatient tx (Levaquin, cipro), however this is often treated inpatient as below
- Low concern for ESBL
  - Generally start broad and await culture
  - Ceftriaxone and transition to Omnicef when doing well to complete total 10-14 day course
  - Zosyn and transition to PO regimen based on culture
  - Consider use of Levaquin if cannot use above or if culture mandates. Avoid use if possible due to sideeffects

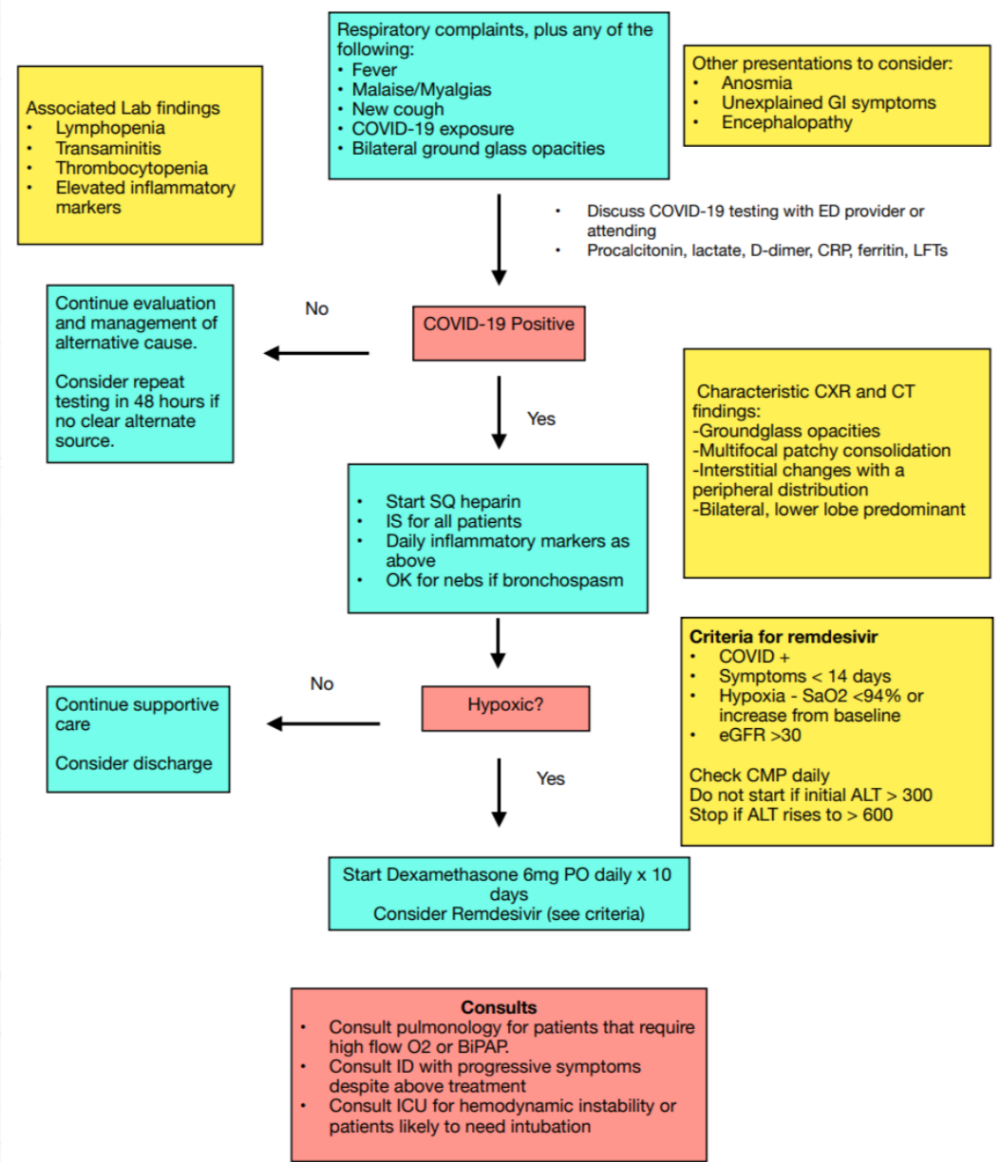
        - Levaquin: 750mg IV/PO q day for 5-7 days
        - IV is equivalent to PO
- High concern for ESBL
    - Consider empiric tx if positive culture for ESBL in past 3 months or if clinical picture worsens by standard tx as above without culture data available yet
        - Meropenem 1g IV q8
- Concern for other resistant organisms
    - MRSA: vancomycin
    - Vancomycin resistant Enterococcus: linezolid

5.12: COVID

COVID considerations

- do NOT enter a COVID room without appropriate PPE (CAPR or N95 with goggles and a gown and gloves). Please discuss with your attending or senior on appropriate application of PPE if any questions
- as of this writing, there are infusions in TCH outpatient infusion center of monoclonal antibodies for those who are NOT hypoxic and will no longer be inpatient and are early on in their COVID course.

COVID inpatient algorithm



6.1: AKI

- Definition
  - No universally accepted guidelines, however The Kidney Disease: Improving Global Outcomes (KDIGO) defines AKI as:
    - Increase in serum creatinine by ≥0.3 mg/dL (≥26.5 micromol/L) within 48 hours; or
    - Increase in serum creatinine to ≥1.5 times baseline, which is known or presumed to have occurred within the prior seven days; or
    - Urine volume <0.5 mL/kg/h for six hours
  - Remember that the creatinine must double to cut the GFR in half. A change in Cr from 0.6 to 1.0 is a huge change in kidney function, whereas a change in Cr of 4.5 to 4.9 likely has little clinical significance.
- Approach- Your initial job is to identify which category of Acute Kidney Injury the patient has:
  - Pre-renal - The kidney is not getting as much blood flow as it wants
  - Intrinsic - The kidney is damaged in some way
  - Post-renal - The kidney is tired of pushing urine out against pressure
- History
  - Pre-renal
    - Poor po intake, vomiting/diarrhea
    - Diuretics
    - Infection/sepsis
    - DKA/hyperglycemia
    - Hypercalcemia
    - Bleeding
    - Acute exacerbation of CHF (decreased CO leads to decreased effective volume)
    - Acute liver failure
  - Intrinsic
    - Acute Tubular Necrosis (ATN) - iodinated contrast, profound hypotension/sepsis, Renal artery stenosis, rhabdomyolysis, Meds: vanc & zosyn combination, NSAIDs, ACEi
    - Glomerular disease: nephritic and nephrotic syndromes
    - Small vessel vascular disease - TTP/HUS, malignant hypertension
    - Acute Interstitial Nephritis (AIN) - antibiotics, autoimmune dx
  - Obstructive - Often rapid rise with very high Cr (>5) with hyperkalemia in patient without known kidney disease
    - BPH
    - Kidney stones
    - Metastatic cancer
    - Severe Constipation
- AKI ORDERS
  - Nursing
    - Strict I/Os
    - Bladder scan/post-void residual - all older males and consider in many other patients, especially those that have diabetic neuropathy elsewhere or on chronic opiates
    - Foley with elevated bladder scan or bladder distention on exam
    - Call with UOP < 0.5 mL/kg/hr (ideal body weight)
  - Labs
    - Renal, CBC, Liver panel, UA with micro
    - FeNa or FeUrea

        - If trying to distinguish pre-renal from intrinsic/post-renal
        - FeNa if not on diuretics, FeUrea if on diuretics
        - FeNa: check urine Na & Cr and calculate
            - < 1% is likely pre-renal
        - FeUrea: Check urine urea nitrogen and Cr and calculate
            - < 35% is likely pre-renal
    - Consider
        - Urine eosinophils
        - Urine protein to Cr ratio (ratio approximates proteinuria in g/day)
        - SPEP/UPEP or Kappa/Lambda light chains
        - ANCA, anti GBM
        - Hep B & C and HIV, RPR
        - Complements
    - Imaging - Usually not necessary
        - Renal U/S if concern for obstruction but normal bladder scan, or if not improving with initial therapy
        - CT Abd/pelvis without contrast only if concerned for kidney stones
    - Meds
        - MIVF +/- bolus depending on fluid status in pt with pre-renal or intrinsic disease
        - Lasix/diuresis if signs of fluid overload
        - Hold nephrotoxic meds, common ones to look out for
            - ACEi/ARB
            - NSAIDs
            - Diuretics if volume depleted
            - BP meds if hypotensive
        - Eval antibiotics as possible cause
        - Remember that home meds may need dose adjustments with worsening kidney function

6.2: Dialysis

DIALYSIS… or, when do I call nephrology in the middle of the night?
Indications for emergent dialysis are: **AEIOU**

- **A**cidosis (severe) in patients who cannot get bicarb (fluid overload, DKA)
- **E**lectrolytes- Severe hyperkalemia, refractory to medical management
- **I**ngestions
- Fluid **O**verload (severe), refractory to diuretics
- **U**remic signs (severe)

Contrast Induced Nephropathy
Risk: See table below to assess risk for this before giving ***iodinated*** contrast study

- Consider need for test if score above 5
- Discuss risks and benefits with patient prior to ordering test

Prophylaxis: Give to all people at risk, starting ASAP once you've decided to do study

- Normal saline, 1mL/kg/hr for 6-12 hr prior to procedure and 6-12 hours following

Table 1. Predicting the Risk of an Acute Decline in Kidney Function after Percutaneous Coronary Intervention.*

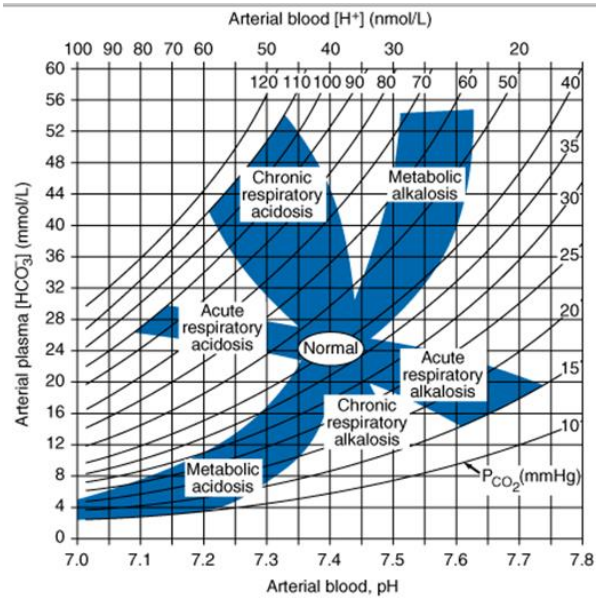
Risk Factor	Score
Systolic pressure <80 mm Hg for >1 hr and patient requires inotropic support or an intraaortic balloon pump within 24 hr after the procedure	5
Use of intraaortic balloon pump	5
Heart failure (New York Heart Association class III or IV), history of pulmonary edema, or both	5
Age >75 yr	4
Hematocrit <39% for men or <36% for women	3
Diabetes	3
Volume of contrast medium	1 for each 100 ml
Serum creatinine level >1.5 mg/dl (133 μmol/liter) or Estimated GFR† <60 ml/min/1.73 m^2 body-surface area	4 2, 40 to <60 ml/min/1.73 m^2 4, 20 to 39 ml/min/1.73 m^2 6, <20 ml/min/1.73 m^2

Total Risk Score‡	Risk of an Increase in Serum Creatinine Levels of >0.5 mg/dl (44 μmol/liter) or >25 Percent	Risk of Dialysis
	percent	
≤5	7.5	0.04
6 to 10	14.0	0.12
11 to 15	26.1	1.09
≥16	57.3	12.6

6.3: Acid - Base

- Arterial blood gas
  - Why order a blood gas?
    - CO2 on BMP < 16 or > 40
    - Evaluate for CO2 retention
    - Somnolence or increased WOB
    - Evaluate oxygenation when unclear from Pulse Ox
- Normal Values
  - pH: 7.35-7.45
  - pCO2: 35-45
  - Bicarb: 22-26
  - pO2: 80-100
- Steps in Interpreting ABG
  - Based on the pH, do you have an acidosis (pH<7.4) or alkalosis (pH >7.4)
  - If Acidosis (pH < 7.4):
    - What is the pCO2?

        - Over 40: Respiratory Acidosis is primary problem: Calculate Corrected Bicarb (Anion Gap - 12 + HCO3=Corrected Bicarb)
            - >30: metabolic alkalosis also present
            - 23-30: No additional abnormality
            - <23: Non-Anion Gap Metabolic Acidosis also present
        - pCO2 40 or less: Metabolic Acidosis is primary problem: Check for Respiratory Compensation: Pred pCO2=(1.5 x HCO3) + 8
            - If pCO2 is within 2 of predicted, then proper respiratory compensation
            - If pCO2 is lower than predicted, then also have respiratory alkalosis
            - If pCO2 is higher than predicted, then also have respiratory acidosis
- If Alkalosis (pH >7.4)
    - What is the pCO2?
        - 40 or Greater: Primary problem is metabolic alkalosis: Check for respiratory compensation: predicted pCO2 = (0.9 x HCO3) + 16
            - If Predicted pCO2 is higher than actual (+/- 5 or so): additional respiratory acidosis
            - If Predicted pCO2 is lower than actual (+/- 5 or so): additional respiratory alkalosis
        - Less than 40: Primary problem is respiratory alkalosis: Check for Anion Gap (AG):
            - Elevated AG: Anion gap metabolic acidosis also present
                - Evaluate the corrected bicarb: AG - 12 + HCO3
                    - >30: Metabolic alkalosis is also present
                    - 23-30: No additional abnormality
                    - <23: Non-anion Gap Metabolic acidosis is also present
            - Normal AG
                - Evaluate the corrected bicarb: AG - 12 + HCO3
                    - >30: Metabolic alkalosis is also present
                    - 23-30: No additional abnormality
                    - <23: Non-anion Gap Metabolic acidosis is also present



Met Acidosis: Low pH, Low HCO3 ↓ 1.2 PCO2: ↓ 1mEq/L HCO3	Met Alkalosis: High pH, High HCO3 ↑ PCO2 0.7:↑ 1mEq/L HCO3
Respiratory Acidosis: Low pH, High pCO2 Acute: ↑ HCO3 1mEq/L : ↑ 10 PCO2 Chronic: ↑ HCO3 3.5 : ↑ 10 PCO2	Respiratory Alkalosis: High pH, Low pCO2 Acute: ↓ 2 HCO3 : ↓ 10 PCO2 Chronic: ↓ 4 HCO3: ↓ 10 PCO2

6.4: Anion Gap

- Unmeasured anions in plasma (normally 10 to 12 mmol/L)
- AG = Na+ − (Cl− + HCO3−)
- The unmeasured anions include anionic proteins, phosphate, sulfate, and organic anions
- Anion Gap Metabolic acidosis
    - Lactic acidosis
    - Ketoacidosis
        - DKA, alcohol, starvation
    - Toxins
        - Ethylene glycol, Methanol, Salicylates, Propylene glycol, Pyroglutamic acid
    - Renal failure
- Non-gap Metabolic Acidosis
    - Gastrointestinal bicarbonate loss → Diarrhea
    - Renal Tubular Acidosis
    - Normal saline
    - TPN
    - Enteric & pancreatic fistula

7.1: AMS

Horses	Mules	Zebras
Medications	NMS	Vasculitis
Infection/Sepsis	Thyrotoxicosis	Autoimmune encephlitis
Hypoglycemia	Wernicke's	Transient global amnesia
Dehydration	Atypical Migraine	Tertiary syphilis
Hypercarbia	Hypercalcemia	Neurosarcoidosis
Hypoxia	HTN/PRES	Prion disease
Hyperammonemia	Tumor	HIV
Uremia	Myxedema	Wilson's disease
Intoxication	Catatonia	Heavy metal poisoning
Withdrawal	Serotonin syndrome	Leptomeningeal carcinomatosis
ICH/SAH	TTP	Lyme disease
Hyponatremia	Hypothermia	Hyperviscoisity syndrome
Decreased Cardiac Output	Hyperparathyroidism	Reye's syndrome
Menigoencephelitis	Conversion d/o	
Hyperglycemia	Carbon monoxide poisoning	
Seizure	Hypophosphatemia	
Psychiatric disease	Hyper/hypothyroidism	
ICU encephalitis	Demyelinating disorder	
CVA	Status epilepticus	
B12 deficiency	Parkinson's disease	
Acid/base disorders		
Delirium		

AMS Orders- *Not all patients require all of these orders. Please use your differential as a guide*
Nursing

- Consider neuro checks
- Delirium precautions if concerned for agitation
- Bladder scan
- CIWA if concern for withdrawal

Labs

- CBC
- Renal panel/Mg/Phos
- Liver panel/Ammonia
- B12, TSH

- Urinalysis
- Blood cultures
- Urine tox screen (must be done in ED or wont be back for a week)
- Toxic drug levels: digoxin, anti-epileptic drugs
- Consider HIV, RPR, SPEP/UPEP or Kappa/Lambda light chains, cortisol, PTH
- If ordering LP – (Fever, nuchal rigidity, headache)
    - CSF Glucose
    - CSF Protein
    - Cell count
    - Gram Stain/Culture
    - HSV PCR
    - Enterovirus & West nile virus PCR - (Summer/fall)
    - Also consider
        - Fungal cultures
        - AFB
        - Cytology
        - Anti NMDA & anti GABA antibodies
        - Oligoclonal bands (OLIG)
        - CSF latex agglutination

Imaging

- CT head without contrast - for acute bleed
- CXR - eval for PNA
- MRI head without contrast - for CVA
- MRI head with/without contrast - for masses, demyelinating disease, some infection, PRES
- EEG - Can have status epileptics without convulsions

AMS Medications

- Can trial empiric naloxone if concern for opioid intoxication - can be iatrogenic
- High dose thiamine if alcohol history
- Reduce or discontinue sedating or confusion inducing medications
- Treat agitation as below

7.2: Delirium

- A disturbance of consciousness with reduced focusing ability (inattention), which fluctuates over the course of the day.
- Signs and Symptoms: Confusion assessment method (CAM) –95% sensitive
    - Must have ALL of the following:
    - Acute + Waxing and waning + inattention AND have at least 1 of the following: Disorganized thought OR Altered LOC
    - Can be both Hyperactive and Hypoactive
- Causes
    - Medications - See Beer's List for more complete list
        - Anticholinergics – Benadryl, Bentyl, Phenergan, Detrol, Lomotil, muscle relaxers
        - H2 Blockers
        - Reglan
        - TCA, MAOI

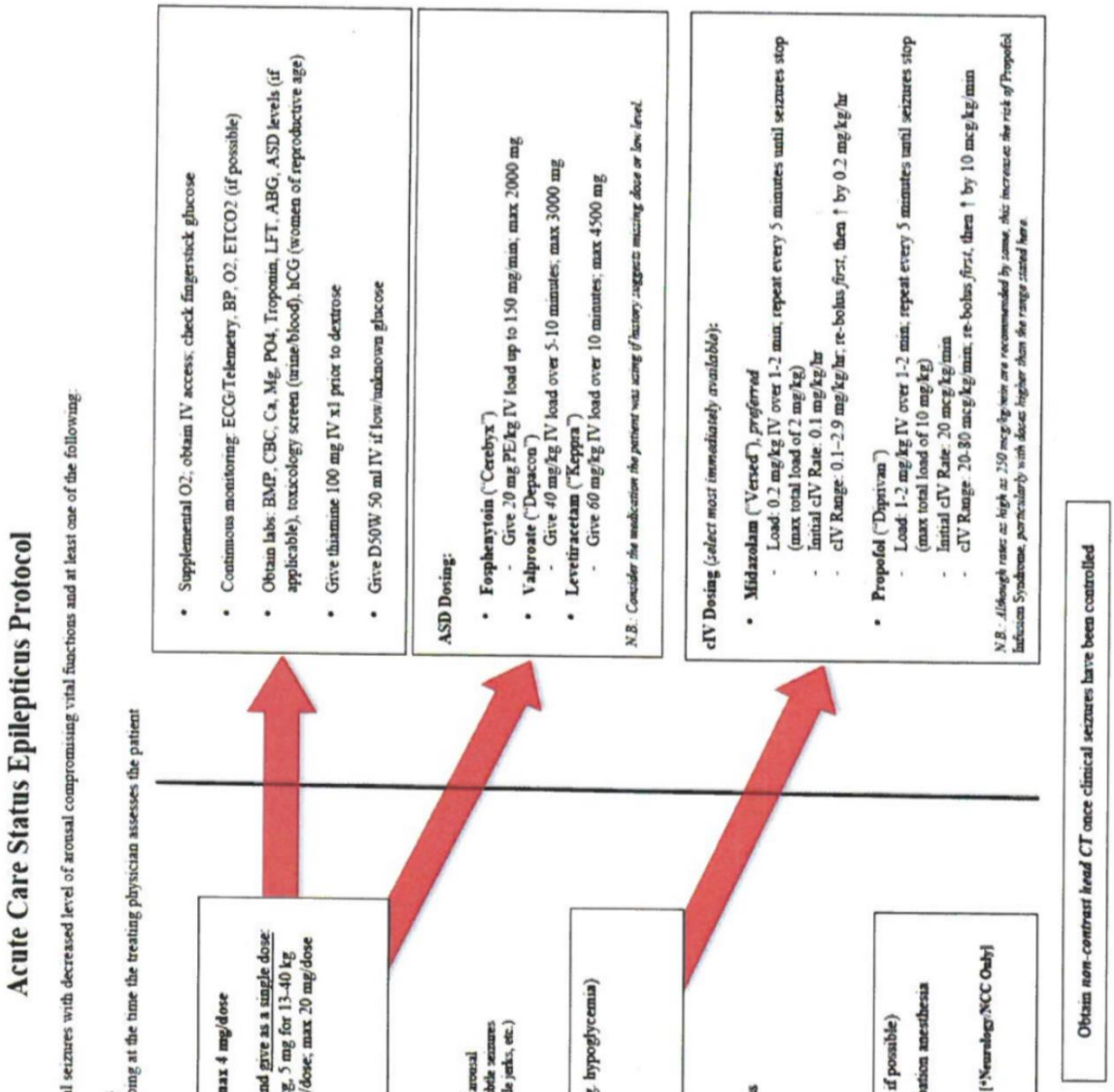
        - Opiates
        - Benzos
        - Cefepime
        - Also consider any medications new to patient
    - Infections (Cellulitis, Pneumonia, UTI, Cdiff)
    - Sensory deprivation: missing glasses, hearing aids, etc
    - Constipation, urinary retention
    - Sleep/wake cycle disturbance (altered and decreased sleep in the hospital)
    - Change in routine, new environments
    - Lines - foley, O2, fluids, tele
    - Electrolyte disturbances
    - Uncontrolled pain
    - Medication withdrawal (was anything held on admission?)
    - Alcohol withdrawal
    - Dehydration
- Work-up:
    - Review all medications and remove delirium producing meds
    - Vitals: BP, Pulse Ox, HR
    - Infectious w/u (as indicated): U/A & culture, CXR, Blood cultures, thorough physical exam
    - Renal/Liver panel, ammonia (as indicated)
    - Consider EKG, Cardiac Enzymes if cardiac history or high risk
    - Head CT ONLY if focal deficits concerning for CVA or history of fall with head injury or other head trauma within last 2 weeks (rule out subdural)
    - Assess environment and try to limit distractions and tethers
- Management:
    - Often a brief conversation with the patient and staff can go a long way to avoiding medications or restraints for hyperactive delirium. Remember management is also important for hypoactive. A few tips:
    - Geri order set for delirium orders and sleep order set
    - Encourage family to be there- familiar face, and they may know secrets to comfort patients
    - Be calm, agree with the patient whenever you can. There's no point in arguing about what they did and didn't see. If someone is stealing from them, tell them you'll look into it. If they just saw their brother Fred, tell them that Fred is just getting coffee and will be back shortly.
    - Can you DC a line (foley, IV, tele…)? Can you back off on vitals (q shift is usually adequate)?
    - Ask nursing to get a sitter or let them sit at the nurses' station in a geri-chair.
    - Work with nursing to limit overnight interruptions and maximize sleep. Review med list and make sure none are being given overnight if possible.
    - Encourage ambulation safely
    - Melatonin 6mg at dinnertime (it takes 3-4 hours to kick in).
    - Encourage daytime wakefulness, ambulation, eating and being out of bed
    - Encourage adequate hydration and nutrition – may need to engage nursing and PCA's to make sure this is happening, make sure patient has assistance with meals if needed.
- Medications:
    - No medication to treat delirium so prevention is key
    - Antipsychotics are drug of choice for acute agitation if danger to self or others only
        - Haldol (0.5-2 mg PO/IM/IV) IV/IM only on tele floors
        - Zyprexa Zydis (2.5-10mg ODT)
    - Benzos can cause paradoxical worsening of agitation but may be safer at low dose for many patients

        - Ativan (0.5-1 mg PO or IV)

7.3: Seizures

- Seizures divided as follows:
    - Simple: no LOC
        - Can present as confusion, headache, smells, sounds, stomach ache, or muscle twitches
    - Complex: LOC
    - Partial (or focal): focal to a particular part of the brain – usually one lobe of one hemisphere.
        - Can have secondary generalization
    - Generalized: electrical activity is diffusely scattered across the brain
    - Grand-Mal seizures are the classic, fall to the ground and repeatedly extend and contract the limbs/muscles, hence the term "tonic clonic"
    - Absence: Brief lapses in focus, staring spells
    - Febrile: can occur in infants as they are spiking a very high fever.
- History
    - There is often an aura preceding a seizure
    - Post-ictal confusion afterwards
    - May have loss of bowel/bladder control
    - Complex seizures are NEVER remembered
    - Can have family history
- Causes of new seizure or decompensation in seizure disorder
    - Infection
    - Dehydration
    - Electrolyte imbalance
    - Hypoglycemia
    - Uremia
    - Alcohol/benzo withdrawal
    - Trauma
    - ICH/mass
    - Encephalitis
    - Sleep deprivation
- Orders
    - Not necessarily an inpatient workup
        - Labs
            - Fingerstick BG
            - CBC
            - BMP/Mg/Phos
            - Liver panel
            - Can check prolactin within 20 min of seizure activity to differentiate from pseudoseizire
            - AED levels if on AEDs
            - Can consider LP based on history (see altered mental status)
        - Imaging
            - CT head if trauma
            - EEG: we now have ability to obtain continuous EEGs while inpatient. Order if concern for status epilepticus
                - place the order as detailed in below attachment
                - call the SICU charge nurse to clarify that transfer is for cEEG.
                - we have the ability to maintain attending vs transfering to intensivist service.

- MRI if focal findings on exam
- Treatment
  - No treatment if first seizure and no abnormality on imaging/EEG or if cause has resolved
  - If status epilepticus, see algorithm below and usually done in discussion with ICU.



- Don't forget to review seizure precautions: No driving for 3 months, no baths (showers ok), no swimming, no ladders, no roofs

- Duration of continuous EEG: typically 24 hours.
    - if seizing while on EEG, may continue for longer
- How to transfer
    - place the order
    - call the SICU charge nurse to clarify that transfer is for cEEG.
    - we have the ability to maintain attending vs transferring to intensivist service.

7.4: Stroke / TIA

- TIA: stroke sxs without tissue damage on MRI
    - highest risk for stroke is within 48 hours following a TIA
- Stroke: Tissue damage on MRI
    - **Always call the stroke team (513-584-8282) if concerned for stroke, even if the patient has already been triaged in the ED and stroke team hasn't been called yet.** They have intervention trials going out to >24 hours, so the 3 hours rule does not always apply
- Stroke Orders
    - Use CVA add on in general admission order set
    - Some highlights
        - Strict NPO for all patients until swallow assessment can be performed
        - Chlorohexadine mouth wash ordered for all stroke patients to reduce risk of aspiration pneumonia
        - CT of head without contrast STAT (rule out bleeding)
        - Permissive HTN OK unless >220/120 or active cardiac condition (MI, CHF).
            - Allow for 48 hours of permissive HTN
            - If above >220 SBP or >120 DBP, 48 hours of permissive HTN does not apply; aim for lowering BP by 15%
        - Anti-platelet therapy
            - All ischemic stroke patients get ASA 325 on presentation, then ASA 81 thereafter
            - If ABCD2 score 4 or more for TIA or NIH Stroke score </= 3 for CVA, patients also should get plavix daily for 21 days (as long as no contraindications such as elevated bleeding risk)
        - DVT prophylaxis: SCDs have the best data. Indeterminant on if lovenox or sub q hep are effective, however, should use DVT ppx if PADUA score is $\geq$ 4
        - Hold anticoagulation acutely for afib
            - it is reasonable to restart anticoagulation within 4-14 days after stroke (timing depends on size of the CVA)
        - PT/OT - get pt's moving, but avoid high intensity therapy in first 24 hours at it is associated with worse outcomes
        - O2 sat goal >94%
    - Imaging
        - CT head without contrast STAT (to rule out hemorrhage)
        - MRI head without contrast: consider if suspect multiple deficits on neuro exam indicative of different cerebral locations for injury. Consider if never had MRI in past.
            - not specifically guideline bases but this is general practice style

        - Call the stroke team if any questions on the following
            - CTA head (with and without) /neck (with) or MRA head/neck
                - obtain STAT if patient is between 6-24 hours of last known well and NIHSS score ≥6 as it is useful in selecting candidates for mechanical thrombectomy
            - Consider STAT MRI head with flair: obtain in acute ischemic stroke patients who have unclear time of onset but are at least between 4.5-24 hours from last known well or baseline state with significant symptoms (presuming prior functional status good). If done within 4.5 hours of stroke symptom recognition, this test helps determine if patient can get TPA.
        - Echo: consider if multiple locations of bilateral infarction, concern for intracardiac thrombus, endocarditis, etc. Not needed for most strokes (ie: single location with risk factors of age, comorbidities)
        - Carotid dopplers: obtian if not getting vascular imaging of head and neck and if patient has a non disabling stroke in the carotid territory
- Stroke Secondary prevention
    - Anti-platelet therapy: as above
    - High-dose Statin
    - Blood pressure control with goal <140/90 for majority
    - Lifestyle changes

Calculate ABCD2 score for risk of stroke

	Age	BP	Clinical	Duration	Diabetes
0 points	<60	Normal		< 10 min	Absent
1 point	>60	>140/90	Speech only	10-59 min	Present
2 points			Unilat weakness	>60 min	

7.5: Syncope

- Types
    - Orthostatic – common - syncope with position change
        - Volume depletion
            - Vomiting/diarrhea
            - Diuretics
            - Dehydration
            - Anemia
        - Medications
            - BB, CCB, nitrates
            - Flomax, alpha blockers
        - Bed rest
        - Adrenal insufficiency
        - Autonomic dysfunction
            - DM

        - Parkinson's
      - Venous insufficiency
  - Neurocardiogenic / vasovagal - common
  - Cardiogenic – less common but most feared
    - Arrhythmias - palpitations or sudden LOC without warning
    - Bradycardia
    - Aortic stenosis - syncope with activity
  - Neurogenic – less common
    - Carotid stenosis - passed out wearing tight collar
    - Vertebral artery stenosis - passed out looking up
    - CVA - very uncommon as would need to be bilateral

- Syncope Orders
  - Nursing
    - Orthostatic VS - sensitivity 20-30% - does not rule out orthostasis
    - Telemetry
    - EKG
  - Labs
    - CBC
    - BMP/Mg/Phos
    - AM Cortisol
    - TSH
  - Imaging
    - Echocardiogram
    - Consider CT/MRI head or carotid dopplers based on history

7.6: Pain management

- Non-opioid
  - Acetaminophen - IV/PO - Max 3 g/day
  - NSAIDS - avoid in liver disease/kidney disease
    - Ibuprofen PO 800mg q 8 or 600mg q 6
    - ketorolac IV 30mg q 6 hours - do not exceed 5 days
  - Lidocaine patch - apply daily
  - Gabapentin - for neurogenic pain; sedating
- Opioids
  - Always use an opioid conversion table/calculator
    - 1mg IV dilaudid = 7 mg IV morphine
  - IV opioids have short half-life and should be dosed q 2 hours
  - Transition to PO opioids as soon as possible
  - Start Senna-s if you are starting opioids
- Conversion to long acting opioids
  - Should be done sparingly and with the assistance of the attending
  - Calculate the total opioid does for the patient and convert to the desired medication
  - Basal dose: 50-60% of the total daily dose and divided BID/TID of the appropriate ER form
  - Breakthrough dose: 10-20% of total daily dose to get prn dose of IR form to give q4-6h

- Example: total daily dose of Roxicodone 240 mg = OxyContin 60 mg BID + Roxicodone 30-40 mg q4h prn
-

8.1: COPD

Updated 4/2020: GOLD 2020 and ATS 2020 guidelines

- Overview
  - obstruction of airflow based on FEV1/FVC of <0.7
  - 85% are smokers but only 15% of smokers get COPD
- Severity
  - Determine the GOLD classification of airflow limitation

GOLD category	FEV_1
In patients with FEV_1/FVC <0.70	
1. Mild	FEV_1 ≥80% predicted
2. Moderate	50% ≤FEV_1 <80% predicted
3. Severe	30% ≤FEV_1 <50% predicted
4. Very severe	FEV_1 <30% predicted

MMRC Dyspnea Scale

Grade	Description of Breathlessness
0	I only get breathless with strenuous exercise.
1	I get short of breath when hurrying on level ground or walking up a slight hill.
2	On level ground, I walk slower than people of the same age because of breathlessness or have to stop for breath when walking at my own pace.
3	I stop for breath after walking about 100 yards or after a few minutes on level ground.
4	I am too breathless to leave the house or I am breathless when dressing.

- Initial Maintenance Treatment

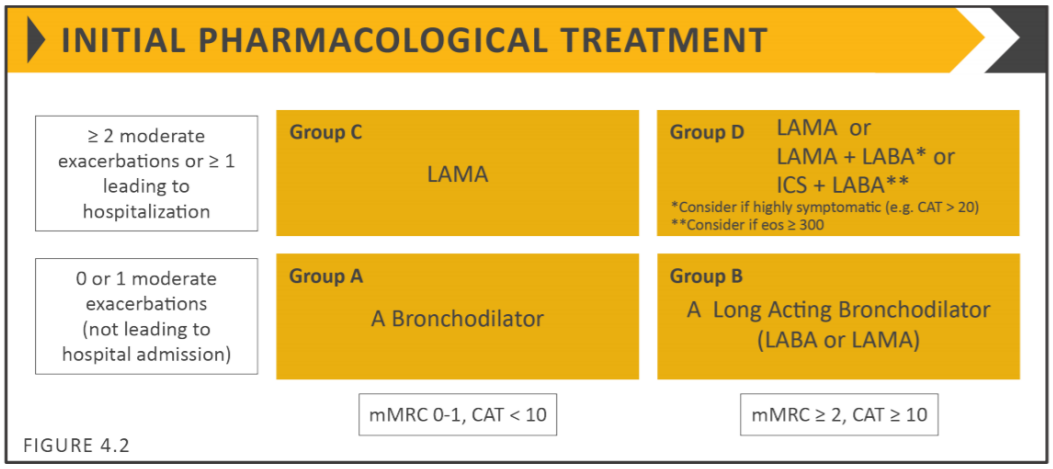


FIGURE 4.2

Definition of abbreviations: eos: blood eosinophil count in cells per microliter; mMRC: modified Medical Research Council dyspnea questionnaire; CAT™: COPD Assessment Test™.

- Escalation of Maintenance Treatment

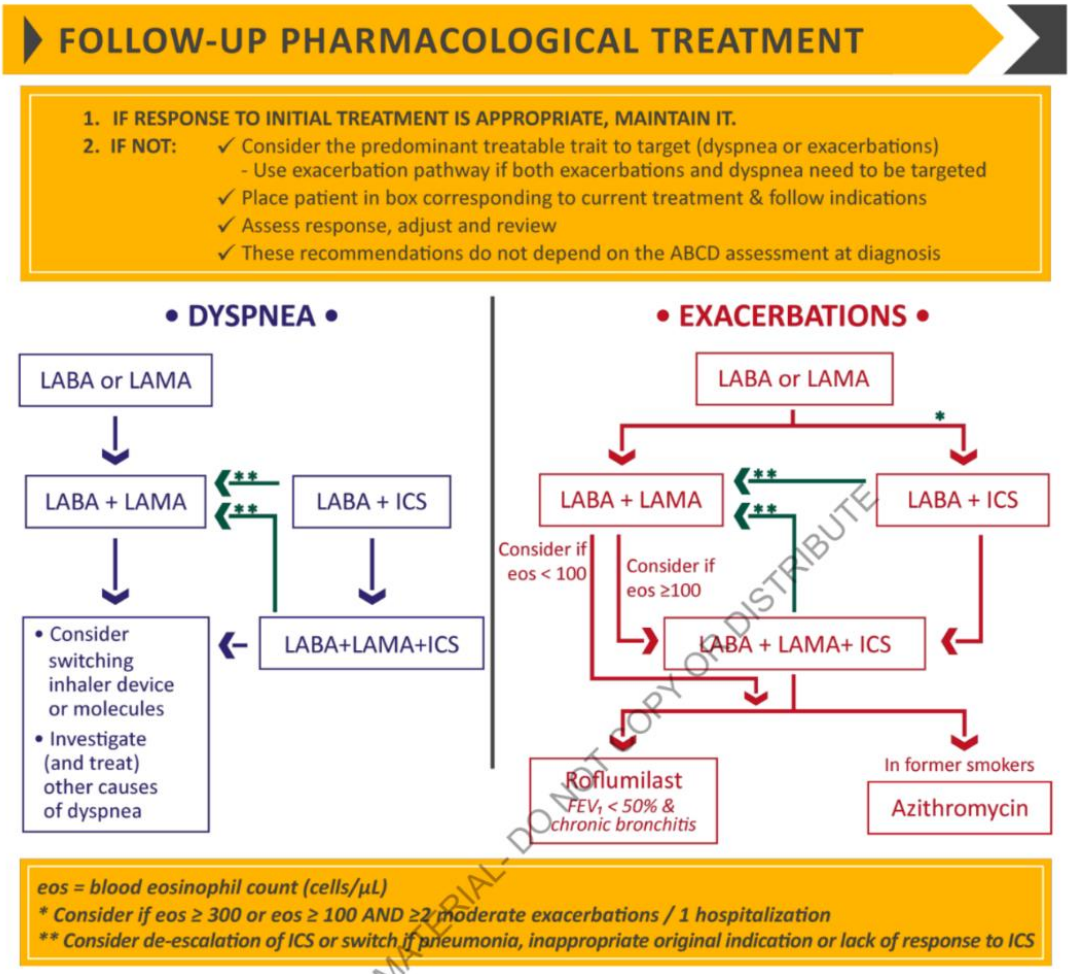
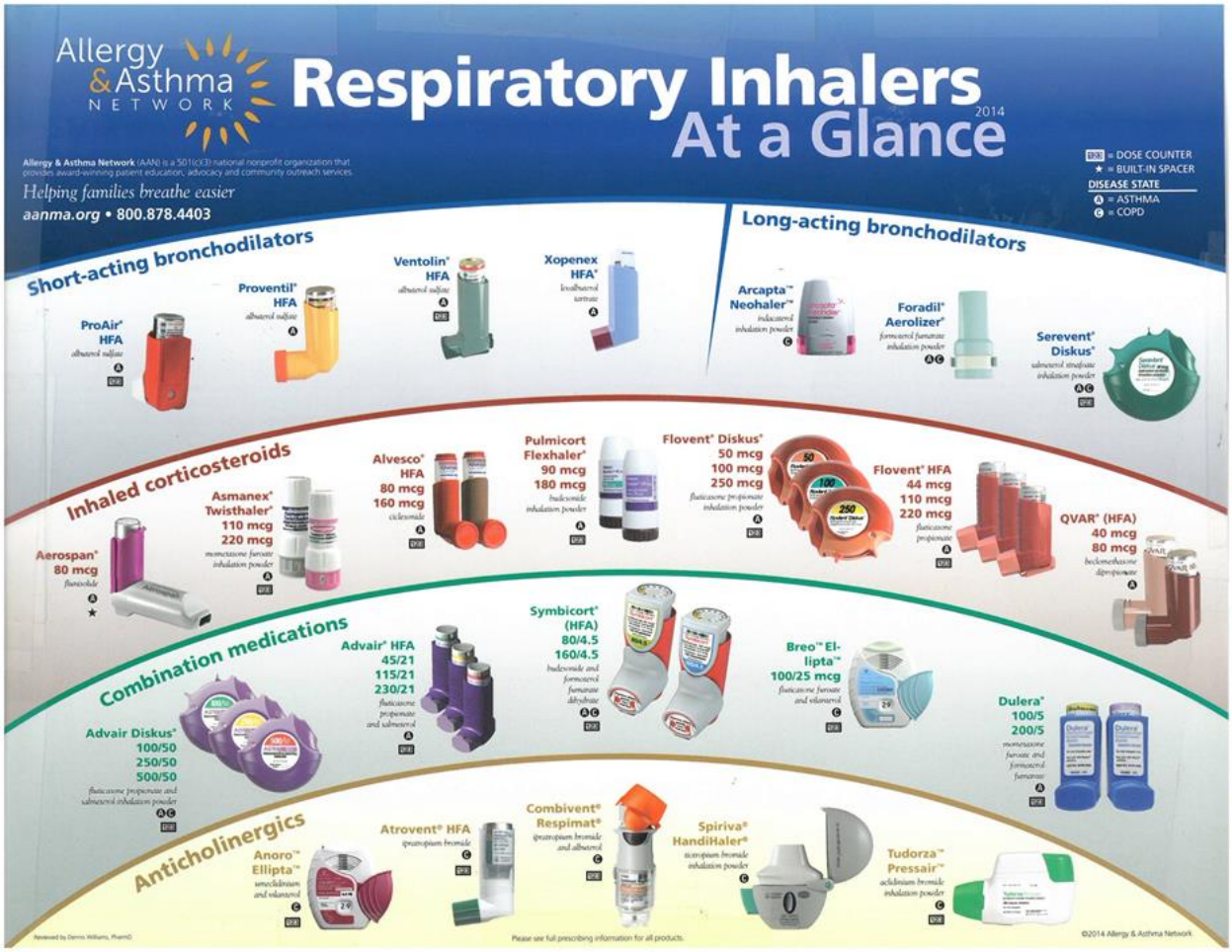


FIGURE 4.3

- Other COPD maintenance treatments:
  - Oral PDE4 inhibitors (roflumilast) are considered an add-on therapy only for patients with COPD with chronic bronchitis and severe airflow restriction who experience COPD exacerbations despite use of a combination bronchodilator with inhaled corticosteroid.
  - Azithromycin 250mg q day or three times per week for one year reduces risk of exacerbations in patients prone to exacerbations. There are associations of increased bacterial resistance, prolongation of QTc interval. Evidence shows less of a benefit in active smokers. No evidence showing benefit beyond one year of treatment.
  - Pulmonary Rehab: improves quality of life and exercise capacity. Reduced hospitalization in patients who have had a recent exacerbation
  - Oxygen: Long term oxygen therapy improves survival, exercise, and cognitive performance;
    - decreases mortality if worn for >15 hours per day. To qualify, O2 sat must be < 88% at rest
  - Additional concerns
    - American Thoracic Society 2020 guidelines give broad guidance on increased risk of pneumonia when using ICS. **Consider adding ICS if recurrent exacerbations, but attempt to wean off if no previous exacerbations in past year.**



- COPD Exacerbation
    - Make sure patient is stable for the floor and does not need to go to ICU for intubation or bipap. Check ABG to assist in this decision making.
    - Consider differential: pneumonia, PE, decompensated CHF
    - Work up: consider ABG, EKG, CXR, CBC w/ diff, EP1, Mg, Phos, Echo (If suspect CHF), BNP, Sputum/blood (if CAP), d-dimer (if feel PE needs to be r/o)
    - Order Treatment:
        - Make sure to use COPD add on order set
        - Duonebs - q2 hours to q4 hours; allow for PRN albuterol, and decide if you think this person needs to be woken up for treatments (they probably do if they are being admitted)
            - If needs q2 hour: Albuterol can be dosed every 2 hours but ipratropium should stay every 4 hours.
            - Respiratory therapy will try to decrease rather aggressively. If patient needs q2 or q3 hour treatments, then continue the treatments.
        - LAMA: hold home LAMA while admitted as patient will get enough while on duonebs
        - Steroids: There is not any evidence to support IV over PO and the recommendations are to utilize PO.
            - Commonly used: PO Prednisone: 40 mg daily x 5 days
            - IV Solu-Medrol: 60 mg Q6H
        - Antibiotics: should be given to patients with COPD who have the following:
            - Risk of Pseudomonas: 4 or more course of antibiotics in past year; hospitalization of 2 days or more in the past 90 days; prior pseudomonas; severe underlying COPD (FEV1<50%)

        - levofloxacin or piperacillin-tazobactam or cefepime or ceftazidime
    - No Risk for Pseudomonas
        - Augmentin or azithromycin or doxy
- Procalcitonin (PCT): initially promising use but now the picture is cloudy on the effectiveness on using procalcitonin to assist in abx decision making.

8.2: Asthma Exacerbation

- Assess the pt: May need ICU if: peak flow (PEFR) < 40% expected**, elevated PaCO2 on ABG (this will go up before O2 sat drops), too dyspneic to speak, drowsy, or confused.
- Ddx & work up similar to COPD: see above
- Treatment:
    - Breathing treatments: albuterol or duonebs (albuterol + ipratropium) q2 to q4 hrs, depending on severity and response
    - Steroids: indicated for patients w/ PEFR < 70% predicted after receiving 2 back-to-back treatments with
        - Continue steroids until PEFR of 70% is achieved.
        - There is not any benefit in a taper with asthmatics
    - Antibiotics: not indicted in asthma unless there is a coexisting pneumonia.
    - IV Magnesium: may decrease admission rates in severe exacerbations (PEFR < 30% predicted or no response to albuterol tx's). NNT = 4. Low side effect profile.
    - Peak flows should be performed daily while in the hospital to monitor response to tx's

**must look up chart to determine predicted PEFR as it is based on gender, age, & height. See: http://www.asthma.partners.org/NewFiles/Appendix2.html

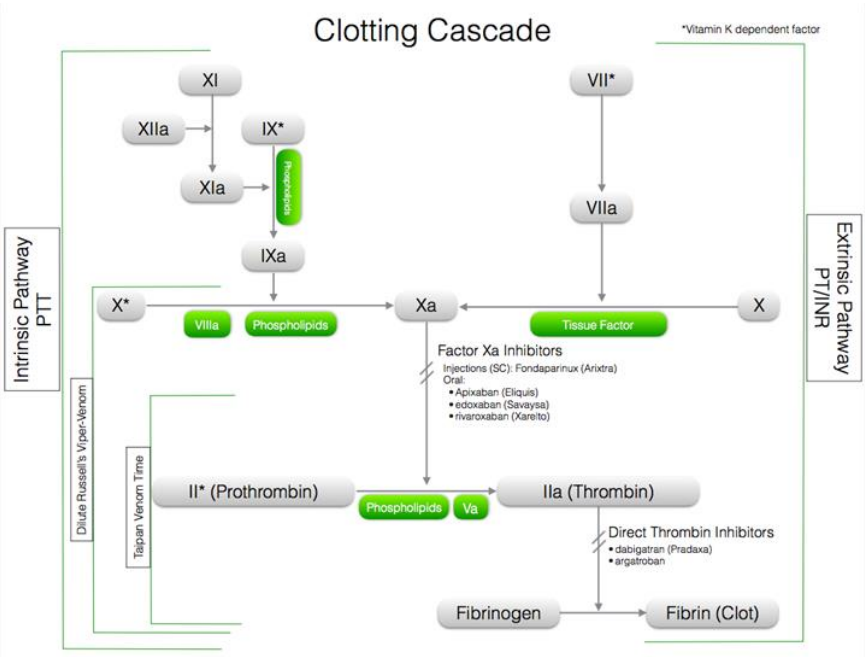
8.3: Pleural Effusion

- Light's criteria: Need only 1 to make dx of exudative
    - Fluid/Serum Prot >.5
    - Fluid/serum LDH >.6
    - Fluid LDH >2/3 normal
        - *some attendings also use pleural fluid protein > 2.9 (don't need to get blood draw for this one)
        - *If using Light's criteria, must make sure serum total protein & LDH levels are drawn the same day as the thoracentesis
- Diagnosis:
    - CHF is most common cause, so if suspected ok to diurese and repeat CXR in 48-72 hours.
        - If it has not resolved perform lateral debub views to determine amount of fluid and rule out loculations.
    - If CHF is not suspected, proceed to lateral decub.
    - If CXR w/ lat decub shows at least 1 cm thickness AND unclear etiology or no clinical improvement to empiric tx, then get thoracentesis (via IR or pulm consult)
        - Pleural fluid testing: always order protein, LDH, cell count, culture, & glucose

Dx	Type of fluid	pleural fluid results
CHF (*most common*)	Transudate	
Cirrhosis	Transudate	
Nephrotic syndrome (or peritoneal dialysis)	Transudate	
Hypoalbuminemia	Transudate	
PE	**Transudate OR exudate**	Cell count may have neutrophil predominance
Malignancy	Exudate	Low glucose, cell count w/ lymphocytosis possible, may want to order cytology (low yield)
Parapneumonic or empyema	Exudate	Low glucose, cell count with PMN predominance
Tb	Exudate	Low glucose, cell count w/ lymphocytosis, elevated adenosine deaminase (ADA), AFB & cx not likely positive from pleural fluid
CTD (SLE, RA)	Exudate	Low glucose, pos ANA or RF

- Special notes
  - 80% of CHF related effusions are bilateral
  - Diuresis will resolve about 75% of CHF related effusions within 48 hours. Tap can be done for therapeutic reasons (to alleviate SOB, need to pull off about 1500ml)

9.1 Clotting Cascade



9.2: VTE prophylaxis

- VTE Prophylaxis
  - Indications
    - Nearly all patients admitted started on prophylaxis, but type dependent on risk score.
    - See below chart for details depending upon risk
  - Medical patients:
    - Use Padua score to define risk
    - Options:
      - Chemical:
        - Enoxaparin 40mg daily if no AKI and GFR >30. There is a dose for GFR<30, but do not recommend. Patient's GFR often fluctuates during hospitalization and would risk dipping too low.
        - SC Heparin: 5000 units BID if contraindications to enoxaparin
      - Mechanical
        - SCDs (sequence compression devices) also called IPCD (Intermittent Pneumonatic Compression Devices)
        - TED stockings: Careful secondary to skin breakdown ris

Patient Category	Method of VTE Prophylaxis	Duration
Medical Inpatient		
Hospitalized Patients	High Risk for VTE (Padua Prediction Score ≥4; Inflammatory Bowel Disease without bleeding; Liver Cirrhosis): Low Molecular Weight Heparin (LMWH: enoxaparin 40mg daily unless AKI or GFR <30) or Unfractionated Heparin (5000 Units BID). High Risk for VTE and bleeding or high risk for major bleed: mechanical thromboprophylaxis (IPCD: intermittent pneumatic compression devices) and/or graduated compression stockings (GCS). Low Risk (Padua Prediction Score <4): No pharmacological or mechanical prophylaxis	Duration of hospitalization
Critically Ill Hospitalized Patients	Routine use of LMWH or UF. If Bleeding or high risk for major bleed: Mechanical thromboprophylaxis (IPCD) or GCS until risk decreases.	Duration of hospitalization
Outpatient		
Outpatient Cancer Patients	Without additional VTE Risk Factors: No prophylaxis With additional VTE risks (prior VTE, immobilization, hormonal therapy, angiogenesis inhibitors, thalidomide, and lenalidomide) an slow risk for bleeding, recommend LMWH (enoxaparin 40mg daily unless AKI or GFR <30) or UH (5000 units BID). Note: PICC or other line does not warrant prophylaxis unless other risk factor identified.	
Chronically Immobilized Patients	No VTE prophylaxis recommended	
Traveling Long Distances	If at increased risk (including previous VTE, recent surgery or trauma, active malignancy, pregnancy, estrogen use, advanced age, limited mobility, severe obesity, or known thrombophilic disorder): GCS at 15-30 mm Hg of pressure and frequent ambulation, calf muscle exercise, and sitting in an aisle seat. If no increased risk, no prophylaxis recommended. No recommendations for asa or anticoagulants to prevent VTE	
Surgical Patients		

Major Orthopedic Surgery (Elective Hip Replacement, Hip Fracture Repair, Elective Knee Replacement)	LMWH recommended over other agents (fondaparinux, apixaban, dabigatran, rivaroxaban, UH, Warfarin, and ASA: other agents are in CHEST guidelines, but guidelines specifically recommends LMWH as first choice). If pt declines injections, recommend apixaban or dabigatran. Mechanical Prophylaxis (IPCD) should be used with chemical If increased risk of bleeding, recommend IPCD.	Minimum: 10-14 Days Goal: 35 days
Knee Arthroscopy	No risk factors: Early and frequent ambulation Additional risk factors: LMWH	Until ambulatory
Elective Spine surgery	No risk factors: IPC and early and frequent ambulation If has risk factors (high risk VTE, Cancer, surgery with anterior and posterior approach): UFH, LMWH once hemostasis established or IPC with GCS	Until ambulatory
General Abdominal-Pelvic Surgery	Very Low Risk for VTE (Rogers Score <7; Caprini Score 0): No intervention other than ambulation Low Risk (Approx 1.5%; Rogers Score 7-10; Caprini Score 1-2) Mechanical Prophylaxis by Intermittent Pneumatic Compression (IPC) Moderate Risk (Approx 3%; Rogers Score >10; Caprini Score 3-4) not at High Risk for Bleeding Complications: LMWH or UH or Mechanical Prophylaxis by IPC (UCFM prefers LMWH) Moderate Risk (Rogers Score >10; Caprini score 3-4) at High Risk for Bleeding Complications: Mechanical Prophylaxis by IPC High Risk for VTE (Approx 6%; Caprini score ≥5) not at high risk for major bleeding complication: LMWH or UH with mechanical prophylaxis by IPC High Risk undergoing surgery for Cancer not at high risk for major bleeding complication: LMWH for 4 weeks	Hospital High VTE-Risk undergoing surgery for Cancer:28 days with LMWH

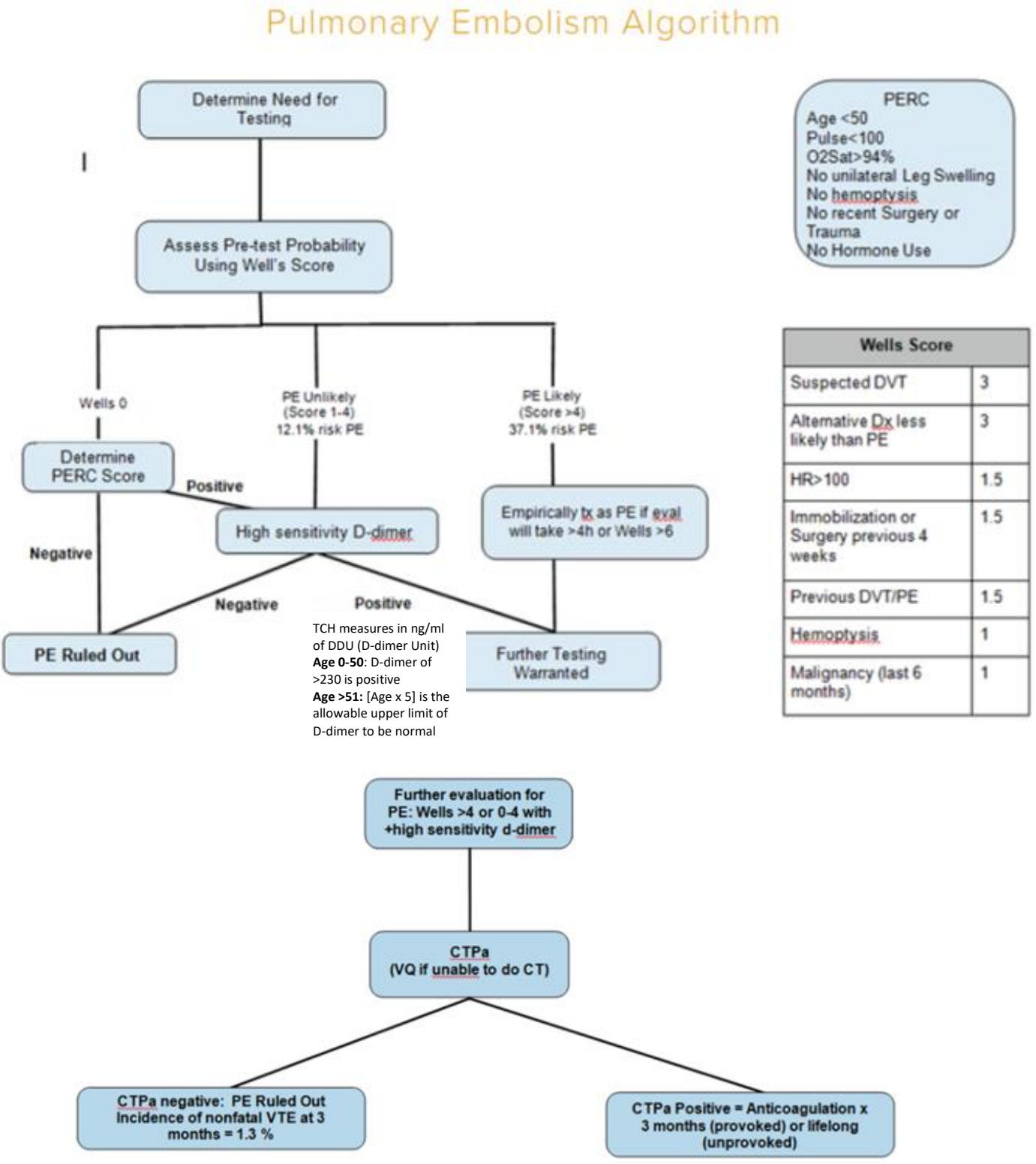
	High Risk for VTE (Caprini score ≥5) at high risk for major bleeding complication: Mechanical Prophylaxis by IPC	

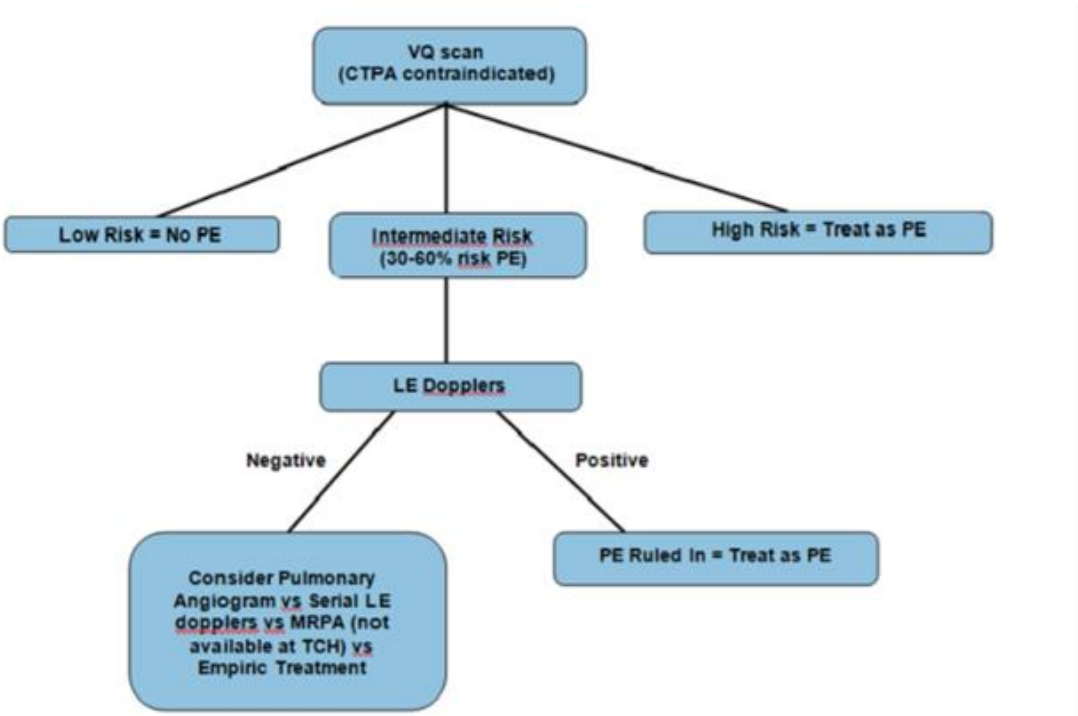
Padua Risk Score

Risk Factor	Points
Active Cancer	3
Previous VTE (excluding superficial vein thrombosis)	3
Reduced mobility (anticipated or current bed rest with bathroom only for 3 days)	3
Already known thrombophilic condition (carriage of antithrombin, protein C or S, factor V leiden, prothrombin gene mutation, antiphospholipid syndrome)	3
Recent (<1 mo) trauma and/or surgery	2
Elderly age (70 or older)	1
Heart and/or respiratory failure	1
AMI or ischemic CVA	1
Acute infection and/or rheumatologic disorder	1
Obesity (BMI 30 or higher)	1
Ongoing hormonal treatment	1

9.3: PE algorithm

- First ask if workup is indicated, meaning, are you concerned for a PE. Wells score does not tell if you are concerned and inteaed helps with defining workup based on pre-test probability. Do not mention a Wells score in A/P to explain why you did not workup up PE. **Wells is used once you decide to work it up**





9.4: VTE Treatment

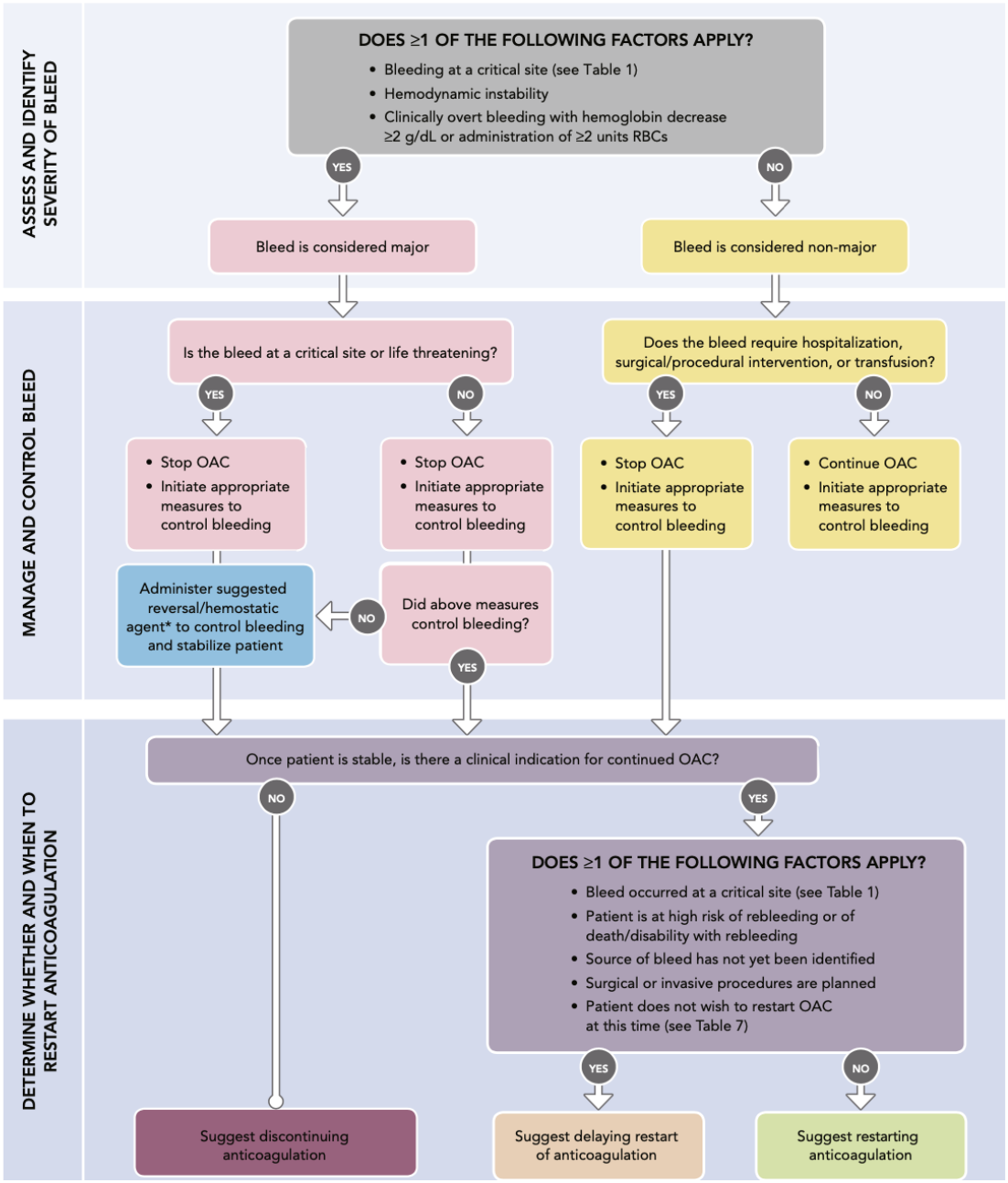
- DVT workup
  - If indicated, check Wells score for DVT.
    - Indications: signs and symptoms of LE DVT (asymmetric swelling, pain/tenderness; fever of unknown origin)
      - Wells score for DVT different from PE
    - DVT Unlikely (Wells <2)
      - Check d-dimer. Negative rules out. If positive check LE duplex
      - If LE duplex negative, DVT r/o
    - DVT Likely (Wells 2 or higher)
      - Check d-dimer and LE duplex
      - If LE duplex negative and d-dimer negative: r/o
      - If LE duplex negative but d-dimer positive: recheck duplex in 1 week. If negative in 1 week, r/o
  - Do not perform screening duplexes: only check if signs/symptoms
  - If asymmetric UE edema even with a PICC, need to check
- DVT treatment

Clinical Situation	Recommended Treatment	Duration
During Work-up	High Clinical Suspicion (Wells >6): Initiate treatment with lovenox 1mg/kg vs IV heparin (weight based protocol) vs rivaraxaban or apixaban. Intermediate Clinical Suspicion (Wells 2-6): Initiate treatment if unable to perform work-up within 4 hours Low Clinical Suspicion (Wells <2): Initiate treatment if unable to perform work-up within 24 hours.	
Proximal DVT **(no Cancer)**	Initial Treatment: Can start rivaroxaban or apixaban acutely or could start with LMWH (enoxaparin 1mg/kg bid) (or heparin if renal disease). Dabigatran and edoxaban can likely be given acutely, but studies were performed after 5 days of LMWH or heparin, therefore, CHEST recommends treating with LMWH (or IV heparin) for 5 days then changing to dabigatran or edoxaban if planning to use either. Outpatient Treatment: dabigatran, rivaroxaban, apixaban, or edoxaban over warfarin. At TCH, favor apixaban (can start immediately, excellent data). Transitioning from LMWH (or IV heparin) to PO: LMWH to NOAC: give NOAC 6-12 hours after dose of LMWH IV Heparin: Give NOAC when Heparin stopped Warfarin: Must bridge for 5 days AND INR >2 x 24 hours	**Provoked (surgery or other transient condition)**: 3 months **<u>Unprovoked</u>**: **Men**: lifetime unless higher risk of bleeding (minimum of 3 months if high risk for bleed) **Women**: Lifetime vs check D-dimer 1 month after stopping (at least 3 months). If negative, ASA alone. If d-dimer positive, continue treatment.
Distal DVT	Treat as Proximal DVT If: 1) D-dimer is positive (age adjusted) 2) >5 cm in length or multiple distal veins 3) close to a proximal vein 4) No reversible provoking factor 5) Cancer 6) Prior VTE 7) Inpatient Status. If none of the above: No treatment, instead repeat u/s in 1 week and 2 weeks. If no extension, stop u/s and no further investigation. Note: Muscle veins of distal LE (soleus, gastrocnemius) are even lower than other distal DVTs (peroneal, tibial).	Depends: Serial duplex vs treat as proximal.

Pulmonary Embolism (no Cancer)	**<u>PESI <85 (low risk PE)</u>**: Can treat outpatient with rivaroxaban or apixaban if excellent follow-up, able to obtain medication, and stable social situation. **<u>PESI >85 (hemodynamically stable)</u>**: Initial Treatment: Can start rivaroxaban or apixaban acutely or could start with LMWH (or IV heparin: LMWH preferred). Dabigatran and edoxaban can likely be given acutely, but studies were performed after 5 days of LMWH or heparin, therefore, CHEST recommends treating with LMWH (or IV heparin) for 5 days then changing to dabigatran or edoxaban if planning to use either. Outpatient Treatment: dabigatran, rivaroxaban, apixaban, or edoxaban over warfarin. At TCH, favor apixaban (can start immediately, excellent data). Transitioning from LMWH (or IV heparin) to PO: LMWH to NOAC: give NOAC 6-12 hours after dose of LMWH IV Heparin: Give NOAC when Heparin stopped Warfarin: Must bridge for 5 days AND INR >2 x 24 hours **<u>Hemodynamically Unstable or Right Heart Strain or Large Saddle Embolism</u>**: Discuss with attending thrombolytics (systemic vs EKOS). Next step would be to d/w pulm and transfer to ICU Note: 2016 CHEST states it is possible to not treat sub-segmental PE. Not sufficient evidence to make this a standard, but if a patient has a surprising (no symptoms, not looking for PE), solitary sub-segmental PE, then can consider not treating. If go this route, perform LE duplex now, 1 week, and 2 weeks to r/o DVT (evolving or current DVT).	**Provoked (surgery or other transient condition)**: 3 months **<u>Unprovoked</u>**: **Men**: lifetime unless higher risk of bleeding (minimum of 3 months if high risk for bleed) **Women**: Lifetime vs check D-dimer 1 month after stopping (at least 3 months). If negative, ASA alone. If d-dimer positive, continue treatment.
VTE and Cancer	Recommend initial and longer term treatment with LMWH for treatment over NOACs or warfarin.	Time of active cancer
Indications for IVC Filter	Proximal DVT or PE and contraindications to anticoagulation (active bleeding, entering surgery). Always place retrievable IVC and arrange for f/u with IR to retrieve once able to go back on anticoagulation. IVC Filters are discouraged in all other clinical scenarios.	

9.5: Coagulation reversal

- Warfarin
  - 5-10mg of vitamin K PO or IV. Do not give it IM or SQ, as these have unpredictable absorption.
    - PO: takes about 24 hours
    - IV: takes about 12-16 hours
  - If actively bleeding or needs urgent procedure, also give either
    - FFP (15ml/kg; each unit is 200-250ml).
      - Only give on day of procedure as effect is short
      - Can take a while if needing to run in multiple units (30 minutes per unit to run, but there is also the delay in getting the FFP and thawing)
    - Four Factor PCC (Kcentra)
      - PCC: prothrombin-complex concentrates: contains all of the Vitamin K dependent clotting factors (II, VII, IX, and X)
      - Similar to FFP, results are transient (hours) but works extremely well and within minutes
      - Far less volume needed than FFP and more predictable results
      - Very expensive and use is limited to ICU at the moment.
      - Dose:
        - INR 2-4: 25 units/kg (max: 2,500 units)
        - INR 4-6: 35 units/kg (max: 3,500 units)
        - INR >6: 50 units/kg (max: 5,000 units)
- Newer Oral Anticoagulants (NOACs)
  - To reverse Dabigatran (pradaxa)
    - Idarucizumab (praxbind): limited use at TCH for ICU patients with active bleeding.
  - To reverse Factor Xa inhibitors: Rivaroxaban, apixaban, edoxaban, fondaparinux, and even LMWH
    - Andexanet: apparently looks like Factor Xa and will bind the Factor Xa inhibitor. Can work quickly
    - Not approved, but believe TCH is part of the study: talk to pharmacy if emergency
  - Time: Need 5 half lives to say out of system:
    - Dabigatran: 12-17 hour half life, 5 half lives: 2.5-3.5 days
    - Rivaroxaban: 5-9 hour half life, 5 half lives: 1-2 days (typically say 48 hours)
    - Apixaban: 8-15 hour half life, 5 half lives: 1.5-3 days
    - Edoxaban: 6-11 hour half life, 5 half lives: 1.3- 2 days



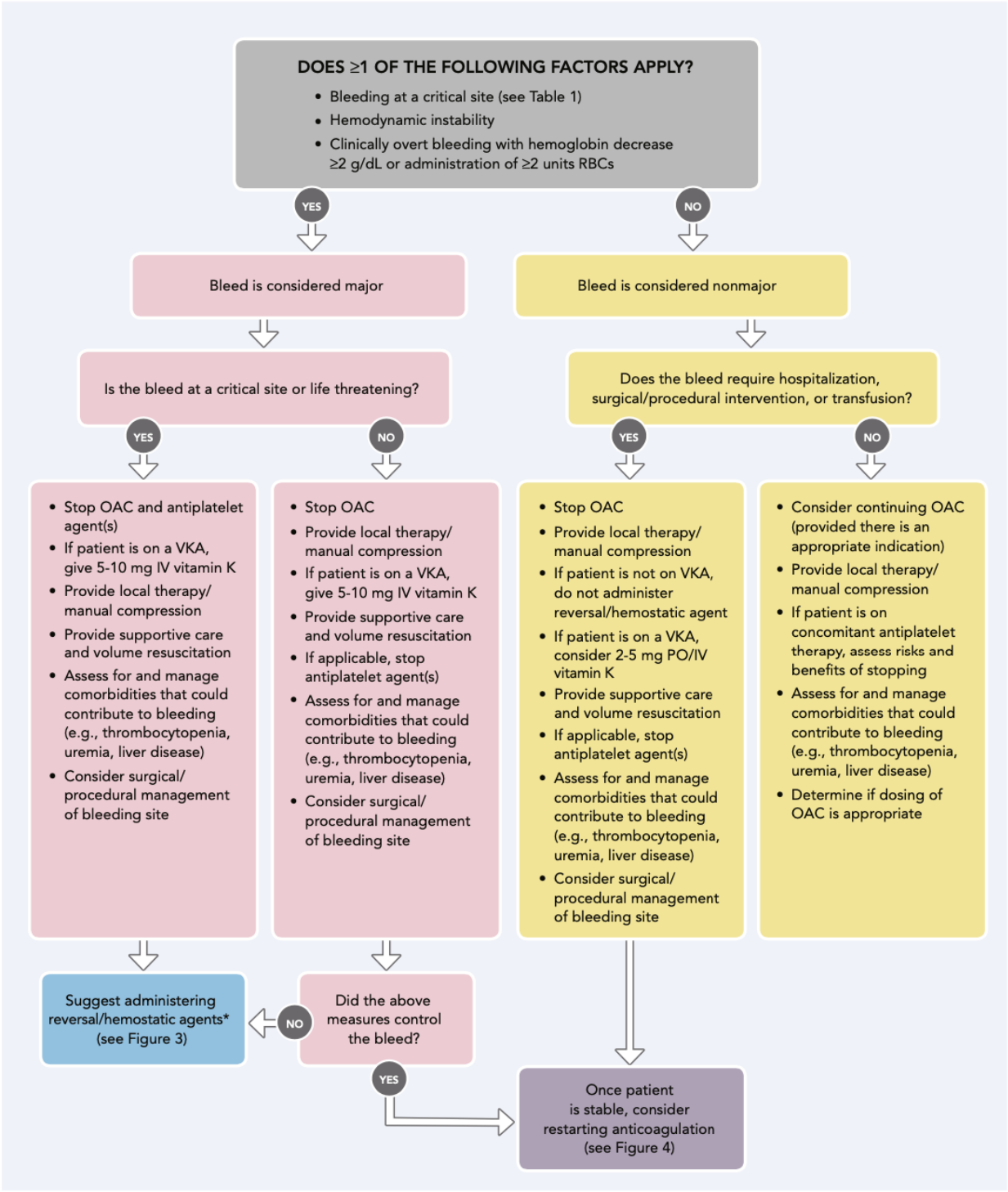
e Bleeds

Initial Signs and Symptoms
• Unusually intense headache, emesis, reduced or loss of consciousness, vision changes, numbness, weakness, aphasia, ataxia, vertigo, seizures
• **Intraocular:** monocular eye pain, vision changes, blindness • **Spinal:** back pain, bilateral extremity weakness or numbness, bowel or bladder dysfunction, respiratory failure
• Shortness of breath, tachypnea, hypotension, paradoxical pulse, jugular venous distension, tachycardia, muffled heart sounds, rub
• **Airway:** hemoptysis, shortness of breath, hypoxia • **Posterior epistaxis:** profuse epistaxis, hemoptysis, hypoxia, shortness of breath
• **Hemothorax:** tachypnea, tachycardia, hypotension, decreased breath sounds • **Intra-abdominal (non-GI):** abdominal pain, distension, hypotension, tachycardia • **Retroperitoneal hemorrhage:** back/flank/hip pain, tachycardia, hypotension
• **Intramuscular**: pain, swelling, pallor, paresthesia, weakness, diminished pulse • **Intra-articular:** joint pain, swelling, decreased range of motion

tracranial hemorrhage.

Your management of the oral anticoagulant depends on the severity of the bleed:

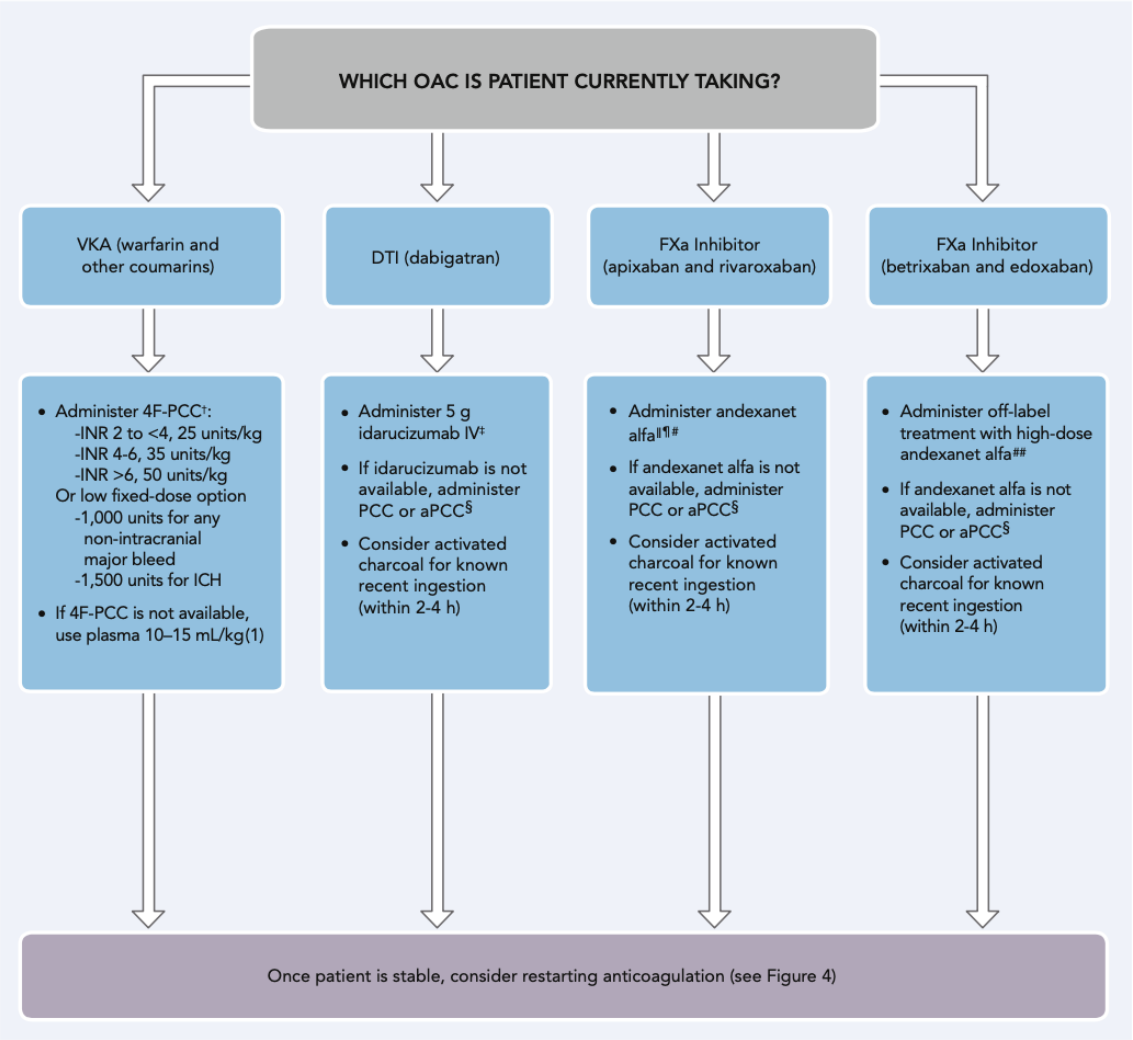
FIGURE 2 **Assessing Bleed Severity and Managing Major and Non-Major Bleeds**



DOAC = direct-acting oral anticoagulant; IV = intravenous; OAC = oral anticoagulant, including DOACs and VKAs; PCC = prothrombin complex concentrate; PO = per os "by mouth"; RBCs = red blood cells; VKA = vitamin K antagonist *Reversal/hemostatic agents include repletion strategies such as PCCs, plasma, vitamin K, and specific reversal agents for DOACs (e.g., idarucizumab for dabigatran; andexanet alfa for apixaban or rivaroxaban).

You may need to use reversal agents:

FIGURE 3 Considerations for Reversal/Hemostatic Agents*

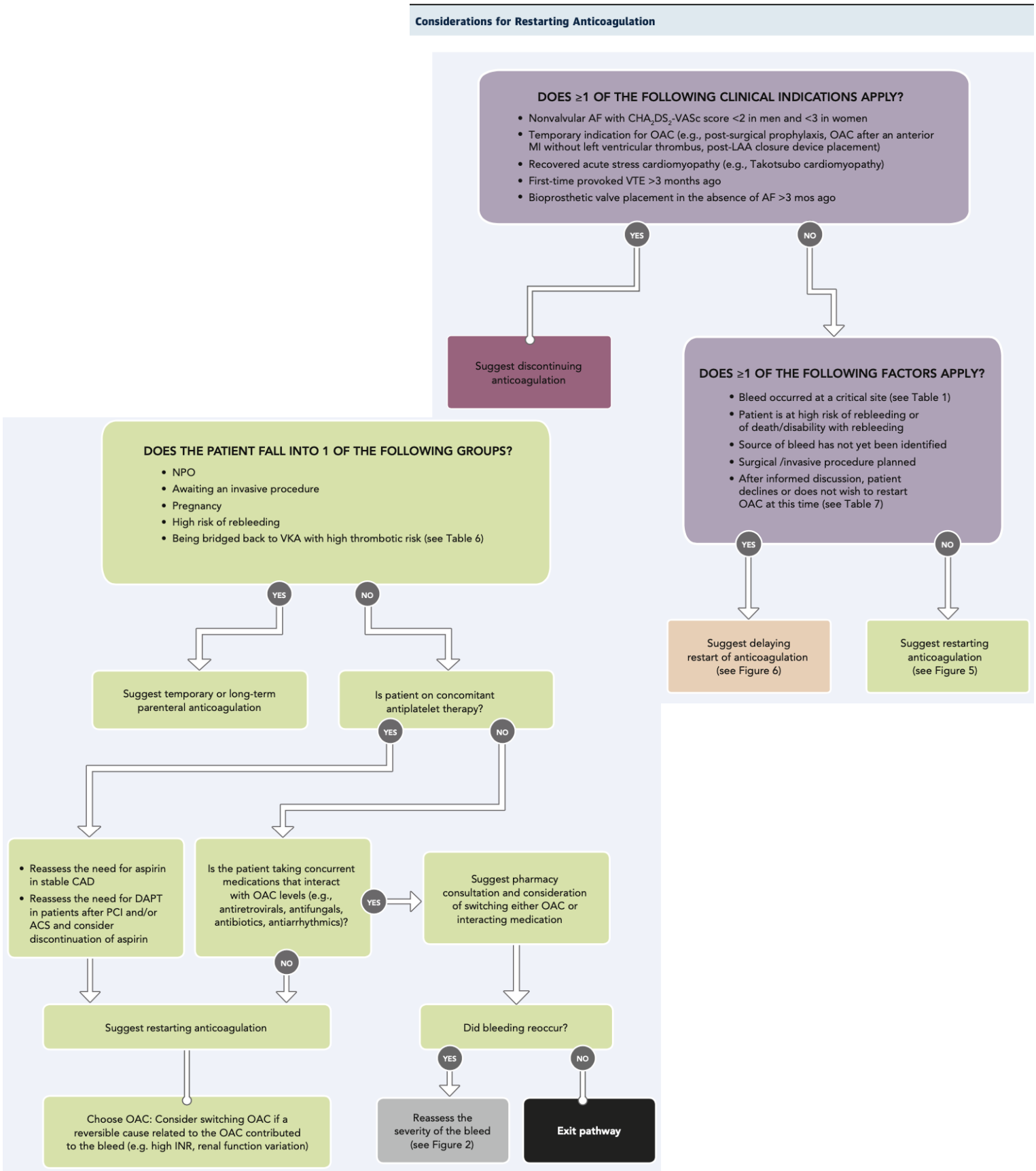


4F-PCC = four-factor prothrombin complex concentrate; aPCC = activated prothrombin complex concentrate; DOAC = direct-acting oral anticoagulant; DTI = direct thrombin inhibitor; FXa = Factor Xa; h = hours; ICH = intracranial hemorrhage; INR = international normalized ratio; IV = intravenous; OAC = oral anticoagulant, including DOACs and VKAs; PCC = prothrombin complex concentrate; VKA = vitamin K antagonist.

*Reversal/hemostatic agents include repletion strategies such as PCCs, plasma, vitamin K, and specific reversal agents for DOACs (e.g., idarucizumab for dabigatran; andexanet alfa for apixaban or rivaroxaban). †When PCCs are used to reverse VKAs, vitamin K should also always be given (see **Figure 2** for dosing guidance). ‡If bleeding persists after reversal and there is laboratory evidence of a persistent dabigatran effect, or if there is concern for a persistent anticoagulant effect before a second invasive procedure, a second dose of idarucizumab may be reasonable. §Refer to prescribing information for maximum units. ‖ In patients taking ≤5 mg apixaban or ≤10 mg rivaroxaban, administer low dose andexanet alfa = initial IV bolus 400 mg at a target rate of 30 mg/min, followed by IV infusion 4 mg/min for up to 120 minutes. ¶In patients taking >5 mg apixaban or >10 mg rivaroxaban, administer high dose andexanet alfa = initial IV Bolus 800 mg at a target rate of 30 mg/min, followed by IV infusion 8 mg/min for up to 120 minutes. #ANNEXA-4 full report excluded patients with DOAC levels <75 ng/ml because those patients were considered to have clinically insufficient levels for reversal agent. If drug effect/level can be assessed without compromising urgent clinical care decisions, then assessment should be performed before andexanet alfa is administered ## In patients taking betrixaban or edoxaban, administer high dose andexanet alfa = initial IV Bolus 800 mg at a target rate of 30 mg/min, followed by IV infusion 8 mg/min for up to 120 minutes.

1. Sarode R, Milling TJ Jr, Refaai MA, et al. Efficacy and safety of a 4-factor prothrombin complex concentrate in patients on vitamin K antagonists presenting with major bleeding: a randomized, plasma controlled, phase IIIb study. Circulation 2013; 128:1234-43.

When to restart anticoagulation:



9.6: Coumadin Initiation

- Bridging
  - Warfarin takes minimum of 5 days to have full anticoagulation effect, so must bridge if you need to 3be anti-coagulated immediately. There is an additional theoretical hyper coagulable state you can create with initiation of warfarin secondary to Protein C and S effects, but only been shown to be true in HIT.
  - Why Bridge?: Warfarin inhibits Vitamin K, thus inhibiting synthesis of all of the vitamin K dependent clotting factors (II, VII, IX, X, Protein C and S). After stopping all production, will need to wait until vitamin K dependent factors are out of system. Each has its own half life, with some shorter than others. Factor II has the longest half life and is the key factor. Factor VII is reflected in extrinsic pathway, but factor VII's half life is shorter than II.
  - How Long to bridge: Minimum of 5 days and INR therapeutic for 24 hours. (Therapeutic INR is 2.0 to 3.0, or with valve replacement, 2.5 to 3.5.)
  - With What: Lovenox 1mg/kg/day or heparin drip if AKI or CKD
    - DOACS are not approved for bridging
- Initiation: Generally, start at 5mg po daily and check INR each morning until it is within goal range for 24 hours.
  - See algorithm below for assistance. Do not be afraid to discuss with pharmacy: can be very helpful!
  - Remember, any change today will not be reflected for 48 hours. We often hold for too long: if high, consider giving a low dose once in the 3's to prevent over correcting.
  - Dosing is based upon total per week. In outpatient, make changes by calculating total weekly dose and adjusting by 5-15% depending upon the severity. Remember, do not change abnormalities that are just off by a touch, just rechec

TABLE 1
Initiation of 5-mg Warfarin (Coumadin) Therapy*

Day	*INR*	*Dose (mg)*
1	-	5.0
2	-	5.0
3	< 1.5	10.0
	1.5 to 1.9	5.0
	2.0 to 3.0	2.5
	> 3.0	0.0
4	< 1.5	10.0
	1.5 to 1.9	7.5
	2.0 to 3.0	5.0
	> 3.0	0.0
5	< 2.0	10.0
	2.0 to 3.0	5.0
	> 3.0	0.0
6	< 1.5	12.5
	1.5 to 1.9	10.0
	2.0 to 3.0	7.5
	> 3.0	0.0

INR = International Normalized Ratio.
*-Developed in inpatients with venous thromboembolism who were also receiving heparin.
Adapted with permission from Kovacs MJ, Rodger M, Anderson DR, Morrow B, Kells G, Kovacs J, et al. Comparison of 10-mg and 5-mg warfarin initiation nomograms together with low-molecular-weight hepar for outpatient treatment of acute venous thromboembolism. A randomized, double-blind, controlled trial. Ann Intern Med 2003;138:715.

TABLE 2
Estimating the Final Maintenance Dosage of Warfarin (Coumadin)*

INR on day 5	*Mg per week*
1.0	71
1.2	48
1.4	39
1.6	33
1.8	29
2.0	26
2.2	23
2.4	21
2.6	19
2.8	17
3.0	16
3.2	14
3.4	13

INR = International Normalized Ratio.
*-Based on INR on day 5 after 5 mg of warfarin per day on days 1 through 4 in patients not receiving heparin.
Adapted with permission from Pengo V, Biasiolo A, Pegoraro C. A simple scheme to initiate oral anticoagulant treatment in outpatients with nonrheumatic atrial fibrillation. Am J Cardiol 2001;88:1215.

9.7: Perioperative management of anticoagulation for non-valvular afib

Sources:

- 2017 ACC Expert Consensus Decision Pathway for Periprocedural Management of Anticoagulation in Patients with Nonvalvular Atrial Fibrillation
- Perioperative Management of Antithrombotic Therapy. CHEST 9th edition. 2012
- Common Procedures and Associated Procedural Bleed Risk. Compiled by the American College of Cardiology

Step 1: Assess bleeding risk for procedure

- Very Low
  - Cataract surgery
  - Arthrocentesis
  - Injection of bursa, trigger point, tendon
- Low
  - Minor hand surgery, including carpal tunnel and trigger finger
  - Dental extractions
  - Thoracentesis
  - CVC insertion, ultrasound guided
  - Cervical biopsy and LEEP
  - Paracentesis
  - Skin biopsy
  - Core needle breast biopsy
  - Punch biopsy
  - Diagnostic EGD, colonoscopy, flex sig
  - Peripheral nerve block
  - Cystoscopy
  - Pacemaker implant
- Intermediate
  - Vascular surgery of head and neck (carotid)
  - Implantable cardioverter defibrillator implant
  - Partial mastectomy
  - Excisional biopsy of breast
  - Hysterectomy
  - Lower extremity fracture closed reduction and intern fixation
  - EGD with feeding tube
- High
  - Cardiovascular surgery: valve repair, bypass surgery, open heart surgery
  - Total hip arthroplasty or revision
  - Total knee arthroplasty or revision
  - Spine surgeries
  - Lumbar puncture
  - Mastectomy (except partial)
  - Kidney biopsy
  - Any procedures >45 min duration

Step 2: Assess Risk from a bleed

- All procedures involving spine, all neurosurgical procedures, and cardiac surgeries carry significant complications from any bleeding

Step 3: Assess risk form a thrombus

- Low Risk (<5% annual risk)
  - Thrombotic event (VTE or CVA) over 12 months ago: single episode, no additional risk factors
  - CHADS-VASc 0-4, no prior CVA
- Moderate (5-10% annual risk)
  - Thrombotic event more than 3 months ago
  - CHADS-VASc 5-6
- High (>10% annual risk)
  - Thrombotic event within past 3 months
  - CHADS-VASc 7 or higher

Step 4: Determine preoperative anticoagulation for non-valvular afib based on above risk profiles

Low Bleeding Risk, Low Risk from Bleed

Continue anticoagulation without interruption

Low Bleeding Risk, High Risk from Bleed

Low Thrombotic Risk:
- Warfarin:
  - Hold 5 days prior, checking INR within 24 hour of procedure.
  - Restart 24 hours after procedure and all neuroaxis catheters removed, no bridging
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart 24 hours after completion of procedure and all neuroaxis catheters removed

Intermediate Thrombotic Risk:
- Warfarin:
  - If INR 1.5-1.9, hold 3-4 days 5 prior and check INR within 24 hours of procedure
  - If INR 2-3, hold 5 days prior and check INR within 24 hours of procedure
  - If INR >3, hold at least 5 days prior and monitor INR.
  - Consider UFH or LMWH when INR <2.0 if history of prior CVA and no major bleed or Intracranial Hemorrhage (ICH) in the past 3 months. Hold LMW 12-24 hours prior to procedure, depending on if once or twice a day dosing, Hold UFH at least 4 hours prior to procedure.
  - Restart warfarin 24 hours after procedure and all neuroaxis catheters removed. Bridge with LMWH or UFH.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart 24 hours after completion of procedure and all neuroaxis catheters removed

High Thrombotic Risk:
- If elective procedure: delay intervention if it will lead to reduction in thrombotic risk.
- Warfarin:
  - If INR 1.5-1.9, hold 3-4 days 5 prior and check INR within 24 hours of procedure
  - If INR 2-3, hold 5 days prior and check INR within 24 hours of procedure
  - If INR >3, hold at least 5 days prior and monitor INR.
  - Start UFH or LMWH when INR <2.0. If major bleed or ICH in the past 3 months, may consider not using UFH or LMWH once <2.0. Hold LMW 12-24 hours prior to procedure, depending on if once or twice a day dosing, Hold UFH at least 4 hours prior to procedure.
  - Restart warfarin 24 hours after procedure and all neuroaxis catheters removed. Bridge with LMWH or UFH.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart 24 hours after completion of procedure and all neuroaxis catheters removed

Intermediate or High Bleeding Risk, High Risk from Bleed

Low Thrombotic Risk:
- Warfarin:
  - Hold 5 days prior, checking INR within 24 ho of procedure (goal <1.5 INR).
  - Restart in conjunction with input from specialty team, bridging not recommended
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart

Intermediate Thrombotic Risk:
- Warfarin:
  - If INR 1.5-1.9, hold 3-4 days 5 prior and check INR within 24 hours of procedure
  - If INR 2-3, hold 5 days prior and check INR within 24 hours of procedure
  - If INR >3, hold at least 5 days prior and monitor INR.
  - Consider UFH or LMWH when INR <2.0 if history of prior CVA and no major bleed or Intracranial Hemorrhage (ICH) in the past 3 months. Hold LMW 12-24 hours prior to procedure, depending on if once or twice a day dosing, Hold UFH at least 4 hours prior to procedure.
  - Restart in conjunction with input from specialty team. If prior CVA, consider bridging. If no prior CVA, consider not bridging.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart in conjunction with input from specialty team

High Thrombotic Risk:
- If elective procedure: delay intervention if it will lead to reduction in thrombotic risk.
- Warfarin:
  - If INR 1.5-1.9, hold 3-4 days 5 prior and check INR within 24 hours of procedure
  - If INR 2-3, hold 5 days prior and check INR within 24 hours of procedure
  - If INR >3, hold at least 5 days prior and monitor INR.
  - Start UFH or LMWH when INR <2.0. If major bleed or ICH in the past 3 months, may consider not using UFH or LMWH once <2.0. Hold LMW 12-24 hours prior to procedure, depending on if once or twice a day dosing, Hold UFH at least 4 hours prior to procedure.
  - Restart in conjunction with input from specialty team. Recommend bridging.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart in conjunction with input from specialty team

Intermediate or High Bleeding Risk, NOT a High Risk from Bleed (not neuro axis or cardiac)

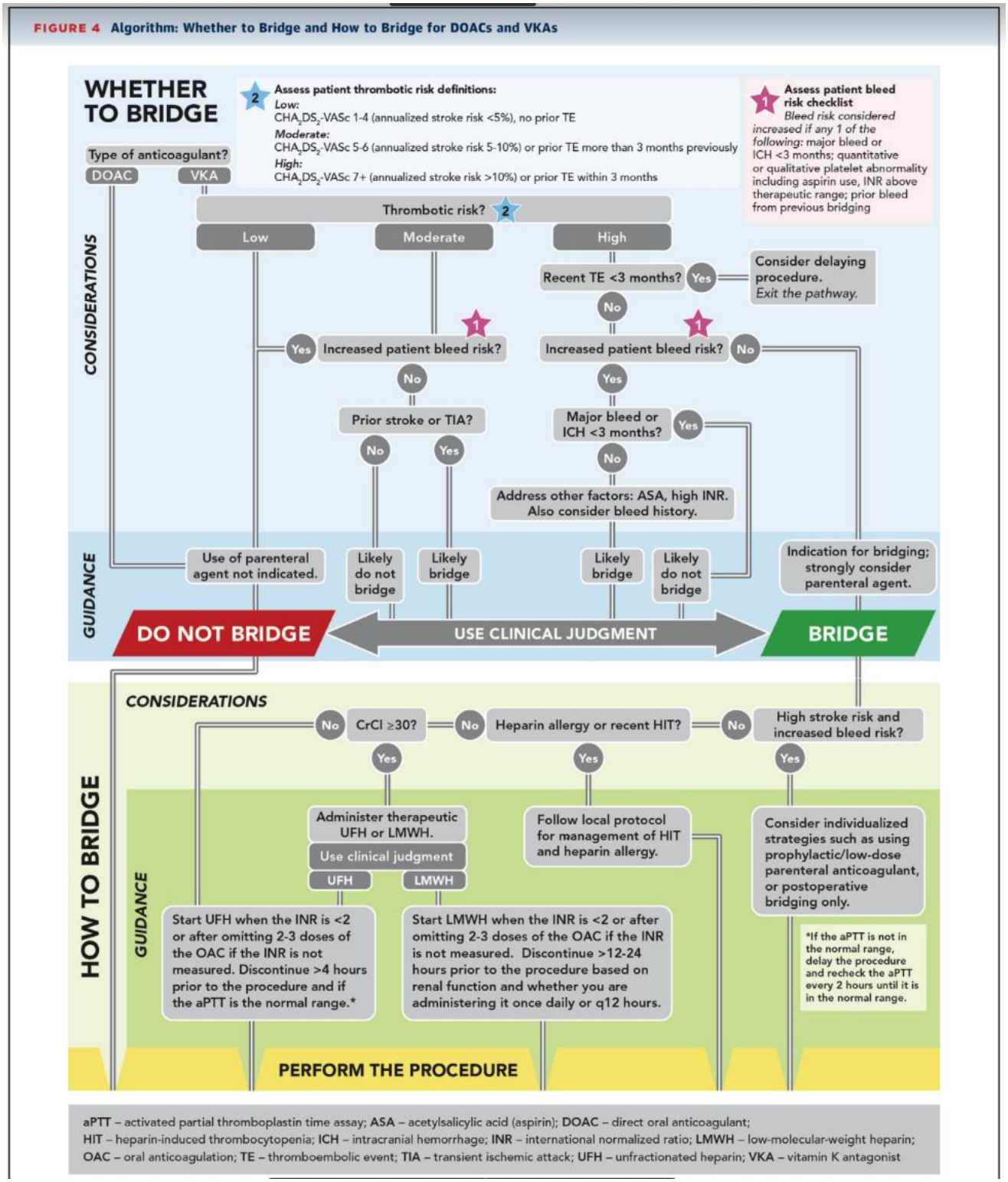
Low Thrombotic Risk:
- Warfarin:
  - Hold 5 days prior, checking INR within 24 hour of procedure.
  - Restart Warfarin without bridging 24 hours after procedure.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart 48-72 hours after procedure

Intermediate Thrombotic Risk:
- Warfarin:
  - If INR 1.5-1.9, hold 3-4 days 5 prior and check INR within 24 hours of procedure
  - If INR 2-3, hold 5 days prior and check INR within 24 hours of procedure
  - If INR >3, hold at least 5 days prior and monitor INR.
  - Consider UFH or LMWH when INR <2.0 if history of prior CVA and no major bleed or Intracranial Hemorrhage (ICH) in the past 3 months. Hold LMW 12-24 hours prior to procedure, depending on if once or twice a day dosing, Hold UFH at least 4 hours prior to procedure.
  - Restart Warfarin within 24 hours. If prior CVA, consider starting bridge 48 hours after procedure. If no prior CVA, no bridge.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart 48-72 hours after procedure

High Thrombotic Risk:
- If elective procedure: delay intervention if it will lead to reduction in thrombotic risk.
- Warfarin:
  - If INR 1.5-1.9, hold 3-4 days 5 prior and check INR within 24 hours of procedure
  - If INR 2-3, hold 5 days prior and check INR within 24 hours of procedure
  - If INR >3, hold at least 5 days prior and monitor INR.
  - Start UFH or LMWH when INR <2.0. If major bleed or ICH in the past 3 months, may consider not using UFH or LMWH once <2.0. Hold LMW 12-24 hours prior to procedure, depending on if once or twice a day dosing, Hold UFH at least 4 hours prior to procedure.
  - Restart Warfarin within 24 hours and start bridging 48 hours after procedure.
- NOAC:
  - Dabigatran: hold 4-5 days prior to surgery
  - Direct Factor Xa Inhibitors: Hold 3-5 days prior to surgery
  - Restart 48-72 hours after procedure

Step 5: Do I need to bridge, and if so, how?

Source: From the 2017 ACC Expert Consensus Decision Pathway for Periprocedural Management of A/C in patients with Non-valvular Afib.



10.1: BEERS list

Table 1.

Abbreviated Beers List of High-Severity Medications

Drug	Concern
Indomethacin	Most CNS side effects of any NSAID
Pentazocine	Confusion, hallucinations
Trimethobenzamide	Ineffective, adverse extrapyramidal effects
Muscle relaxants & antispasmodics: methocarbamol, carisoprodol, cyclobenzaprine, metaxalone, oxybutynin	Anticholinergic side effects, sedation, weakness
Flurazepam	Prolonged half-life in elderly, leading to prolonged sedation and increased risk of falls
Amitriptyline	Anticholinergic side effects
Doxepin	Anticholinergic side effects
Meprobamate	Highly addictive, sedating
Benzodiazepines (short-acting): >3 mg lorazepam, >60 mg oxazepam, >2 mg alprazolam, >15 mg temazepam, >0.25 mg triazolam	Increased sensitivity in elderly—use lowest effective dose
Benzodiazepines (long-acting): chlordiazepoxide, diazepam	Prolonged half-life in elderly, leading to prolonged sedation and increased risk of falls
Disopyramide	Most potent negative inotrope, could induce CHF, has anticholinergic side effects
Methyldopa	Bradycardia, exacerbation of depression
Chlorpropamide	Prolonged half-life in elderly, leading to hypoglycemia
GI antispasmodics: dicyclomine, hyoscyamine, belladonna alkaloids	Anticholinergic side effects
Anticholinergics & antihistamines: chlorpheniramine, diphenhydramine, hydroxyzine, cyproheptadine, promethazine	Anticholinergic side effects
Barbiturates (except phenobarbital), except when used for seizures	Addictive, more ADEs than other sedatives in elderly
Meperidine	Ineffective, may cause confusion
Ticlopidine	Not proven better than ASA, possibly more toxic
Ketorolac	Avoid in elderly—asymptomatic GI pathology possible
Amphetamines & anorexics	Dependence, HTN, angina, MI
NSAIDs: naproxen, oxaprozin, piroxicam	GI bleeding, renal failure, HTN, CHF
Fluoxetine	Long half-life, excessive CNS stimulation, agitation
Stimulant laxatives (long-term), except in presence of opiate analgesics: bisacodyl, cascara sagrada	Exacerbate bowel dysfunction
Amiodarone	Prolonged QT interval, risk of TDP
Nitrofurantoin	Renal impairment
Methyltestosterone	Prostatic hypertrophy, cardiac problems
Thioridazine	CNS, EPS
Nifedipine (short-acting)	Hypotension, constipation
Mineral oil	Potential for aspiration
Desiccated thyroid	Cardiac effects

ADE: adverse drug event; ASA: aspirin; CHF: congestive heart failure; CNS: central nervous system; EPS: extrapyramidal side effects; GI: gastrointestinal; HTN: hypertension; MI: myocardial infarction; NSAID: nonsteroidal anti-inflammatory drug; TDP: torsades de pointes.
Source: Reference 11.

10.2: ECG interpretation

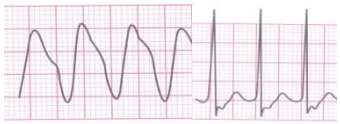
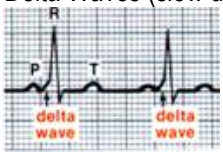
Myocardial Infarction

Type	Artery	Indicative Leads	Reciprocal Leads	Complications Associated
Inferior	RCA	II, III, aVf	I, aVL, V5, V6	AV blocks, ↓ HR Papillary muscle rupture, ↓ BP, N/V, hiccups
Septal	LAD	V1, V2	II, III, aVF	VSD
Anterior	LAD	V3, V4	II, III, aVF	2nd degree Type 2 block, RBBB, LAHB, Complete Block
Lateral	LCx, LAD	I, aVL	II, III, aVF	Ventricular Aneurysm
Apical	LAD, RCA, LCx	V5, V6	II, III, aVF	Ventricular Aneurysm
RVI	RCA	V3r, V4r		RV failure, AV block
Posterior	RCA, LCx	None	V1, V2 reciprocal	AV blocks, bradycardia

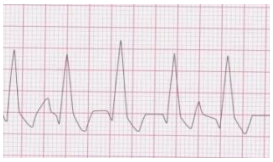
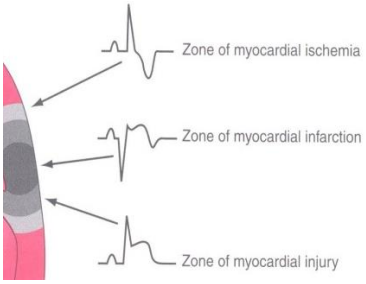
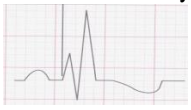
- Basics
  - 1 small box = 1 mm & represents 0.04 sec (upwards = 0.1 mV)
  - 1 large box = 5 mm & represents 0.2 sec (upwards = 0.5 mV)
  - Lead II: "The Rhythm Strip"
  - Leads V1 & V2: Right heart / Leads V5 & V6: Left heart
  - Rate by # of Big Boxes (if regular): 300, 150, 100, 75, 60, 50
  - Rhythm: Sinus?
  - Intervals
    - P wave = 0.12 sec
    - The PR interval is measured from the beginning of the P wave to the first part of the QRS complex - normally 0.14-0.20 sec
    - QRS = nl lasts for 0.06 to 0.10 seconds (2 1/2 small boxes)
    - QTc = nl ≤0.44 sec
  - Axis

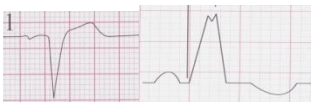
Axis	I	aVF	II
Normal (0 to 90)	↑	↑	
Left Physiologic (0 to -30)	↑	↓	↑
Left Pathologic (-30 to -90) (Left Anterior Fascicular Block)	↑	↓	↓
Right (90 to 180) (RVH or Left Posterior Fascicular Block)	↓	↑	
Indeterminate (180 to -90	↓	↓	

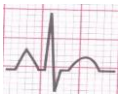
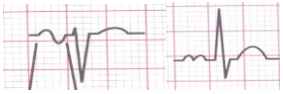
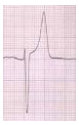
    -
  - Q wave: small spetal Q waves may be seen in the limb leads and at the left precordial leads (V4-V6)

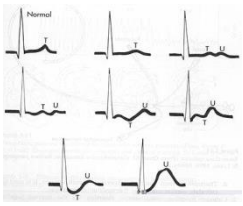
Pathology	Things to look for on ECG	General Notes
Supraventricular tachycardia	*P waves are present & regular *Rate above 100 bpm	
Supraventricular bradycardia	*P waves are present & regular *Rate is below 60 bpm	
Atrial fibrillation	*Irregular rate but b/w 60-100 bpm *P waves are absent *Baseline can be coarse or fine *QRS complex irregular, slow or rapid	
Atrial flutter	*Rapid Flutter (F) Waves *QRS regular, irregular or slow *P wave "Saw teeth" in <u>EVERY</u> lead & most of the time *Rhythm regular or variable	
Multifocal atrial tachycardia	*Rate >100 bpm *Will see a clear baseline (unlike atrial fib or flutter) *Present P waves of variable shapes *QRS complexes whenever-irregular	*This occurs b/c there are multiple pacemakers that send signals to AV node-accounts for variability in how often QRS appears
Wandering atrial pacemaker	*Looks exactly like multifocal atrial tachycardia EXCEPT the rate is <100 bpm	*This occurs b/c a single signal wanders around atrium and the distance it travels to the AV node changes
AV Nodal Re-entrant Tachycardia (AVNRT)	Antidromic Orthodromic  Antidromic = Wide Complex Delta Waves Orthodromic = Narrow Complex, No Delta Waves	<u>Antidromic</u> = APB goes down the accessory, up the AVN <u>Orthodromic</u> = APB goes down the AV node, up the accessory pathway.
AV Re-entrant Tachycardia (AVRT) Pre-Excitation Syndrome Wolf-Parkinson-White (WPW) Syndrome	Delta Waves (slow upstroke of QRS) 	*Occurs in pts w/ an accessory path *On a normal ECG there will be a vertical straight upstroke of the QRS
1st degree heart block	*Electrical signal is "retarded" *QRS is delayed but always present & looks normal *PR interval is >0.2 sec (>1 big box) *Rate is regular *P-R interval is <u>constant</u> (though long)	*A block is a delay in conduction from atria to ventricles
2nd degree heart block Type I (Wenkenbach)	*P-R interval successively lengthens (NOT <u>constant</u>) until it is so long that QRS gets dropped *Think "longer, longer, longer, bach"	*Electrical signal variably penetrates the AV node (QRS occasionally dropped) *Only case where QRS gets dropped
2nd degree heart block Type II (Mobitz)	*P waves normal *QRS normal *Multiple P waves are required before QRS	

	*<u>Ratio is constant</u>	
3rd degree heart block	*P-P interval constant *P-R interval constant *P & QRS are completely unrelated *QRS NEVER gets dropped	*No electrical signal gets thru AV node *No communication b/w atria and ventricles *Atria: 60-100 bpm *Ventricles: 20-40 bpm

Junctional Rhythm	*40 – 60 bpm *Narrow QRS *P wave (often inverted) may be buried in QRS or follow it	
Ventricular Tachycardia	* Rate > 100 bpm *Atria and ventricles are beating independently *AV dissociation = P waves are "marching through" 	
Ventricular flutter	*"Earthquake" appearance *High amplitude waves that look like QRS complexes *No clear P or QRS *NO return to baseline	*Requires cardioversion
Ventricular fibrillation	*Oscillations but smaller amplitude than ventricular flutter *No clear P or QRS *NO return to baseline	*Requires cardioversion
Infarcts	<u>Onset – 2 -3 days</u> = Large ST elevation <u>From 2 – 3 days on</u> = Q Waves, R wave disappear, T wave inversion 	*Anterior = LAD = V1-V4 *Inferior = RCA = II, III, aVF *Lateral = Circumflex = I, aVL, V5-6 *Posterior = Circumflex = Look at V1 & think backwards **Presence of Q wave in whichever lead will tell you where the infarct is
Right bundle branch block (RBBB)	*WIDE QRS (≥ 0.12 sec, 3 little boxes) *QRS has "bunny ears" (RSR') in V1 	*Bunny ears are due to the splitting of the R wave (RSR') b/c left side of heart depolarizes b/f right side, due to right side block

Left bundle branch block (LBBB)	*WIDE QRS (≥0.12 sec, 3 little boxes) *QRS is totally (-) in V1 (completely below baseline) V1 V6 	*Basically, if you see widened QRS without bunny ears, it is a left bundle block

Right Ventricular Hypertrophy (RVH)	*Tall R wave (> 7 mm) in V1 *Right axis deviation (> +105°) *RAE	
Left Ventricular Hypertrophy (LVH)	Look in the precordial leads for LVH Voltage criteria: R in V5 or V6 > 26mm R in aVL =/> 11mm S in V1 + R in V5 or V6 =/> 35mm LAE Abnormal repolarization: ST-T wave changes: “Strain pattern”	
Right Atrial Enlargement (RAE)	Tall P wave in Leads I , II, III or aVF (>/= 3 mm) 	
Left Atrial Enlargement (LAE)	*Negative (or late negative) deflection in V1 at least 1 box wide and 1 box deep (Left Pic) *“P Mitrale”: double humped p wave in Lead II (Right Pic) 	
Torsade de Pointe	*Oscillation of the type of amplitude seen in ventricular flutter	*Associated w/ quinidine *Prolongation of the Q-T interval (time b/w depolarization & repolarization) *This prolongation makes the patient more susceptible to developing Torsades
Low Voltage	Obesity, emphysema, infiltrative cardiomyopathy, pericardial effusion	
Hyperkalemia		

Hypokalemia		

Junctional Rhythm
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Left Ventricular Hypertrophy (LVH)
- Look in the precordial leads for LVH

- Voltage criteria
    - R in V5 or V6 > 26mm
    - R in aVL =/> 11mm
    - S in V1 + R in V5 or V6 =/> 35mm

Right Atrial Enlargement (RAE)
- Tall P wave in Leads I , II, III or aVF (>/= 3 mm)

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*This prolongation makes the patient more susceptible to developing Torsades
Low Voltage
*Obesity, emphysema, infiltrative cardiomyopathy, pericardial effusio

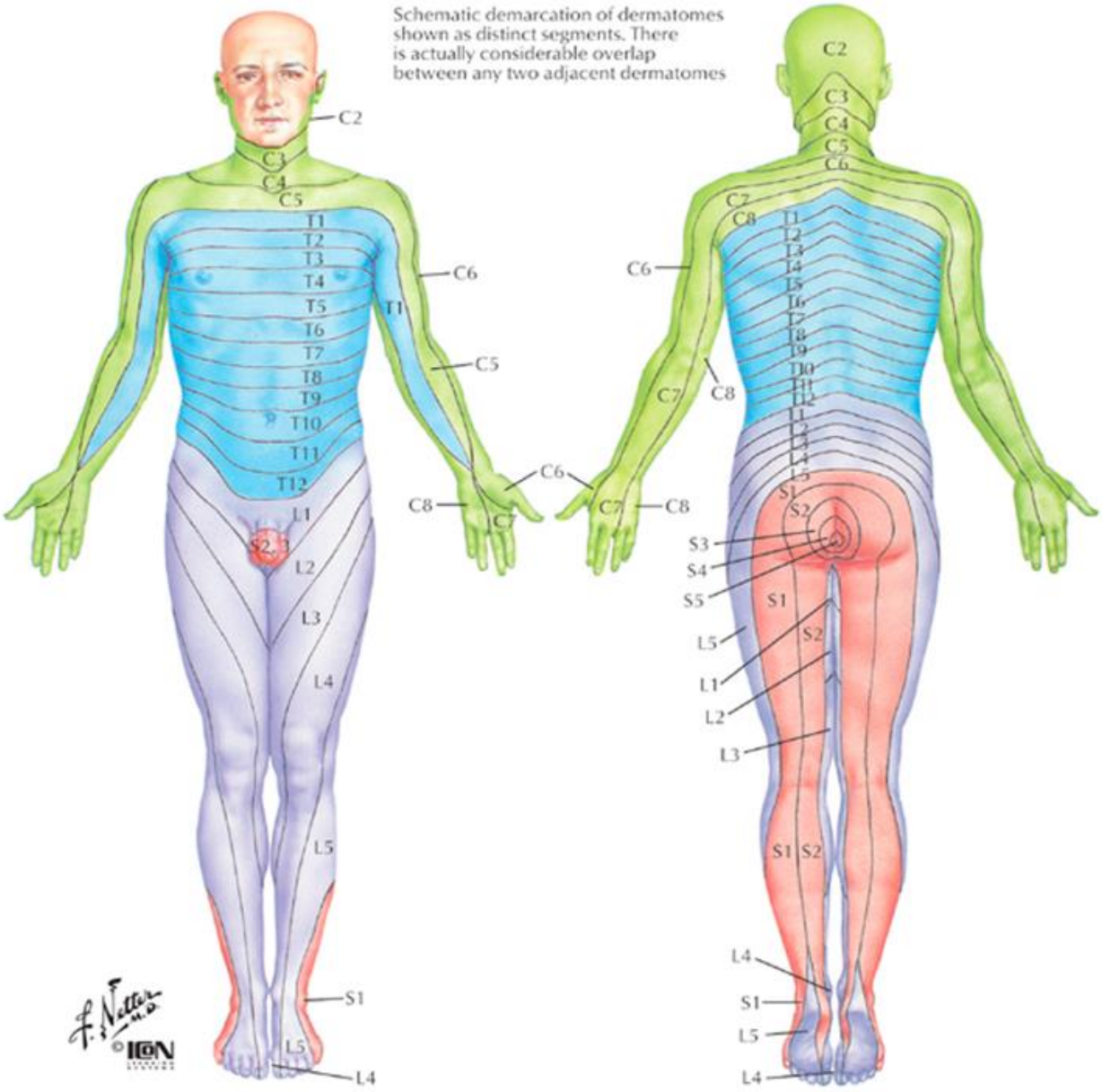
10.3: Neuro Exam

Cranial Nerves	
I Olfactory	Smell
II Optic	Vision
III Oculomotor	Levator palpebrae, superioris, super, med & inf recti muscle, parasymp to ciliary and pupillary constrictor
IV Trochlear	Superior oblique (down and out)
V Trigeminal	Mastication muscles, sensory for head/neck, sinuses, meninges, ext surface of TM
VI Abducens	Lateral rectus
VII Facial	Facial expression, parasymp to glands except parotid, sensory for ear and TM, Taste ant 2/3 tongue
VIII Vestibulo-cochlear	Hearing and Balance
IX Glossopharyngeal	Parotid Gland, Carotid body (senses BP), sensation and taste post 1/3 tongue & int surface of TM
X Vagus	Muscles pharynx and larynx, parasymp to neck/ thorax/ abdomen, sensory from pharynx/ larynx/ viscera, sensory ext ear
XI Spinal Accessory	Trapezius and sternocleidomastoid
XII Hypoglossal	Tongue motor

Reflexes	
C5-6	Biceps
C5-6	Brachioradialis
C7-8	Triceps
L2-4	Knee
L5-S2	Ankle

Sensation	
C5	Lateral Aspect of Arm (axillary N.)
C6	Palmar aspect of thumb and index finger (median nerve)
C7	Palmar aspect of 3rd digit
C8	Palmar aspect of little finger (ulnar nerve)
T1	Inner forearm
L3	Inner aspect of thigh
L4	Inner aspect of lower leg
L5	Dorsum of foot btwn 1st -2nd toe (common peroneal)
S1	Lateral aspect of foot

Motor		
Shoulder abd.	C5	Axillary N.
Elbow flexion	C5-6	Biceps
Elbow ext.	C6-8	Triceps
Wrist ext.	C6-8	Radial N.
Grip Strength	C7-T1	
Finger abd.	C8-T1	Ulnar N.
Thumb oppos	C8-T1	Median N.
Hip Flex	L2-4	Iliopsoas
Hip Adduct	L2-4	Adductors
Hip Abd	L4-S1	Gluteus
Hip Ext	S1	Glut Max
Knee Ext	L2-4	Quads
Knee Flex	L4-S2	Hamstring
Ankle Dorsiflex	L4-5	
Ankle Plantar Flex	S1	


Schematic demarcation of dermatomes shown as distinct segments. There is actually considerable overlap between any two adjacent dermatomes
C2
C3
C4
C5
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2, 3
C6
C5
C6
C8
C7
C2
C3
C4
C5
C6
C7
C8
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
C6
C7
C8
C7
C8
S1
S2
L5
L1
L2
L3
S1
S2
L4
S1
L5
L4
F. Netter M.D.
©IGN

10.4: CAP algorithm

Treatment of Community Acquired Pneumonia

Diagnosis of CAP

↓

Severity score (CURB 65 or PSI)

↓

Outpatient treatment

→ **Inpatient treatment**

Previously healthy; no risk factors for pseudo/MRSA	Amoxicillin 1g TID (preferred) **OR** Doxycycline 100mg BID (less preferred)		
Comorbidities for DRSP; no risk factors for pseudo/MRSA	[Beta lactam (Augmentin XR 2g-125mg BID **OR** cefuroxime 500mg BID)] + [Macrolide: azithromycin (preferred) 500mg first day, 250mg thereafter **OR** doxycycline 100mg BID (less preferred)]	OR	RFQ alone (Levaquin 750mg q day)
Risk factors for Pseudomonas or MRSA	Patients with risk factors for pseudomonas or MRSA are unlikely to be managed in outpatient setting. If very stable by assessment, would need coverage for these organisms as in inpatient regimens		

Comorbidities for DRSP
- cardiac dz
- pulmonary dz
- liver dz
- renal dz
- DM
- alcoholism
- malignancy
- asplenia
- immunosuppressed

Aspiration pneumonia coverage needed?
Only add coverage if lung abscess or empyema suspected

Severe vs Not Severe Pna

Major Criteria
1. Invasive mechanical ventilation
2. Septic shock with the need for vasopressors

Minor Criteria
1. RR≥30
2. PaO2 / FiO2 <250
3. Multilobar infiltrates
4. Disorientation
5. BUN ≥20
6. WBC <4,000
7. Plt < 100,000
8. Temp < 36 Celsius
9. Hypotension requiring aggressive fluid resuscitation

Criteria for discharge
1. T≤37.8C
2. HR≤100
3. RR≤24
4. SBP≥90
5. O2 sat ≥90%
6. Ability to maintain PO intake
7. Normal mental status

Abx duration:
- continued for a minimum of 5 days. After 5 days, abx can be d/c when afebrile 72 hrs and all d/c criteria met
- MRSA or pseudo pna should be covered for at least 7 days

Additional pearls
- Test all patients with rapid flu in flu season and treat
- May use procalcitonin to help deescalate (but not initially withhold) abx if PCR shows influenza
- Legionella urine testing: with severe CAP or regional legionella outbreak

Non Severe CAP
(No major criteria and <3 minor criteria)

Standard Regimen	[B-lactam (amp-sulbactam, ceftriaxone) + Azithromycin] Or RFQ alone (Levaquin)				
Prior resp isolation of MRSA in last year	[B-lactam (amp-sulbactam, ceftriaxone) + Azithromycin] Or RFQ alone (Levaquin)	+	MRSA Coverage (vanc or linezolid)		Blood cx, sputum cx, nasal PCR and deescalate if negative
Prior resp isolation of pseudo in last year	Azithromycin Or RFQ	+	Pseudomonas coverage (zosyn or cefepime) **		Blood cx, sputum cx, and deescalate at 48hrs if negative
Hosp in last 90 days with IV abx and NO respiratory MRSA/pseudo isolated	[B-lactam (amp-sulbactam, ceftriaxone) + Azithromycin] Or RFQ alone (Levaquin)				Blood cx, sputum cx, nasal PCR. **Only add pseudo/MRSA coverage if testing positive**

Severe CAP
(One major criteria or ≥ 3 minor criteria)

Standard Regimen	B-lactam (amp+sulbactam, ceftriaxone) + [azithromycin OR RFQ]			Obtain Blood cx, sputum cx, nasal PCR
Prior resp isolation of MRSA in last year	B-lactam (amp+sulbactam, ceftriaxone) + [azithromycin OR RFQ]	+	MRSA coverage (vanc or linezolid)	Blood cx, sputum cx, nasal PCR and deescalate if negative
Prior resp isolation of pseudo in last year	Azithromycin OR RFQ	+	Pseudo coverage (zosyn or cefepime) **	Blood cx, sputum cx, and deescalate at 48hrs if negative
Hosp in last 90 days with IV abx and NO respiratory MRSA/pseudo isolated	Azithromycin OR RFQ	+	MRSA coverage (vanc or linezolid) AND Pseudo coverage (zosyn or cefepime) **	Blood cx, sputum cx, nasal PCR. Deescalate at 48hr if negative. May still deescalate from MRSA PCR + if sputum cx negative.

INPATIENT CAP TREATMENT NOTES
- If cannot tolerate FQ or Macrolides as the base of pna treatment as above, may use B-lactam + doxy 100mg BID
- If anaphylactic reaction to PCN previously, can use carbapenems (meropenem 1g q8h; imipenem 500mg q6h) for pseudo coverage instead of zosyn or cefepime
- **Double coverage (usually adding Levaquin to cefepime or zosyn) for pseudomonas if inpatient antibiogram shows resistance >10% to agent
- DOSING REGIMENS: Amp+sulbactam (1.5-3g q6h); ceftriaxone (1-2g qd); Azithromycin (500mg qd); Levaquin (750mg PO/IV q day); vanc (15mg/kg q12h, goal trough 15-20); Linezolid (600mg q12h); zosyn (4.5g q8); cefepime (2g q8)

10.5: Opioid Conversion

Equianalgesic Opioid Dosing

Drug	Equianalgesic Doses (mg)	
	Parenteral	Oral
Morphine	10	30
Buprenorphine	0.3	0.4 (sl)
Codeine	100	200
Fentanyl	0.1	NA
Hydrocodone	NA	30
Hydromorphone	1.5	7.5
Meperidine	100	300
Oxycodone	10*	20
Oxymorphone	1	10
Tramadol	100*	120

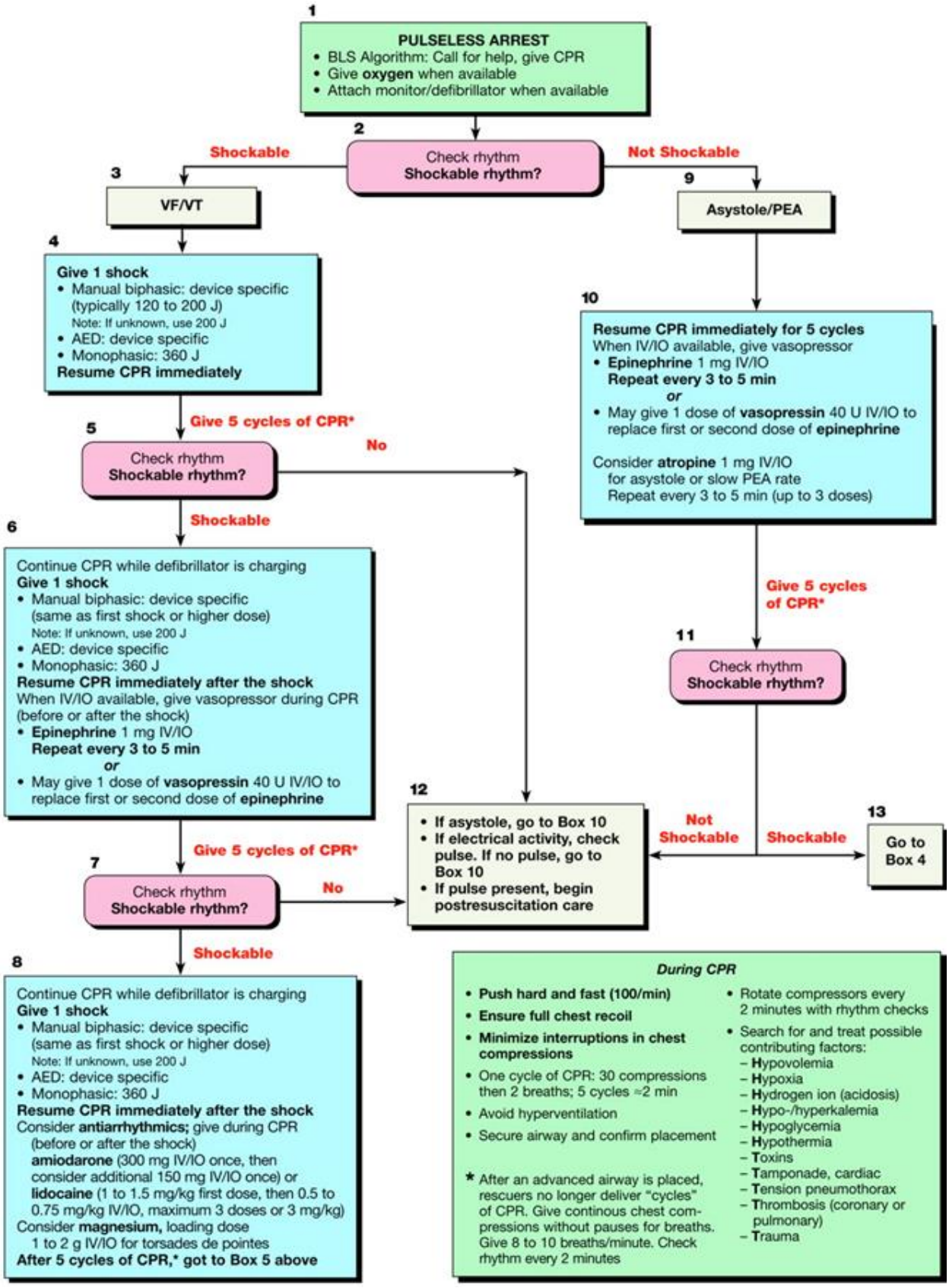
*Not available in the US

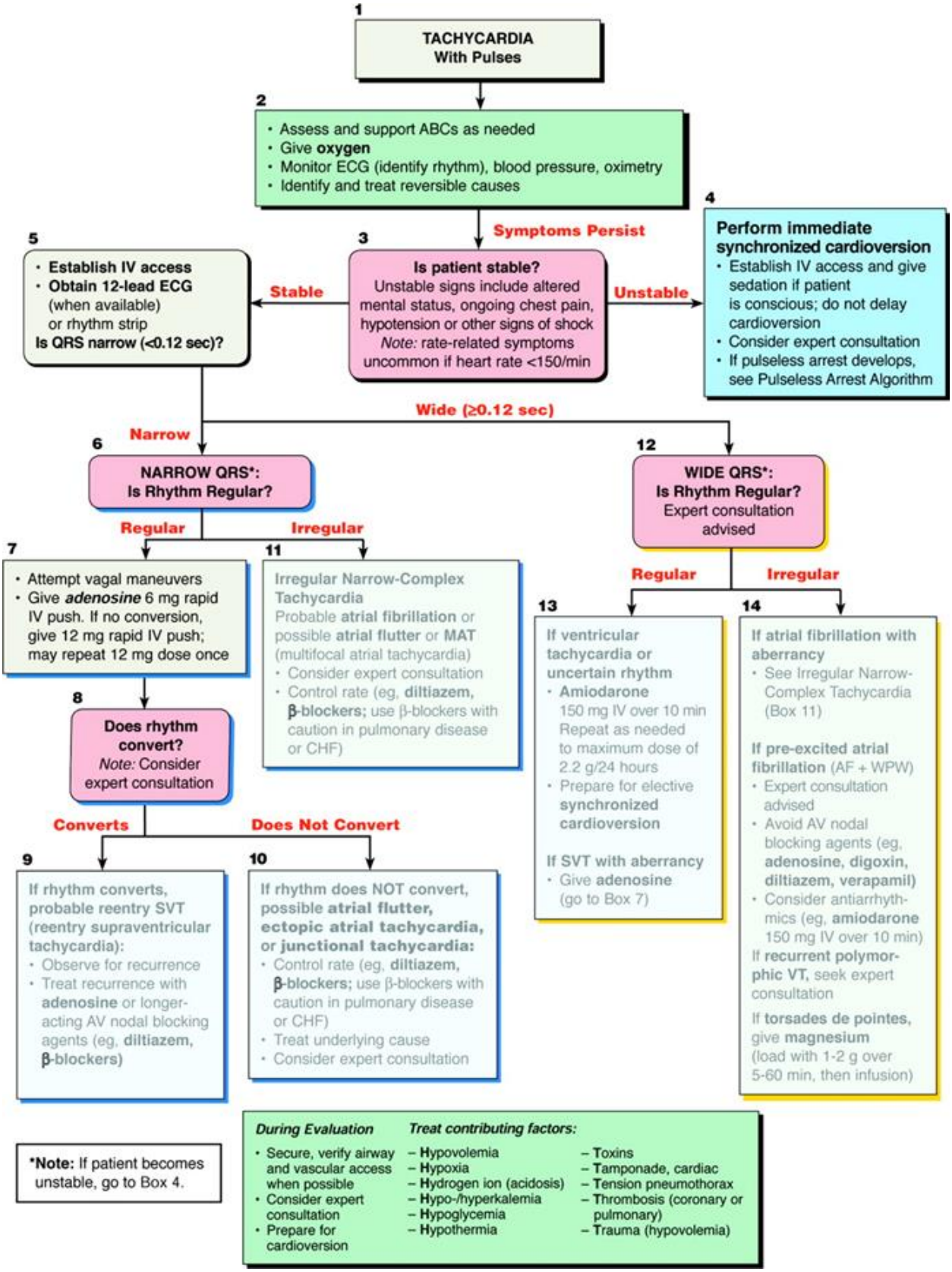
McPherson ML. *Demystifying Opioid Conversion Calculations: A Guide For Effective Dosing*. Amer Soc of Health-Systems Pharm, Bethesda, MD, 2010. Copyright ASHP, 2010. Used with permission. NOTE: Learner is STRONGLY encouraged to access original work to review all caveats and explanations pertaining to this chart.

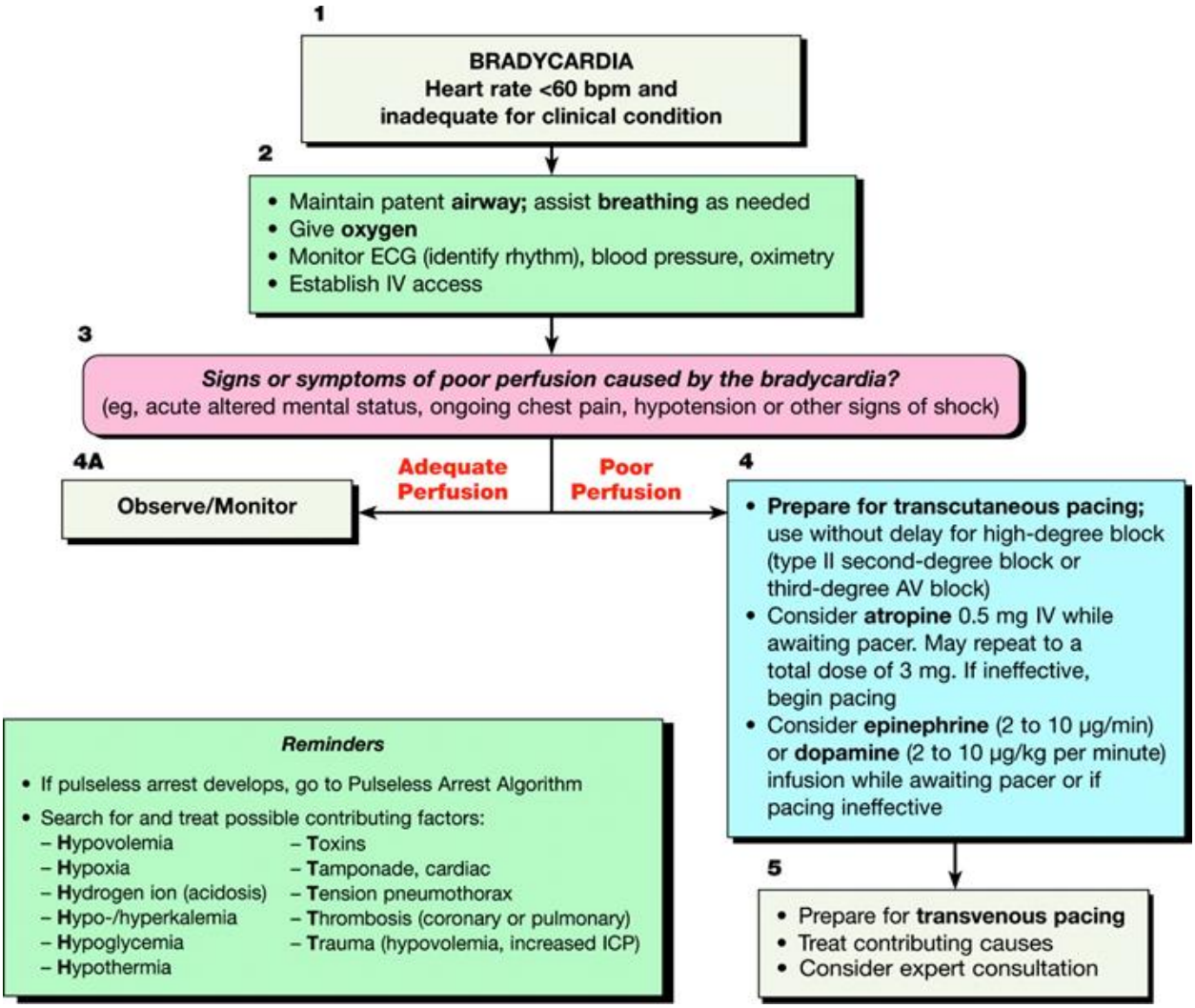
10.6: Diuretic Ratios

	Furosemide	Bumetanide	Torsemide
Relative IV potency	40mg	1mg	20mg
Bioavailability	**50%**	80%	80%
PO:IV conv.	2:1	1:1	1:1
t½	1.5-2 hr	1 hr	**3-4 hr**

10.7: ACLS Algorithms




1
TACHYCARDIA
With Pulses
2
• Assess and support ABCs as needed
• Give oxygen
• Monitor ECG (identify rhythm), blood pressure, oximetry
• Identify and treat reversible causes
Symptoms Persist
3
Is patient stable?
Unstable signs include altered mental status, ongoing chest pain, hypotension or other signs of shock
Note: rate-related symptoms uncommon if heart rate <150/min
Stable
Unstable
4
Perform immediate synchronized cardioversion
• Establish IV access and give sedation if patient is conscious; do not delay cardioversion
• Consider expert consultation
• If pulseless arrest develops, see Pulseless Arrest Algorithm
5
• Establish IV access
• Obtain 12-lead ECG (when available) or rhythm strip
Is QRS narrow (<0.12 sec)?
Narrow
Wide (≥0.12 sec)
6
NARROW QRS*:
Is Rhythm Regular?
Regular
Irregular
7
• Attempt vagal maneuvers
• Give adenosine 6 mg rapid IV push. If no conversion, give 12 mg rapid IV push; may repeat 12 mg dose once
8
Does rhythm convert?
Note: Consider expert consultation
Converts
Does Not Convert
9
If rhythm converts, probable reentry SVT (reentry supraventricular tachycardia):
• Observe for recurrence
• Treat recurrence with adenosine or longer-acting AV nodal blocking agents (eg, diltiazem, β-blockers)
10
If rhythm does NOT convert, possible atrial flutter, ectopic atrial tachycardia, or junctional tachycardia:
• Control rate (eg, diltiazem, β-blockers; use β-blockers with caution in pulmonary disease or CHF)
• Treat underlying cause
• Consider expert consultation
11
Irregular Narrow-Complex Tachycardia
Probable atrial fibrillation or possible atrial flutter or MAT (multifocal atrial tachycardia)
• Consider expert consultation
• Control rate (eg, diltiazem, β-blockers; use β-blockers with caution in pulmonary disease or CHF)
12
WIDE QRS*:
Is Rhythm Regular?
Expert consultation advised
Regular
Irregular
13
If ventricular tachycardia or uncertain rhythm
• Amiodarone 150 mg IV over 10 min Repeat as needed to maximum dose of 2.2 g/24 hours
• Prepare for elective synchronized cardioversion
If SVT with aberrancy
• Give adenosine (go to Box 7)
14
If atrial fibrillation with aberrancy
• See Irregular Narrow-Complex Tachycardia (Box 11)
If pre-excited atrial fibrillation (AF + WPW)
• Expert consultation advised
• Avoid AV nodal blocking agents (eg, adenosine, digoxin, diltiazem, verapamil)
• Consider antiarrhythmics (eg, amiodarone 150 mg IV over 10 min)
If recurrent polymorphic VT, seek expert consultation
If torsades de pointes, give magnesium (load with 1-2 g over 5-60 min, then infusion)
*Note: If patient becomes unstable, go to Box 4.
During Evaluation
• Secure, verify airway and vascular access when possible
• Consider expert consultation
• Prepare for cardioversion
Treat contributing factors:
– Hypovolemia
– Hypoxia
– Hydrogen ion (acidosis)
– Hypo-/hyperkalemia
– Hypoglycemia
– Hypothermia
– Toxins
– Tamponade, cardiac
– Tension pneumothorax
– Thrombosis (coronary or pulmonary)
– Trauma (hypovolemia)



10.8 ACLS Meds

Drugs Used In ACLS – Cardiac Arrest

Drug	Dose	Route	Notes
Adenosine	6-12 mg	IV	Push
Amiodarone 1st dose	300 mg	IV	
Amiodarone 2nd dose	150 mg	IV	Max 2.2g in 24 hrs
Atropine	0.5-1 mg	IV	Max 0.04 mg/kg
Epinephrine	1mg	IV	Q3-5 min
Diltiazem	10-20 mg	IV load	Over 2 min
	5-15 mg/hr	Infuse	
Magnesium Sulfate	1-2g	IV	Over 5-60 min
Vasopressin	40 IU	IV	Replaces epi x1

10.9: End of Life Decisions

- Palliate care number is 585-4157
- Pastoral services is 585-2265
    - this team helps with advanced directives
- The Palliative Performance Scale is a prognostic tool used in palliative care patients. It is reliable and validated, using observable behaviors to prognosticate survical time

PALLIATIVE PERFORMANCE SCALE (PPS)

%	Ambulation	Activity Level Evidence of Disease	Self-Care	Intake	Level of Consciousness	Estimated Median Survival in Days (a)	(b)	(c)
100	Full	Normal *No Disease*	Full	Normal	Full	N/A	N/A	108
90	Full	Normal *Some Disease*	Full	Normal	Full			
80	Full	Normal with Effort *Some Disease*	Full	Normal or Reduced	Full			
70	Reduced	Can't do normal job or work *Some Disease*	Full	As above	Full	145		
60	Reduced	Can't do hobbies or housework *Significant Disease*	Occasional Assistance Needed	As above	Full or Confusion	29	4	
50	Mainly sit/lie	Can't do any work *Extensive Disease*	Considerable Assistance Needed	As above	Full or Confusion	30	11	41
40	Mainly in Bed	As above	Mainly Assistance	As above	Full or Drowsy or Confusion	18	8	
30	Bed Bound	As above	Total Care	Reduced	As above	8	5	
20	Bed Bound	As above	As above	Minimal	As above	4	2	6
10	Bed Bound	As above	As above	Mouth Care Only	Drowsy or Coma	1	1	
0	Death	-	-	-	--			

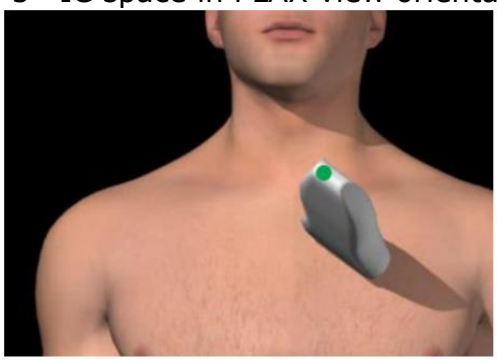
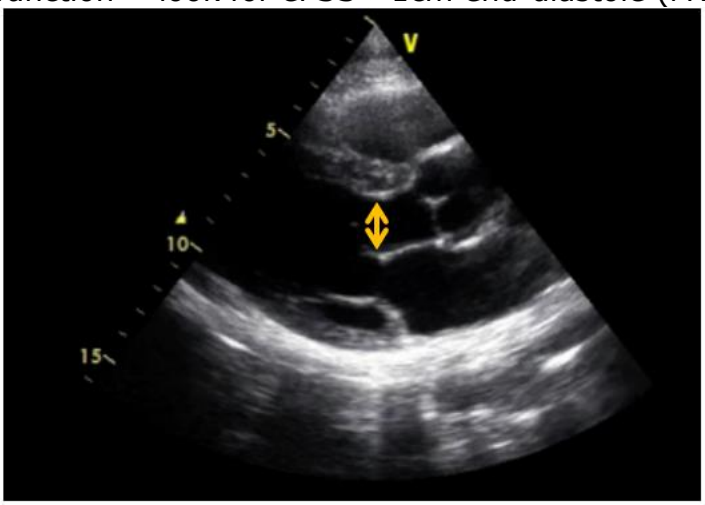
(a) Survival post-admission to an inpatient palliative unit, all diagnoses (Virik 2002).
(b) Days until inpatient death following admission to an acute hospice unit, diagnoses not specified (Anderson 1996).
(c) Survival post admission to an inpatient palliative unit, cancer patients only (Morita 1999).

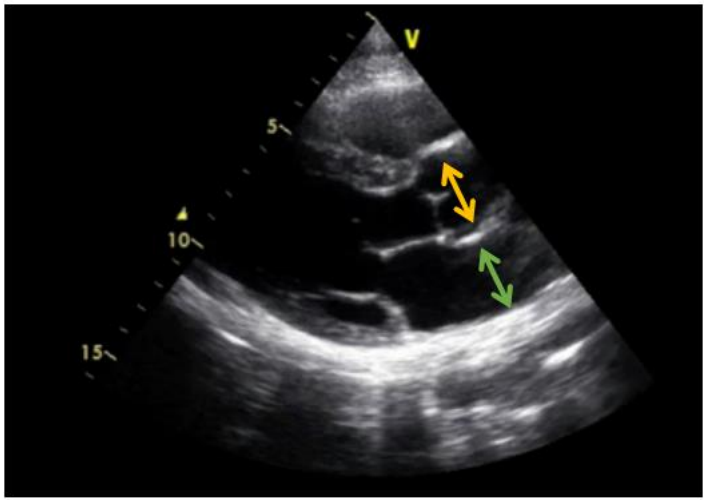
- Advance directives is a general term that describes end-of-life documents:
    - Living Will – document which allows patients to put in writing their wishes
    - Durable Power of Attorney for Healthcare (DPAHC)– document which lists the person(s) authorized to deal with all medical situations when patients cannot make health care decisions

    - Medical (or physician's) orders for life sustaining treatment (MOLST or POLST): This is portable document of physician medical orders, often limiting (but no necessarily so) certain unwanted treatments
        - **If the patient has both a living will and a DPAHC, the living will supersedes DPAHC.
- A DNR order is a physician's written order instructing healthcare providers not to attempt CPR in case of cardiac or respiratory arrest.
- DNR-CC – State of Ohio Do Not Resuscitate Comfort Care Protocol
    - Can be activated immediately on signing the order or in the event of a cardiac or respiratory arrest (DNRCC – Arrest)
    - Specifies that emergency medical services and other health care workers provide comfort care measures (suctioning, O2, pain control, emotional support, etc) but will refrain from life-prolonging measuring (intubations, CPR, resuscitative drugs like epi or atropine, defibrillate, etc).
- Fast Facts for the code status discussion:
    - Only 15% (about 1 in 6) of hospitalized pts who are resuscitated will survive to discharge (this number drops to 5% if the pt is elderly). This is a result of the comorbidities that landed the patients in the hospital in the first place. Those that do survive are at risk of neurologic and functional impairment.
    - The lay public believes that CPR has a 60-85% success rate
    - Cancer patients have lower survival rates, about 7% survive to discharge (and that drops to 2% if hospitalized in the ICU).

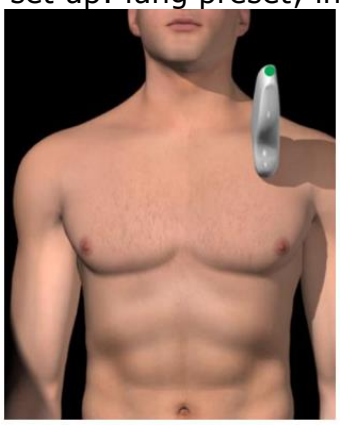
Myth	Fact
Financial power of attorney (POA) is the same as healthcare POA	These are separate legal documents
It's not appropriate to discuss advance directives with a PCP	Most patients want to discuss advance care planning before they become ill. Doctors should ask these questions during outpt visits
Having an advance directives means "don't treat"	Better definition is "treat me the way I want to be treated." Ongoing education for pts & staff is needed.
Having an advance directive means I don't have control of my care	As long as the patient has decision making capacity they retain control of their medical destiny. Advance directives are only activated when a person cannot speak for him or herself
Only old people need advance directives	The stakes may actually be higher for younger people if tragedy strikes

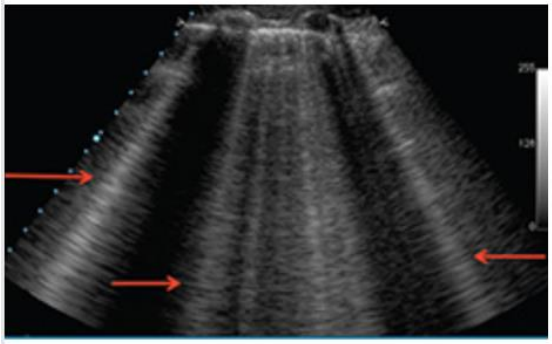
10:10: CLUE protocol to evaluate for dyspnea

- **Q1: LV systolic dysfunction?**
  - Image set up: Cardiac pre-set (Reverse orientation); indicator toward right shoulder; 4th-5th IC space in PLAX view orientation
    - 
  - LV dysfunction = look for ePSS >1cm end-diastole (MV anterior leaflet)
    - 

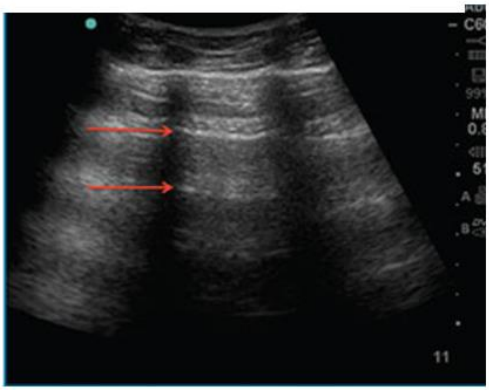
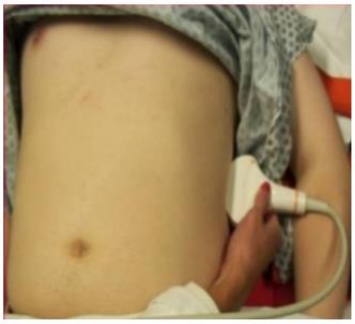
  - The yellow line is the EPPS (E-point Septal Separation). This is a measurement of the tip of the anterior leaflet of the mitral valve to the septum during diastole. If the distance is >1cm, there is likely LV dysfunction. See Evernote "2 Application: Cardiac - Overview"
- **Q2: LA enlargement?**
  - Image setup: same as assessment for LV systolic dysfunction
  - LA enlargement = LA diameter > Aortic outflow diameter (LA diameter >4cm is large)
    - 

      - superior line = aortic outflow diameter

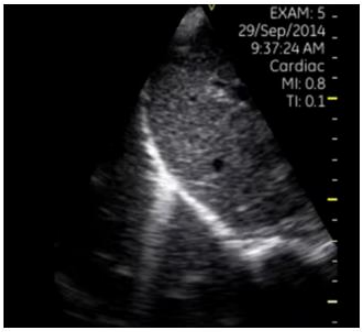
        - inferior line = LA diameter
- **Q3: Pulmonary edema?**
    - presence is confirmed if 3 or more B-lines (they look like vertical search lights) are seen in mid-clavicular assessment
    - Image set up: lung preset; indicator sagittal / cephalad, 2nd-3rd intercostal space
    - 
    - Pulmonary edema = B-lines (vertical search lights)

      Normal lung = A-lines (horizontal, equidistant reverberation lines)

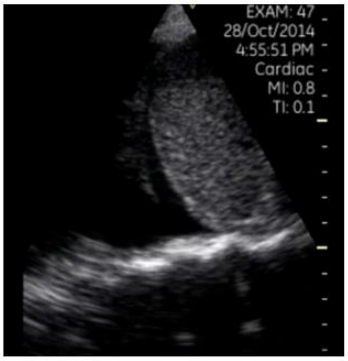
      
    - see evernote: "2 Application: lung - overview"
- **Q4: Pleural effusion?**
    - Image: lung pre-set; indicator oblique parallel with ribs; right = mid-axillary, 7th-8th intercostal space; left = posterior ("knuckles on table" orientation); 5th-6th intercostal space; through liver or spleen with diaphragm in view
    - See evernote: "2 Application: Lung - overview"
    - 

No effusion:
Mirror image of the liver seen on the other side of the diaphragm (ex: hepatization)
Curtain sign: with inspiration of air, this mirror image of the liver disappears and is covered by a 'black curtain,' the expanding lung filled with air which appears black on US.

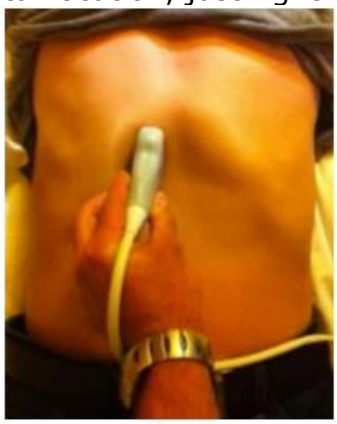


Effusion:

Black fluid seen on other side of liver (or spleen) and diaphragm. Can also see "spine sign" which is the white transverse area at the bottom of the image

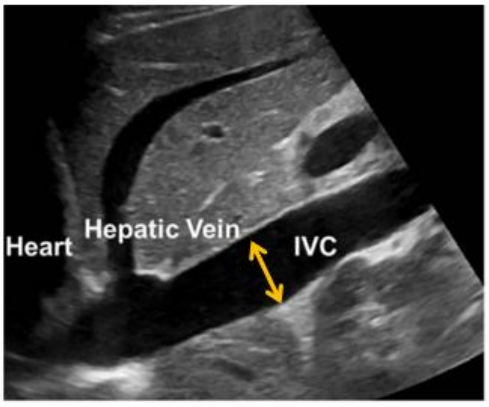


- **Q5: Elevated CVP?**
  - present if IVC >2.5cm and <50% collapse with inspiration when assessed at subcostal location, just right of midline.



Elevated CVP = >2.5cm diameter of IVC (as measured 2cm distal from diaphragm)

Low CVP = <1.2cm or 50-100% collapsing with inspiration



  - Image set up: abdominal pre-set; indicator sagittal/cephalad; subcostal/subxiphoid, just right of midline (or rather right and fan through right liver lobw); hepatic vein confirms
  - See evernote: "2 Application: Vascular - IVC assessment"

10.11 Residency Numbers

2020-2021 TCH-UC Family Medicine Residents

NAME	PAGER NUMBER	BACKUP/CELL NUMBER	EMAIL ADDRESS
Fifth Year			
Bhattacharyya, Darshana	513-343-2197	515-450-3389	darshana.uc@gmail.com
Puthota, Aruna	513-343-2198	845-548-0663	Aruna.puthota624@gmail.com
Fourth Year			
Champlin, Christopher	513-343-2378	513-646-4752	chris.r.champlin@gmail.com
Third Year			
Hollis, Sarah (thru 9/4)	513-343-2242	614-940-3762	sarah.hollis0706@gmail.com
Jaramillo, Andrea	513-230-0004	765-588-7968	agpjaramillo@gmail.com
Lammie, Samantha	513-343-2680	304-919-0689	lammie.samantha1@gmail.com
Ledvora, Laura	513-343-2681	630-222-1989	lrledvora88@gmail.com
Levinson, Emily	513-343-0038	574-532-3018	elevinson3@gmail.com
Maples, Sara	513-577-2684	513-293-9411	sara.stigler@gmail.com
Peters, Elizabeth	513-577-0094	513-382-3068	Elizabeth.nell.peters@gmail.com
Saab, Melissa	513-577-2698	740-821-6921	MelissaCSaab@gmail.com
Vance, Alexander	513-577-2700	317-407-3437	alexrvance@gmail.com
Second Year			
Crosbie-Cockroft, Josh	513-343-2244	303-807-3446	jd.crosbie@gmail.com
Delong, Caitlin	513-343-2255	260-760-4569	cnmdelong@gmail.com
Douglas, Xavier	513-577-0028	330-256-2601	xdouglas1@gmail.com
Durchholz, Christina	513-577-2696	513-519-5912	christina.durchholz@gmail.com
Hsiao, Florence	513-577-0103	510-320-2486	flo.hsiao@gmail.com
Lawson, Sean	513-577-0105	859-640-8431	lawsons8892@gmail.com
Rosado, Andrea	513-577-0254	631-804-7756	rosadoandrea112@gmail.com
Seto, Jordan	513-577-1167	253-432-1352	jordansetoERAS@gmail.com
Smith, LaToya	513-577-0379	618-567-5198	lmsmith027@gmail.com
First Year			
Banks, Quincy	513-343-3243	615-971-2351	quincybanks2020@gmail.com
Bohler, Rynita	513-343-3246	586-215-0016	brynita92@gmail.com
Furnish, Emily	513-343-3248	502-424-8731	mlefurniture@gmail.com
Gerth, Alyssa	513-343-3249	513-900-0788	alyssabrogden@gmail.com
Mamidi, Madhulika	513-343-3252	859-466-7987	meena.mamidi29@gmail.com
Nahreini, Jhenya	513-343-3254	720-355-6229	jhenya.nahreini@gmail.com
Norbu, Dorjee	513-343-1602	763-227-4841	dorjee.p.norbu@gmail.com
Onusko, Evan	513-343-3256	937-218-9803	onuskoee@gmail.com
Smith, Josh	513-343-1691	847-254-5674	joshuaasmith92@gmail.com

10.12 TCH numbers / logistics / scrubs/ breast feeding

TCH Numbers (Prefix for 5 digit #'s that start with 4=564-, 5 = 585-, 6= 206-, 7= 557, 8=648)

Hospital Wide:

Admitting/Beds 52337

Schedulease 52668

Paging 52669

IT Help Desk 54357

Translation:

800-264-1552, code 194311

Stroke Team:

844-7686

Surg resident 10556

Colorectal 230-3058 (10431)

UCFM:

3N fax 50670

Team A 50883

Team B 50884

Faculty Team 50502

Intern seats 50799

Senior seat 50882

B team room 50880

FMC MOB 585-3238

ER: 52235, 52236

52456, 50753, 51464, 50929, 50977, 51535, 53656, 51537

UC Stroke Team: 513-584-8282

Departments:

Pharmacy 52432

PharmD 24h 52585

Matt pharm 51456

Lab 52454, 353-6616

Path 51111

Cath lab 52436

Vasc lab 51480

Heart Station 52517

Inpt Dialysis 52431

Palliative Care 54157

Social Wk 52427

Case Mgmt 52447

OT 52497

PT/Speech 52474

Rehab 52297

DM Educ 52072

IV pharm / TPN 51171

Nutrition 54206

Radiology:

Radiology 52421, #2

Rad Hot Seat 52126

Film Lib 52467;153

MRI 50118, 50125

CT Scan 51469

Echo Lab 52517

Nuclear Med 51146

Endoscopy 51483

IR 52467

Floors:

A7 CVSU 52325

B7 PACU 52341

B7 SICU 52999

2S 52553

2W Rehab 52255

3S Ortho 52250

3S Fax 52242

3W Geri 52351

4S Tele 52543

4W Onc 52284

5S Surg 52316

5W Renal 52301

6S Tele 52327

6W Psych 52414

7S Tele 51620

7W MICU 52386

JSC 3 74700

JSC 4 74600

JSC 5 74500

Internal Med:

ICU Senior 51088

IM Hospitalist 52410

Geri Hospitalist 53488

IM Inpt 52258

Cardiology service:

859-572-5050 *Press option 1 for TCH, then *Clinical – 1; CHF – 2; LVAD - 3; Cardiac surgery – 4; EP – 5; vascular – 6; primary intervention – 7; CVICU – 8.

Teresa (Holters): 61144

Cardiology NPs:

Allison 54947, Mandy 53357

Carrie 61119, Kathy 50020

Tanisha 53738, Jessica 54024

Anne (CHF) 50453

Julie (CHF) 54024

Jen/Kory (EP) 61072

Danielle (CHF) 50708

Laura (CT surg) 50924

Sandy 54948

Other NPs/PAs:

Lisa Niehaus (Endocrine) 230-0734

Amy, PA (GI) 50335

Ashley, PA (GI) 50229

Deb (ID) 575-6986

Charity/Vicky (IR) 53800

Brooke (Onc) 266-3492

Eric, PA (Ortho) 52081

JR, PA (Ortho) 52441

Michelle, PA (ortho) 74895

PICC team 50066

Amy (Surgery) 54122

Transplant surg 50636

Linda Bolt, PA (Urology) 50446

OB Triage: 585-2335/585-1741 OB charge nurse: 585-1740 9th Floor L&D: 585-2336 9th Floor fax: 585-4192 9 South: 585-2306 OB U/S: 585-1980 OB resident: 585-2786 Prenatal clinic: 585-0614/585-0619	**Attendings** Dr Rosenthal: 249-0679 (P), 218-0913 (C) Dr Lazaron: 971-9041 (P), 513-460-4634 (C) Dr Spata: 209-0431 (P), 425-591-6008 (C) Michelle Zamudio, CNM: 249-0017 (P), 513-225-1709 (C) Jackie Martin, CNM: 513-535-1815 (C) Dr. Mount: 230-1705 (P), 513-374-2460 (C) FM OB phone 50022	**OB Backup** Bruce Allen, MD 310-1104 (C), 871-0290 (O) David Barrere, MD 543-1483 (C), 784-1201 (O) Harley Grim, MD 554-7211 (P), 931-3400 (O) Melissa Heidi, MD 325-3250 (C), 221-6300 (O) Israel Washington, MD 305-1741 (C), 699-2810 (O) Anita Weisberger, MD 513-460-8359 (C), 859-341-5550(W)

Lactation:

There is a pumping room on the 4th floor with 2 areas to pump, a sink and a fridge. It is shared with other nursing staff members. **4 North Room Number 4171; code is 541.** For other questions, see the "For Breastfeeding Moms" on the squarespace site under "Resources," or ask your chiefs.

Mental Health

Are you struggling with your mental health? You are not alone! There are many resources here to help including the following:

Lindner Center for Hope Physician Mental Health Program: (513) 536-0311
Ohio Physician Health Program: 614- 841-9690
TCHHN Employee Assistance Program: 1-800-634-6433
Jennifer Reemtsma, MEd in the GME office: 940-600-7905 (cell)

Call nights:

When on call overnight there are a few options for sleeping if the opportunity presents itself.

- The 8th floor has call rooms available: Room 8140 is for family medicine, Room 8142 is a flex room that can be used by multiple services including ours. The restrooms there have codes:
    - Men's restroom code: 906
    - Women's restroom code: 703
- Many people also sleep on the couches in the work room.

Scrub Machines

Dispensing locations
- A level: by male employee's locker room
- B level: by anesthesia work form in JSC building (room B946)
- C Level: physician's locker room (C809)
- D Level: across from D750 and D752 by the elevator bank
- 9th floor: in equipment storage room 9132 behind L&D

Scrub Return Locations
- A level
  - Female / male employee locker room
  - Female / male surgeons locker room
- B level
  - Female surgeons Locker room (B947) – JSC
  - Male surgeons Locker room (B948) – JSC
  - PACU Locker ROOM (B812) – JSC
- 9th floor
  - Female employees locker room (9135)
  - Male employees locker room (9134)

For Scrub machine issues, please contact Roger Grammer at 263-1690

10.13: Consultants

Medical Consults

Cardiology - Ohio Heart

Clinical Cardiology

NP/ resident phones: 53357, 50020
Night NP coverage: 61119
If need to speak to cardiologist for any clinical service: 859-572-5050, option 2, then select number for appropriate service
Office: (513) 206-1120
Physicians: Gregory Clarke, JoAnna English, Daniel Glassman, George George, Wojciech Mazur, Thomas Murtaugh, Santosh Menon, Robert Pelberg, Jason Smith, Terri Stewart-Dehner, John Szawaluk,

Heart Failure

Pager: (859) 572-5050, option 2, then appropriate service. Office: (513) 206-1180
Physicians: Eugene Chung, Greg Egnaczyk, Tom O'Brien, Timothy Raymond

Electrophysiology

Pager: (859) 572-5050, option 2, then appropriate service
Office: (513) 792-7800
Physicians: Daniel Beyerbach, Madhukar Gupta, Daniel Pelchovitz, Edward Schloss, Theodore Waller
Dermatology - Will not come to the hospital, but willing to discuss over the phone
Office: (513) 579-9191
Physicians: Stephanie Blackburn

Endocrinology

Pager: (513) 230-0734
Office: (513) 272-0313
NP: 230-0734
Physician: Susannah Becker, Amanda Denney, Shannon Haggerty, Meenakshi Iyer, Katherine Miller, Shawn Peavie, Barbra Ramlo-Halsted
Other providers: Lisa Neihaus, NP, Kimberly Withers, NP

Gastroenterology

Ohio GI & Liver
Office Phone: (513) 751-6667
PA: (513) 585-0335, (513) 585-0229
Physicians: Pradeep Bekal, Manish Chokshi, John Czarnecki, Michael Kreines, Amit Gajera, Roopa Gandhi, Karen Haberthier, Joshua Peck

Cincinnati GI - Only if they have seen the patient previously
David Hess: (513) 233-4100
Stephen Ionna (513) 231-9010
Harold Loewenstine (513) 721-5300

Heme/Onc
Office: 513-321-4333
Physicians: Manish Bhandari, Gina Chung, Robert Cody, Irfan Firdaus, Brian Mannion, Slobodan Stanisic, Jamie Waselenko, Weiping Zang

Rad Onc
Office: (513) 321-4333
Physicians: Rodney Geier, Cornelia McCluskey, Robert Summe

Infectious Diseases
Office: (513) 585-2791
Physician: John Cafardi, James England, Douglas Haas, Thomas Lamarre, Tricia Young
Other Providers: Debra Koenke, NP

Nephrology - Alternate between groups if no previous nephrologist

Mt Auburn Nephrology
Office Phone: (513) 841-0222
Physicians: Muhammad Ashraf, Shaoming Huang, Ian Meyer, Shazad Safdar

Kidney & Hypertension Center
Office: (513) 241-5630
Physicians: Joe Austin, Michael Cardi, John Hergenrother, Joe Kremer, Karl Pembaur, Stanca Schilff

Neurology
Office: (513) 241-2370
Physicians: Marsha Smith, Todd Hayes, David Schmerler, Michael Schmerler
Other Providers: Jessica Nurre, NP

Pulmonology
Office: (513) 241-5489
Physicians: , Chris Orabella, Chris Schmidt, Mark Scott, Eric Weinstein, Kiranmayee Lanka

Rheumatology
Office: (513) 351-0800
Physicians: Paige De Buys, Lou Flaspohler, Deepa Kudalkar

Cardiothoracic Surgery - Ohio Heart
Pager: (859) 572-5050, option 2, then appropriate service
Office: (513) 206-1170
Physicians: Geoffrey Answini, Mario Castillo Sang, Jeffery Griffin

ENT
Office: (513) 421-5558
Physicians: Collin Burkart, Joseph Hellmann, Matthew Hensler, Thomas Kereiakes, Ernest Manders

General Surgery
Office: (513) 585-2062
Physicians: David Fischer, Thomas Husted, Gina Maccarone, Jonathan Schilling
Other Providers: Amy Bates, NP; Suzanne Burlage, NP

Gynecology
Bruce Allen
Phone: (513) 871-0290
Cell: (513) 310-1104

David Barrere
Office: (513) 784-1201

Harley Grim
Office: (513) 931-3400

Melissa Heidi
Office: (513) 564-6644

Anita Weisberger
Office: (513) 564-6644

Interventional Radiology
NP x 53800. Generally only call this for surgical IR cases. For procedures like thoracentesis or paracentesis, you need to call the imaging department

Neurosurgery
TCH Office: (513) 792-7443
Physicians: Mark Magner, Monir Tabbosha
Other Providers: Jeffrey Holtz, PA; Lauren Smith, NP

TCH Ortho-Spine
Office: (513) 792-7445
Physicians: John Roberts

Mayfield
Office: (513) 221-1100
Physicians: Robert Bohinski, William Tobler

Orthopedics
Office: (513) 791-5200
Physicians: Paul Favorito, Jacob Gunzenhauser, Warren Harding, Patrick Kirk, Edward Lim, Marc Schneider, Scott True
Other Providers: Stephanie Ellis, NP; Victor Imrie, PA; Michelle O'Donnell, PA; Eric Washnock, PA

Ortho Hand
Office: (513) 221-5500
Physicians: Bryan Beutel, Noah Shaftel

Ortho Foot
Office: (513) 271-3222
Physicians: Sandra Eisele, Jeffery Wu

Podiatry
Office: (513) 333-3338
Physicians: Samantha Baker, Robert Craig, Douglas Schuckmann,

Surg Onc
Breast
Office: (513) 564-5000
Physicians: Jennifer Manders, Kelly McLean

General
Office: (513) 585-0694
Physicians: Rod Flynn, Sandra Miller

GYN
Office: (513) 751-4448
Physicians: Marcia Bowling

Transplant - Performs all dialysis related procedures
Office: (513) 475-8787
Physicians: This is UC coverage. Dr. Madison Cuffy
Vascular surgery resident pager numbers

- Mon - Sat: 513-856-1484
- Sunday 6am - Monday 6am: 513-230-3058

Urology
Office: (513) 721-7373
PA: Linda Bolt , Ilvia Sabato (513) 585-0446
Physicians: Jennifer Bennett, Justin Cox, Anish Shah, Reed Shank, Gil Weizer

Vascular Surgery - Ohio Heart
Pager: (859) 572-5050, option 2, then appropriate service
Office: (513) 541-0700
Physicians: Mark Harding, Sashi Kilaru, Chris Paprzycki
NP - Olivia Lally
Mercy Vascular surgeons- Dr. Zenni still has admitting privileges at Christ but majority works at Mercy. Do not consult unless this patient was operated on recently and has specific vascular question. Office: 513-421-3494

10.14: Noon conference topics

Topic	Date Covered	Attendings
[]Renal failure / uremia		
[]CHF tx / diuretic overview		
[]Pancreatitis		
[]Pain management		
[]Pulmonary Embolism		
[]COPD exacerbation		
[]Hyponatremia		
[]Afib with RVR		
[]CVA/TIA		
[]CAP / HAP		
[]Cellulitis		
[]Glucose management		
[]AMS workup / delirium management		
[]Tachy-brady / overnight EKG call management		
[]POC and other resources for answering clinical questions		