My Little Book of Family Medicine

Inpatient Rounding Tools
Read this carefully before you proceed

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I would appreciate feedback regarding any errors discovered while using this tool or any general comments on how to improve this rounding tool. Send comments or errors to fmiroringtool@gmail.com

Carlos F Dumois, MD
<table>
<thead>
<tr>
<th>FMI Orientation</th>
<th>Intensive Care / Critical Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>Nephrology / Urology</td>
</tr>
<tr>
<td>Important Numbers</td>
<td>Neurology</td>
</tr>
<tr>
<td>Cardio-Vascular Disorders</td>
<td>Ophthalmology for Hospitalist</td>
</tr>
<tr>
<td>Dermatology for the Hospitalist</td>
<td>Procedures / Imaging / Labs</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>Pulmonology</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>Surgery</td>
</tr>
<tr>
<td>Geriatric / Palliative care</td>
<td>Toxicology / Pain Management / Joint</td>
</tr>
<tr>
<td>Hematology / Oncology</td>
<td>Women’s Health</td>
</tr>
<tr>
<td>Infectious Disease</td>
<td>References</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>-A-</td>
</tr>
<tr>
<td>A1C</td>
</tr>
<tr>
<td>A1C Target Goal</td>
</tr>
<tr>
<td>ABI. Ankle Brachial Index</td>
</tr>
<tr>
<td>A.Fib</td>
</tr>
<tr>
<td>ABCD2 Score</td>
</tr>
<tr>
<td>Abdominal Pain</td>
</tr>
<tr>
<td>Epigastric</td>
</tr>
<tr>
<td>LUQ</td>
</tr>
<tr>
<td>LLQ</td>
</tr>
<tr>
<td>RUQ</td>
</tr>
<tr>
<td>RLQ</td>
</tr>
<tr>
<td>Functional Abdominal Pain</td>
</tr>
<tr>
<td>ABG Made Simple</td>
</tr>
<tr>
<td>Abnormal Urine Color</td>
</tr>
<tr>
<td>Acetaminophen Overdose</td>
</tr>
<tr>
<td>Acute GI Bleed</td>
</tr>
<tr>
<td>Acute Myocardial Infarction</td>
</tr>
<tr>
<td>Acute Renal Failure</td>
</tr>
<tr>
<td>Admission vs Observation</td>
</tr>
<tr>
<td>Adult History and Physical</td>
</tr>
<tr>
<td>Adrenal Incidentalomas</td>
</tr>
<tr>
<td>Alcohol withdraw</td>
</tr>
<tr>
<td>AMA</td>
</tr>
<tr>
<td>Anemia</td>
</tr>
<tr>
<td>Angina Classification</td>
</tr>
<tr>
<td>Anion gap</td>
</tr>
<tr>
<td>Antiplatelet Therapy in CAD</td>
</tr>
<tr>
<td>Topic</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Anticoagulation</td>
</tr>
<tr>
<td>Anticoagulants Comparison</td>
</tr>
<tr>
<td>APACHE – II Score</td>
</tr>
<tr>
<td>APSO Progress Notes</td>
</tr>
<tr>
<td>Arrhythmia Algorithm (Diagnostic)</td>
</tr>
<tr>
<td>Aspirin therapy</td>
</tr>
<tr>
<td>Asthma</td>
</tr>
<tr>
<td>AUB</td>
</tr>
<tr>
<td>Basics of Vent Management</td>
</tr>
<tr>
<td>BEERs List</td>
</tr>
<tr>
<td>Bleeding Risk Score</td>
</tr>
<tr>
<td>Bell’s Palsy</td>
</tr>
<tr>
<td>Billing: Quick Guide</td>
</tr>
<tr>
<td>Blood Patch for post LP Headache</td>
</tr>
<tr>
<td>Blood Transfusion</td>
</tr>
<tr>
<td>BP Goals for CVA</td>
</tr>
<tr>
<td>Caffeine Content</td>
</tr>
<tr>
<td>Caprini Risk Score</td>
</tr>
<tr>
<td>Cardiac Markers</td>
</tr>
<tr>
<td>Cellulitis</td>
</tr>
<tr>
<td>Clostridium difficile infection = CDI</td>
</tr>
<tr>
<td>CHAD2 / CHA2DS2-VASc</td>
</tr>
<tr>
<td>Chest Pain</td>
</tr>
<tr>
<td>Chronic Renal Disease</td>
</tr>
<tr>
<td>Cirrhosis</td>
</tr>
<tr>
<td>CIWA Protocol</td>
</tr>
<tr>
<td>Contrast Induced Nephropathy</td>
</tr>
<tr>
<td>Constipation</td>
</tr>
<tr>
<td>Compression Stockings</td>
</tr>
<tr>
<td>Cool Case Guide</td>
</tr>
<tr>
<td>COPD</td>
</tr>
<tr>
<td>Coronary CTA</td>
</tr>
<tr>
<td>CT vs MRI</td>
</tr>
<tr>
<td>CURB-65</td>
</tr>
<tr>
<td>D Dimer (causes of elevated)</td>
</tr>
<tr>
<td>Death Summary</td>
</tr>
<tr>
<td>Delirium</td>
</tr>
<tr>
<td>Diabetes: Hospital Treatment</td>
</tr>
<tr>
<td>Diabetic Foot Infection</td>
</tr>
<tr>
<td>Dictation</td>
</tr>
<tr>
<td>Discharge Summary Template</td>
</tr>
<tr>
<td>Diverticulosis / Diverticulitis</td>
</tr>
<tr>
<td>DKA</td>
</tr>
<tr>
<td>Dumois Headache Cocktail</td>
</tr>
<tr>
<td>DVT Arm</td>
</tr>
<tr>
<td>DVT Leg</td>
</tr>
<tr>
<td>DVT Prophylaxis</td>
</tr>
<tr>
<td>Eliquis</td>
</tr>
<tr>
<td>ECG Quick Reference Guide</td>
</tr>
<tr>
<td>FENa</td>
</tr>
<tr>
<td>Fever Unknown Origin</td>
</tr>
<tr>
<td>Fructosamine</td>
</tr>
<tr>
<td>GERD</td>
</tr>
<tr>
<td>Geriatric Assessment</td>
</tr>
<tr>
<td>Glasgow Coma Scale</td>
</tr>
<tr>
<td>Topic</td>
</tr>
<tr>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Glomerular Filtration Rate (GFR)</td>
</tr>
<tr>
<td>GoodRx</td>
</tr>
<tr>
<td>Gout/Gout Score</td>
</tr>
<tr>
<td>GRACE Score</td>
</tr>
<tr>
<td>HASBLED score</td>
</tr>
<tr>
<td>HCAHPS</td>
</tr>
<tr>
<td>Headaches</td>
</tr>
<tr>
<td>Head CT in head trauma rules</td>
</tr>
<tr>
<td>Hearing a dictated report</td>
</tr>
<tr>
<td>Heart Failure</td>
</tr>
<tr>
<td>Heart Failure in AMI</td>
</tr>
<tr>
<td>Hemolysis</td>
</tr>
<tr>
<td>Heparin Induced Thrombocytopenia</td>
</tr>
<tr>
<td>Heparin protocol</td>
</tr>
<tr>
<td>Hospital Score (readmission risk)</td>
</tr>
<tr>
<td>Hyperbilirubinemia</td>
</tr>
<tr>
<td>Hypercalcemia</td>
</tr>
<tr>
<td>Hypercoagulable States</td>
</tr>
<tr>
<td>Hypertension JNC-8</td>
</tr>
<tr>
<td>Hypertension SPRINT Trial</td>
</tr>
<tr>
<td>Hypertensive Emergency</td>
</tr>
<tr>
<td>Hyponatremia</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**TABLE OF CONTENT**

Click on title to go to that topic
<table>
<thead>
<tr>
<th>Topic</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>-M-</td>
<td>-P-</td>
</tr>
<tr>
<td>Macrocytic Anemia</td>
<td>Padua Score</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>Pain Management</td>
</tr>
<tr>
<td>MELD Score</td>
<td>Pancreatitis</td>
</tr>
<tr>
<td>Medication Resources</td>
<td>Paracentesis</td>
</tr>
<tr>
<td>MONA - BASH</td>
<td>PCA Pump</td>
</tr>
<tr>
<td>MRI Complications</td>
<td>PCA Dosing</td>
</tr>
<tr>
<td>MRI With contrast or without</td>
<td>Peri-op warfarin mgnt</td>
</tr>
<tr>
<td></td>
<td>Peri-op anticoagulation mgnt</td>
</tr>
<tr>
<td>-N-</td>
<td></td>
</tr>
<tr>
<td>Narcotic Bowel Syndrome</td>
<td>Peri-op mgnt new anticoagulants</td>
</tr>
<tr>
<td>Nephrolithiasis</td>
<td>Platelet transfusion</td>
</tr>
<tr>
<td>Neutrapenic Fever</td>
<td>PID</td>
</tr>
<tr>
<td>Nicotine addiction</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>NIH Stroke Scale</td>
<td>Pneumonia Severity Index</td>
</tr>
<tr>
<td>NLR / PLR Ratio</td>
<td>Pneumococcal vaccine for adults</td>
</tr>
<tr>
<td>Nonketotic Hyperglycemia (NKH)</td>
<td>Poison Control Number</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>Post-op Fever</td>
</tr>
<tr>
<td>NSTEMI</td>
<td>Post-LP Headache</td>
</tr>
<tr>
<td>-O-</td>
<td></td>
</tr>
<tr>
<td>Opiate RX</td>
<td>Power Plans</td>
</tr>
<tr>
<td>Ottawa Ankle rules</td>
<td>Pradaxa</td>
</tr>
<tr>
<td>Ottawa Knee Rules</td>
<td>Prescribing Opiates on DC</td>
</tr>
<tr>
<td>Orthostatic Hypotension</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Pre-op anticoagulation Therapy</td>
<td></td>
</tr>
<tr>
<td>Pre-op Evaluation Risk Calculator</td>
<td></td>
</tr>
<tr>
<td>Pre-op Clearance Note</td>
<td></td>
</tr>
<tr>
<td>Pre-op Evaluation</td>
<td></td>
</tr>
<tr>
<td>Pre-op Workup</td>
<td></td>
</tr>
<tr>
<td>Procalcitonin</td>
<td>SBO</td>
</tr>
<tr>
<td>sepsis</td>
<td></td>
</tr>
<tr>
<td>Sepsis Antibiotic</td>
<td></td>
</tr>
<tr>
<td>Secretion Management in Elderly</td>
<td></td>
</tr>
<tr>
<td>Shaw Protocol for Constipation</td>
<td></td>
</tr>
<tr>
<td>STATIN Comparison</td>
<td></td>
</tr>
<tr>
<td>Status Epilepticus</td>
<td></td>
</tr>
<tr>
<td>STEMI</td>
<td></td>
</tr>
<tr>
<td>Stroke Ischemic (CVA)</td>
<td></td>
</tr>
<tr>
<td>Surgical Risk Calculator</td>
<td></td>
</tr>
<tr>
<td>Superficial Venous Thrombosis</td>
<td></td>
</tr>
<tr>
<td>Re-admission Scores</td>
<td></td>
</tr>
<tr>
<td>Red Eye</td>
<td></td>
</tr>
<tr>
<td>Richmond Agitation Sedation Scale</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>-T-</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Telemetry</td>
<td></td>
</tr>
<tr>
<td>Thoracentesis</td>
<td></td>
</tr>
<tr>
<td>Thromboembolism and Cancer</td>
<td></td>
</tr>
<tr>
<td>TIA</td>
<td></td>
</tr>
<tr>
<td>TIMI Score</td>
<td></td>
</tr>
<tr>
<td>Transfusion Reaction</td>
<td></td>
</tr>
<tr>
<td>Troponin</td>
<td></td>
</tr>
<tr>
<td>Thyroid Function Test</td>
<td></td>
</tr>
<tr>
<td>Thyroid Nodule workup</td>
<td></td>
</tr>
<tr>
<td>-U V-</td>
<td></td>
</tr>
<tr>
<td>Urine Drug Screen</td>
<td></td>
</tr>
<tr>
<td>UTI</td>
<td></td>
</tr>
<tr>
<td>Valsalva square wave</td>
<td></td>
</tr>
<tr>
<td>Vision Loss</td>
<td></td>
</tr>
</tbody>
</table>
FMI Orientation

Topics
*Click” on topics below to go directly to that page

♣ Welcome to FMI
♣ Adult History and Physical
♣ Admission Addendum for Geriatric Patients
♣ APSO Progress note
♣ Community Medicine Clinic
♣ Cool Case Guide
♣ Death Summary
♣ Discharge Summary Template
♣ FMI Core Competencies
♣ Power Plans and Essential Elements
♣ Winter Park Hospital Important Numbers
The Team: 1 attending (Dr Ambs, Dr Dumois or guest attending), 2 senior residents (one on day and one on night float), 3 interns (2 on days, one on nights, up to 2 medical students).

Team Goals:
- Patient census of 12-14 daily (Ideal)
- HCAPS above 80<sup>th</sup> percentile
- Meet all hospital Core Measures for Patient Quality and Safety

Caps: Interns: 5-7 patients at the discrepancy of the attending. Seniors: no limit. Team cap: 20 pts.

Senior responsibilities:
- Facilitate, supervise, guide and educate the Interns and students.
- See all new patients admitted the previous day
- Make sure patients are divided equally between the interns at the beginning of the day. When patient number over 14, senior will have direct patient responsibility. Senior should see all new patients and ICU admissions to become familiar with them.
- Manage the team. Make sure all DC summaries are completed the day of discharge.
- Assign PEARLS to students and interns. Prepare and present Cool Case on 3rd Wednesday of the block, and Whole person care case on 1<sup>st</sup> Wednesday of the block
- Make sure that all admitted patients have a “clean” Anticipated discharge bundle order by day 2 of admission.
- Multidisciplinary rounds (MDR) on high 2400s at 9:00 AM, prepare interns to present in one sentence pts chief complaint, then after other disciplines present, present “today’s plan”. Gather the team at 8:45 to prepare for multidisciplinary rounds
- At the end of the block make arrangements to sign off your patients to the incoming team.
- On nights, Code Blue responsibilities between 7 and 7. Write event note on any rapid response patients you get called to see or those that your fellow senior signed out as needing closer follow up. Prepare interns for presentations of cases to attendings and for sign out.

Intern responsibilities:
- All patients seen and notes completed on Cerner by rounding time at 9:00am.
- Use the APSO note format for progress notes
- Daily PEARLS. Present 3 PEARLS, based on your reading about patients on service to the rounding team during rounds, except Mondays.
- Discharges completed by same day of discharge
- Address glycemic management every day, and document it on your note
- Screen all patients for Protein/caloric malnutrition using ASPEN criteria, if positive, consult nutrition and document severe protein/caloric malnutrition in your notes
- Respond to all CDI request within 24 hrs
- Present in one sentence pts chief complaint, then after other disciplines present, present “today’s plan”.

Table of Content
Student responsibilities
➢ On Day 1 make sure you have access to Cerner and the student note writing section.
➢ You should be seeing 2-3 patients daily. You will co-manage them with an intern or senior.
➢ All patients seen and notes completed on Cerner by rounding time at 9:00 am. Send your notes to the senior on service, to Dr Ambs, or Myself when we are on service. If you’re not given feedback on your notes (sometimes we are busy or in my case I might forget) please do not be afraid to ask for feedback.
➢ Daily PEARLS. Present 3 PEARLS, based on your reading about patients on service to the rounding team during rounds daily, except Mondays. (for UCF M3 you’re excused on Wednesdays too)
➢ On rounds present your patient. Make presentation concise but complete include assessment with differential and a treatment plan.
➢ On the units if we are not seeing your patient, contact the nurse so we can round with them as a team.
➢ In the afternoon, you’ll be asked to go down to ED to perform admissions and follow up on patients.

Team responsibilities
➢ If taking care of a patient from our clinic send a message to PCP, at time of admission and at time of DC with diagnosis and follow up plan
➢ Round with nursing at least once a day
➢ Admissions completed before midnight, that have not been seen by an attending, will need a repeat H/P (note the next day. It is okay to copy, paste and edit the days previous H/P. Admissions after midnight can use power note (if admitted after 4 am, no note is required)
➢ Use Power order sets. Become familiar with them and use them whenever possible.
➢ All patients need a “clean” anticipated discharge bundle.

Clinics:
➢ Senior: clinics on Tuesday and Wednesday. (attending will act as the senior resident on these 2 days, but interns will take turns holding FMI phone)
➢ Interns: 1 intern on Monday, 1 intern on Friday

Transferring a patient to Florida Hospital Orlando (South)
➢ Use “wireless messenger”, send message to: IM Faculty on Call.
➢ Message should include: PT, Fin #, phone number, from WP FAM MED

General Flow of the day
➢ 7:00 Sign out from night float resident to FMI team
➢ 7:15 – 9:00: pre-rounds Depending on how many patients you have and how efficient you are rounding you may need to arrive prior to 7:00. Expectation are that you’re notes will be completed by 9:00 for attending rounds. All progress notes need to be done on Cerner power notes.
➢ 9:00 Multidisciplinary Rounds: At 2400s, followed by teaching rounds
➢ 11:30: Break for lunch and learn
➢ 1:00 complete rounds, follow up on patients, tests.
➢ 2-6:00: Unassigned admissions, exceptions Thursday during didactics
➢ 5:30: Sign-out from FMI team to night float resident.
➢ Admissions after 5:00 pm go to the night float resident. Admissions after 6:30 am go to the day team.
➢ Resources: The FMI Service website at: thefmiservice.webs.com Download My Little Book of Inpatient Tools. Has many tools you will need on inpatient medicine.
<table>
<thead>
<tr>
<th>Medical Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Coronary Syndrome</td>
</tr>
<tr>
<td>Acute Renal Failure</td>
</tr>
<tr>
<td>Alcohol and Drug Withdrawal</td>
</tr>
<tr>
<td>Asthma</td>
</tr>
<tr>
<td>Cardiac Arrhythmia</td>
</tr>
<tr>
<td>• A. Fib</td>
</tr>
<tr>
<td>• SVT</td>
</tr>
<tr>
<td>• Brady arrhythmias</td>
</tr>
<tr>
<td>Cellulitis</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease</td>
</tr>
<tr>
<td>Pneumonia</td>
</tr>
<tr>
<td>• Community-Acquired</td>
</tr>
<tr>
<td>• Hospital-Acquired</td>
</tr>
<tr>
<td>Heart Failure</td>
</tr>
<tr>
<td>Delirium and Dementia</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
</tr>
<tr>
<td>• Hospital glycemic management</td>
</tr>
<tr>
<td>• DKA</td>
</tr>
<tr>
<td>• HHS</td>
</tr>
<tr>
<td>Gastrointestinal Bleed</td>
</tr>
<tr>
<td>Pain Management</td>
</tr>
<tr>
<td>Perioperative Medicine</td>
</tr>
<tr>
<td>Sepsis Syndrome</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
</tr>
<tr>
<td>Venous Thromboembolism</td>
</tr>
<tr>
<td>• DVT</td>
</tr>
<tr>
<td>• PE</td>
</tr>
<tr>
<td>*Pancreatitis</td>
</tr>
<tr>
<td>* Liver disease</td>
</tr>
<tr>
<td>*Identifying patients support structure/barriers to care</td>
</tr>
<tr>
<td>* Perform a spiritual assessment and appropriately consults chaplaincy service</td>
</tr>
</tbody>
</table>
QUICK & EASY GUIDE FOR COOL CASE PRESENTATION

❖ POWER POINT SLIDES REQUIRED
❖ Discuss case with your attending
❖ Forward presentation to Dr Dumois
❖ Pick up computer at administration office

Main presenter: Senior resident from FMI and ICU

When: Wednesday, Time 12:00 - 100

Location: WPH Conference Room 2nd Floor or Miller Conference Room (Code 1967#)

Case Presentations

Note: when asking the audience start with students then interns and go around the room, that way no one is singled out and everyone can participate.

1. Chief complaint
2. HPI

Stop and ask the audience for any questions they may have regarding HPI. The following can be pertinent positives and negatives to save time.

3. Review of Systems
4. Past Medical History
5. Past Surgical History
6. Medications/Allergies
7. Social History (include smoking, alcohol drugs, work)
8. Family History

Stop and ask for differential diagnosis. If more than 1 presenting problem that cannot be explained by 1 diagnosis produce 2 lists. Try to have the audience link them together if possible

Probe the audience for knowledge: example so if you think this patient has HF what would you expect to find on your physical exam or so you mentioned meningitis what findings would you expect patient to have on exam.

9. Physical exam
   • VS
   • Pertinent positives
   • Pertinent negatives

Stop and ask the audience if one diagnosis is more possible than another now. Number the diagnosis in probable order.
Probe the audience for what work up they would like to obtain, and ask them what they would expect to find or rule out with that test. For example, if patient comes in with symptoms suggestive of a PE, and someone says let’s get a D dimer, you can ask them what is their pretest probability of it being positive (using wells criteria) for MI you can use the Timi, GRACE or HEART score for risk stratification). If the audience suspects meningitis and they want a LP ask them what they would expect to find if indeed it is bacterial meningitis vs. viral or aseptic meningitis.

10. Labs / exams

First give results of labs or test that the audience asked for. Engage the audience if they ask for a CXR pull up the CXR don’t give them the result, ask them what they see. If they ask for an ECG bring copies of pts ECG and have a student or fellow resident read it.

Later give results of other test that ED or you may have ordered.

Ask What’s your diagnosis can you eliminate from your differential which are still possible, what further testing would you want?

11. Give 3-4 learning Pearls from this case preferably in a POWER POINT Presentation. (things you want the audience to remember regarding this case. Can be regarding History, PE work up or management, can be as simple as “always include psychological etiology in your differential”)
General Information

Topics

*Click” on topics below to go directly to that page

- Admission vs Observation
- Adult History and Physical
- Admission Addendum for Geriatric Patients
- Patients leaving AMA
- APSO Progress note
- Billing: Quick Guide
- Caffeine Content
- Consulting a consultant
- Consulting Oral/Maxfacial surgery
- Community Medicine Clinic
- Compression Stockings
- Death Summary
- Discharge Summary Template
- DVT Prophylaxis (Padua)
- ICU Note
- HCAHPS
- Indication for Telemetry
- LACE Score
- Malnutrition
- Medication Resources
- Free Medications at Publix
- NSAIDs (Using NSAIDs safely)
- Pneumococcal vaccine for adults
- Pre-op Clearance Note
- Power Plans and Essential Elements
- Readmission Risk Scores
- Urine Drug Screen
- Whole Person Care / Spiritual Assessment
- Winter Park Hospital Important Numbers

Click to go to GoodRx
<table>
<thead>
<tr>
<th>BILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Admission</strong></td>
</tr>
</tbody>
</table>
| 99221 | Detailed Hx: Detailed Exam: Low MDM  
30 min  3 of 3 |
| 99222 | Comp Hx: Comp Exam: Mod MDM  
50 min  3 of 3 |
| 99223 | Comp Hx: Comp Exam: High MDM  
70 min  3 of 3 |
| **Subsequent Visit** |
| 99231 | Pt stable, recovering or improving------15 min  
PF Hx: PF Exam: Low MDM   2 of 3 |
| 99232 | Pt responding inadequately to therapy or has developed a minor complication-----25 min  
Exp PF Hx & Ex: Mod MDM   2 of 3 |
| 99233 | Pt unstable or has developed a significant complication or a significant new problem------35 min  
Detail Hx & Ex/High MDM   2 of 3 |
| **Discharge** |
| 99238 | D/C Less Than 30 Minutes |
| 99239 | D/C More Than 30 Min |
| **Observation Admit & D/C Same Day** |
| 99234 | Low level  
40 min |
| 99235 | Mid level  
50 min |
| 99236 | High Level  
55 min |
<p>| <strong>Obs Discharge</strong> |
| 99217 | |</p>
<table>
<thead>
<tr>
<th>Observation Admission</th>
<th>99218</th>
<th>Detailed Hx &amp; Exam: Low MDM 30 min, 3 of 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>99219</td>
<td>Comp Hx &amp; Exam: Mod MDM 50 min, 3 of 3</td>
</tr>
<tr>
<td></td>
<td>99220</td>
<td>Comp Hx &amp; Exam: High Comp MDM 70 min, 3 of 3</td>
</tr>
<tr>
<td>Observation follow-up</td>
<td>99224</td>
<td>Low Level 15 min</td>
</tr>
<tr>
<td></td>
<td>99225</td>
<td>Mid Level 25 min</td>
</tr>
<tr>
<td></td>
<td>99226</td>
<td>High Level 35 min</td>
</tr>
<tr>
<td>Critical care</td>
<td>99291</td>
<td>Initial 30 min</td>
</tr>
<tr>
<td></td>
<td>99292</td>
<td>add on</td>
</tr>
<tr>
<td>Smoking Cessation</td>
<td>99406</td>
<td>counseling 3-10 min</td>
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<tr>
<td></td>
<td>99407</td>
<td>counseling &gt; 10 min</td>
</tr>
<tr>
<td>Advance care planning</td>
<td>99497</td>
<td>explanation and discussion of advance directives Initial 30 min, minimal 15 min</td>
</tr>
<tr>
<td></td>
<td>99498</td>
<td>add on, over 30 min</td>
</tr>
</tbody>
</table>

Billing tool for Medical decision-making
Click on toolbox
FLORIDA HOSPITAL WINTER PARK IMPORTANT NUMBERS

<table>
<thead>
<tr>
<th>Nursing Unit</th>
<th>Patient Rooms</th>
<th>Phone Number</th>
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<th>Printer</th>
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<tr>
<td>East 2</td>
<td>2201-2205</td>
<td>7811</td>
<td>7820</td>
<td>IWG4</td>
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<tr>
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<td>2207-2218</td>
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<td>ED</td>
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<td>7322</td>
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<td>ICU</td>
<td>2251-2268</td>
<td>7435</td>
<td>7608</td>
<td>NGO3</td>
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<tr>
<td>MPCU</td>
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<td>7604</td>
<td>IAV9</td>
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<td>24 East</td>
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<td>MSU</td>
<td>2601-2623</td>
<td>7185</td>
<td>7602</td>
<td>HK57</td>
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<tr>
<td>Maternal Baby</td>
<td>3101-3136</td>
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<td>Ortho</td>
<td>2801-2823</td>
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<td>6054</td>
<td>HUN7</td>
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<td>Rehab</td>
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<td>SE 1</td>
<td>1801-1821</td>
<td>7940</td>
<td>7945</td>
<td>NGZ5</td>
</tr>
<tr>
<td>CDU / SW 1</td>
<td>1601-1610</td>
<td>7106</td>
<td>7108</td>
<td>IBQ0</td>
</tr>
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<td>SPCU</td>
<td>3401-3425</td>
<td>7190</td>
<td>7042</td>
<td>HK83</td>
</tr>
</tbody>
</table>

CENTRE for FAMILY MEDICINE

| Office Number       | 407 646-7070 |
| Back Number         | Coming Soon  |

FLORIDA HOSPITAL COMMUNITY MEDICINE CLINIC

Office: 407 303-7298  Fax: 407 303-2886

❖ Scheduling Patients at the New Florida Hospital Community Medicine Clinic for Uninsured from Winter Park Hospital and Florida Hospital Orlando

➢ Ask the Care Manager to call The Care Coordination Center at 407 200-2020

➢ The Care Coordination Center scheduler will contact the Community Medicine Clinic to secure the necessary appointment.

➢ The scheduler will then call the patient and provide them with their appointment date and time.
New 2014: Medicare requires a 2 + midnights stay to approve admission status. Need to document: Consequence of not admitting patient, estimated duration of stay and deposition.

According to Interqual (Medical Necessity criteria utilized by CMS), Observation should be considered when the patient is hemodynamically stable.

The admission into observation or inpatient status is based on the patient’s severity of illness and the intensity of service provided. A patient in observation status should not be converted to an inpatient at the end of the 23-hour timeframe unless the patient’s acuity and treatment meet inpatient.

Commercial payers will only authorize observation up to 23 hours.

Below Is A Partial List That Generally Support An Inpatient Admission

- Persisting chest pain at the time of admission or recurrent episodes of chest pain during the hospital stay
- Persisting significant shortness of breath or severe wheezing at the time of admission or recurring during the hospital stay
- Persisting acute neurological symptoms at the time of admission or recurring during the hospital stay
- Persisting acute mental status changes at the time of admission or recurring during the hospital stay
- Unstable vital signs that did not respond promptly to ED treatment or that recur during the hospital stay
- Persisting or uncontrolled bleeding
- Multisystem symptoms or physical findings indicative of multiple simultaneous active diagnoses/problems
- Significant symptoms or physical findings where the diagnosis is unknown
- Multiple active comorbidities that require significant management

Findings:

- Elevated troponin level
- New EKG changes
- CO2 retention
- Ventricular arrhythmias or symptomatic atrial fibrillation
- Hypoxemia requiring an FiO2 >4L oxygen by nasal cannula
- Major electrolyte abnormalities requiring urgent intervention
- Recurrent or persistent hypoglycemia despite treatment
Interventions:
- IV drips of vasoactive medications (nitroglycerin, nitroprusside, dopamine)
- Recurrent intravenous medications to control blood pressure or pulse
- Intravenous insulin drip
- BiPAP to support ventilation
- Endotracheal intubation
- External pacemaker
- Central or arterial line placement
- Nasogastric tubes
- Continuous bladder irrigation
- Continuous oxygen saturation monitoring

According to Medicare the following are indications for an extended Observation (up to 48 hours) and generally lack medical necessity for inpatient admission unless specific complications or co-morbidities exist
- Rule Out Myocardial Infarction / Chest Pain
- Asthma or COPD
- Simple Pneumonia
- Congestive Heart Failure
- Syncope or decreased responsiveness
- Atrial Arrhythmias
- Gastroenteritis/Esophagitis
- Renal Colic/UTI
- Dialysis
- Lower back pain
- Fracture, Sprain, stain of upper are or lower leg

Additional diagnosis appropriate for an observation stay according to commercial payers utilizing Milliman & Robertson criteria include the following
- Diabetes
- Rule Out CVA
- Hypertension
- Dehydration

Adapted from Dr Keehbauch’s When Should a Patient be Admitted Information Sheet

**POWER PLANS and ESSENTIAL ELEMENTS**

- Use when admitting patients at Winter Park Memorial Hospital. With **Acute MI, COPD, Pneumonia, Stroke, Sepsis and Heart Failure**
- PowerPlan use is correlated with:
  - Decreased Mortality
  - Decreased LOS
  - Decreased Cost of Care

### Acute MI

**AMI ESSENTIAL ELEMENTS**
- Anticoagulants
- Aspirin
- Beta Blockers
- Cardiac Monitor
- ECG
- Nitrates
- Pain Control
- Statins
- Thienopyridines
- Troponin

**AMI POWERPLANS**
- Acute MI STEMI Thrombolysis Tenecteplase (TNKase)
- Admission Acute Myocardial Infarction (AMI) EBP 959-1563
- Admission Chest Pain R/O MI 959-1362
- Admission Heart Failure EBP 959-1350
- Chest Pain Observation EBP 959-1608

### COPD

**COPD ESSENTIAL ELEMENTS**
- Antibiotics
- Bronchodilators
- Cardiac Monitor
- ECG
- Oxygen Administration (Therapy)
- Oxygen Assessment
- Steroids

**COPD POWERPLANS**
- Asthma
- Admission Chest Pain R/O MI 959-1362
- Admission Heart Failure EBP 959-1350
- Admission Pneumonia - CAP EBP 959-1370B
- COPD
- Observation CHF EBP 959-1617
- Pneumonia, CAP EBP 959-1370B
- Pneumonia, HAP/HCAP and VAP Antimicrobial
- Chest Pain Observation EBP 959-1608

### Heart Failure

**HEART FAILURE ESSENTIAL ELEMENTS**
- ACE/ARB
- Beta Blockers
- BNP
- Chest Xray
- ECG
- Diuretics
- Troponin
- 2D Echo

**HEART FAILURE POWERPLANS**
- COPD
- Admission Chest Pain R/O MI 959-1362
- Admission Heart Failure EBP 959-1350
- Admission Pneumonia - CAP EBP 959-1370B
- Chest Pain Observation EBP 959-1608
- Dizziness/Near Syncope & Syncope
- Chest Pain Observation EBP 959-1608
- Observation CHF EBP 959-1617
- Pneumonia, CAP EBP 959-1370B
- Admission Acute Myocardial Infarction (AMI) EBP 959-1563
- Atrial Fibrillation
### Pneumonia

**PNEUMONIA POWERPLANS**
- Admission Chest Pain R/O MI 959-1362
- Admission Heart Failure EBP 959-1350
- COPD
- Pneumonia - CAP EBP 959-1370B
- Asthma
- Chest Pain Observation EBP 959-1608
- Pneumonia, CAP ICU Admit Antimicrobial
- Pneumonia, CAP Non - ICU Admit Antimicrobial
- Pneumonia, Suspected Pseudomonas Antimicrobial
- Ventilator Management 959-1923

**PNEUMONIA ESSENTIAL ELEMENTS**
- Antibiotics
- Blood Culture
- Chest Xray
- Lactic Acid
- Oxygen Assessment
- Urinary Antigen Test

### Sepsis

**SEPSIS POWERPLANS**
- Admission ICU Severe Sepsis 959-1937
- Admission Pneumonia - CAP EBP 959-1370B
- Dizziness/Near Syncope & Syncope
- DKA and HHS with insulin infusion, Adult 959-3013
- Meningitis
- Pain, Agitation, and Delirium 959-3211
- Pneumonia, HAP/HCAP and VAP Antimicrobial
- Skin and Skin Structure Infections
- COPD

**SEPSIS ESSENTIAL ELEMENTS**
- Antibiotics
- Blood Culture
- Fluids
- Lactic Acid
- Vasopressors

### Stroke

**STROKE POWERPLANS**
- Admission Brain Attack (Ischemic Stroke) EBP 959-1333C
- Admission Brain Attack Post IV Alteplase Management EBP 959-1333F
- Admission Hemorrhagic Stroke EBP 959-2018B
- Admission Neuro Critical Care 959-3154
- Admission Trans Ischemic Attack (TIA) EBP 959-1333B
- Brain Attack Inpatient Code Gray EBP 959-3189
- Brain Attack IV Alteplase Administration EBP 959-1333E
- Catastrophic Brain Injury 959-1249
- Dizziness/Vertigo
- Admission Chest Pain R/O MI 959-1362
- Admission Heart Failure EBP 959-1350
- Admission Seizure Monitoring Unit 959-1902
- Chest Pain Observation EBP 959-1608
- Dizziness/Near Syncope & Syncope
- Seizure

**STROKE ESSENTIAL ELEMENTS**
- Anticoag Studies
- Aspirin
- Brain Imaging
- ECG
- Glucose POC
- Neuro Assess
- rtPA
- Swallow Study
HOW TO IMPROVE YOUR HCAHPS SCORE

HCAHPS = Hospital Consumer Assessment of Healthcare Providers & Systems. It is a government survey for measuring patient satisfaction at hospitals.

Why does it matter?
CMS Centers for Medicare and Medicaid Services intends to use the HCAHPS patient experience data to determine the level of funds it will reimburse hospitals for services they provide to their Medicare patients. Also many Hospitalist groups have incorporated HCAHPS scores into their Bonus calculations.

What can you do to improve your patient satisfaction scores
❖ Understand the process and what questions are asked.
   ❖ Hospitals provide each eligible inpatient (those over 18 years of age who are not receiving psychiatry, rehabilitation and skilled nursing services) with a survey of 27 questions relating to how often the patient perceived something to have occurred during their Hospital stay.
   ❖ The 3 questions pertaining to physicians are:
     • During this hospital stay, how often did doctors treat you with courtesy and respect?
     • During this hospital stay, how often did doctors listen carefully to you?
     • During this hospital stay, how often did doctors explain things in a way you could understand?
   ❖ Questions are answered on a scale of always, usually, sometimes and never.
   ❖ The results represent the percentage of patients who responded with “always.”
❖ Introduce yourself clearly to the patient. Explain your role in their care. If possible give patients a detailed, photo brochure identifying the physicians in your group. The goal is to help patients recognize which physician are treating them. If you are consulting other physician let the patient know their name and why you’re consulting them.
❖ Communication and active listening are vital to a good patient experience
   ❖ Dr. Harrington a Hospitalist at IN Compass developed a mnemonic physicians can use to remind themselves of the key elements of a successful patient encounter: “PCARE”
     Preparation: Prepare for a patient visit by familiarizing yourself with labs and test results, consultant recommendation. Speak with patients nurse for updates on patient condition.
     Communication: Communicate in laypersons’ terms that the patient can understand
     Appearance: Appear presentable and sit down with the patient during every visit. Studies have demonstrated that sitting down with the patient improve satisfaction rates. Patients perceive that their doctor spent more time with them, and that they listened to them.
Relationship: Focus on relationships with the patient, family members and other hospital staff

Expectations: Manage patient expectations. Invite them to become part of the decision making team. Educate them regarding what test you are ordering, results, condition

❖ One strategy is to use the “Automobile Showroom Approach” to satisfaction surveys.
  • “Before a patient is discharged, the doctor should explain to the patient that the patient may be asked to fill out a satisfaction survey.”
  • Doctors should not be afraid to come right out and ask the patient to return the survey. (without soliciting a high score)
  • “If a patient expresses dissatisfaction, the doctor should ask whether there’s anything that would help improve the experience and remedy the situation if possible.”

❖ Conclude your encounter with an open-ended question.
  Examples: Do you have any questions?
    Do you understand what I or Dr XXX (specialist) explained to you or why we are getting this test or what the result of the test was?
    Is there something I (or the team) can get for you?

❖ Institute follow-up calls to patients to make sure the transition home is smooth. Utilize a discharge coordinator that can follow up with the patient 2-3 days post hospitalization to see if pt had any difficulty w/Rx or scheduling follow up. She / he can also ask pt what was their hospital experience like and re-enforce to fill out survey.

Some interesting points raised at a recent Society of Hospital Medicine (SHM) session by Winthrop Whitcomb and Nancy Mihevc on patient satisfaction. To improve satisfaction scores:

Barbara Kirchheimer. Do hospitalists get a bad rap from satisfaction surveys? Physicians share strategies that can improve your scores. Today’s Hospitalist December 2008

❖ Physician / Nurse rounding: Improves communication between the treatment team, and seems to have improved our HCAHPS at Winter Park Hospital
WHOLE PERSON CARE / SPIRITUAL ASSESSMENT

➢ Benefits
- Build trust and rapport
- Strengthens the physician-patient relationship
- Improved adherence to physician-recommended lifestyle changes or compliance with therapeutic recommendations
- May help patients recognize spiritual or emotional challenges that are affecting their physical and mental health
- May let them tap into an effective source of healing or coping

❖ Joint Commission: now requires a patient spiritual assessment upon hospital admission

➢ BMSEST and 3H Model (developed by Gowri Anandarajah)
- BMSEST = body, mind, spirit, environment, social, transcendent
- 3 H model = head, heart, hands

➢ Obtain a psychosocial family history
- Living situation, are they married, occupation, if retire what was their occupation
- Does patient live alone,
- Do they have good family or community support
- Ask about any current stressors, monetary restraints. Any perceived barrier to treatment or follow up treatment

Developed in conjunction with Dr. Serina Gui, and part of Whole Person Care Rounds at Florida Hospital South and Winter Park.

➢ Spirituality Assessment Tools

FICA Spiritual History Tool

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faith and belief</td>
<td>Do you have spiritual beliefs that help you cope with stress?</td>
</tr>
<tr>
<td>Importance</td>
<td>Have your beliefs influenced how you take care of yourself in this illness?</td>
</tr>
<tr>
<td>Community</td>
<td>Are you part of a spiritual or religious community?</td>
</tr>
<tr>
<td>Address in care</td>
<td>How would you like me to address these issues in your health care?</td>
</tr>
</tbody>
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### HOPE Questions for Spiritual Assessment

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H:</strong> sources of hope</td>
<td>What are your sources of hope, strength, comfort, peace?</td>
</tr>
<tr>
<td><strong>O:</strong> organized religion</td>
<td>Are you part of a religious or spiritual community? Does it help you? How?</td>
</tr>
<tr>
<td><strong>P:</strong> personal spirituality and practices</td>
<td>Do you have personal spiritual beliefs?</td>
</tr>
<tr>
<td><strong>E:</strong> effects on medical care and end-of-life issues</td>
<td>Are there any specific practices or restrictions I should know about in providing your medical care?</td>
</tr>
</tbody>
</table>

*Spirituality and medical practice: using the HOPE questions as a practical tool for spiritual assessment. Am Fam Physician. 2001;63(1):87*

### The Open Invite Mnemonic

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample questions</th>
</tr>
</thead>
</table>
| **Open** (i.e., open the door to conversation) | May I ask your faith background?  
Do you have a spiritual or faith preference?  
What helps you through hard times? |
| **Invite** (i.e., invite the patient to discuss spiritual needs) | Do you feel that your spiritual health is affecting your physical health?  
Does your spirituality impact the health decisions you make?  
Is there a way in which you would like for me to account for your spirituality in your health care?  
Is there a way in which I or another member of the medical team can provide you with support?  
Are there resources in your faith community that you would like for me to help mobilize on your behalf? |


- 77% of pts feel their doctors should know about their spiritual belief
- 48% want their doctors to pray with them
- After performing spiritual assessment consider consulting the hospital chaplain or the pts spiritual leader (Imam, Minister, Priest or Rabbi) to address patients spiritual need

*Presented by Dr Gui, behaviorist, during our Whole Patient Care Rounds on the FMI service*
ADULT ADMISSION: Full History and Physical Form

ADULT ADMIT

❖ PCP:
❖ Date / Time Seen
❖ Attending MD:
❖ Historian: ___patient ___family ___translator

❖ Chief Complaint: (patient’s words)
  • Time of onset:
  • Age:

❖ HPI
  • Location
  • Quality
  • Severity
  • Duration
  • Timing
  • Context
  • Modifying factors
  • Associated signs and symptoms
  • Similar symptoms previously
  • Recently seen / treated by doctor

❖ Past Medical History: high blood pressure, diabetes, NIDDM, IDDM, high cholesterol, heart disease, angina, CHF, MI, lung disease, asthma, COPD, neuro disease, seizures, CVA, thyroid disease, hypo, hyper, GI disease, reflux, ulcer, hepatitis, GU disease, nephropathy, cancer, HIV/AIDS, Previous Hospitalizations.

❖ Past Surgical History: None, appendectomy, cholecystectomy, CABG x angioplasty, splenectomy, BTL, C/S, hysterectomy, oophorectomy (R / L), other:

❖ Current Medications:

❖ Allergies:

A brief HPI includes documentation of one to three HPI elements.

An extended HPI: Should describe at least four elements of the present HPI or the status of at least three chronic or inactive conditions.
**Family History:**

Past Medical History, Family History and Social History all 3 are need for a level 99223. If pt is unresponsive document that History was unattainable because patient unresponsive and document where the information was gathered from.

**Social History:** occupation, tobacco, __ppd for ___yrs, alcohol, sexual hx, drugs

**HOPE Questions for Spiritual Assessment**

**Review of Systems:** Need 10 + systems for level 99223

ROS, Denied (circle positives)

<table>
<thead>
<tr>
<th>CONSTITUTIONAL</th>
<th>GI</th>
<th>GU</th>
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</thead>
<tbody>
<tr>
<td>Fever, weight loss</td>
<td>abdominal pain, vomiting, diarrhea, hematemesis, BRBPR, melena</td>
<td>Dysuria, hematuria</td>
</tr>
<tr>
<td>EYES</td>
<td>GI</td>
<td>GU</td>
</tr>
<tr>
<td>acute vision changes, eye pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENMT</td>
<td>GYN:</td>
<td>MUSCULOSKELETAL</td>
</tr>
<tr>
<td>hearing changes, difficulty swallowing</td>
<td>G____, P____, LMP____</td>
<td>joint pain, swelling</td>
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<tr>
<td>EYES</td>
<td>SKIN</td>
<td>NEURO</td>
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<tr>
<td></td>
<td>Rash, lesion</td>
<td>Seizures, blackout, numbness, focal weakness</td>
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<tr>
<td>ENMT</td>
<td>GYN:</td>
<td>ENDO</td>
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<tr>
<td></td>
<td></td>
<td>Polyuria, polydipsia</td>
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<tr>
<td>ENMT</td>
<td>ENDO</td>
<td>HEME</td>
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<tr>
<td></td>
<td></td>
<td>Anemia, blood clots, easy bleeding</td>
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<tr>
<td>ENMT</td>
<td>HEME</td>
<td>PSYCH</td>
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<td></td>
<td>Hallucination, depression</td>
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<tr>
<th>CARDIAC</th>
<th>HEME</th>
<th>PSYCH</th>
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</thead>
<tbody>
<tr>
<td>chest pain, edema, PND, orthopnea</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>RESPIRATORY</th>
<th>ALLERGY</th>
<th>VITALS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea, cough, wheeze</td>
<td>Hives, allergic rxn</td>
<td>T____ P____ R____ BP_____/______ SaO2_______</td>
</tr>
</tbody>
</table>

**Physical Exam** Weight_________
| **CONSTITUTIONAL:** | Distress: No Acute, Mild, Moderate, Severe  
Well Nourished, Hydrated, Cachectic, Dehydrated |
|----------------------|-------------------------------------------------|
| **EYES:** | Conjunctiva Clear, PERRL, EOMI, No Ptosis, Scleral Icterus /Pale Conjunctiva  
Pupil Asymmetry, Retinal Hemorrhage |
| **EARS/NOSE/THROAT:** | External Ears/Nose Normal, Canals Clear/TMs Intact  
Oral Mucosa Normal, Purulent Nasal Discharge, Pharyngeal Exudate, Cerumen Impaction (R / L) |
| **NECK:** | Supple W/O Meningismus, Trachea Midline, No Mass, Thyromegaly.  
Lymphadenopathy (R / L) |
| **RESPIRATORY:** | Lungs CTA Bilaterally, Unlabored Breathing, Good Air Movmnt  
Decreased Breath Sounds, Rales, Rhonchi, Wheezing |
| **CARDIOVASCULAR:** | Regular Rate And Rhythm, No Murmur, No Gallop or Rub, PMI @ 5th ICS-MCL, No JVD, No Carotid Bruit, Radial & DP Pulses Normal, No Edema, Irregularly Irregular Rhythm, Brady or Tachycardia, Murmur Systolic or Diastolic; grade___/6, Extrasystoles, PMI Displaced Laterally, JVD Present, Carotid Bruit (R / L), Decreased Pulse(S), Edema Present |
| **BREASTS:** | *deferred / refused by patient*  
Symmetric w/o Discharge, No Mass or Palp Nodes, Mass |
| **ABDOMEN/GI:** | Normoactive Bowel Sounds, Non-Tender, No Rebound,  
No Hepatosplenomegaly, Abnl Bowel Sounds, Tenderness, Guarding,  
Hepatomegaly/Splenomegaly/Mass |
| **RECTAL:** | *rectal deferred / refused*  
Normal Rectal Tone, Heme - Stool, Heme + Stool Black/Bloody Stool |
| **MALE GU:** | *deferred / refused by patient*  
Penis w/o Lesion, Testes Without Mass, Prostate Nontender, Hernia,  
Scrotal Mass, Prostate Tender / Mass |
| **FEMALE GU:** | *deferred / refused by patient*  
Normal External Genitalia, Hernia, Lesion, Uterus Normal Size,  
Uterine/Adnexal Mass, No Adnexal Mass, Adnexal Tenderness (R / L),  
No Adnexal Tenderness |
<table>
<thead>
<tr>
<th><strong>LYMPHATICS:</strong></th>
<th>No Cervical / Axillary Nodes, No Inguinal Nodes, Mild Shotty Cervical Lymphadenopathy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MUSCULOSKELETAL:</strong></td>
<td>full ROM, no joint swelling, no joint erythema, joint Erythema, calf tenderness, limited ROM, joint swelling, gait / coordination normal,</td>
</tr>
<tr>
<td><strong>SKIN:</strong></td>
<td>warm / dry, no rash or lesion, no large nevi or ulcers, cool, rash, ulcer, lesion</td>
</tr>
<tr>
<td><strong>NEURO:</strong></td>
<td>CN II-XII normal, sensation normal, DTR 2+ bilaterally, CN abnl, weakness, numbness DTR abnl</td>
</tr>
<tr>
<td><strong>PSYCH:</strong></td>
<td>alert, oriented x3, mood / affect appropriate, memory intact, judgment / insight good, obtunded, disoriented, affect abnl, memory loss</td>
</tr>
</tbody>
</table>

- **EKG, Imaging , Labs**
- **Impression / Plan**
  - Differential Diagnosis.
    - For differential list, I recommend using a mobile app like DIAGNOSAURUS

          ![DIAGNOSAURUS](image)  
  
  Click above to go to website

- Document your thought process and planned work up
- Document: any chart review, discussion with other health care workers concerning the patient, review of Imaging, ECG, Labs. This documentation is needed to support a higher level of medical decision making.
- Document patients **DVT Risk use PADUA Risk Score.**
- If no DVT prophylaxis document why (Padua less than 4, GI bleed, already on anticoagulation, ect)
ADMISSION ADDENDUM for GERIATRIC PATIENTS

❖ Creatinine Clearance
Online calculator at mdc-calculator.com

\[
\text{CrCl} = \frac{[(140 - \text{age}) \times \text{IDW}]}{(\text{SCr} \times 72)} \times 0.85 \text{ if female}
\]

➢ If less than or equal to 30 ➔ consider pharmacology consultation/evaluation

❖ Medications
➢ Are any medications on the Beer’s List?

Click here for Beers Criteria Medication List
➢ If so, list them and consider substitution or discontinuation

❖ Mentation*
➢ Ask the patient to remember the following Items:
   1. Penny
   2. Apple
   3. House
➢ Ask the patient to repeat this back to you.

❖ Mobility and Gait
➢ Has the patient fallen to the ground during the last 12 months
➢ Ask: Can you rise and walk from a chair without help and walk 10 ft in 15 sec
➢ If positive fall history or if needs assistance ➔ consider PT/OT consultation to evaluate and treat gait + home eval for fall risks (ex: rugs, lighting, cords etc).

❖ Personal Items
➢ Do you use or are you missing any assistive devices? Such as glasses, dentures, hearing aids.
   • List them:
➢ If you do not have them w/ you, can someone bring them to you?
   • Name:  Contact:
❖ **Advanced Directives**
  ➢ Do you have a “Living Will” an “Advanced Directive” or a legally designated “Durable Power of Attorney” in case you become unable to make your own decisions?
    • If so, do you have a copy?
    • If not, would you like to make/designate one?

❖ **Mentation**
  ➢ Ask the patient; What were the 3 items I asked you to remember?
    • Penny
    • Apple
    • House
    Score: ______ out of 3
  ➢ Consider MMSE/Dementia work up / Geri Assessment if fails to recall 1 item.
  ➢ Consider Psych for capacity evaluation if 0-1/3.

❖ **Social/ADLs**
  ➢ Does patient have a person who can help them if they become ill?
  ➢ Does patient do own shopping, money mgmt, cooking, and cleaning?
  ➢ If no to either, consult Case Mgt and consider full Geri Assessment.

❖ **Nutrition**
  ➢ Has patient lost 10 or more lbs in the last 6 months or is patient underweight?
  ➢ If yes, Pre-Albunin level, Case Mgt, Geri Assessment and Nutritional Consult.

❖ **Continence**
  ➢ **Men:** Do you get up to urinate more than twice during the night?
  ➢ **Women:** Do you ever have unexpected wetness?
  ➢ If yes, consider Urology consultation, PSA, or Pelvic PT. Medication effect?

❖ **Depression**
  ❖ Has patient felt sad or depressed in the last few weeks?
  ➢ If yes, consider full Yesavage Depression Scoring
  ➢ Geri Assessment or Psych Consult.

❖ **Wounds**
  ❖ Does the patient have, or is at risk for any type of wound?
  ➢ If yes, Document stage of wound [click here](#) to review stages
    • Wound Care and Minimize risks (2hr turns).

Adapted from ADMISSION ADDENDUM FOR GERIATRIC INPATIENT TEAM
Florida Hospital Family Medicine Residency Program and Geriatric Fellowship
The most important part of the note in regards to caring for the patient is the assessment and plan. The APSO format (assessment/plan first followed by subjective and objective data) accomplishes this.

APSO Progress Note

- The A/P should have a daily follow up of patient’s condition and any new complaints or new lab abnormality with plan for each condition.
- Example. If patient was admitted with pneumonia but also has diabetes, hypokalemia, HTN, and GERD. The A/P Would look like this (speculating he is getting better)

<table>
<thead>
<tr>
<th>A/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CAP: improving off of oxygen, afebrile continue antibiotics</td>
</tr>
<tr>
<td>2. DM II: stable, BG reviewed. No changes to glycemic management</td>
</tr>
<tr>
<td>3. Hypokalemia: resolved K 4.2 today</td>
</tr>
<tr>
<td>4. HTN: Bp has been poorly controlled since admission will add low dose ACE</td>
</tr>
<tr>
<td>5. GERD: stable, no complaints continue H2 blocker</td>
</tr>
</tbody>
</table>

Limit Subjective and objective finding to today’s finding. What’s pt CC for the day not when he came in. We can and should ask how he is doing from his original CC but also ask if any new complaints are occurring. Depending on CC for the day adjust our ROS and PE

In Summary. All follow up notes will include

- A/P: with update on patient’s conditions, any new complaints or new lab abnormality with plan for each condition.
- S: Chief complaint for the day and follow up on reason for admission
  - HPI: 4 or more elements or documentation of the status of 3 chronic medical conditions
  - ROS: 2-9 systems
  - PMFSH: None needed
  - Hospital course (optional)
- O: PE: Using 1997 guidelines). A general multi-system exam should include at least six organ systems or body areas. For each system/area selected, performance and documentation of at least two elements is expected

Template available on CERNER

On CERNER search for patient CRAYOLA, GREEN. FIN No. 20635382. Look under PowerNote for template under title CFM Service 1 PN (APSO)
FH TRANSITION SUMMARY TEMPLATE (Discharge Summary)

- New DC summary template at WPMH
- FH Transition Summary
  - Primary Care Physician
  - Date of Admission
  - Date of Discharge
  - Lace Score/Re-Admission Risk
  - Discharge Plan
    - Pending Results
    - Hospital Findings Requiring Additional Outpatient Evaluation
    - Follow up Plan (appts with PCP, specialist)
    - Medication Reconciliation
    - Durable medical Equipment
    - Ancillary Medical Services
  - Discharge Diagnosis
  - Procedures
  - Consultants
  - Brief Description of Hospitalization (problem focused)
  - Disposition
  - Code Status

COMMUNICATING WITH CONSULTANTS

❖ Calling the Consultant
  - If you know the consultant is “on service” the personal phone numbers are in Cerner. If you suspect that the consultant might be on vacation or otherwise not clinically available. Call the office number, also available on Cerner, to find out if the desired consultant is available, and if not, who is taking consultations.

❖ Presentation skills
  - Keep it brief and specific. Remember sometimes consultants are like children and have a short attention span.
  - Provide the patients name, room #, reason for call.
  - Example: “Dr Jones I’m calling you regarding Ms Smith in room1816, a 72 yr old female who came 2 days ago with a GI bleed and now has an upper extremity DVT. I would like to consult you for anticoagulation recommendations. Thank you”
CONSULTING A SPECIALIST AT WPMH
❖ Check with your attending or senior prior to consulting a specialist
❖ Check the CFM preferred teaching preceptors list
  ➢ STAT Consultation – immediate response for dx or tx of pt with serious condition
    • Requesting physician must personally discuss the request with consultant
    • Consulted physician must respond by telephone within 15 min
  ➢ Physician to Physician Consultation
    • Personal discussion between requesting physician and consultant
    • Response time within 2 hours of phone consultation
  ➢ Routine Consultation – request does not require an immediate response
    • Not require to personally discuss with consultant.
    • Response time within 24 hrs.
  ➢ Courtesy Consultation- when attending wants to notify consultant that a patient with previously established phys/pt relationship is hospitalized
    • Consultant not obligated to see patient

CONSULTING ORAL AND MAXILLOFACIAL SURGERY at WINTER PARK
❖ The Department of Oral and Maxillofacial Surgery has established some guidelines to assist when deciding when to place a consult to one of their members:
❖ Criteria requiring a physician to physician call for consult in the Emergency Department:

<table>
<thead>
<tr>
<th>Yes/No</th>
<th>*Yes answers require physician to physician call for consult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral/surgical facial fracture</td>
<td></td>
</tr>
<tr>
<td>Infections that require admission:</td>
<td></td>
</tr>
<tr>
<td>Fever&gt;101°</td>
<td></td>
</tr>
<tr>
<td>Leukocytosis</td>
<td></td>
</tr>
<tr>
<td>Appreciable swelling (must be able to quantify the degree of swelling)</td>
<td></td>
</tr>
<tr>
<td>Limited opening of the mouth (less than 2 finger breadths)</td>
<td></td>
</tr>
<tr>
<td>Airway compromise</td>
<td></td>
</tr>
</tbody>
</table>

* Due to the critical time nature of avulsed teeth, any tooth that has been out of the mouth for more than 30 minutes cannot be satisfactorily re-implanted.
Criteria requiring a physician to physician call for consult in the Hospital:

<table>
<thead>
<tr>
<th>Yes/No</th>
<th>*Yes answers require physician to physician call for consult</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infections that require admission:</td>
</tr>
<tr>
<td></td>
<td>Fever &gt;101°</td>
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<td></td>
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<td></td>
<td>Limited opening of the mouth (less than 2 finger breadths)</td>
</tr>
<tr>
<td></td>
<td>Airway compromise</td>
</tr>
<tr>
<td></td>
<td>Pre –valve replacement/transplant dental clearance</td>
</tr>
<tr>
<td></td>
<td>Clear odontogenic infections/abscess accumulation</td>
</tr>
</tbody>
</table>

The following items do not constitute proper consultation of the Oral and Maxillofacial Surgery Service:

- Tooth Pain
- Oral hygiene checks
- Cavities
- Chipped teeth
- Routine extractions

For patients requiring routine dental follow up for non-emergent issues that do not warrant an OMS consult, please review the list of options for free dental clinics with the Care Management Team on the unit.

INDICATIONS and DURATION for TELEMETRY

<table>
<thead>
<tr>
<th>24 hours</th>
<th>48 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest pain</td>
<td>Acute Stroke</td>
</tr>
<tr>
<td>Syncope NOS</td>
<td>CHF</td>
</tr>
<tr>
<td>TIA</td>
<td>Acute MI</td>
</tr>
<tr>
<td>Uncomplicated arrhythmia</td>
<td>Complex major surgery</td>
</tr>
<tr>
<td>Major surgery</td>
<td>Syncope suspect arrhythmia</td>
</tr>
<tr>
<td>Non-urgent PCI</td>
<td>Thoracic Surgery</td>
</tr>
<tr>
<td>AICD or pacer placement</td>
<td></td>
</tr>
</tbody>
</table>

The rating system devised by the American College of Cardiology Emergency Cardiac Care Committee

- **Class I**: Cardiac monitoring is indicated in most, if not all, patients in this group.
- **Class II**: Cardiac monitoring may be of benefit in some patients but is not considered essential for all patients.
- **Class III**: Cardiac monitoring is not indicated because a patient’s risk of a serious event is so low that monitoring has no therapeutic benefit.

### 48 Hour Indications

Renewal may be appropriate for certain indications as noted below.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Source of Guideline Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Coronary Syndrome Requiring Cardiology Input</td>
<td>Class I AHA Recommendation</td>
</tr>
<tr>
<td>Arrhythmia with Unstable Hemodynamics</td>
<td>Class I AHA Recommendation Indicated until arrhythmia resolves or controlled</td>
</tr>
<tr>
<td>Atrial Tachyarrhythmia- Uncontrolled</td>
<td>Class I AHA Recommendation</td>
</tr>
<tr>
<td>Atrio-ventricular Block- 2nd or 3rd Degree Only</td>
<td>Class I AHA Recommendation Mobitz type II block, advanced second degree (2:1 or higher), or complete AV block (AHA Guidelines).</td>
</tr>
<tr>
<td>Chest Pain- Intermediate or High Risk (not low risk) TIMI score&gt;2</td>
<td>Class I AHA Recommendation/CPE Review Monitoring recommended until MI ruled out</td>
</tr>
<tr>
<td>Congestive Heart Failure- Active treatment, left or right sided</td>
<td>Class I AHA Recommendation Patients with unstable heart failure are at risk for ventricular arrhythmias. Telemetry may be removed when the patient is on stable dosing and heart failure is no longer a primary clinical concern for ongoing hospital admissions.</td>
</tr>
<tr>
<td>Obstructive Sleep Apnea- post-op only</td>
<td>CEP Task Force Decision telemetry for 24 hours post-op</td>
</tr>
<tr>
<td>QT Prolonging Medications with Known Risk of Torsades</td>
<td>Class I AHA Indication The following drugs require 24 hour telemetry while initiating or increasing dosing: quinidine, procainamide, disopyramide, sotalol, dofetilide, and IV Haldol.</td>
</tr>
<tr>
<td>Status Post Acute MI</td>
<td>Class I AHA Indication Patients with predictors of ventricular arrhythmia including HTN, COPD, multiple MIs, STEMI, lower initial blood pressure- may require monitoring until hospital discharge.</td>
</tr>
<tr>
<td>Status Post Cardiac Arrest</td>
<td>Class I AHA Indication</td>
</tr>
</tbody>
</table>
Status Post Cardiac Surgery  
Risk factors for post-op a-fib include advanced age, history of a fib, presence of valvular disease and preoperative beta blocker withdrawal.

Class I AHA Indications  
Telemetry for a minimum of 48 to 72 hours. Patients at high risk for atrial fibrillation, monitoring should continue until hospital discharge.

Stroke, Acute and Confirmed  
CEP Review  
Telemetry indicated for at least 48 hours in these patients.

### 24 Hour Indications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Guidelines and Notes</th>
</tr>
</thead>
</table>
| **Temporary Pacer**                           | Class I AHA Recommendation  
Until permanent pacing is obtained                                                                                                                                                                                   |
| **Chest Pain- Low Risk TIMI< 2**              | Low risk chest pain patients have an insignificant risk of arrhythmia. Maybe admitted without telemetry at all. If telemetry is ordered, it should be discontinued as soon as the second set of cardiac enzymes returns a normal value. |
| **Electrolyte Imbalance (severe) of Potassium, Magnesium, and Calcium** | Class II AHA Indication                                                                                                                                                                                                  |
| **Post- Operative State**                     | It is common practice for post-op patients to be placed on telemetry, though the AHA Guidelines provide no support for this practice.                                                                                      |
| **Syncope**                                   | Patients being evaluated should remain on telemetry for at least 24 hours.                                                                                                                                              |
| **Status post AICD Firing**                   | Class I AHA Recommendation  
Patients s/p post AICD firing should be placed on cardiac monitoring until the electrophysiology service has evaluated the device. A properly working AICD is its own monitoring device should make telemetry redundant. |
| **Status post Pacemaker/AICD placement**      | Class I AHA Recommendation  
12-24 hours post-procedure in patients who are not pacemaker dependent. (AHA Guideline).                                                                                                                                 |
| **Status post Complicated or Uncomplicated PCI** | Class I AHA Recommendation  
6-8 hours post-procedure monitoring in patients following an uncomplicated stent placement and up to 24 hours if the procedure was complicated or no stent was placed.                                      |
| **Status Post Successful Arrhythmia Ablation** | Class II AHA Recommendation                                                                                                                                                                                                  |
### Indications for Which Inpatient Telemetry is NOT Indicated

<table>
<thead>
<tr>
<th>Condition</th>
<th>Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV Beta Blocker or Calcium Channel Blocker without underlying conduction delay</td>
<td>Patients with no underlying conduction delay (AV block, bundle branch block) do NOT require telemetry monitoring for IV beta blocker or calcium channel blocker therapy. Patients with underlying conduction delay should be monitored until the dose is stabilized.</td>
</tr>
<tr>
<td>Permanent Rate Controlled Atrial Arrhythmia</td>
<td>Patients with known atrial fibrillation that is rate controlled do not require telemetry monitoring.</td>
</tr>
<tr>
<td>Chronic Premature Beats</td>
<td>do not require inpatient telemetry monitoring.</td>
</tr>
<tr>
<td>Stable Pulmonary Embolus without hemodynamic instability</td>
<td>Patients who are hemodynamically unstable, have right heart failure, or are otherwise complicated by serious cardiac co-morbidity, may have fulfill criteria for the “heart failure” or other cardiac indications.</td>
</tr>
<tr>
<td>Acute Exacerbation of COPD</td>
<td>COPD exacerbations that are not complicated by congestive heart failure do not routinely require telemetry.</td>
</tr>
<tr>
<td>GI Bleeding outside of ICU</td>
<td>Cardiac monitoring is indicated for patients with massive GI bleeding who are in an ICU setting.</td>
</tr>
<tr>
<td>Anemia with or without transfusion</td>
<td>Transfusion for massive blood loss requires monitoring, but these patients should be in an ICU setting.</td>
</tr>
</tbody>
</table>

*AHA Scientific Statement. Practice Standards for Electrocardiographic Monitoring in Hospital Settings An American Heart Association Scientific Statement From the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: Endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses*
MALNUTRITION

Use diagnosis: **Severe protein-calorie malnutrition.** ICD 10 code: **E43**

- Malnutrition is a major contributor to increased morbidity and mortality, decreased function and quality of life, increased frequency and length of hospital stay, and higher healthcare cost.
- 1 in 3 patients are malnourished.
- Patients diagnosed with malnutrition have a length of stay 3 times higher.
- Surgical patients with malnutrition have a 4 times higher risk of pressure ulcer development.

**American Society for Parenteral and Enteral Nutrition (ASPEN)**

- At our Hospital 30% of patients admitted are malnourished and 30% become malnourished while admitted.
- Very important to recognize, treat and document malnutrition in our patients.

**ASPEN Criteria for diagnosis of malnutrition (2 or more of the following 6 characteristics is recommended for diagnosis) See table on the following page**

- Insufficient energy intake
- Weight loss
- Loss of muscle mass
- Loss of subcutaneous fat
- Localized or generalized fluid accumulation that may sometimes mask weight loss
- Diminished functional status as measured by handgrip strength

**What about albumin and prealbumin**

- “The Academy of Nutrition and Dietetics Evidence Analysis Library (EAL) analyzed reduction and/or change in serum albumin and prealbumin with weight loss in prolonged protein energy restriction, anorexia nervosa, non-malabsorptive gastric partitioning bariatric surgery, calorie-restricted diets, starvation, low-calorie diets, and nitrogen balance. The analysis indicated that these acute phase proteins do not consistently or predictably change with weight loss, calorie restriction, or nitrogen balance. They appear to better reflect severity of the inflammatory response rather than poor nutrition status. These laboratory tests, although probable indicators of inflammation, do not specifically indicate malnutrition and do not typically respond to feeding interventions in the setting of active inflammatory response.”

*JPEN J ParenterEnteral Nutr. 2012;36:275-283*

- Not a perfect test, but can be used to screen patients at risk, if low, confirm using ASPEN criteria and consult nutrition, if normal or elevated, evaluate patient using ASPEN criteria and if 2/6 positive document and consult nutrition.
**Energy intake**: The clinician may obtain or review the food and nutrition history, estimate optimum energy needs, compare them with estimates of energy consumed, and report inadequate intake as a percentage of estimated energy requirements over time.

**Weight loss**: The clinician may assess weight change over time reported as a percentage of weight lost from baseline.

**Body fat**: Loss of subcutaneous fat (eg, orbital, triceps, fat overlying the ribs)

**Muscle loss**: (eg, wasting of the temples [temporalis muscle], clavicles [pectoralis and deltoids], shoulders [deltoids], interosseous muscles, scapula [latissimus dorsi, trapezious, deltoids], thigh [quadriceps], and calf [gastrocnemius])

**Fluid accumulation**: The clinician may evaluate generalized or localized fluid accumulation.

---

### Academy/A.S.P.E.N. Clinical Characteristics That the Clinician Can Obtain and Document to Support a Diagnosis of Malnutrition

<table>
<thead>
<tr>
<th>Clinical Characteristic</th>
<th>Malnutrition in the Context of Acute Illness or Injury</th>
<th>Malnutrition in the Context of Chronic Illness</th>
<th>Malnutrition in the Context of Social or Environmental Circumstances</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy intake</strong></td>
<td>&lt;75% of estimated energy requirement for &gt;7 days</td>
<td>≤50% of estimated energy requirement for ≥5 days</td>
<td>&lt;75% of estimated energy requirement for ≥1 month</td>
</tr>
<tr>
<td><strong>Interpretation of weight loss</strong></td>
<td>% 1–2; Time 1 wk, 1 mo, 3 mo</td>
<td>% &gt;2, &gt;5, &gt;7.5; Time 1 wk, 1 mo, 3 mo</td>
<td>% &gt;5, &gt;7.5, &gt;10, &gt;20; Time 1 wk, 1 mo, 3 mo</td>
</tr>
<tr>
<td><strong>Loss of subcutaneous fat</strong></td>
<td>Mild</td>
<td>Moderate</td>
<td>Mild</td>
</tr>
<tr>
<td><strong>Muscle mass</strong></td>
<td>Mild</td>
<td>Moderate</td>
<td>Mild</td>
</tr>
<tr>
<td><strong>Fluid accumulation</strong></td>
<td>Mild</td>
<td>Moderate to Severe</td>
<td>Mild</td>
</tr>
<tr>
<td><strong>Reduced grip strength</strong></td>
<td>N/A</td>
<td>Reduced</td>
<td>N/A</td>
</tr>
</tbody>
</table>

This table was developed by Annalynn Skipper PhD, RD, FADA
RE-ADMISSION SCORES

❖ Lace index scoring tool
LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

❖ Step 1. Length of Stay (including day of admission and discharge): ________ days

<table>
<thead>
<tr>
<th>Length of stay (days)</th>
<th>Score (circle as appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4-6</td>
<td>4</td>
</tr>
<tr>
<td>7-13</td>
<td>5</td>
</tr>
<tr>
<td>14 or more</td>
<td>7</td>
</tr>
</tbody>
</table>

❖ Step 2. Acuity of Admission
Was the patient admitted to hospital via the emergency department? If yes, enter “3” in Box A, otherwise enter “0” in Box A

❖ Step 3. Comorbidities

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score (circle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous myocardial infarction</td>
<td>+1</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>+1</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>+1</td>
</tr>
<tr>
<td>Diabetes without complications</td>
<td>+1</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>+2</td>
</tr>
<tr>
<td>Diabetes with end organ damage</td>
<td>+2</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>+2</td>
</tr>
<tr>
<td>Mild liver or renal disease</td>
<td>+2</td>
</tr>
<tr>
<td>Any tumor (including lymphoma or leukemia)</td>
<td>+2</td>
</tr>
<tr>
<td>Dementia</td>
<td>+3</td>
</tr>
<tr>
<td>Connective tissue disease</td>
<td>+3</td>
</tr>
<tr>
<td>AIDS</td>
<td>+4</td>
</tr>
<tr>
<td>Moderate or severe liver or renal disease</td>
<td>+4</td>
</tr>
<tr>
<td>Metastatic solid tumor</td>
<td>+6</td>
</tr>
</tbody>
</table>

If the TOTAL score is between 0 and 3 enter the score into Box C.
If the score is 4 or higher, enter 5 into Box C.
Step 4. Emergency department visits
How many times has the patient visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission)? Enter this number or 4 (whichever is smaller) in Box E.

Add numbers in Box L, Box A, Box C, Box E to generate LACE score

LACE: ____

LACE Score Risk of Readmission: > 10 High Risk

HOSPITAL Score

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Points If positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points Low hemoglobin level at discharge (12 g/dL)</td>
<td>1</td>
</tr>
<tr>
<td>Discharge from an oncology service</td>
<td>2</td>
</tr>
<tr>
<td>Low sodium level at discharge (135 mEq/L)</td>
<td>1</td>
</tr>
<tr>
<td>Procedure during hospital stay (any ICD-9-CM coded procedure)</td>
<td>1</td>
</tr>
<tr>
<td>Index admission type: urgent-1, selective-0</td>
<td>1</td>
</tr>
<tr>
<td>No. of hospital admissions during the previous year</td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>0</td>
</tr>
<tr>
<td>2-5</td>
<td>2</td>
</tr>
<tr>
<td>More than 5</td>
<td>5</td>
</tr>
<tr>
<td>Length of stay ≥5d</td>
<td>2</td>
</tr>
</tbody>
</table>

The HOSPITAL score is the first risk prediction score to focus on potentially avoidable readmissions as opposed to all-cause readmissions, using readily available predictors at the time of discharge.

**MEDICATION RESOURCES**

*GoodRX.com* allows you to search for the best price of a particular medication in a particular location (City, County, State). This site also lets you print coupons for the medications to use at the pharmacy. Also available as a mobile app for iPhones and androids. Click on Rx Icon to go to the site (if connected to the internet)

[Click to go to GoodRx]

**MEDICATIONS OFFERED FREE AT PUBLIX**

- **Amlodipine** 90-day supply
  - 180 tablets of 2.5-mg
  - 180 tablets of 5-mg
  - 90 tablets of 10-mg
- **Lisinopril** 90-day supply all strengths
- **Montelukast 10 mg 90-day supply**
- **Metformin** 90-day supply of immediate-release metformin
  - 360 tablets of 500-mg,
  - 270 tablets of 850-mg
  - 225 tablets of 1000-mg
- **Antibiotics** up to a 14-day supply
  - Amoxicillin
  - Ampicillin
  - Sulfamethoxazole/Trimethoprim (SMZ-TMP)
  - Ciprofloxacin (excluding Ciprofloxacin XR)
  - Penicillin VK

**REDUCED PRICE GENERIC MEDICATIONS**

<table>
<thead>
<tr>
<th>Walmart</th>
<th>Shippens</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 4 Generic list</td>
<td>Requires a yearly membership, medication priced into 3 tiers</td>
</tr>
</tbody>
</table>

[Click on Logo to go to site]
PATIENT LEAVING AGAINST MEDICAL ADVICE

❖ DOCUMENTATION: document the following eight criteria on progress note / DC summary:

1. The patient’s ability to express a choice; ability to understand relevant information; ability to appreciate the significance of the information and its consequences; and, ability to manipulate information.

⚠️ A patient does not have to be free of mental illness or delusions

2. The signs and symptoms
3. The extent and limitation of the evaluation
4. The current treatment plan, risks, and benefits
5. The risks and benefits of forgoing treatment
6. The alternatives to suggested treatment
7. The exact statement made by the patient who left AMA, as well as the explicit documentation of what the patient was refusing
8. The follow-up care including discharge instructions

❖ KEY POINTS:

• Give the patient immediate attention so long as another patients care is not compromised
• Do not express your frustration and anger to the patient
• Do not refuse to provide treatment – give the patient what she may be willing to accept, such as prescriptions or future appointments, even if not the entire nor ideal treatment plan
• If unsure of capacity, call for help, which will usually entail a psychiatric consult
  • Use standard hospital and professional procedures if there is any threat the patient may harm herself or others (Baker Act / Marchman Act)
• Focus on medical management and not insurance issues
  • Although providers will often help whenever possible, insurance coverage is ultimately the patient’s responsibility

Even if patient leaves AMA a DC summary is needed. I recommend adding the 8 criteria mentioned above in DC summary

Table of Content  General Information
## Caffeine Content

### Coffees

<table>
<thead>
<tr>
<th>Drink</th>
<th>Serving Size</th>
<th>Caffeine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starbucks Coffee, Blonde Roast</td>
<td>venti, 20 oz.</td>
<td>475</td>
</tr>
<tr>
<td>Dunkin' Donuts Coffee with Turbo Shot</td>
<td>large, 20 oz.</td>
<td>398</td>
</tr>
<tr>
<td>Starbucks Coffee, Pike Place Roast</td>
<td>grande, 16 oz.</td>
<td>310</td>
</tr>
<tr>
<td>Panera Coffee, Light Roast</td>
<td>regular, 16 oz.</td>
<td>300</td>
</tr>
<tr>
<td>Starbucks Coffee, Pike Place Roast</td>
<td>tall, 12 oz.</td>
<td>235</td>
</tr>
<tr>
<td>Dunkin' Donuts Cappuccino</td>
<td>large, 20 oz.</td>
<td>233</td>
</tr>
<tr>
<td>Starbucks Caffè Americano</td>
<td>grande, 16 oz.</td>
<td>225</td>
</tr>
<tr>
<td>Dunkin' Donuts Coffee</td>
<td>medium, 14 oz.</td>
<td>210</td>
</tr>
<tr>
<td>Starbucks Iced Coffee</td>
<td>grande, 16 oz.</td>
<td>190</td>
</tr>
<tr>
<td>Panera Frozen Mocha</td>
<td>medium, 16 oz.</td>
<td>188</td>
</tr>
<tr>
<td>McDonald Coffee</td>
<td>Large 21 oz</td>
<td>180</td>
</tr>
<tr>
<td>Starbucks Caffè Mocha</td>
<td>grande, 16 oz.</td>
<td>175</td>
</tr>
<tr>
<td>Starbucks Iced Black Coffee, bottle</td>
<td>11 oz.</td>
<td>160</td>
</tr>
<tr>
<td>Starbucks—Caffè Latte or Cappuccino</td>
<td>grande, 16 oz.</td>
<td>150</td>
</tr>
<tr>
<td>Starbucks Espresso</td>
<td>doppio, 2 oz.</td>
<td>150</td>
</tr>
<tr>
<td>Starbucks Doubleshot Energy Coffee, can</td>
<td>15 oz.</td>
<td>145</td>
</tr>
<tr>
<td>Starbucks Coffee Frappuccino, bottle</td>
<td>14 oz.</td>
<td>130</td>
</tr>
<tr>
<td>Starbucks Mocha Frappuccino</td>
<td>grande, 16 oz.</td>
<td>110</td>
</tr>
<tr>
<td>Starbucks Coffee Frappuccino</td>
<td>grande, 16 oz.</td>
<td>95</td>
</tr>
<tr>
<td>Dunkin' Donuts, Panera, or Starbucks Decaf Coffee</td>
<td>16 oz.</td>
<td>10-25</td>
</tr>
</tbody>
</table>

### Teas

<table>
<thead>
<tr>
<th>Drink</th>
<th>Serving Size</th>
<th>Caffeine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starbucks Chai Latte—iced or regular</td>
<td>grande, 16 oz.</td>
<td>95</td>
</tr>
<tr>
<td>Honest Tea Organic Lemon Tea</td>
<td>17 oz.</td>
<td>90</td>
</tr>
<tr>
<td>Starbucks Green Tea Latte—iced or regular</td>
<td>grande, 16 oz.</td>
<td>80</td>
</tr>
<tr>
<td>KeVita Master Brew Kombucha</td>
<td>15 oz.</td>
<td>80</td>
</tr>
<tr>
<td>Black tea, brewed</td>
<td>8 oz.</td>
<td>47</td>
</tr>
<tr>
<td>Tazo Organic Iced Black Tea, bottle</td>
<td>14 oz.</td>
<td>45</td>
</tr>
<tr>
<td>Snapple Lemon Tea</td>
<td>16 oz.</td>
<td>37</td>
</tr>
<tr>
<td>Arizona Iced Tea, black</td>
<td>16 oz.</td>
<td>30</td>
</tr>
<tr>
<td>Green tea, brewed</td>
<td>8 oz.</td>
<td>29</td>
</tr>
<tr>
<td>Lipton Lemon Iced Tea</td>
<td>20 oz.</td>
<td>25</td>
</tr>
<tr>
<td>Gold Peak Unsweetened Tea</td>
<td>19 oz.</td>
<td>23</td>
</tr>
<tr>
<td>Arizona Iced Tea, green</td>
<td>16 oz.</td>
<td>15</td>
</tr>
<tr>
<td>Lipton Decaffeinated Tea, black, brewed</td>
<td>8 oz.</td>
<td>5</td>
</tr>
<tr>
<td>Herbal tea, brewed</td>
<td>8 oz.</td>
<td>0</td>
</tr>
</tbody>
</table>

### Soft Drinks

<table>
<thead>
<tr>
<th>Drink</th>
<th>Serving Size</th>
<th>Caffeine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge</td>
<td>16 oz.</td>
<td>69</td>
</tr>
<tr>
<td>Pepsi Zero Sugar</td>
<td>12 oz.</td>
<td>69</td>
</tr>
<tr>
<td>Mountain Zevia (Zevia)</td>
<td>12 oz.</td>
<td>55</td>
</tr>
<tr>
<td>Mountain Dew—diet or regular</td>
<td>12 oz.</td>
<td>54</td>
</tr>
<tr>
<td>Diet Coke</td>
<td>12 oz.</td>
<td>46</td>
</tr>
<tr>
<td>Dr Pepper or Sunkist—diet or regular</td>
<td>12 oz.</td>
<td>41</td>
</tr>
<tr>
<td>Pepsi</td>
<td>12 oz.</td>
<td>38</td>
</tr>
<tr>
<td>Pepsi True</td>
<td>12 oz.</td>
<td>38</td>
</tr>
<tr>
<td>Coca-Cola, Coke Zero, or Diet Pepsi</td>
<td>12 oz.</td>
<td>34</td>
</tr>
<tr>
<td>Coca-Cola Life</td>
<td>12 oz.</td>
<td>28</td>
</tr>
<tr>
<td>Barq's Root Beer, regular</td>
<td>12 oz.</td>
<td>22</td>
</tr>
<tr>
<td>Energy Drinks</td>
<td>Serving Size</td>
<td>Caffeine (mg)</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Bang Energy</td>
<td>16 oz.</td>
<td>357</td>
</tr>
<tr>
<td>5-hour Energy</td>
<td>2 oz.</td>
<td>200</td>
</tr>
<tr>
<td>Redline Energy</td>
<td>4 oz. (1/2 bottle)</td>
<td>163</td>
</tr>
<tr>
<td>Full Throttle</td>
<td>16 oz.</td>
<td>160</td>
</tr>
<tr>
<td>Hiball—Organic Energy Drink or Sparkling Energy Water</td>
<td>16 oz.</td>
<td>160</td>
</tr>
<tr>
<td>Monster Energy</td>
<td>16 oz.</td>
<td>160</td>
</tr>
<tr>
<td>NOS Energy</td>
<td>16 oz.</td>
<td>160</td>
</tr>
<tr>
<td>Rockstar Energy</td>
<td>16 oz.</td>
<td>160</td>
</tr>
<tr>
<td>Venom Energy</td>
<td>16 oz.</td>
<td>160</td>
</tr>
<tr>
<td>AMP Zero Energy</td>
<td>16 oz.</td>
<td>157</td>
</tr>
<tr>
<td>AMP Energy Boost Original</td>
<td>16 oz.</td>
<td>142</td>
</tr>
<tr>
<td>ávitæ Caffeine + Water</td>
<td>17 oz.</td>
<td>45-125</td>
</tr>
<tr>
<td>Mountain Dew Kick Start</td>
<td>16 oz.</td>
<td>90-92</td>
</tr>
<tr>
<td>Red Bull</td>
<td>8 oz.</td>
<td>80</td>
</tr>
<tr>
<td>V8 V-Fusion+Energy</td>
<td>8 oz.</td>
<td>80</td>
</tr>
<tr>
<td>Bai Antioxidant Infusion</td>
<td>16 oz.</td>
<td>70</td>
</tr>
<tr>
<td>Mountain Dew Kickstart Hydrating Boost</td>
<td>12 oz.</td>
<td>68</td>
</tr>
<tr>
<td>Crystal Light Energy</td>
<td>1 packet, makes 16 oz.</td>
<td>60</td>
</tr>
<tr>
<td>MiO Energy, all flavors</td>
<td>½ tsp., makes 8 oz.</td>
<td>60</td>
</tr>
<tr>
<td>Ocean Spray Cran-Energy</td>
<td>8 oz.</td>
<td>55</td>
</tr>
<tr>
<td>Glacéau Vitaminwater Energy</td>
<td>20 oz.</td>
<td>50</td>
</tr>
<tr>
<td>Starbucks Refreshers, can</td>
<td>12 oz.</td>
<td>50</td>
</tr>
<tr>
<td>Caffeinated Snack Foods</td>
<td>Serving Size</td>
<td>Caffeine (mg)</td>
</tr>
<tr>
<td>STEEM Caffeinated Peanut Butter</td>
<td>2 Tbs., 36g</td>
<td>150</td>
</tr>
<tr>
<td>Awake Energy Chocolate</td>
<td>1 bar, 1.55 oz.</td>
<td>101</td>
</tr>
<tr>
<td>Jelly Belly Extreme Sport Beans</td>
<td>1 package, 1 oz.</td>
<td>50</td>
</tr>
<tr>
<td>Run Gum</td>
<td>1 piece</td>
<td>50</td>
</tr>
<tr>
<td>Awake Energy Granola</td>
<td>1 bar, 34g</td>
<td>50</td>
</tr>
<tr>
<td>GU Energy Chews Raspberry</td>
<td>4 chews</td>
<td>40</td>
</tr>
<tr>
<td>GU Energy Gel—Espresso Love, Caramel Macchiato, or Jet Blackberry</td>
<td>1 packet</td>
<td>40</td>
</tr>
<tr>
<td>Blue Diamond Café Mocha Almonds</td>
<td>1 oz.</td>
<td>24</td>
</tr>
<tr>
<td>GU Energy Stroopwafel—Caramel Coffee or Wild Berries</td>
<td>1 waffle</td>
<td>20</td>
</tr>
<tr>
<td>GU Energy Chews—Strawberry or Black Cherry</td>
<td>4 chews</td>
<td>20</td>
</tr>
<tr>
<td>Ice Cream &amp; Yogurt</td>
<td>Serving Size</td>
<td>Caffeine (mg)</td>
</tr>
<tr>
<td>Bang!! Caffeinated Ice Cream</td>
<td>4 oz.</td>
<td>125</td>
</tr>
<tr>
<td>Dannon Coffee Yogurt</td>
<td>1 container, 6 oz.</td>
<td>30</td>
</tr>
<tr>
<td>Häagen-Dazs Coffee Ice Cream</td>
<td>4 oz.</td>
<td>29</td>
</tr>
<tr>
<td>Stonyfield Gotta Have Java Nonfat Frozen Yogurt</td>
<td>4 oz.</td>
<td>28</td>
</tr>
<tr>
<td>Dreyer's or Edy's Slow Churned Coffee Ice Cream</td>
<td>4 oz.</td>
<td>15</td>
</tr>
<tr>
<td>Breyers Coffee Ice Cream</td>
<td>4 oz.</td>
<td>11</td>
</tr>
<tr>
<td>Häagen-Dazs Chocolate Ice Cream</td>
<td>4 oz.</td>
<td>less than 1</td>
</tr>
<tr>
<td>Dannon Oikos Café Latte Greek Yogurt</td>
<td>1 container, 5 oz.</td>
<td>less than 1</td>
</tr>
<tr>
<td>Pure Caffeine</td>
<td>Serving Size</td>
<td>Caffeine (mg)</td>
</tr>
<tr>
<td>Caffeine powder</td>
<td>1/16 or 1/32 tsp.</td>
<td>200</td>
</tr>
<tr>
<td>Liquid Caffeine (brand)</td>
<td>1 tsp.</td>
<td>83</td>
</tr>
</tbody>
</table>
### Caffeine Chart from the Center for Science in the Public Interest

#### Chocolate Candy & Chocolate Drinks

<table>
<thead>
<tr>
<th>Product</th>
<th>Serving Size</th>
<th>Caffeine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crackheads² Gourmet Chocolate Coffee Caffeine</td>
<td>1 box, 40g</td>
<td>600</td>
</tr>
<tr>
<td>Crackheads Espresso Bean Candies</td>
<td>1 package, 28g</td>
<td>200</td>
</tr>
<tr>
<td>Awake Caffeinated Chocolate Bar</td>
<td>1.55 oz.</td>
<td>101</td>
</tr>
<tr>
<td>Starbucks Hot Chocolate</td>
<td>grande, 16 oz.</td>
<td>25</td>
</tr>
<tr>
<td>Hershey’s Milk Chocolate Bar</td>
<td>1.6 oz.</td>
<td>9</td>
</tr>
<tr>
<td>Hershey’s Milk Chocolate Kisses</td>
<td>9 pieces, 1.4 oz.</td>
<td>9</td>
</tr>
<tr>
<td>Hershey’s Cocoa</td>
<td>1 Tbs.</td>
<td>8</td>
</tr>
<tr>
<td>Silk Soymilk—Chocolate or Light Chocolate</td>
<td>8 oz.</td>
<td>4</td>
</tr>
<tr>
<td>Silk Dark Chocolate Almondmilk</td>
<td>8 oz.</td>
<td>4</td>
</tr>
<tr>
<td>Hershey’s Chocolate Lowfat Milk</td>
<td>12 oz.</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Over-The-Counter Pills

<table>
<thead>
<tr>
<th>Product</th>
<th>Serving Size</th>
<th>Caffeine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zantrex-3 weight-loss supplement</td>
<td>2 capsules</td>
<td>300</td>
</tr>
<tr>
<td>NoDoz or Vivarin</td>
<td>1 caplet</td>
<td>200</td>
</tr>
<tr>
<td>Excedrin Migraine</td>
<td>2 tablets</td>
<td>130</td>
</tr>
<tr>
<td>Midol Complete</td>
<td>2 caplets</td>
<td>120</td>
</tr>
<tr>
<td>Bayer Back &amp; Body</td>
<td>2 caplets</td>
<td>65</td>
</tr>
<tr>
<td>Anacin</td>
<td>2 tablets</td>
<td>64</td>
</tr>
</tbody>
</table>

---

### ORDERING COMPRESSION STOCKINGS

Please indicate type, compression and style:

- **Type:** Ready-to-Wear, Custom
- **Compression:** 15-20 mmHg, 20-30 mmHg, 30-40 mmHg, Extra Firm
- **Styles:** Arm, Thigh, Upper, Lower, Maternity, Arm, Calf

---

**Table of Content**
Death summary

- Called to pronounce___________. (Deceased name)
- Note date and time of death pronouncement (the physician time of pronouncement is the official time of death—do not delay unnecessarily).
- Note admitting date
- Note admitting diagnosis (Pt admitted for ....)
- Note if family is present or if family and attending physician were notified.
- Note family response if indicated
- Document if the coroner was notified.

Pronouncement of death

- EXAM
  - Note general appearance of the body.
  - Note no reaction to verbal & tactile stimulation.
  - Note no pupillary light reflex (pupils will be fixed and dilated).
  - Breathing and other lung sounds will be absent.
  - No carotid pulse or heart sound can be heard.
- Note if the family accepts or declines autopsy

Preparation before Death Pronouncement

- Be prepared to answer pertinent questions.
- Review chart and ask the nursing staff regarding recent event, if death was expected or sudden, any special family dynamics, any special problems or concerns.
- If family not present, ask the nursing staff if family was notified.
- Ask if attending was notified.

Entering the Room

- Take the nurse with you. Introduce yourself and role “I am the doctor on call, I’ve been called to pronounce ____________”
- “I am sorry for your loss; I know this is a difficult time”
- Determine relationships of persons present and invite to them to remain

Pronouncement Procedure Clinical Examination (Examine respectfully)

- Check ID bracelet and pulse
- Check for spontaneous respiration
- Note general appearance of the body.
- Note no reaction to verbal or tactile stimulation.
- Note no pupillary light reflex (pupils will be fixed and dilated).
- Breathing and other lung sounds will be absent.

When to call the coroner:
Call if the patient was in the hospital less than 24 hours and death wasn’t expected.
Call if the death had unusual circumstances.
Call if the death was associated with trauma regardless of the cause of death.
- No carotid pulse or heart sound can be heard.
- Record time of death

⚠️ If family asks any questions you don’t know the answer to or don’t feel comfortable answering just say “Sorry I do not know the answer to that. I recommend you write all your questions down and maybe the nurse or attending will be able to answer those questions for you.”

Cardio-Vascular Disorders

Topics *Click on topics below to go directly to that page

- ABCD2 Score
- Acute MI
  - NSTEMI/Unstable Angina
  - STEMI
- A.Fib
- Angina Classification
- Arrhythmia Algorithm (Diagnostic)
- Aspirin therapy
- DAPT Therapy
- Anticoagulants Comparison
- Antiplatelet Therapy in CAD
- BP Goals for CVA
- Brugada syndrome
- New Anticoagulants doses and indications
  - Pradaxa
  - Xarelto
  - Eliquis
- Lipid 2018 Guidelines
- Cardiac Markers
- CHAD2 / CHA2DS2-VASc
- Chest Pain
- Coronary CTA
- Coumadin/Warfarin
- Chest Pain Risk Score:
  - HEART Score
  - Grace Score
  - TIMI Score
- ECG Quick Reference Guide
- Emergency Department Assessment Of Chest Pain Score (EDACS)
- Heart Failure
  - Assessment of HF in AMI
- Hypertension JNC-8
- Hypertension goal
- Hypertension SPRINT Trial
- Hypertensive Emergency
- Orthostatic Hypotension
- Pretest probability of CAD
- STATIN Comparison
- STENTS
  - COURAGE-ORBITA Trials
- Syncope
- Ischemic Stroke (CVA)
- TIA
- Troponin
General

- ECG Grid

Systemic Approach to interpreting ECG

- **Rate**: fast or slow? 300/150/100/75/60/50
- **Rhythm**: regular or irregular?
- **Intervals**: PR, QRS, QT
- **Axis**: left or right?
- **Hypertrophy**: LVH, RVH, left or right atrium enlargement?
- **Ischemia**: Flipped T waves.
- **Infarct**: Deep Q wave

Rate

- Count boxes b/n R waves: 300/150/100/75/60/50
- **Regular Rate** Rule of 300 - rate can be estimated by dividing 300 by the number of large boxes in the R-R interval
- **Irregular Rate**: Count the number of QRS complexes in a six second interval (30 big boxes or 2 three second slash marks). Multiply the number of QRS complexes by ten to get the heart rate.

Rhythm

- Regular rhythm?
- Are P waves present
  - P waves are always upright in lead II when the rhythm is sinus
- Are P waves related to the QRS
- What’s the QRS width
Interval

<table>
<thead>
<tr>
<th>Interval</th>
<th>Quick Read</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR interval:</td>
<td>Prolonged if greater than 1 large box</td>
<td>0.12-0.20 sec, Prolonged: AV heart block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shortened: WPW</td>
</tr>
<tr>
<td>QRS interval:</td>
<td>Widen: if larger than ½ a large box</td>
<td>&lt;0.12 sec, &lt; 3 small boxes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widen + Sinus = BBB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widen + no p waves = Ventricular arrhythmia</td>
</tr>
<tr>
<td>QT interval:</td>
<td>Long: If more than ½ theR-R interval</td>
<td>Varies with HR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long QT with normal QRS: Dugs, low K, or Mg,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>neurological</td>
</tr>
<tr>
<td>QTc interval:</td>
<td></td>
<td>0.33-0.47 sec</td>
</tr>
</tbody>
</table>

Axis

- Normal axis: -30 to +90 degrees.
- Look at Leads I and AVF

<table>
<thead>
<tr>
<th>Axis determination</th>
<th>Lead I</th>
<th>AVF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>RAD</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>LAD</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Pathologic LAD = LAHB (Left anterior hemiblock) = Lead II more negative than -30 degrees

- Lead I: +, AVF: = = LAD, then look at Lead II to see if its pathologic

<table>
<thead>
<tr>
<th>Lead II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Less negative than -30</td>
</tr>
<tr>
<td>=</td>
<td>At -30 degrees</td>
</tr>
<tr>
<td>-</td>
<td>More negative than -30</td>
</tr>
</tbody>
</table>

Table of Content
Cardio-Vascular Disorders
Hypertrophy

❖ Atrial Enlargement
  ❖ The 2 leads to use to assess for atrial enlargement are **leads II and V1**.
  ❖ Note in Normal Sinus Rhythm the P is upright in lead II and may be upright, negative or biphasic in lead V1.

❖ Right Atrial Enlargement: P - Pulmonale
  ❖ Lead II: The P wave is tall (≥2.5 mm) and pointed

❖ Left Atrial Enlargement: P - Mitrale
  ❖ Lead II: The P is either notched and/or
  ❖ V1: there is a deep negative component to the P wave

❖ Right Ventricular Hypertrophy (usually associated with increased pulmonary pressure)
  ❖ RAD (Right Axis Deviation): highly suggestive of RVH
  ❖ RAE (Right Atrial Enlargement): highly suggestive of RVH
    • Only one condition produces RAE without RVH (tricuspid stenosis).
  ❖ IRBBB (rSr’ in V1) presence of an r’ (r prime) in lead V1 supports the diagnosis of pulmonary disease/possible RVH if seen in association with other findings
    • by itself this ECG finding is benign and commonly seen in healthy individuals
  ❖ Persistent S Waves: S wave amplitude usually peaks (is tallest) in V4 or V5 and then drops off (in V5,V6). Normally, there is not any S wave at all in V5,V6.
    • IF more than tiny S waves are still present in V5,V6. Think RVH, COPD, large body habitus
  ❖ Low Voltage: QRS amplitude ≤5 mm (ie, ≤1 large box) in all 6 limb leads (I,II,III,aVR,aVL,aVF). Think COPD.
    • also seen in hypothyroidism; obesity; pneumothorax; pericardial effusion; and normal variant.
  ❖ Tall R in Lead V1: IF ever the R wave is taller than the S wave in lead V1 patient is likely to have end-stage COPD and/or pulmonary hypertension

❖ Left Ventricular Hypertension
  ❖ Remember two numbers “35” and “12”. This identifies up to 90% of patients with LVH on ECG
  ❖ Patient must be older than 35
  ❖ The **deepest S wave in V1,V2 + the tallest R wave in V5, V6 is >35**
  ❖ R wave in aVL ≥12mm
Ischemia

- For a ST-elevation MI (STEMI) look for **ST-elevations of 1 mm** or more in **two contiguous limb leads** (high lateral: I, aVL; inferior: II, III, aVF)
  - OR
- **2 mm elevations in the precordial leads** (anterior: V1, V2, V3; lateral: V4, V5, V6)
- **Q waves** is significant if width > 0.04 sec, or depth > ¼ of the R wave in the same lead
- **Q waves in AVR or isolated Q waves in III not significant**
- Sub-endocardial infarction = non Q wave infarction

<table>
<thead>
<tr>
<th>Location</th>
<th>ST Elevations</th>
<th>Reciprocal ST-depressions</th>
<th>Affected Artery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior MI</td>
<td>V1-V6</td>
<td>none</td>
<td>LAD</td>
</tr>
<tr>
<td>Septal MI</td>
<td>V1-V3</td>
<td>none</td>
<td>LAD</td>
</tr>
<tr>
<td>Inferior MI</td>
<td>II, III, aVF</td>
<td>I, aVL</td>
<td>RCA (80%) or R Cx (20%)</td>
</tr>
<tr>
<td>Lateral MI</td>
<td>I, aVL, V5, V6</td>
<td>II, II, aVF</td>
<td>R Cx</td>
</tr>
<tr>
<td>Posterior MI</td>
<td>V7, V8, V9</td>
<td>V1-V3</td>
<td>R Cx</td>
</tr>
<tr>
<td>Right Ventricular MI</td>
<td>V1, V4R</td>
<td>I, aVL</td>
<td>RCA</td>
</tr>
</tbody>
</table>

Click to return to Chest Pain

Table of Content
Cardio-Vascular Disorders
Heart Block

- **1st Degree** - prolonged PR interval greater than 0.20 sec
- **2nd Degree** - P waves are regular, but are not always followed by a QRS
- **Mobitz Type I** (Wenckeback) - progressively prolonged PR interval until a dropped QRS complex
- **Mobitz Type II** - the PR interval is constant with dropped QRS complexes
- **3rd Degree** - complete dissociation between P waves and the QRS complex

**Bundle branch block**
- You can distinguish between LBBB (Left Bundle Branch Block) from RBBB (Right Bundle Branch Block) simply by looking at the QRS morphology in V1 and V6.
  - If the QRS looks like W in V1 and M in V6 it is LBBB. (WiLLiaM)
  - If the QRS looks like M in V1 and W in V6 it is RBBB. (MoRRoW)

Diagnosing acute myocardial infarction when a LBBB is present.

**Sgarbossa Criteria** -
- A score of 3 points is required to diagnose an acute MI.
- The Sgarbossa criteria, and they are listed below.
  - ST segment elevation > 1 mm and in the same direction (concordant) with the QRS complex = 5 points
  - ST segment depression > 1 mm in leads V1, V2 or V3 = 3 points
  - ST segment elevation > 5 mm and in the opposite direction (discordant) with the QRS = 2 points
- Examining the T wave in leads V5 to V6 can be helpful, as well. In the Sgarbossa study, there was a 26% sensitivity to detect acute MI when the T wave was upright rather than inverted.
❖ **Cabrera’s sign** is used to diagnose an acute MI in the setting of a LBBB and consists of notching at 40 milliseconds in the upslope of the S wave in lead V3 and V4. This has a poor sensitivity of 27% for myocardial infarction.

❖ **Chapman’s sign** is used to diagnose an acute MI in the setting of a LBBB and consists of a notch in the upslope of the R wave in lead I, aVL or V6. This has a low sensitivity, but a specificity of about 90%.

Special Conditions

Pulmonary Embolism

- RBBB
- S1Q3T3 pattern
- A.fib, sinus tachycardia – most common

Hyperkalemia

- **First sign:** peaked T waves  K level around 6 meq/L.
- **Second sign:** prolongation of PR interval.  K level around 7 meq/L.
- **Third sign:** Absent P wave with widen QRS complex sets the stage for ventricular tachycardia/fibrillation.  K level around 8-9 meq/L.

Hypokalemia  K+ falls below about 2.7 mmol/l

- Increased amplitude and width of the P wave
- Prolongation of the PR interval
- T wave flattening and inversion
- ST depression
- Prominent U waves (best seen in the precordial leads)
- Apparent long QT interval due to fusion of the T and U waves (= long QU interval)

Hypercalcemia, speeds repolarization.

- Mild: broad based tall peaking T waves
- Severe: extremely wide QRS, low R wave, disappearance of p waves, tall peaking T waves
Hypocalcemia

- Narrowing of the QRS complex
- Reduced PR interval
- T wave flattening and inversion
- Prolongation of the QT-interval
- Prominent U-wave
- Prolonged ST and ST-depression

COPD

- Low voltage QRS complexes in leads I, II, and III and a right axis deviation.

Brugada Syndrome

- Type 1 (Coved ST segment elevation >2mm in >1 of V1-V3 followed by a negative T wave) This has been referred to as Brugada sign.
- Type 2 has >2mm of saddleback shaped ST elevation.
- Type 3 can be the morphology of either type 1 or type 2, but with <2mm of ST segment elevation
Epidemiology of Chest Pain in Primary Care and Emergency Department Settings

<table>
<thead>
<tr>
<th>DIAGNOSIS</th>
<th>Percentage of Patients Presenting With Chest Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Care: USA</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Musculoskeletal condition</td>
<td>36</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>19</td>
</tr>
<tr>
<td>Serious cardiovascular disease†</td>
<td>16</td>
</tr>
<tr>
<td>Stable coronary artery disease</td>
<td>10</td>
</tr>
<tr>
<td>Unstable coronary artery disease</td>
<td>1.5</td>
</tr>
<tr>
<td>Psychosocial or psychiatric</td>
<td>8</td>
</tr>
<tr>
<td>Pulmonary disease‡</td>
<td>5</td>
</tr>
<tr>
<td>Nonspecific chest pain</td>
<td>16</td>
</tr>
</tbody>
</table>

†— Including infarction, unstable angina, pulmonary embolism, and heart failure.
‡— Including pneumonia, pneumothorax, and lung cancer.

Adapted from Diagnosing the Cause of Chest Pain. Am Fam Physician. 2005 Nov 15;72(10):2012-2021

Life – threatening causes of chest pain

- D = Dissection (aneurysm)
- E = Embolism (pulmonary)
- A = Acute Coronary Syndrome
- T = Tension Pneumothorax
- H = Hole in GI tract
  - Esophageal rupture
  - Perforated ulcer

David M Schneider, MD at FMX 2016

Non-Cardiac etiology of chest pain

- PE
  - Costochondritis
  - Billiary colic
- Pneumothorax
  - Fibromyalgia
  - Peptic Ulcer Dz
- PNA
  - Herpes Zoster
  - Esophagitis
- Pleurisy
  - Neuropathic pain
  - Esophageal spasm
- Depression
  - Rib fracture
  - GERD
- Anxiety
  - Sternoclavicular arthritis
  - Esophageal rupture
- Somatoform
  - Cholangitis
  - Pancreatitis
- Delusional
  - Cholecystitis
- Cervical disc dz
  - Choledocholithiasis

Table of Content
Cardio-Vascular Disorders
Emergency Department Assessment of Chest Pain Score (EDACS)

- Identifies chest pain patients with low risk of major adverse cardiac event.
- This score only applies to patients
  - ≥18 years old with normal vital signs
  - Chest pain consistent with ACS
  - No ongoing chest pain or crescendo angina
- It is a rule-out rule to "rule-out" patients at high risk of cardiac disease, and is not specific
- The EDACS-ADP was 99-100% sensitive for correctly identifying patients as low-risk and identified 45% of its cohort as low-risk. This is much higher than other ED-based risk scores like HEART, Vancouver Chest Pain Score, ADAPT and GRACE.

Emergency Department Assessment of Chest Pain Score (EDACS)

Online calculator click here

<table>
<thead>
<tr>
<th>CLINICAL CHARACTERISTICS</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Age (Please Circle SINGLE Best Answer)</td>
<td></td>
</tr>
<tr>
<td>18-45</td>
<td>+2</td>
</tr>
<tr>
<td>46-50</td>
<td>+4</td>
</tr>
<tr>
<td>51-55</td>
<td>+6</td>
</tr>
<tr>
<td>56-60</td>
<td>+8</td>
</tr>
<tr>
<td>61-65</td>
<td>+10</td>
</tr>
<tr>
<td>66-70</td>
<td>+12</td>
</tr>
<tr>
<td>71-75</td>
<td>+14</td>
</tr>
<tr>
<td>76-80</td>
<td>+16</td>
</tr>
<tr>
<td>81-85</td>
<td>+18</td>
</tr>
<tr>
<td>86+</td>
<td>+20</td>
</tr>
<tr>
<td>b) Male Sex (Please Circle if true)</td>
<td>+6</td>
</tr>
<tr>
<td>c) Aged 18-50 years and either (i) known Coronary Artery Disease OR (ii) ≥ 3 Risk Factors in patient</td>
<td>+4</td>
</tr>
<tr>
<td>d) Symptoms and signs (Circle EACH if Present)</td>
<td></td>
</tr>
<tr>
<td>Diaphoresis</td>
<td>+3</td>
</tr>
<tr>
<td>Radiates to arm or shoulder</td>
<td>+5</td>
</tr>
<tr>
<td>Pain† occurred or worsened with inspiration</td>
<td>-4</td>
</tr>
<tr>
<td>Pain† is reproduced by palpation</td>
<td>-6</td>
</tr>
</tbody>
</table>

EDACS Total (Please Add ALL Circled Figures and enter to right)
Results / Recommendations

<table>
<thead>
<tr>
<th>2b: EDACS Accelerated Diagnostic Protocol (EDACS-ADP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low-risk</strong></td>
</tr>
<tr>
<td>(i) EDACS &lt;16</td>
</tr>
<tr>
<td>(ii) No new ischemia on ECG</td>
</tr>
<tr>
<td>(iii) 0 and 2hr troponin both negative</td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td>Patient safe for discharge to early outpatient follow-up investigation (or proceed to earlier in-patient testing)</td>
</tr>
</tbody>
</table>

| **Not low risk**                                     |
| (i) EDACS ≥16                                       |
| (ii) New ischemia on ECG                           |
| (iii) Either 0 or 2hr troponin positive             |
| **Recommendation**                                   |
| Proceed with usual care with further observation and delayed troponin |

†Pain that caused presentation to hospital. ‡A 2 hr troponin is only required if other parameters are low risk. *Safety point: patients with an unstable presentation (abnormal vital signs or pain that is ongoing or in a crescendo pattern) should not be considered for the low-risk protocol.


Provided by Scott Marberry, MD (8/2016)

2011 ACCF/AHA Guidelines For The Management of Patients w/ UA/NSTEMI

- Rapid clinical determination of the **likelihood risk of CAD** (i.e., high, intermediate, or low) should be made in all patients with chest discomfort (LOE: C)
- Use of **risk-stratification models**, such TIMI or GRACE assist in decision making with regard to treatment options in patients with suspected ACS. (LOE: B)
- Re-measure positive **biomarkers at 6–8 hr intervals 2-3** times or until levels have peaked, as an index of infarct size and dynamics of necrosis. (LOE: B)
- Coronary CT angiography is appropriate for acute chest pain evaluation for those with intermediate and possibly low **pretest probability of CAD** when serial **ECG and biomarkers** are negative.
- Serial electrocardiograms are indicated at 15-30 minute intervals if suspicion for ACS is high, and the patient has ongoing chest discomfort and original EKG is non-diagnostic.
Clinical pre-test probabilities in patients with stable chest pain symptoms

**Table of Content**

**Cardiovascular Disorders**

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### Classification of angina severity according to the Canadian Cardiovascular Society

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Ordinary activity does not cause angina such as walking and climbing stairs. Angina with strenuous or rapid or prolonged exertion at work or recreation.</td>
</tr>
<tr>
<td>Class II</td>
<td>Slight limitation of ordinary activity. Angina on walking or climbing stairs rapidly, walking or stair climbing after meals, or in cold, wind or under emotional stress, or only during the first few hours after awakening. Walking more than two blocks on the level and climbing more than one flight of ordinary stairs at a normal pace and in normal conditions.</td>
</tr>
<tr>
<td>Class III</td>
<td>Marked limitation of ordinary physical activity. Angina on walking one to two blocks on the level or one flight of stairs in normal conditions and at a normal pace.</td>
</tr>
<tr>
<td>Class IV</td>
<td>Inability to carry on any physical activity without discomfort, angina syndrome may be present at rest.</td>
</tr>
</tbody>
</table>

---

* Probabilities of obstructive coronary disease shown reflect the estimates for patients aged 35, 45, 55, 65, 75, and 85 years. This slide corresponds to Table 13 in the full text.

### Probability of ACS (acute coronary syndrome)

<table>
<thead>
<tr>
<th>High Likelihood</th>
<th>Intermediate Likelihood</th>
<th>Low Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absence of high-risk features and any of the following:</strong></td>
<td><strong>Absence of high- or Intermediate But may have:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>History</strong></td>
<td><strong>History</strong></td>
<td><strong>History</strong></td>
</tr>
<tr>
<td>● Chest or left arm pain as <strong>Chief Complaint</strong> reproducing prior angina</td>
<td>● Chest or left arm pain or discomfort as <strong>chief symptom</strong></td>
<td>● Probable ischemic symp in absence of any of the intermediate likelihood characts</td>
</tr>
<tr>
<td>● Known history of CAD, including MI</td>
<td>● Age greater than 70</td>
<td>● Recent cocaine use</td>
</tr>
<tr>
<td><strong>Physical Exam</strong></td>
<td><strong>Physical Exam</strong></td>
<td><strong>Physical Exam</strong></td>
</tr>
<tr>
<td>● Transient murmur</td>
<td>● Extracardiac vascular disease</td>
<td>● Chest discomfort reproduced by palpation</td>
</tr>
<tr>
<td>● Hypotension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Diaphoresis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● PE or rales</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ECG</strong></td>
<td><strong>ECG</strong></td>
<td><strong>ECG</strong></td>
</tr>
<tr>
<td>● New, or transient ST-segment dev (1 mm or greater)</td>
<td>● Fixed Q waves</td>
<td>● T-wave flattening or inversion less than 1 mm in leads w/ dominant R waves</td>
</tr>
<tr>
<td>● T-wave inversion in multiple precordial leads</td>
<td>● ST depression 0.5 to 1 mm or T-wave inversion greater than 1 mm</td>
<td>● Normal ECG</td>
</tr>
<tr>
<td><strong>Cardiac markers</strong></td>
<td><strong>Cardiac markers</strong></td>
<td><strong>Cardiac markers</strong></td>
</tr>
<tr>
<td>Elevated cardiac enzymes: Troponin T, or CK-MB</td>
<td>Normal</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**Cardio-Vascular Disorders**

---

**Table of Content**
**Risk-Stratification Models**

- **HEART Score**
  - Low risk patients 0-3 and have a less than 2% risk of MACE at 6 weeks
  - HEART Score is superior to TIMI and GRACE in the risk stratification of undifferentiated chest pain

| HEART Score |  
|---|---|
| **History** |  
| Highly Suspicious | +2  
| Moderately Suspicious | +1  
| Slightly Suspicious | 0  
| **EKG** |  
| Significant ST-Depression | +2  
| Non Specific Repolarization | +1  
| Normal | 0  
| **Age** |  
| >65 | +2  
| 45-65 | +1  
| Less than 45 | 0  
| **Risk Factors** |  
| 3 risk factor or personal hx of CAD | +2  
| 1-2 risk factors | +1  
| no risk factors | 0  
| **Troponin** |  
| >3X normal limit | +2  
| 1-3 X normal limit | +1  
| Normal | 0  

*Low risk patients 0-3: less than 2% risk of MACE*

*Intermediate 4-6: Observation with Imaging*

*High Risk 7-9: Admit full Inpatient MACE 50-65%*
- **TI MI Score** (Thrombolysis in Myocardial Infarction Score)

<table>
<thead>
<tr>
<th>Timi Score Questions</th>
<th>Point</th>
<th>Risk Of Death, MI, Urgent Myocardial Revascularization</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥ 65 years</td>
<td>1</td>
<td>0 - 1 point: 5%</td>
<td>Low</td>
</tr>
<tr>
<td>≥ 3 Risk Factors for CAD</td>
<td>1</td>
<td>2 points: 8%</td>
<td>Int</td>
</tr>
<tr>
<td>Known CAD (stenosis ≥ 50%)</td>
<td>1</td>
<td>3 points: 13%</td>
<td>High</td>
</tr>
<tr>
<td>ASA Use in Past 7d</td>
<td>1</td>
<td>4 points: 20%</td>
<td>High</td>
</tr>
<tr>
<td>Severe angina (≥ 2 episodes w/in 24 hrs)?</td>
<td>1</td>
<td>5 points: 26%</td>
<td>High</td>
</tr>
<tr>
<td>ST changes ≥ 0.5mm</td>
<td>1</td>
<td>6-7 points: 41%</td>
<td>High</td>
</tr>
<tr>
<td>Positive Cardiac Marker</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pts with a score of 0:* Have a 1.8% of having a cardiac event within 30 days

*S (Sensitivity 97.2%, 95% CI 96.4-97.8; specificity 25.0%, 95% CI 24.3-25.7; positive likelihood ratio 1.30, 95% CI 1.28-1.31; negative likelihood ratio 0.11, 95% CI 0.09-0.15)


- **GRACE Score** (Global Registry of Acute Coronary Events)

  Online calculator click here

  - The GRACE Score risk stratifies patients to estimate their in-hospital and 6-month to 3-year mortality
  - Low risk scores allow consideration for CPU (chest pain obs unit) management
  - The NICE guidelines recommend the GRACE Score for risk stratification of patients with ACS
  - Scores has been validated in >20,000 patients in multiple databases and is extremely well studied and supported.
  - The GRACE Score involves 8 variables from history, exam, EKG and laboratory testing.
  - GRACE 2.0 allows for substitutions of Killip Class for diuretic usage and for serum creatinine with history of renal dysfunction.

Summary of ECG criteria for MI
- 1mm (2 small boxes) ST elevation (except V2-V3)
- 1mm ST depression (except V2-V3)
- Q waves 1mm wide, 1mm deep (except V2-V3)
- Everything should be in 2 contiguous leads
- New onset LBBB

Cardiac Markers
- The troponin I is the most sensitive cardiac marker, detectable in serum 3-6 hours after an MI, and its level remains elevated for 14 days.
- Concomitant measurement of CK-MB or myoglobin levels, is not recommended (LOE: A)

<table>
<thead>
<tr>
<th>Marker</th>
<th>Initial Elevation</th>
<th>Peak Elevation</th>
<th>Return to Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myoglobin</td>
<td>1-4 h</td>
<td>6-7 h</td>
<td>18-24 h</td>
</tr>
<tr>
<td>CK-MB</td>
<td>4-12 h</td>
<td>10-24 h</td>
<td>48-72 h</td>
</tr>
<tr>
<td>Cardiac Trop I</td>
<td>3-12 h</td>
<td>10-24 h</td>
<td>3-10 d</td>
</tr>
<tr>
<td>Cardiac Trop T</td>
<td>3-12 h</td>
<td>12-48 h</td>
<td>5-14 d</td>
</tr>
</tbody>
</table>

Conditions Commonly Associated With Elevated Troponin
- Acute MI
- Acute PE
- Acute pericarditis
- Acute or severe HF
- Myocarditis
- Sepsis and/or shock
- Renal failure
- Rapid Atrial Fibrillation
- False-positive troponin
➢ **Low Risk Patients**

- Risk stratified with non-invasive testing or
- Patients may be safely evaluated as outpatients with a cardiologist within 72 hrs.
- Those with non-angina pain may follow up with a primary care physician within one to three days.

➢ **Intermediate Risk Patients**

- Most suitable for admission to an observation or chest pain unit
- Should undergo risk stratification with
  - Assessment of cardiac biomarkers
  - **Repetitive electrocardiograph assessment**
  - Cardiac imaging and/or stress testing
  - Consider Consulting Cardiology
  - selected intermediate-risk patients:
    - Initiate anticoagulant therapy: enoxaparin or UFH or fondaparinux; enoxaparin or fondaparinux preferable.
    - Initiate clopidogrel, prasugrel, or ticagrelor

➢ **High-Risk ACS Patients**, TIMI risk score of three or higher, **Unstable Angina** or **NONSTEMI**

- Consult Cardiology
- **MONA BASH**
  - **Morphine sulfate** 2 to 4 mg IV PRN for severe pain. May repeat dose of 2 to 8 mg at 5 to 15-minute intervals.
  - **Oxygen**, keep SaO2 > 92%
  - **Nitroglycerin** (NTG) 0.3-0.6 mg SL q5min PRN chest pain. Max: 3 doses within 15 minutes.

**Contraindications**

- Systolic <90 mm Hg or 30 mm Hg below baseline
- Right ventricle (RV) infarct
- Use of phosphodiesterase-5 inhibitors (sildenafil within 24 hours or tadalafil within 48 hours)
- **Aspirin**, initial dose 162–325 mg chewed, then 81mg QD after that. Avoid enteric coated.
- **Beta-blocker**, Metoprolol tartrate 25mg po q6h

**Contraindications**

- Heart failure avoid in Killip III/IV patients
- Cardiogenic shock
- Suspected cocaine ingestion

---

<table>
<thead>
<tr>
<th>Class</th>
<th>Classification</th>
<th>30-day mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>No signs of congestion</td>
<td>2-3 %</td>
</tr>
<tr>
<td>Class II</td>
<td>S3 and basal rales</td>
<td>5-12 %</td>
</tr>
<tr>
<td>Class III</td>
<td>Acute pulmonary edema</td>
<td>10-20 %</td>
</tr>
<tr>
<td>Class IV</td>
<td>Cardiogenic shock</td>
<td>10-20 %</td>
</tr>
</tbody>
</table>

**Killip Classification for Heart Failure**

Quantifies severity of **heart failure in ACS** and predicts 30-day mortality.
Predicts mortality in ACS and is validated for both STEMI and NSTEMI.
• **ACE inhibitor.** - Lisinopril 5mg po in patients with pulmonary congestion or left ventricular ejection fraction (EF) ≤40%.
  • Substitute ARB for ACE-intolerant patients
• **Statin.** High-intensity statin for all patients with ACS – atorvastatin 80mg po or rosuvastatin 20-40 mg daily.
• **Heparin.** For all patients with non-ST elevation ACS, start anticoagulation ASAP after you’ve made the diagnosis. Will start heparin instead of Lovenox. Heparin is easily reversible if needed. 60 U/kg IVB (max 4000 U); 12 U/kg/hr (max 1000 U/hr initially).
• **Other**
  • Antiarrhythmics as needed
  • Anxiolytics as needed
  • Treatment for depression PRN (common post-MI)
  • Smoking cessation
  • Coronary reperfusion
    • PCI with stent placement
    • CABG surgery

➢ **STEMI** treatment of STEMI is beyond the scope of this tool, but below is a quick review
  • Consult Cardiology
  • PCI versus fibrinolysis: goal is to keep total ischemic time within 120 minutes.
    • Door to needle time should be within 30 minutes
    • Door to balloon time within 90 minutes.
  • Coronary reperfusion therapy
  • Primary PCI
    • Symptom onset of ≤12hours
    • Symptom onset of ≤12hours and contraindication to fibrinolytic therapy irrespective of time delay
    • Cardiogenic shock or acute severe HF irrespective of time delay from onset of MI
    • Evidence of ongoing ischemia 12–24 hours after symptom onset
    • If substantial risk for intracranial hemorrhage (ICH)
    • Age <75 years with STEMI or LBBB who develop shock within 36 hours of AMI
  • Fibrinolysis
    • If no contraindications, administer within 12 hours, but not beyond 24 hours, of onset of symptoms to patients with STEMI in ≥2 contiguous leads and/or new or presumably new left bundle branch block (LBBB).
    • Alteplase, Reteplase, Tenecteplase
Controversy in stable CAD

➢ COURAGE Trial
   • Conclusion: No difference in survival between PCI plus medical therapy and medical therapy alone in patients with SCAD (stable coronary artery disease)
   • 2,287 patients with SCAD in US and Canada

➢ ORBITA Trial
   • Conclusion
     • PCI did not significantly improve exercise time. The numerical incremental increase in average exercise time was 16 seconds (P=0.20).
     • PCI did not significantly improve measures on well-validated patient-centered angina questionnaires.
     • PCI did not significantly improve the Duke treadmill score or peak oxygen uptake.
     • PCI did significantly improve the dobutamine stress echo wall-motion index, indicating that stenting reduced ischemic burden.
   • ORBITA enrolled patients with single-vessel disease
     • Results do not apply to patients with multivessel disease or left main disease.
     • Patients with symptoms refractory to medical therapy should be offered PCI.

➢ Bare Metal
   • Foreign body increase risk of in-stent thrombosis Plavix and ASA decrease risk.
   • Epithelization may progress to instent stenosis

➢ Drug-eluting
   • Delay epithelization maintaining bare metal longer decrease stenosis but increase thrombosis

➢ Antiplatelet Therapy
   • Aspirin 81 mg indefinitely for all STENTS
   • Dual Antiplatelet Therapy = DAPT (aspirin plus P2Y12 inhibitor therapy)
     • In patients with stable ischemic heart disease (SIHD) after drug-eluting stent (DES) DAPT for at least 6 months (Class I).
     • In patients with SIHD after bare-metal stent (BMS) DAPT for a minimum of 1 month (Class I)
   • Post ACS all STENTS (DES or BMS) DAPT for minimum 12 months
     • In patients with SIHD treated with DAPT after BMS or DES who have tolerated DAPT without a bleeding complication and who are not at high bleeding risk continuation of DAPT for longer than 1 month in patients with BMS or longer than 6 months in patients with DES may be reasonable (Class IIb).
In patients with ACS (NSTE-ACS or STEMI) treated with coronary stent implantation who have tolerated DAPT without a bleeding complication and who are not at high bleeding risk continuation of DAPT for longer than 12 months may be reasonable (Class IIb).

A new risk score (the “DAPT score”), see below, derived from the Dual Antiplatelet Therapy study, may be useful for decisions about whether to continue (prolong or extend) DAPT in patients treated with coronary stent implantation.

In patients with STEMI treated with DAPT in conjunction with fibrinolytic therapy, DAPT should be continued for a minimum of 14 days and ideally at least 12 months (Class I).

Elective noncardiac surgery should be delayed 30 days after BMS implantation and 6 months after DES implantation.

In patients treated with DAPT after coronary stent implantation who must undergo surgical procedures that mandate the discontinuation of P2Y12 inhibitor therapy, it is recommended that aspirin be continued if possible and the P2Y12 platelet receptor inhibitor be restarted as soon as possible after surgery (Class I).

ACC/AHA Guideline Update on Duration of Dual Antiplatelet Therapy in CAD Patients 2016

**DAPT Trial**
- 9961 pts, drug eluting stents, 18 months of DAPT
- Decrease: Stent thrombosis (NNT 100); MI (NNT 50); MACE (NNT 63)
- 56% mod/severe bleeding (NNH 57), Increase all-cause mortality (NNH200)

**DAPT Score**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 75</td>
<td>-2</td>
</tr>
<tr>
<td>Age 65 - 75</td>
<td>-1</td>
</tr>
<tr>
<td>Age &lt; 65</td>
<td>0</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>1</td>
</tr>
<tr>
<td>DM</td>
<td>1</td>
</tr>
<tr>
<td>Prior PCI or MI</td>
<td>1</td>
</tr>
<tr>
<td>Stent Diameter &lt; 3 mm</td>
<td>1</td>
</tr>
<tr>
<td>Paclitaxel-eluting stent</td>
<td>1</td>
</tr>
<tr>
<td>CHF or LVEF &lt; 30%</td>
<td>2</td>
</tr>
<tr>
<td>Saphenous graft PCI</td>
<td>2</td>
</tr>
</tbody>
</table>

Score ≥ 2 favorable benefit / risk ratio for prolonged DAPT 53% reduction ischemic events, no significant increase bleeding

Score < 2 unfavorable benefit / risk ratio no significant reduction in ischemic events, 114% increase bleeding

CORONARY CT ANGIOGRAPHY (CCTA)

❖ Sensitivity and Specificity
• In the ACCURACY trial patients with chest pain without known CAD and intermediate disease prevalence, a 64-slice CCTA had a patient-based sensitivity of 94% and a specificity of 83% in detecting stenosis of 70% or greater (comparable values were seen at a 50% stenosis level).
• The NPV of CCTA was 99%
• The ACCURACY trial suggested that, compared with other noninvasive modalities such as stress echo and stress nuclear testing, CCTA has comparable specificity but superior sensitivity and NPV

❖ Indications
• Chest pain, low and intermediate pretest probability, and No ECG changes and serial enzymes negative
• Suspected anomalous coronary artery anatomy or other complex congenital heart disease
• Evaluation of coronaries for etiology of new onset heart failure
• Evaluation of cardiac mass, tumor or thrombus, or pericardial disease when echo, TEE or MRI technically limited
• Mapping of coronary veins prior to bi-V pacer implantation
• Evaluation of aortic dissection, thoracic aortic aneurysm, or pulmonary embolus
• Mapping of old bypass grafts prior to re-do CABG
• Evaluation of aortic dissection, thoracic aortic aneurysm

❖ Contraindications
• Atrial fibrillation, cardiac arrhythmias at time of test
• Bigeminy, trigeminy, high degree heart block
• Severe asthma
• Creatinine > 1.8 (eGFR < 60)
• Failed steroid prep for contrast allergy
• Recent CTA in past 24 hours (Contact Radiologist)
• Morbid obesity (BMI > 40)
• Pts with high probability of CAD
• Age 75 or over, younger if they have risk factors for CAD (SHAPE Task Force)

There is a diltiazem protocol that can be used

Not recommended in
Male: Age>65
Female: Age>70
Flash CCTA available at Winter Park, able to perform on HR >90
There is a CCTA power plan, Use it

❖ Interpretation of CCTA

<table>
<thead>
<tr>
<th>CCT Angiography</th>
<th>Stenosis &lt; 30%</th>
<th>Stenosis 30% – 70%</th>
<th>Stenosis &gt; 70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary</td>
<td>Stress Test</td>
<td>Heart Cath</td>
<td>Prevention</td>
</tr>
</tbody>
</table>

Cardiology Consult

❖ Secondary Prevention = Risk factor modification
- Lipid panel sent consider Hi intensity STATIN therapy Crestor 20mg po qd
- HTN mgmt. Consider ACE Lisinopril 10mg po qd
- Beta blocker Metoprolol 25mg po bid (12.5mg bid in elderly)
- All should be discharged on ASA 81mg.


ACCURACY (Assessment by Coronary Computed Tomographic Angiography of Individuals Undergoing Invasive Coronary Angiography) trial, J Am Coll Cardiology 52 2008 1724-1732

Lecture by Christopher Smith MD, Medical Director of the Chest Pain Observation Unit at Florida Hospital South, given to Family Medicine Residents on June 2012
Acute myocardial infarction is further classified into six types:

- **Type 1**: infarction due to coronary atherothrombosis
- **Type 2**: infarction due to a supply–demand mismatch that is not the result of acute atherothrombosis
- **Type 3**: infarction causing sudden death without the opportunity for biomarker or ECG confirmation
- **Type 4a**: infarction related to a percutaneous coronary intervention (PCI)
- **Type 4b**: infarction related to thrombosis of a coronary stent
- **Type 5**: infarction related to coronary artery bypass grafting (CABG)

For an excellent review of acute MI click on the following link [http://thefmiservicechief.webs.com/articles](http://thefmiservicechief.webs.com/articles) and download the article Acute MI

*Provided by Dr Ambs during FMI rounds 2017*
### JNC 8 Hypertension Guidelines

<table>
<thead>
<tr>
<th>Population</th>
<th>Goal BP</th>
<th>Initial Drug Treatment Options</th>
</tr>
</thead>
</table>
| General ≥60         | <150/90 | **Nonblack population, including those with DM:** Thiazide- type Diuretic, CCB, ACEI, or ARB.  
 **Moderate—Grade B** |
| General <60         | <140/90 | **Black population, including those with DM:** Thiazide-type Diuretic or CCB  
 General black population: **Moderate—Grade B**  
 Black patients with diabetes: **Weak—Grade C** |
| Diabetes            | <140/90 | **Patients with CKD, regardless of race or DM:** initial (or add-on) antihypertensive should include an ACEI:  
 **Moderate—Grade B** |
| Pt w /CKD           | <140/90 |                                                                     |

- If goal BPs not reached within a month, increase the dose of the initial drug or add a second drug from Thiazide-type diuretic, CCB, ACEI, or ARB.
- Continue to assess BP and adjust the treatment regimen until goal BP is reached.
- If goal BP cannot be reached with 2 drugs, add and titrate a third drug (Thiazide-type diuretic, CCB, ACEI, or ARB).
- Do not use an ACEI and an ARB together in the same patient.
- If goal BP cannot be reached using only the drugs recommended (Thiazide-type diuretic, CCB, ACEI, or ARB) because of a contraindication or the need to use more than 3 drugs to reach goal BP, antihypertensive drugs from other classes can be used.
- Referral to a hypertension specialist may be indicated for patients in whom goal BP cannot be attained using the above strategy or for the management of complicated patients for whom additional clinical consultation is needed. **Expert Opinion—Grade E**

*2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults*  
*Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8); JAMA. doi:10.1001/jama.2013.284427. Published online December 18, 2013*
Summary of Hypertension goals from different Organizations

<table>
<thead>
<tr>
<th>Age / Comorbidities</th>
<th>BP Goal</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>General ≥60</td>
<td>&lt;150/90</td>
<td>JNC 8, ACP, AAFP</td>
</tr>
<tr>
<td>&gt;60 with Hx of CVA, TIA, or high CV risks</td>
<td>Systolic &lt;140/90</td>
<td>ACP, AAFP</td>
</tr>
<tr>
<td>Diabetes</td>
<td>130/90</td>
<td>ADA 2016</td>
</tr>
<tr>
<td>Diabetes</td>
<td>&lt;140/90</td>
<td>JNC 8, ADA, AHA, ACP, AAFP</td>
</tr>
<tr>
<td>CKD</td>
<td>&lt;140/90</td>
<td>ADA, AHA, JNC 8</td>
</tr>
<tr>
<td>CVD</td>
<td>&lt;140/90</td>
<td>ACP, AAFP</td>
</tr>
<tr>
<td>CVD</td>
<td>120/90</td>
<td>* SPRINT TRIAL</td>
</tr>
<tr>
<td>General &lt; 60</td>
<td>&lt;140/90</td>
<td>JNC 8</td>
</tr>
</tbody>
</table>

What New in Medicine 2017 presented by Dr Dumois during Thursday didactics

**HYPERTENSION SPRINT TRIAL**

- Among patients at high risk for cardiovascular events but without diabetes, targeting a systolic blood pressure of less than 120 mm Hg, as compared with less than 140 mm Hg, resulted in lower rates of fatal and nonfatal major cardiovascular events and death from any cause.
- Significantly higher rates of some adverse events were observed in the intensive-treatment group.

- Click on link to review Sprint Trial [SPRINT TRIAL](Published on November 9, 2015, at NEJM.org.)
## Classification System for HTN (JNC VII)

<table>
<thead>
<tr>
<th>Category</th>
<th>Blood Pressure Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120 / &lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>121–139 / 80–89</td>
</tr>
<tr>
<td>Stage I</td>
<td>140–159 / 90–99</td>
</tr>
<tr>
<td>Stage II</td>
<td>&gt;160 / &gt;100</td>
</tr>
<tr>
<td>Severely Elevated Blood Pressure</td>
<td>&gt; 180/120</td>
</tr>
</tbody>
</table>

### Hypertensive Urgency
- Severe Elevation in BP in a pt with risk factors for progressive end-organ damage (Hx of heart failure, unstable angina, preexisting renal insufficiency)

### Hypertensive Emergency(Crisis)
- Severe Elevation in BP, with evidence of acute or progressive end organ dysfunction

## Malignant Hypertension
- Severe elevation in BP with retinopathy changes + papilledema

### Treatment Goals
Depending on clinical situation:

<table>
<thead>
<tr>
<th>Category</th>
<th>Treatment Goals</th>
</tr>
</thead>
</table>
| Severely Elevated Blood Pressure| - Initiate treatment with an oral medication in pts w/ SBP < 200 mm Hg, or DBP < 120 mm Hg, optional for patients with lower BP  
- Safely discharge the pt, emphasizing the importance of close follow-up  
- Follow-up w/ in 1-7 days|
| Hypertensive Urgency            | - Initiate treatment, follow-up w/in 24 to 48 hrs  
- If follow-up is uncertain or pt has many risk factors, consider hospitalization|
| Hypertensive Emergency(Crisis)  | - ICU admission and rapid but gradual lowering of BP - using IV med |
Hypertensive Emergency - Treatment Goals

- Reduction of mean arterial BP by 20-25% or reduction of DBP to around 100-110 mmHg over several min to first hour
- BP lowered to 160/110 in next 2-6hrs
- Transition to oral antihypertensives, when BP consistently maintained ≤160/100 mm Hg
- **BP should not be lowered to normal levels** Rapid reduction of BP below the autoregulatory range results in reduction in organ perfusion and risk of ischemia and infarction

Preferred IV Antihypertensive Agents for Hypertensive Emergency

| Acute Aortic Dissection | • Preferred treatments: Labetalol or (Nitroprusside + Esmolol)  
| | • CV surgical consultation is needed |
| Acute MI | • Preferred treatments: (Labetalol or Esmolol) + NTG  
| | • (Nicardipine or Fenoldopam) may be added if BP not controlled with Labetalol or Esmolol alone |
| Acute Pulmonary Edema | • Preferred treatments: (Nitroprusside or Fenoldopam) + NTG + loop diuretic |
| Acute Renal Failure | • Preferred treatments: Fenoldopam or Nicardipine |
| Hypertensive Encephalopathy | • Preferred treatments: Fenoldopam, Labetalol, or Nicardipine |
| Sympathetic Crisis | • Preferred treatments: Fenoldopam, Nicardipine, or Verapamil  
| | • Avoid beta blockers |

| Labetalol | 1st dose Bolus of 20mg IV, double bolus up to 80 mg, or infusion of 2mg/min to maximum total of 300mg / d |
| Nitroglycerin | Infusion rate 5-10mcg/min, titrate up 10mcg every 5 mins |
| Nitroprusside | Dose: 0.5 μg/kg/min; titrate as tolerated to maximum of 2 μg/kg/min. |

Nitroprusside is a powerful vasodilator, and most authors caution against its use in patients with increased intracranial pressure and other conditions. Thiocyanate toxicity, (confusion and lactic acidosis), is likely with Nitroprusside infusions, especially when high doses and in the setting of renal insufficiency. For this reason, Nitroprusside infusions should not continue beyond 24 hours.

❖ Other IV meds Used in Hypertensive Emergencies
<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage and Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clevidipine</td>
<td>Loading dose of 1-2 mg, followed by repeated incremental doubling of the dose at 90-s intervals until the desired blood pressure is achieved. As blood pressure approaches goal, increase the dose by less than double and lengthen the time between dose adjustments to every 5-10 min. An approximately 1-2 mg/h increase will generally produce an additional 2-4 mm Hg decrease in systolic pressure. Most patients respond at doses of 4-6 mg/h. Patients with severe hypertension may require doses up to 32 mg/h. Limited data w 32mg/h or higher rate or duration over 72 hrs.</td>
</tr>
<tr>
<td>Enalaprilat</td>
<td>IV injection of 1.25 mg over 5 min every 6 h, titrated by increments of 1.25 mg at 12-24-h intervals to a maximum of 5 mg every 6 h.</td>
</tr>
<tr>
<td>Esmolol</td>
<td>IV loading dose of 500-1000 μg/kg over 1 min (1 mg/kg ideal body weight), followed by an infusion at 25-50 μg/kg/min, may be increased by 25 μg/kg/min every 10-20 min until the desired response to a maximum of 300 μg/kg/min.</td>
</tr>
<tr>
<td>Fenoldopam</td>
<td>An initial IV dose of 0.1 μg/kg/min, titrated by increments of 0.05-0.1 μg/kg/min to a maximum of 1.6 μg/kg/min.</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>5 mg bolus then 5-10 mg IV every 20-30 min as needed.</td>
</tr>
<tr>
<td>Nicardipine</td>
<td>5 mg/h; titrate to effect by increasing 2.5 mg/h every 5 min to a maximum of 15 mg/h.</td>
</tr>
</tbody>
</table>

HF may be due to abnormalities in myocardial contraction (systolic dysfunction), relaxation and filling (diastolic dysfunction), or both.

Heart failure with preserved systolic function (previously termed diastolic heart failure) is diagnosed when signs and symptoms of systolic heart failure are present but an echocardiogram reveals a normal left ventricular ejection fraction and the absence of significant valvular or pericardial abnormalities.

- Heart failure with preserved systolic function is common, especially in elderly and in conditions causing significant left ventricular hypertrophy (eg, hypertension, aortic stenosis, hypertrophic cardiomyopathy).

HF is classified in terms of natural history by American College of Cardiology/American Heart Association (ACC/AHA) HF stage

And in terms of symptom status by New York Heart Association (NYHA) Functional Class

### Classification of Heart Failure

<table>
<thead>
<tr>
<th>New York Heart Association</th>
<th>ACC / AHA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class I:</strong> no limitation in any activities; there are no symptoms from ordinary activities</td>
<td><strong>Stage A:</strong> Pts at high risk for developing HF in the future but no functional or structural heart disorder</td>
</tr>
<tr>
<td><strong>Class II:</strong> slight, mild limitation of activity; the patient is comfortable at rest or with mild exertion</td>
<td><strong>Stage B:</strong> a structural heart disorder but no symptoms at any stage.</td>
</tr>
<tr>
<td><strong>Class III:</strong> marked limitation of any activity; the patient is comfortable only at rest</td>
<td><strong>Stage C:</strong> previous or current symptoms of HF in the context of an underlying structural heart problem, but managed with medical treatment</td>
</tr>
<tr>
<td><strong>Class IV:</strong> any physical activity brings on discomfort and symptoms occur at rest</td>
<td><strong>Stage D:</strong> advanced disease requiring hospital-based support, a heart transplant or Palliative care</td>
</tr>
</tbody>
</table>

JVD is the most specific and reliable physical exam indicator of right-sided volume overload and is representative of left-sided filling pressures except in cases of disproportionate right heart dysfunction (e.g., pulmonary hypertension, severe tricuspid regurgitation, and pericardial disease). JVD is best visualized with oblique light and the patient at 45 degrees.
### Management

<table>
<thead>
<tr>
<th>Class I</th>
<th>Usual Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Life style changes</td>
</tr>
<tr>
<td></td>
<td>• Quit smoking</td>
</tr>
<tr>
<td></td>
<td>• Treat high blood pressure.</td>
</tr>
<tr>
<td></td>
<td>• Treat high cholesterol.</td>
</tr>
<tr>
<td></td>
<td>• Discontinue alcohol or illegal drug use.</td>
</tr>
<tr>
<td></td>
<td>• Treat Diabetes, Obesity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class II</th>
<th>Treatment methods above for Class I apply.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• ACE inhibitor or ARB (angiotensin II receptor blocker) or ARNi</td>
</tr>
<tr>
<td></td>
<td>(an ARB combined with an inhibitor of neprilysin)</td>
</tr>
<tr>
<td></td>
<td>• Beta-blockers</td>
</tr>
<tr>
<td></td>
<td>• Surgery options for coronary artery repair and valve repair or replacement</td>
</tr>
<tr>
<td></td>
<td>(as appropriate).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class III</th>
<th>Treatment methods above for Class I apply.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• ACE inhibitor or angiotensin II receptor blocker (ARB) or ARNi</td>
</tr>
<tr>
<td></td>
<td>(an ARB combined with an inhibitor of neprilysin)</td>
</tr>
<tr>
<td></td>
<td>• Beta-blockers</td>
</tr>
<tr>
<td></td>
<td>• Diuretics</td>
</tr>
<tr>
<td></td>
<td>• An aldosterone inhibitor (Spirinolactone)</td>
</tr>
<tr>
<td></td>
<td>• Restrict dietary sodium (salt).</td>
</tr>
<tr>
<td></td>
<td>• Monitor weight.</td>
</tr>
<tr>
<td></td>
<td>• Restrict fluids (as appropriate).</td>
</tr>
<tr>
<td></td>
<td>• Drugs that worsen the condition should be discontinued.</td>
</tr>
<tr>
<td></td>
<td>• Digoxin in pts w/ A.Fib</td>
</tr>
<tr>
<td></td>
<td>• African Americans benefit from hydralazine and fixed dose of isosorbide</td>
</tr>
<tr>
<td></td>
<td>dinitrate.</td>
</tr>
<tr>
<td></td>
<td>• Some patients may be candidates for biventricular pacing (CRT) ejection</td>
</tr>
<tr>
<td></td>
<td>fraction of &lt;35% or an implantable defibrillator.</td>
</tr>
</tbody>
</table>

CoQ10 100 mg 3 times daily added to standard therapy showed a decrease in all-cause mortality and Cardiovascular death in those with CHF. NNT 8-9.

*The Effect of Coenzyme Q10 on Morbidity and Mortality in Chronic Heart Failure Results From Q-SYMBIO: A Randomized Double-Blind Trial.* (Mortensen, MD, et al.) *JACC: HEART FAILURE VOL. 2, NO. 6, 2014*
Class IV

- Treatment methods for Class I, II and III apply.
- Patient should be evaluated to determine if the following treatments are available options:
  - Heart transplant
  - Ventricular assist devices
  - Surgery options
  - Research therapies
  - Continuous infusion of intravenous heart pump drugs
  - End-of-life (palliative or hospice) care

2016 ACC/AHA/HFSA Focused Update on New Pharmacological Therapy for Heart Failure: An Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure

- Fluid and free water restriction (<1.5 L/d) is especially in the setting of hyponatremia volume overload.
- Negative inotropes (e.g., verapamil, diltiazem) should be avoided in patients with impaired ventricular contractility, as should over-the-counter β stimulants (e.g., compounds containing ephedra, pseudoephedrine hydrochloride).
- NSAIDs, which antagonize the effect of ACE inhibitors and diuretic therapy, should be avoided
- Administration of supplemental oxygen may relieve dyspnea, improve oxygen delivery, reduce the work of breathing, and limit pulmonary vasoconstriction in patients with hypoxemia but is not routinely recommended in patients without hypoxemia.
- Sleep apnea has a prevalence as high as 37% in HF population. Treatment with nocturnal positive airway pressure improves symptoms and EF

ACE inhibitors should not be initiated or administered if creatinine >3, if K+ >5 mEq/L, or in patients with bilateral renal artery stenosis. AM Fam Physician 2002 Aug 1;66(3):461-469
- Check individual ACE-I for starting dose for those patients with renal insufficiency
- Renal function and K+ levels should be monitored with dose adjustment and periodically
- A rise in serum creatinine up to 30% above baseline may be seen when initiating an ACE inhibitor and should not result in discontinuation of therapy (N Engl J Med 2002;347:1256-61).
- ACE inhibitors are contraindicated in pregnancy. Enalapril and captopril may be safely used by breastfeeding mothers
- ARNi (Entresto) an ARB combined with an inhibitor of nephrilysin, an enzyme that degrades natriuretic peptides, bradykinin, adrenomedullin, and other vasoactive peptides.
  - Do not use an ARNi with an ACE-I
Heart failure with preserved systolic function  **HFpEF** (diastolic dysfunction)

- Guidelines recommend the use of diuretic agents and nitrates to alleviate congestive signs and symptoms, avoiding hypotension
- Aggressively treat hypertension
- Several calcium channel blockers and most β-blockers may improve diastolic filling by slowing the heart rate, thus prolonging diastolic filling time.
- ACE-I, ARBs may also be of benefit. The CHARM Trial demonstrated a modest improvement in outcome.
- Avoid clonidine and Positive inotropic agents
- Control heart rate and rhythm
  - Goal heart rate under 100
  - Maintain sinus rhythm (cardioversion, ablation)
  - Pacemaker therapy (when necessary) to maintain atrioventricular synchrony or for patients who have chronotropic incompetence
- Treat comorbidities
  - Myocardial ischemia (medications, revascularization)
  - Dyslipidemia
  - Anemia
  - Chronic kidney disease
- Nonpharmacologic therapy
  - Instruct patients to keep diary of daily weight and blood pressure
  - Prescribe exercise training (cardiac rehabilitation) in mild-to-moderate HF
  - Treat obstructive sleep apnea, and nocturnal hypoxia

❖ Treatment of Acute Decompensated Heart Failure (ADHF)

❖ Hemodynamic profiles of HF and treatment strategies

<table>
<thead>
<tr>
<th>Perfusion</th>
<th>Dry</th>
<th>Wet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm</td>
<td>Stable, Compensated HF continue current treatment</td>
<td>Diuresis loop diuretics (Lasix, Bumex, Demadex)</td>
</tr>
<tr>
<td>Cold</td>
<td>Inotropic support to improve perfusion Beta-agonists (dobutamine, dopamine) phosphodiesterase inhibitors (milrinone)</td>
<td>Diuresis and Inotropic support</td>
</tr>
</tbody>
</table>

Signs/symptoms of congestion

- Orthopnea
- Paroxysmal Nocturnal Dyspnea
- Edema
- Ascites
- Elevated JVP
- Audible S3
- Crackles on lung auscultation
- Hepatojugular reflux
- Valsalva square wave

Signs/symptoms of low perfusion

- Decreased pulse pressure (pulse pressure = systolic BP–diastolic BP)
- cool extremities
- altered mental status
- worsening renal function, decreased urine output, declining serum sodium level
- Symptomatic hypotension

❖ Most are volume overloaded and adequately perfused (wet/warm, see above).
- Intravenous loop diuretics produce diuresis, a decrease in filling pressures and a vasodilatory effect.
• The dose of diuretic should generally be doubled from the outpatient setting
• Suggested Diuretic Dosing in Heart Failure

<table>
<thead>
<tr>
<th>Drug</th>
<th>Initial Dose</th>
<th>Max Daily Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Loop diuretics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bumetanide</td>
<td>1 mg</td>
<td>5-10 mg</td>
</tr>
<tr>
<td>Torsemide</td>
<td>20 mg</td>
<td>100-200 mg</td>
</tr>
<tr>
<td>Furosemide</td>
<td>40 mg</td>
<td>160-320 mg</td>
</tr>
</tbody>
</table>

**Thiazide diuretics Given 30 min before loop diuretic to augment diuresis.**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Initial Dose</th>
<th>Max Daily Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochlorothiazide</td>
<td>25 mg</td>
<td>100 mg</td>
</tr>
<tr>
<td>Chlorothiazide</td>
<td>250-500 mg</td>
<td>IV once or twice daily plus loop diuretic</td>
</tr>
<tr>
<td>Metolazone</td>
<td>2.5-10 mg</td>
<td>orally once or twice daily with loop diuretic</td>
</tr>
</tbody>
</table>

**IV continuous infusion**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Initial Dose</th>
<th>Max Daily Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bumetanide</td>
<td>1 mg IV load then 0.5-1 mg/h</td>
<td></td>
</tr>
<tr>
<td>Torsemide</td>
<td>20 mg IV load then 5-10 mg/h</td>
<td></td>
</tr>
<tr>
<td>Furosemide</td>
<td>20-80 mg IV load then 5-20 mg/h</td>
<td></td>
</tr>
</tbody>
</table>

• **Morphine** induces vasodilatation and relieves breathlessness as well as anxiety.

• **Vasodilator therapy**
  • ACE-I, ARBs, or hydralazine are the drugs of choice
  • IV vasodilator therapy may be considered if rapid improvement of congestive symptoms is needed but requires close hemodynamic monitoring, ideally ICU

  • Nitrates decrease systemic and pulmonary vascular pressures and are also coronary vasodilators.
    ▶ **Nitroglycerin started at 0.3 to 0.5 mcg/kg/min** so long as systolic pressure is above 95 to 100 mm Hg. Tolerance to the effects of intravenous nitrates may develop within 24 to 48 hours, limiting their usefulness

  • Nitroprusside is indicated when there is a need for acute combined afterload and preload reduction (hypertensive emergency, acute aortic regurgitation, acute mitral regurgitation).
    ➢ **Nitroprusside is started at a dose of 0.1 to 0.2 mcg/kg/min** and advanced as needed to improve clinical and hemodynamic status, using a systolic pressure of 85 to 90 mm Hg as a lower limit for dose titration

• **Supplemental oxygen** and pulse oximetry monitored.
  • Noninvasive positive pressure ventilation, if necessary for acute respiratory failure, has been associated with a reduction in the need for tracheal intubation and mechanical ventilation.
**Cardiorenal syndrome** renal insufficiency complicating HF management. Patients with HF often have baseline impaired renal function as a result of decreased renal perfusion, intrinsic renal disease, elevated central and renal vein pressure, neurohormonal activation, and/or drugs used to treat HF. Renal function may also acutely decline during treatment with diuretics and ACE inhibitors. As HF worsens, an accompanying decline in renal perfusion limits the ability of the kidneys to respond to diuretic therapy.

- In this situation, higher doses of diuretics and/or the addition of other diuretics with synergistic effects (eg, sequential nephron blockade) may be effective.
- **Current studies suggest no significant advantage to the use of continuous intravenous diuretic regimens over intravenous bolus dosing, if appropriate dosing is used (eg, double the outpatient dose).**
- **Dialysis or ultrafiltration** may be beneficial in patients with severe HF and renal dysfunction who cannot respond adequately to fluid and sodium restriction and diuretics. *(J Am Coll Cardiol 2007;49:675)*

**Intravenous inotropic agents** (dobutamine, milrinone, dopamine) usually reserved for pt’s with evidence of cardiogenic shock or with a very low cardiac index (≤1.4 L/min/m^2).

- In this population the benefit of hemodynamic improvement outweighs the risk of arrhythmias and increase in oxygen demand caused by these agents.
- Milrinone is preferred over dobutamine.

**Temporary mechanical circulatory assistance** (intra-aortic balloon, counterpulsation pump or percutaneous ventricular assist device) may be indicated in pts not responding to therapy when there is reasonable potential for myocardial recovery with specific interventions (eg, bypass surgery) or to help “bridge” appropriate patients to long-term mechanical circulatory support or cardiac transplantation.

**Pts with atrial fibrillation (AF) as a suspected cause of new-onset HF**, rhythm control should be pursued. Recommended meds include dofetilide and amiodarone. Sotalol may also be considered in patients with mildly depressed LVEF. Pts with severe LV systolic dysfunction and HF, dronedarone should not be used.

- Pts with preexisting HF who develop AF use of antiarrhythmic drug therapy for the maintenance of sinus rhythm has not been shown to improve mortality.

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**Tolvaptan** is vassopressin V2 receptor antagonist it’s FDA approved for the management of severe and/or symptomatic hyponatremia in patients with HF. In the EVEREST trial. It failed to show a reduction in all-cause mortality, CV death or HF hospitalization. However, it significantly reduced dyspnea, body weight, edema and improved hyponatremia compared with placebo at a dose of 30 mg per day. Careful monitoring of liver function is required.

FYI: I have never used it, I recommend nephrology/cards consultation prior to use.
ATRIAL FIBRILATION

➢ Rate control is the recommended treatment strategy in most patients with atrial fibrillation. Supported by the AFFIRM, RACE, STAF, HOT CAFÉ trials
➢ Rhythm control is an option for patients in whom rate control is not achievable or who remain symptomatic despite rate control.

Management
❖ Step 1 Is patient stable? 
❖ If the patient is clinically stable, the history, physical examination, and diagnostic testing should focus on potential causes, triggers, and comorbid conditions.
❖ Standard tests include
  ➢ Electrocardiography
  ➢ Complete Blood Count
  ➢ Complete Metabolic Profile
  ➢ Thyroid-Stimulating Hormone
  ➢ Echocardiography

<table>
<thead>
<tr>
<th>Medication</th>
<th>Loading dose</th>
<th>Maintance Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diltiazem</td>
<td>IV: 0.25 mg/kg over 2 min</td>
<td>5–15 mg/hr</td>
</tr>
<tr>
<td></td>
<td>PO: Same as maintenance</td>
<td>120–360 mg/d in divided doses</td>
</tr>
<tr>
<td>Verapamil</td>
<td>IV: 0.075–0.15 mg/kg over 2 min</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>PO: Same as maintenance</td>
<td>120–360 mg/d in divided doses</td>
</tr>
<tr>
<td>Esmolol</td>
<td>IV: 0.5 mg/kg over 1 min</td>
<td>0.06–0.2 mg/kg/min</td>
</tr>
<tr>
<td>Metoprolol</td>
<td>IV: 2.5–5.0 mg bolus over 2 min</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(up to three doses)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PO: Same as maintenance</td>
<td>25–100 mg bid</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>IV: 150 mg over 10 min</td>
<td>1 mg/min × 6 h, then 0.5 mg/min</td>
</tr>
<tr>
<td></td>
<td>useful to control the heart rate when other measures are unsuccessful</td>
<td></td>
</tr>
<tr>
<td>Digoxin</td>
<td>IV: 0.25 mg q2h, up to 1.5 mg</td>
<td>0.125–0.375 mg/d IV or orally</td>
</tr>
<tr>
<td></td>
<td>useful in controlling the resting ventricular rate in AF in the setting of LV dysfunction and CHF</td>
<td></td>
</tr>
</tbody>
</table>

Anticoagulate according to CHA2DS2-VASc Score and long term rate or rhythm control

According to 2014 Guidelines
### A FIB: Anticoagulation in A. fib Using CHA2DS2-VASc

#### CHADS2 vs CHA2DS2-VASc

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Points</th>
<th>Diagnosis</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>1</td>
<td>CHF</td>
<td>1</td>
</tr>
<tr>
<td>HTN</td>
<td>1</td>
<td>HTN</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt; 75</td>
<td>1</td>
<td>Age &gt; 75</td>
<td>2</td>
</tr>
<tr>
<td>DM</td>
<td>1</td>
<td>DM</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA</td>
<td>2</td>
<td>Stroke/TIA/Thromboembolism</td>
<td>2</td>
</tr>
</tbody>
</table>

**CHADS2 Calculator**

**CHA2DS2-VASc Calculator**

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk of Stroke</th>
<th>Risk</th>
<th>Rec. Treatment</th>
<th>Score</th>
<th>Risk of Stroke</th>
<th>Risk</th>
<th>Rec. Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>Low</td>
<td>ASA 325</td>
<td>0</td>
<td>0</td>
<td>Low</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>Intermediate</td>
<td>ASA or DOAC</td>
<td>1</td>
<td>1.3</td>
<td>Low</td>
<td>ASA</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>High</td>
<td>DOAC</td>
<td>2</td>
<td>2.2</td>
<td>Intermediate</td>
<td>DOAC</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>High</td>
<td>DOAC</td>
<td>3</td>
<td>3.2</td>
<td>Intermediate</td>
<td>DOAC</td>
</tr>
<tr>
<td>4</td>
<td>8.5</td>
<td>High</td>
<td>DOAC</td>
<td>4</td>
<td>4.0</td>
<td>High</td>
<td>DOAC</td>
</tr>
<tr>
<td>5</td>
<td>12.5</td>
<td>High</td>
<td>DOAC</td>
<td>5</td>
<td>6.7</td>
<td>High</td>
<td>DOAC</td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td>High</td>
<td>DOAC</td>
<td>6</td>
<td>9.8</td>
<td>High</td>
<td>DOAC</td>
</tr>
<tr>
<td>7</td>
<td>9.6</td>
<td>High</td>
<td>DOAC</td>
<td>7</td>
<td>9.6</td>
<td>High</td>
<td>DOAC</td>
</tr>
<tr>
<td>8</td>
<td>12.5</td>
<td>High</td>
<td>DOAC</td>
<td>8</td>
<td>12.5</td>
<td>High</td>
<td>DOAC</td>
</tr>
<tr>
<td>9</td>
<td>15.2</td>
<td>High</td>
<td>DOAC</td>
<td>9</td>
<td>15.2</td>
<td>High</td>
<td>DOAC</td>
</tr>
</tbody>
</table>

In women anti-coagulate if CHA2DS2-VASc is 3 or above

**2019 updated guidelines**
➢ To Bridge or not to Bridge

❖ The BRIDGE trial, found that for patients with atrial fibrillation who require temporary interruption of warfarin treatment for an elective operation or other elective invasive procedure, no-bridging was noninferior to bridging with low-molecular-weight heparin for the prevention of arterial thromboembolism

❖ Pts with CHAD2 score 2-4: no bridge needed
❖ Pts with CHAD2 score 5-6 underrepresented, so bridging maybe appropriate
❖ Pts with mechanical valve excluded, need bridging

➢ Bleeding Risk on anticoagulation. Use HAS-BLED score to assess patients risk of bleeding

❖ HAS-BLED

❖ This Online calculator uses CHA2DS2-VASc and HAS-BLED scores to determine an individual’s risk/benefit profile with the various anticoagulation strategies

➢ Rate vs Rhythm Control

❖ NICE guidelines, and the ACC/AHA/HRS guidelines, recommend rate control as the first-line strategy for AF management, except
❖ Patients under 65 with symptomatic AF
❖ AF has a reversible cause
❖ AF who’s HF believed to be primarily caused by AF
❖ New-onset AF
❖ Atrial flutter that is considered suitable for an ablation strategy
❖ Any AF patient whom a rhythm-control strategy would be more suitable based on clinical judgment.
❖ Patients who continue to experience symptomatic AF despite an adequate trial of rate control

➢ Target Heart Rates

❖ 2006 consensus guidelines for AF recommended target heart rates of 60 to 80 bpm at rest and 90 to 115 bpm during moderate exercise.
❖ AFFIRM trial, recommended targets for rate control were no higher than 80 bpm at rest and no higher than 110 bpm during a 6-minute walk test
❖ RACE II study compared lenient (resting heart rate <110 bpm) or strict (resting heart rate <80 bpm and heart rate during moderate exercise <110 bpm)
❖ Strict rate control no benefit in comparison with lenient rate control for patients with persistent AF, acceptable symptoms, and LVEF >40%.
❖ Patients with AF and HF target resting heart rates in the range of 60 to 70 bpm SHIFT study

➢ Rhythm control

❖ Patients with left atrial diameters >4.5 cm are less likely to remain in sinus rhythm.
❖ patients with left ventricular hypertrophy are at increased risk for proarrhythmic
Patients with paroxysmal AF may be candidates for a “pill in-the-pocket” strategy using propafenone or flecainide.

**Ibutilide** is the only FDA approved drug for pharmacologic cardioversion.
- 45% conversion rate
- Associated with a 4% to 8% risk for torsades de pointes especially in the first 2 to 4 hours after administration.

The efficacy of antiarrhythmics to achieve pharmacologic conversion drops sharply when AF is present for more than >7 days in duration.

For shorter duration AF episodes, **Dofetilide, Sotalol, Flecainide, And Propafenone** have some efficacy.

**Amiodarone** has limited efficacy to achieve pharmacologic cardioversion.

**DC Cardioversion (DCCV)** safest, most effective method of acutely restoring sinus rhythm.

**Unstable patients** with AF and a rapid ventricular response in the setting of ongoing myocardial ischemia, MI, hypotension, or respiratory distress should receive prompt **DC Cardioversion (DCCV)** regardless of the anticoagulation status.

- AF is documented to be <48 hours, cardioversion may proceed without anticoagulation.
- If AF has persisted for >48 hours (or for an unknown duration), patients should be anticoagulated with warfarin or new anticoagulant, for at least 3 weeks before cardioversion, and anticoagulation should be continued following successful cardioversion.

- A **transesophageal echocardiogram** to rule out left atrial appendage thrombus before cardioversion is safe and has the advantage of shorter time to cardioversion than warfarin and is indicated in patients who are not able to wait weeks before cardioversion.
  - Therapeutic anticoagulation with warfarin is indicated after the cardioversion for a minimum of 4 weeks
  - the AFFIRM trial suggests that in patients with high risk for stroke, warfarin should be continued indefinitely.

**Maintenance of sinus rhythm** with antiarrhythmic agents
- Associated with a small risk for life-threatening proarrhythmia.
- Antiarrhythmic therapy should be reserved for patients who have highly symptomatic AF in spite of adequate rate control.
- Most effective agents for maintenance of sinus rhythm are flecainide, propafenone, sotalol, dofetilide, and amiodarone.
## A review of rhythm-control medications

<table>
<thead>
<tr>
<th>Drug</th>
<th>Cardioversion dose</th>
<th>Maintenance of sinus rhythm dose</th>
<th>Specific indications</th>
<th>Cautions or adverse effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class IC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flecainide</td>
<td>Oral: 200-300 mg x 1</td>
<td>50-200 mg q12 hr</td>
<td>AF w/o structural heart disease</td>
<td>Sinus or AV node dysfunction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pill-in-the-pocket</td>
<td>Heart failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CAD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Atrial flutter</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Brugada syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Renal or liver disease</td>
</tr>
<tr>
<td>Propafenone</td>
<td>Oral: 450-600 mg x 1</td>
<td>IR: 150-300 mg q8 hr ER: 225-425 mg q12 hr</td>
<td>AF w/o structural heart disease</td>
<td>Sinus or AV node dysfunction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pill-in-the-pocket</td>
<td>Heart failure</td>
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<td>CAD</td>
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<td></td>
<td>Atrial flutter</td>
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<td></td>
<td>Brugada syndrome</td>
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<td></td>
<td></td>
<td>Liver disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Asthma</td>
</tr>
<tr>
<td><strong>Class III</strong></td>
<td></td>
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</tr>
<tr>
<td>Amiodarone</td>
<td>Oral: 600-800 mg/d divided doses, max total load of 10 g</td>
<td>Oral: 400-600 mg/d for 2-4 wks, then 100-200 mg/d</td>
<td>LV hypertrophy</td>
<td>Phlebitis (with IV route)</td>
</tr>
<tr>
<td></td>
<td>IV: 150 mg over 10 min, then 1 mg/min for 6 hr, then 0.5 mg/hr for 18 hr</td>
<td>IV: 150 mg over 10 min, then 1 mg/min for 6 hr, then 0.5 mg/hr for 18 hr</td>
<td>HF CAD Previous MI</td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Bradiacardia</td>
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<td></td>
<td></td>
<td>QT prolongation</td>
</tr>
<tr>
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<td></td>
<td>Torsades de pointes</td>
</tr>
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<td></td>
<td></td>
<td>GI upset</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Constipation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increased INR</td>
</tr>
<tr>
<td>Dofetilide</td>
<td>Oral: 125 to 500 mcg q12 hr based on renal function</td>
<td>125-500 mcg q12 hr. Must monitor QTc interval and dose accordingly</td>
<td>None</td>
<td>Prolonged QT interval Renal disease Hypokalemia Hypomagnesemia Diuretic therapy</td>
</tr>
<tr>
<td>Sotalol</td>
<td>N/A</td>
<td>40-160 mg q12 hr</td>
<td>None</td>
<td>Prolonged QT interval Renal disease Hypokalemia Hypomagnesemia Diuretic therapy Sinus or AV nodal dysfunction HF, Asthma</td>
</tr>
</tbody>
</table>

---

*Updated 3/2017 by CFDumois MD
Curative catheter ablation of AF

- Highly effective in young patients with structurally normal hearts and a paroxysmal pattern of their AF.
- Cure rates in this patient category are in the range of 80% to 90%.
- Cure rates are diminished in patients with structural heart disease, advanced age, and persistent AF.
BLEEDING RISK

➢ HAS-BLED: acronym of the major factors associated with bleeding risk in patients with atrial fibrillation receiving oral anticoagulation.

➢ Online calculator at mdcalc.com

<table>
<thead>
<tr>
<th>Letter</th>
<th>Clinical Characteristic</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>Abnormal: Renal function (1 point each)</td>
<td>1</td>
</tr>
<tr>
<td>S</td>
<td>Stroke</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>Bleeding</td>
<td>1</td>
</tr>
<tr>
<td>L</td>
<td>Labile INRs</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Elderly</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>Drugs Alcohol (1 point each)</td>
<td>1</td>
</tr>
</tbody>
</table>

Maximum possible score 9

➢ Risk of major bleeding within one year in atrial fibrillation patients enrolled in the Euro Heart Survey

<table>
<thead>
<tr>
<th>HAS-BLED score</th>
<th>Bleeds/100 patients*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.13</td>
</tr>
<tr>
<td>1</td>
<td>1.02</td>
</tr>
<tr>
<td>2</td>
<td>1.88</td>
</tr>
<tr>
<td>3</td>
<td>3.74</td>
</tr>
<tr>
<td>4</td>
<td>8.70</td>
</tr>
<tr>
<td>5</td>
<td>12.50</td>
</tr>
</tbody>
</table>

score of ≥3 indicates sufficient bleed risk for intracranial bleed, bleed requiring hospitalization or a hgb drop > 2g/L Use caution and more regular review

Transient ischemic attack (TIA) is a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction.

*The American Heart Association (AHA), /American Stroke Association (ASA)*

**2009 TIA Guidelines**

**ABCD2 Score** predicts a patient's risk of stroke following a TIA.

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Criterion</th>
<th>Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Age</td>
<td>&gt;= 60</td>
<td>1</td>
</tr>
<tr>
<td>B Blood pressure</td>
<td>&gt;= 140/90 mmHg</td>
<td>1</td>
</tr>
<tr>
<td>C Clinical features of the TIA</td>
<td>unilateral weakness speech disturbance without weakness</td>
<td>2</td>
</tr>
<tr>
<td>D1 Duration of symptoms</td>
<td>&gt;= 60 min</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>10-59 min</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&lt;10 min</td>
<td>0</td>
</tr>
<tr>
<td>D2 Diabetes</td>
<td>Diagnosed w Diabetes?</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ABCD2 score</th>
<th>Risk of stroke at Day 2</th>
<th>Risk of stroke at Day 7</th>
<th>Risk of stroke at Day 90</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>1%</td>
<td>1.2%</td>
<td>3.1%</td>
</tr>
<tr>
<td>4-5</td>
<td>4.1%</td>
<td>5.9%</td>
<td>9.8%</td>
</tr>
<tr>
<td>6-7</td>
<td>8.1%</td>
<td>11.7%</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

Online calculator at mdCalc.com

- **Hospitalization**: Should be considered for those w ABCD2 score of ≥4
- **Lab testing**: Full blood count, serum electrolytes and creatinine; fasting blood glucose and lipids
- **Electrocardiography**: Recommended within 48 hours
- **Brain imaging study**: CT or MRI within 24 hours
- **Vascular imaging**: Carotid imaging, CT or MR angiography within 24 hours
Antithrombotic Therapy for TIA or Minor Stroke

- TIA with ABCD2 score 4 or higher, Minor stroke (NIHSS 0-3)
- DAPT should be started as soon as possible within 24 hours of minor ischemic stroke or high risk TIA and should be continued up to 21 days.
  - Aspirin 162 mg x 5 days, then 81 mg daily, plus clopidogrel 300 mg loading dose, followed by 75 mg daily for 21 days then return to monotherapy (aspirin 81 mg daily or clopidogrel 75 mg daily)

Atherothrombotic TIA: Daily long-term antiplatelet therapy: combination extended-release dipyridamole plus aspirin (first choice), clopidogrel, or aspirin alone. 2nd prevention with aspirin 28%

Cardioembolic TIA: Long-term anticoagulation for atrial fibrillation; check CHA2DS2-VASc and Bleeding score.

Hypertension: BP reduction of 10/5: 24% reduction in CV events (HOPE STUDY), 40% reduction with ACE and HCTZ (PROGRESS STUDY)

Lipids: Initiate a daily statin. 25% RR reduction with lowering cholesterol (HEART PROTECTION STUDY) (using simvastatin)

Smoking: Initiate a cessation program

Diabetes: Fasting blood glucose goal <126mg/dl

Physical activity: Recommend ≥10 min of exercise such as walking, bicycling, running, or swimming ≥3 times/week

Carotid endarterectomy: Preferably within 2 weeks of cerebral or retinal TIA in those with TIA attributed to a high-grade internal carotid artery stenosis:
  - 70-99% internal carotid artery stenosis: Recommended
  - 50-69% stenosis: Recommended for certain patients and only at centers with perioperative complication rate <6%
  - <50% stenosis: Not recommended

*Stroke. 2009;40:2276-2293; originally published online May 7, 2009;* 
*Print ISSN: 0039-2499. Online ISSN: 1524-4628*
### Management Groups

#### Primary prevention Initiating STATIN

<table>
<thead>
<tr>
<th>Age</th>
<th>Determine risk status first</th>
<th>Low Risk (&lt;5%) the emphasis should be on lifestyle changes to reduce risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 20 - 39</td>
<td>Estimate lifetime risk and consider statin if there is a family history of premature ASCVD and LDL ≥160</td>
<td></td>
</tr>
<tr>
<td>Age 40-75 no DM and LDL 70 – 190</td>
<td>MESA Risk Calculator</td>
<td>Borderline Risk (5% to &lt;7.5%) risk discussion</td>
</tr>
<tr>
<td>Age 40-75, no DM and LDL 70 – 190</td>
<td>ACC Risk Cal</td>
<td>If positive risk enhancers, moderate-intensity statins can be considered</td>
</tr>
<tr>
<td><strong>Intermediate Risk</strong> (≥7.5% to 20%) risk discussion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If positive risk enhancers, initiate a moderate-intensity statin with a goal LDL reduction of 30% to 49%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• In intermediate-risk or selected borderline-risk adults, if the decision about statin use remains uncertain, reasonable to use a CAC score in the decision to withhold, postpone or initiate statin therapy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If CAC score: 0 reasonable to withhold statin therapy and reassess in 5 to 10 yrs, as long as high risk conditions are absent (diabetes mellitus, family history of premature CHD, smoker)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If CAC score 1 to 99: reasonable to initiate statin therapy for patients ≥55 yrs of age;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If CAC score is 100 or higher or in the 75th percentile or higher, it is reasonable to initiate statin therapy</td>
<td></td>
</tr>
<tr>
<td><strong>High Risk</strong> (≥20%), initiate a statin to reduce LDL by ≥50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk-Enhancing Factors**

- Family history of premature ASCVD
- Primary hypercholesterolemia
- Metabolic syndrome
- Chronic kidney disease
- Chronic inflammatory conditions such as psoriasis, RA, or HIV/AIDS
- History of premature menopause (before age 40 y)
- history of pregnancy-associated conditions that increase later ASCVD risk such as preeclampsia
- High-risk race/ethnicities (e.g., South Asian ancestry)
- Lipid/biomarkers: Associated with increased ASCVD risk
  - Persistently* elevated, primary hypertriglyceridemia (≥175 mg/dL);
  - Elevated high-sensitivity C-reactive protein (≥2.0 mg/L)
  - Elevated Lp(a): A relative indication for its measurement is family history of premature ASCVD. An Lp(a) ≥50 mg/dL or ≥125 nmol/L constitutes a risk-enhancing factor especially at higher levels of Lp(a).
  - Elevated apoB ≥130 mg/dL: (measure if triglyceride ≥200 mg/dL. A level ≥130 mg/dL corresponds to an LDL-C ≥160 mg/dL and constitutes a risk-enhancing factor
- ABI <0.9
The diagnosis of **metabolic syndrome** is made by the presence of any 3 of the following: elevated waist circumference, elevated serum triglycerides, reduced HDL-C, elevated blood pressure, and elevated fasting glucose.

<table>
<thead>
<tr>
<th>LDL &gt; 190</th>
<th>High-Intensity Statin should be initiated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>no risk assessment</strong> is needed</td>
<td>20 to 75 years with an LDL-C ≥190 who achieve &lt;50% reduction in LDL-C on max tolerated statin therapy and/or who have an LDL-C level ≥100 ezetimibe therapy is reasonable</td>
</tr>
<tr>
<td></td>
<td>20 to 75 years with a baseline LDL-C ≥190 who achieve &lt;50% reduction in LDL-C and have fasting triglycerides ≤300 on max tolerated statin and ezetimibe therapy, the addition of a bile acid sequestrant may be considered</td>
</tr>
<tr>
<td></td>
<td>40 to 75 years with a baseline LDL-C ≥220 and on-treatment with LDL ≥130 on max tolerated statin and ezetimibe therapy, the addition of a PCSK9 inhibitor may be considered</td>
</tr>
</tbody>
</table>

**Diabetes mellitus**

| Age 20 to 39 | DM that is either of long duration (≥10 years of type 2 diabetes mellitus, ≥20 years of type 1 diabetes mellitus), albuminuria (≥30 mcg of albumin/mg creatinine), estimated glomerular filtration rate (eGFR) less than 60 mL/min/1.73 m², retinopathy, neuropathy, or ABI; <0.9, it may be reasonable to initiate statin therapy |
| Age 40-75 | 10yr ASCVD Risk ≥ 7.5% ➔ High intensity statin |
| | 10yr ASCVD Risk ≤ 7.5% ➔ Moderate intensity statin |
| Age >75 years | Perform a clinical assessment and discuss risk with the patient |
## Secondary Prevention

### Patients with ASCVD

<table>
<thead>
<tr>
<th>Not at Very High Risk</th>
<th>≤ 75 yr</th>
<th>Over 75 yr or Not a candidate for HIS</th>
<th>Over 75 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Intensity Statin (HIS) with a goal decrease of ≥50% Those on maximal statin therapy who have not achieved LDL &lt;70, consider adding ezetimibe</td>
<td>Moderate or High Intensity Statin (HIS)</td>
<td>If on HIS, Continue a high-intensity statin</td>
<td></td>
</tr>
</tbody>
</table>

- **Very high risk** is defined as a history of multiple major ASCVD events or 1 major ASCVD event and multiple high-risk conditions

### Major ASCVD Events
- Recent ACS (within the past 12 mo)
- History of MI (other than recent ACS event listed above)
- History of ischemic stroke
- Symptomatic peripheral arterial disease

### High-Risk Conditions
- age ≥65 years
- Hx of prior CABG or PCI
- diabetes mellitus
- hypertension
- CKD
- HeFH
- current smoker
- persistently elevated LDL ≥ 100 on max tolerated statin and ezetimibe
- history of CHF
ACC EXPERT CONSENSUS DECISION PATHWAY on the ROLE of NON-STATIN

- After initiation of STATIN therapy a second lipid panel 4 to 12 weeks
- Lipid panel should be performed every 3 to 12 months as clinically indicated
- Re-check lipid panel 4 to 12 weeks after treatment modification
- LDL reduction goal should be agreed upon, and the response to therapy monitored.

❖ Lipid Monitoring and Management (based on IMPROVE-IT and FOURIER clinical trials)

<table>
<thead>
<tr>
<th>Pts on maximally tolerated statin</th>
<th>Patient achieves ≥50% reduction in LDL</th>
<th>Therapy continued.</th>
</tr>
</thead>
</table>
| Pts on maximally tolerated statin | Response suboptimal (<50%)            | 1. Assess medication adherence  
                                        |                          | 2. Intensify lifestyle interventions 
                                        |                          | 3. Increase to a high-intensity statin  
                                        |                          | 4. Control any other risk factors. |
| Patient on high intensity STATIN | If LDL still not reduced by ≥50%       | Add non-statin therapy (see below) |

❖ Recommendations for non-statin therapy for patient subpopulations:

| Pts ≥21 years with ASCVD without comorbidities on STATIN for secondary prevention | 1. Add ezetimibe 
                                                                                                                                               | 2. if <50% reduction in LDL-C is achieved with dual therapy, a PCSK9 inhibitor may be added in place of or in addition to ezetimibe |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Pts ≥21 years with ASCVD with comorbidities on STATIN for secondary prevention     | ezetimibe or a PCSK9 inhibitor may be considered                                                                                           |
| Patients ≥21 years with ASCVD and baseline LDL-C ≥190 on STATIN for secondary prevention | 1. add ezetimibe or a PCSK9 inhibitor as the initial non-statin agent 
                                                                                                                                               | 2. the other agent added on later if necessary                                                                                             |
| Patients ≥21 years without ASCVD and baseline LDL-C ≥190 mg/dL on STATIN for primary prevention | add ezetimibe or a PCSK9 inhibitor as the initial non-statin agent with the other agent added on later if necessary                            |
| Patients with DM who are 40 to 75 yrs of age, without ASCVD with an LDL-C between 70 to 189 with a 10-year ASCVD risk <7.5% and no high-risk features, who are taking a statin as primary prevention: | On moderate-intensity statin with the goal of achieving a 30% to 49% LDL-C reduction. If that level is not achieved, then a high-intensity statin should be used.  
                                                                                                                                               | If patients achieve a ≥50% reduction in LDL-C from baseline, therapy should be continued.  
                                                                                                                                               | If response is suboptimal, If LDL-C is still not reduced by ≥50%, ezetimibe therapy may be considered |
| Patients with DM who are 40 to 75 yrs of age, without ASCVD with an LDL-C between 70 to 189 with a 10-year ASCVD risk >7.5% and no high-risk features, who are taking a statin as primary prevention: | on high-intensity statins, if LDL is reduced by ≥50% from baseline, then therapy and monitoring should be continued. If a patient taking a high-intensity statin does not achieve a ≥50% reduction in LDL-C and has high-risk features, then ezetimibe may be considered |
### STATIN COMPARISON

<table>
<thead>
<tr>
<th>High intensity</th>
<th>Moderate intensity</th>
<th>Low intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 50% reduction in LDL</td>
<td>30 – 50% LDL reduction</td>
<td>≤ 30% reduction in LDL</td>
</tr>
<tr>
<td>Atorvastatin 40 - 80mg Rosuvastatin 20 - 40mg</td>
<td>Atorvastatin (Lipitor®) 10 - 20mg Rosuvastatin (Crestor®) 5 - 10mg Simvastatin (Zocor®) 20 - 40mg Pravastatin 40 - 80mg Lovastatin 40mg Pitavastatin (Livalo®) 2 – 4 mg</td>
<td>Simvastatin (Zocor®) 10mg Pravastatin 10 - 20mg Lovastatin 20mg Fluvastatin 20 - 40mg Pitavastatin 1mg</td>
</tr>
</tbody>
</table>

### STATINS in WOMEN

- Women of childbearing age who are treated with statin therapy and are sexually active should be counseled to use a reliable form of contraception.
- Women of childbearing age with hypercholesterolemia who plan to become pregnant should stop the statin 1 to 2 months before pregnancy is attempted, or if they become pregnant while on a statin, should have the statin stopped as soon as the pregnancy is discovered.

### NON-STATIN THERAPY

<table>
<thead>
<tr>
<th>Agent</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Ezetimibe | **Dose:** 10 mg PO daily, with or without food. Take either >2 hours before or >4 hours after BAS if used in combination.  
**Mean % reduction in LDL:** Monotherapy 18%; combination therapy with STATIN 25% |
| PCSK9 inhibitors | **Dose and route of administration:**  
**Alirocumab**—initiate 75 mg SQ every 2 weeks. If more LDL reduction needed, may ↑ dose to 150 mg every 2 weeks.  
**Evolocumab**—in primary hypercholesterolemia with established clinical ASCVD or HeFH, give 140 mg SQ every 2 weeks or 420 mg SQ once monthly in abdomen, thigh, or upper arm. In HoFH, give 420 mg SQ once monthly, give 3 (140 mg) injections consecutively within 30 minutes.  
**Mean % LDL-C reduction:** Alirocumab—when added to STATIN therapy, alirocumab 75 mg and 150 mg SQ every 2 weeks ↓ LDL-C by an additional 43% and 47%, respectively.  
When added to STATIN therapy evolocumab 140 mg every 2 weeks and 420 mg SQ every 4 weeks, ↓ LDL-C by an additional 64% and 58%, respectively |
| Bile acid sequestrants | **Dose and route of administration:**  
**Colesevamel:** Tablets: 6 tablets PO once daily or 3 tablets PO twice daily; take tablets with a meal and liquid. Suspension: one 3.75-gram packet PO daily, or one 1.875-gram packet PO twice daily; mixed powder with 4–8 ounces of water, fruit juice, or soft drink; take with meal. 3.75 grams is equivalent to 6 tablets. 1.875 grams is equivalent to 3 tablets.  
**Cholestyramine:** 8-16 grams/day orally divided into 2 doses.  
**Colestipol:** 2 to 16 grams/day orally given once or in divided doses.  
**Mean % LDL reduction** Colesevamel: Monotherapy—15% (6 tablets daily); combination with low- to moderate intensity statin— additional 10-16% reduction in LDL-C (data from simvastatin 10 mg, atorvastatin 10 mg). Cholestyramine: Monotherapy—10.4% vs placebo. |
Phytosterols

**Dose and route of administration:** 1-3 g PO per day with meals either once daily or in divided doses.

**Mean % LDL-C reduction:** Consumption of 2 g/day of phytosterols ↓ LDL-C by 5-15%.

Soluble fiber

**Dose and route of administration:** Food source must be low in saturated fat and cholesterol, and include one or more of the following whole oat or barley foods: 1) oat bran, 2) rolled oats, 3) whole oat flour, 4) whole grain barley or dry milled barley.

**Mean % LDL-D reduction:** With intake of 3.0–12.4 g/day, mean TC and LDL-C levels were ↓ relative to control by 9.7 and 11.6 mg/dL, respectively.

Mipomersen

**Dose and route of administration:** 200 mg SQ once weekly

**Mean % LDL-C reduction:** Response to addition of mipomersen to maximally tolerated lipid-lowering medication in patients with HoFH—25%

Updated Dr Dumois 2018

Grundy SM, et al. 2018 Cholesterol Clinical Practice Guidelines

HYPERTRIGLYCERIDEMIA

❖ Two categories of elevated triglycerides
  ❖ moderate hypertriglyceridemia: fasting or non-fasting triglycerides 150-499 mg/dL
  ❖ severe hypertriglyceridemia fasting triglycerides ≥500 mg/dL
❖ Hypertriglyceridemia cause elevated VLDL (even moderate elevation) and elevated chylomicron (elevations of chylomicrons typically occurs when triglycerides are ≥500)
❖ VLDL are atherogenic and increases the patient’s ASCVD risk
❖ Chylomicrons increases risk of pancreatitis

**Causes of Hypertriglyceridemia**

<table>
<thead>
<tr>
<th>Medications</th>
<th>nphrotic syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated diabetes mellitus</td>
<td>uremia</td>
</tr>
<tr>
<td>Insulin resistance</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>Pregnancy (especially third trimester)</td>
</tr>
<tr>
<td>Obesity</td>
<td>SLE</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Paraproteinemia</td>
</tr>
<tr>
<td>Polycystic ovary syndrome</td>
<td>HIV infection</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td></td>
</tr>
</tbody>
</table>

**Drugs That Raise Triglycerides**

<table>
<thead>
<tr>
<th>Beta-blockers (especially non-beta 1selective)</th>
<th>Immunosuppressive drugs (cyclosporine, sirolimus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral estrogens</td>
<td>Thiazide diuretics</td>
</tr>
<tr>
<td>tamoxifen</td>
<td>Protease inhibitors</td>
</tr>
<tr>
<td>raloxifene</td>
<td>Bile acid sequestrants</td>
</tr>
<tr>
<td>Retinoids isotretinoin</td>
<td>Glucocorticoids</td>
</tr>
<tr>
<td>Atypical antipsychotic drugs</td>
<td>L-asparaginase</td>
</tr>
<tr>
<td>Interferon</td>
<td>Cyclophosphamide</td>
</tr>
</tbody>
</table>
Guidelines for Hypertriglyceridemia

- In all adults 20 years of age or older with moderate hypertriglyceridemia (triglycerides 175 to 499 mg/dL), clinicians should address and treat:
  1. Lifestyle factors
  2. Secondary factors (diabetes mellitus, chronic liver or kidney disease and/or nephrotic syndrome, hypothyroidism)
  3. Medications that increase triglycerides

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Triglyceride Level</th>
<th>ASCVD Risk</th>
<th>Management</th>
</tr>
</thead>
</table>
| 40 to 75 yrs of age | Moderate or Severe Hypertriglyceridemia (149 – 499) and ASCVD risk of > 7.5% | 1. Reevaluate ASCVD risk after lifestyle and secondary factors are addressed  
2. Consider a persistently elevated triglyceride level as a factor favoring  
3. Initiation or intensification of statin therapy | |
| All Adults | Severe Hypertriglyceridemia (fasting triglycerides ≥500) and ASCVD risk of >7.5% | Address reversible causes of high triglyceride and initiate statin therapy | |
| All Adults | Severe Hypertriglyceridemia (fasting triglycerides ≥ 1000) | 1. Identify and address other causes of Hypertriglyceridemia  
2. Initiation of statin therapy  
3. Implementation of a very low fat diet  
4. Avoidance of refined carbohydrates and alcohol  
5. Omega-3 fatty acids, and/or fibrate (to prevent pancreatitis)  
- If a fibrate is necessary in a patient being treated With a statin, it is safer to use fenofibrate than gemfibrozil because of lower risk of severe myopathy | |

Severe or life-threatening hypertriglyceridemia during pregnancy is best managed in consultation with a lipid specialist.

*Updated 2018 Dr Dumois*


*Inherited Triglyceride Disorders, presentation by Anne Carol Goldberg, MD, FNLA Professor of Medicine Washington University School of Medicine May 20, 2016 Grundy SM, et al. 2018 Cholesterol Clinical Practice Guidelines*
❖ Aspirin for primary prevention
❖ Patients without DM and with CV risk factors, aspirin offers no CV benefit and was associated with slight harm (ARRIVE trial)
❖ Patients over 65 without cardiovascular disease, dementia, or physical disability, aspirin offered no benefit however was associated with a significant increase in the rate of major hemorrhage and all-cause mortality. (ASPREE trial)
❖ Patients with DM, the incidence of serious vascular events was 1 percentage point lower in the aspirin group than in the placebo group (8.5% vs. 9.6%; P=0.01), but the incidence of major bleeding events was 1 percentage point higher with aspirin (4.1% vs. 3.2%; P=0.003). (ASCEND trial)
❖ Colorectal cancer reduction: Both the ASCEND or ARRIVE trial failed to show that aspirin lowers the rates of colorectal cancer, but the duration of these studies might have been too short to demonstrate lower cancer incidence.
**USPSTF 2016 ASA guidelines for Prevention of Cardiovascular Disease and Colorectal Cancer**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults aged 50 to 59</td>
<td>The USPSTF recommends initiating low-dose aspirin use for the primary prevention of cardiovascular disease (CVD) and colorectal cancer (CRC) in adults aged 50 to 59 years who have a 10% or greater 10-year CVD risk, are not at increased risk for bleeding, have a life expectancy of at least 10 years, and are willing to take low-dose aspirin daily for at least 10 years.</td>
</tr>
<tr>
<td>Adults aged 60 to 69</td>
<td>The decision to initiate low-dose aspirin use for the primary prevention of CVD and CRC in adults aged 60 to 69 years who have a 10% or greater 10-year CVD risk should be an individual one. Persons who are not at increased risk for bleeding, have a life expectancy of at least 10 years, and are willing to take low-dose aspirin daily for at least 10 years are more likely to benefit.</td>
</tr>
<tr>
<td>Younger than 50 years</td>
<td>The current evidence is insufficient.</td>
</tr>
<tr>
<td>70 years or older</td>
<td>The current evidence is insufficient.</td>
</tr>
</tbody>
</table>

- Low dose aspirin = 81 mg.
- 10 yr Risk Calculator ASCVD-Risk-Estimator, Bleeding Risk HAS-BLED Score

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**DUAL ANTIPLATELET THERAPY (DAPT)**

- **For TIA or Minor Stroke**
  - If ABCD2 score 4 or higher (dual antiplatelet for 21 days)
  - Aspirin 162 mg x 5 days, then 81 mg daily, plus clopidogrel 600 mg loading dose, followed by 75 mg daily for 21 days then return to monotherapy (aspirin 81 mg daily)

- **Patients with Coronary Artery Disease**
  - The recommended daily dose of aspirin in patients treated with DAPT is 81 mg
  - **Patients with stable ischemic heart disease (SIHD)**
    - After drug-eluting stent (DES): DAPT, with clopidogrel for at least 6 months (Class I).
    - After bare-metal stent (BMS): DAPT, with clopidogrel for at least 1 month (Class I).
    - Patients with SIHD treated with DAPT after BMS or DES who have tolerated DAPT without a bleeding complication and are not at high bleeding risk continuation of DAPT for longer than 1 month for pts with BMS or longer than 6 months for DES may be reasonable (Class IIb).
Patients with Acute Coronary Syndrome (ACS) [NSTE] Or [STEMI]

- **After BMS or DES:** DAPT with clopidogrel, prasugrel, or ticagrelor for at least 12 months (Class I).
- Patients with ACS (NSTE-ACS or STEMI) treated with coronary stents who have tolerated DAPT without a bleeding complication and who are not at high bleeding risk, continuation of DAPT (clopidogrel, prasugrel, or ticagrelor) for longer than 12 months may be reasonable (Class IIb).

- **The DAPT score** may be useful for decisions about whether to continue (prolong or extend) DAPT in patients treated with coronary stent implantation.
- Patients with ACS (NSTE-ACS or STEMI) being treated with DAPT who undergo CABG, P2Y12 inhibitor therapy should be resumed after CABG to complete 12 months of DAPT therapy after ACS (Class I).
- Patients with STEMI treated with DAPT in conjunction with fibrinolytic therapy, P2Y12 inhibitor therapy (clopidogrel) should be continued for a minimum of 14 days and ideally at least 12 months (Class I).

Elective noncardiac surgery should be delayed 30 days after BMS implantation and optimally 6 months after DES implantation.

Patients treated with DAPT after coronary stent implantation who must undergo surgical procedures that mandate the discontinuation of P2Y12 inhibitor therapy, it is recommended that aspirin be continued if possible and the P2Y12 platelet receptor inhibitor be restarted as soon as possible after surgery (Class I).

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**ACC/AHA Guideline Update on Duration of Dual Antiplatelet Therapy in CAD Patients**

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[Table of Content][Cardio-Vascular Disorders]
Syncope is a sudden, brief loss of consciousness (LOC) with loss of postural tone followed by spontaneous recovery.

Near-syncope / pre-syncope is light-headedness and a sense of an impending faint without LOC. Should be evaluated as Syncope with same risks of adverse event.

Syncope is classified as neurally mediated (reflex), cardiac, orthostatic, or neurologic.

Classifications of Syncope  
3 main Categories

❖ **Neurally mediated (reflex)**
  - Carotid sinus syndrome/hypersensitivity 1%
  - Situational 5%
  ➢ **Vasovagal 18%** Most common
  - Cerebrovascular
  - Neurogenic

❖ **Cardiac**
  - **Arrhythmia 14%** (e.g., bradyarrhythmias, ventricular tachyarrhythmias, supraventricular tachyarrhythmias, long QT syndrome), pacemaker dysfunction
  - Obstructive cardiomyopathy
  - Structural disease 4% (cardiac)

❖ **Orthostatic**
  - Drug-induced
  - Primary autonomic failure
  - Secondary autonomic failure
  - Volume depletion

❖ **Neurologic 10%**

❖ **Differential of Syncope**
  - Cataplexy
  - Drop attacks
  - Pseudoseizures
  - Psychogenic conditions (e.g., anxiety, hysterical fainting)
  - Transient ischemic attacks (carotid in origin)
  - Metabolic disorders (e.g., hypoglycemia, hypoxia, hyperventilation)
  - Seizures, may present with partial or complete loss of consciousness
  - Acute intoxications
  - Vertebrobasilar insufficiency
Work up for Syncope / pre-syncope

Step 1: Did patient have a seizure. Seizures often can be confused with syncope

Step 2

- Detailed history attention to
  - Hx of CAD, Hx of HF
  - FHx of sudden death
  - Circumstances regarding syncope
  - Frequency of syncope
  - Association with exertion or orthostatic hypotension
  - Prodome syndrome (nausea, diaphoresis, dizziness)
  - Postevent symptoms

- Physical exam with attention to
  - Orthostatic vitals (BP and pulse)
  - Cardiac auscultation

- ECG

- In select patients: Guided by H/P
  - Echocardiogram
  - Ultrasound of aorta
  - Ultrasound Abd for free fluid (FAST exam)
  - Hgb
  - Urine Pregnancy Test in women of child bearing age
  - pBNP
  - Troponin, stress testing
  - D dimer

Step 3. Out-patient, Observation or Admit Further Workup

- Outpatient management for patients with presumptive reflex-mediated syncope and absence of cardiac disease or comorbid neurologic disease
- Observation for patients with worrisome physical findings suggestive of a potentially serious etiology and/or 1 or more high risk factor
- Observation for patients with near or pre-syncope and 2 or more high risk factor
- Admit If chest pain, SOB, Abdominal Pain, Severe Headache, or Hypotension
High Risk Patients  (condensed from multiple studies)

- Male (2017 Guidelines ACC/AHA)
- Age greater than 60 (Sarasin and STePS)
- History of Cardiovascular disease (all studies): Especially any history of heart failure or structural cardiac disease, including valvular
- Syncope without a prodrome, no precipitating factors (EGSYS)
- Hemoglobin less than 10 (SF rule)
- Syncope with Exertion (EGSYS)
- Syncope while supine (EGSYS)
- Palpitations preceding syncope (highest value on EGSYS score)
- Hypotension
- SOB or Hypoxemia (obviously)
- Abnormal ECG – looks for cardiac syncope.

- Abnormal Electrocardiogram (ECG): Defined (San Fran syncope rule) as any new changes when compared to the last ECG or presence of non-sinus rhythm. If no previous ECG was available, ECG was classified as abnormal if any abnormality was present.
- Pay attention to findings indicating these pathologies:
  - Long QT (at least 480-500ms),
  - Brugada morphology
  - RV dysplasia
  - WPW
  - HOCM
  - Non-sinus rhythm
  - SVT or VT
  - 2nd or 3rd degree AV blocks or sinus pause of at least 2 sec.
  - RBBB with hemiblock (bifascicular block)
  - Left BBB
  - Evidence of acute ischemia (may be subtle)
  - Pathologic Q-waves
  - LVH or RV
  - Frequent or repetitive PACs
  - Isolated Right BBB or intraventricular conduction delay
  - PVCs

Not generally considered abnormal ECG findings: Isolated PAC, First Degree AV Block, Sinus bradycardia at a rate of 35-45, and Nonspecific ST-T abnormalities (even if different from a previous ECG).
➢ Algorithm for the initial and evaluations for syncope

Risk Stratification in Patients with Syncope

- **The Canadian Syncope Risk Score.** 4030 adults who presented to six Canadian emergency departments (EDs) within 24 hours after syncopal events. During 30 days of follow-up, serious adverse events (including death and several specified cardiac and noncardiac events occurred in 3.6% of patients. Using multivariable analysis and additional statistical techniques to confirm the validity of the selected predictive variables, the researchers derived a risk score (range, −3 to +11) based on nine clinical predictors.
  ➢ Risk for a serious adverse event ranged from 0.4% (in patients with score of −3) to 41% (in those with scores ≥6).
  ➢ Threshold scores of -2 and -1 had a sensitivity of 99.2% and 97.7% and a specificity of 25.6% and 47% for SAE respectively.
The nine predictors and their associated point values:

- ED diagnosis of vasovagal syncope, **minus 2 points**
- Predisposition to vasovagal symptoms, **minus 1 point**
- Abnormal QRS axis, 1 point
- QRS duration >130 milliseconds, 1 point
- History of heart disease, 1 point
- Systolic blood pressure in the ED of <90 mm Hg or >180 mm Hg, **2 pts**
- Elevated troponin level, 2 points
- Corrected QT interval >480 milliseconds, 2 points
- ED diagnosis of cardiac syncope 2 points

**The San Francisco Syncope Rule (SFSR)** 791 patients evaluated for syncope in the emergency department. Participants were followed to determine serious outcome within 30 days of the visit.

**Predictors of serious outcomes were**

- systolic blood pressure less than 90 mm Hg
- shortness of breath
- history of congestive heart failure
- abnormal electrocardiography (ECG)
- hematocrit level less than 30 percent.

Eighteen percent of patients who had one or more predictors on the SFSR had at least one serious outcome compared with 0.3 percent when the SFSR result was negative (no predictors).

- **The SFSR was 98 percent sensitive and 56 percent specific for syncope**
- **Negative predictive value of 99.7 percent.**
- However, two separate external validation studies of the SFSR have shown lower sensitivity rates (89 to 90 percent), thus challenging the reliability of the rule to safely discharge patients

**The Risk Stratification of Syncope in the Emergency Department (ROSE),** a single-center, prospective, observational study of 550 adults with syncope.

**Independent Predictors of serious outcomes were** (mnemonic BRACES)

- Brain natriuretic peptide (BNP) levels of 300 pg per ml (300 ng per L) or greater
- Bradycardia of 50 beats per minute or less
- Rectal examination with positive fecal occult blood test
- Anemia (hemoglobin of 9 g per dl [90 g per L] or less)
- Chest pain with syncope
- ECG with Q waves
- Oxygen saturation of 94 percent or less on room air.

- Patients are considered high-risk if any of the seven criteria are present.
- The rule has an 87 percent sensitivity and a 98 percent negative predictive value
No syncope decision rule can be perfect but these scoring system can be a useful clinical tool to help guide decision-making on further testing and need for hospital admission

- **Additional testing**
  - **Stress testing.** Stress testing is useful to evaluate patients at risk of cardiovascular disease, those with unexplained syncope, and those with syncope during or shortly after exercise.
  - **Electrocardiographic monitoring.** Patients with an unremarkable cardiovascular evaluation (echocardiography and ischemic evaluation) but who are at high risk of syncope recurrence should undergo electrocardiographic monitoring.
    - Holter monitor
    - event monitor
    - Implantable loop recorders designed to monitor for more than 12 months
  - **Tilt-table testing.** useful to confirm the diagnosis of suspected neurally mediated syncope in the absence of structural heart disease or ischemia.
  - **Electrophysiology.** Indications for electrophysiology include CAD and syncope, CAD with an ejection fraction less than 35 percent, and possibly nonischemic dilated cardiomyopathy. The European Society of Cardiology recommend electrophysiology in patients with structural heart disease.

| Table of Content | Cardio-Vascular Disorders |
Brugada syndrome is an abnormal ECG (Right Bundle Branch Block Pattern with coved ST elevation over the right precordial leads of V1-V3), which leads to ventricular fibrillation (VF) and sudden cardiac death (SCD) in patients with structurally normal hearts.

It’s due to a mutation in the cardiac sodium channel gene (a sodium channelopathy)

Mean age of sudden death is 41

Signs and symptoms

- Syncope and cardiac arrest: Most common clinical manifestations
- Nightmares or thrashing at night
- Asymptomatic, but routine ECG shows ST-segment elevation in leads V1-V3
- Associated atrial fibrillation (20%)
- Fever: Often reported to trigger or exacerbate clinical manifestations

Only treatment that has proven effective in treating ventricular tachycardia and fibrillation and preventing sudden death in patients with Brugada syndrome is implantation of an automatic implantable cardiac defibrillator (ICD).

Brugada types

- Type 1 (Coved ST segment elevation >2mm in >1 of V1-V3 followed by a negative T wave) is the only ECG abnormality that is potentially diagnostic. This has been referred to as Brugada sign.
Orthostatic hypotension, which is a physical finding, not a disease, may be symptomatic or asymptomatic.

Orthostatic Hypotension
- Drop in Systolic Blood Pressure of more than 20 mm Hg, or
- Drop in Diastolic Blood Pressure of more than 10 mm Hg,
- within 3 minutes of standing from a sitting or supine position.

Causes of Orthostatic Hypotension

Neurologic (Involving Autonomic Dysfunction)

- Central
  - Multiple system atrophy
  - Parkinson disease
  - Strokes (multiple)

- Spinal cord
  - Tabes dorsalis
  - Transverse myelitis
  - Tumors

- Peripheral
  - Amyloidosis
  - Diabetic, alcoholic, or nutritional neuropathy
  - Familial dysautonomia (Riley-Day syndrome)
  - Guillain-Barré syndrome
  - Paraneoplastic syndromes
  - Pure autonomic failure
  - Surgical sympathectomy

Cardiovascular

- Hypovolemia
  - Adrenal insufficiency
  - Dehydration
  - Anemia
  - Blood loss

- Impaired vasomotor tone
  - Bed rest (prolonged)
  - Hypokalemia

- Impaired cardiac output
  - Aortic stenosis
  - Constrictive pericarditis
  - Heart failure
  - Myocardial infarction
  - Arrhythmias

- Other
  - Hyperaldosteronism
  - Peripheral venous insufficiency
  - Pheochromocytoma
Drugs

❖ Vasodilators
  • Calcium channel blockers
  • Nitrates

❖ Autonomically active
  • Alpha-blockers
  • Antihypertensives
  • Antipsychotics
  • MAOIs
  • TCA

❖ Other
  • Alcohol
  • Barbiturates
  • Levodopa (rarely)
  • Loop diuretics (eg, furosemide)
  • Quinidine
  • Vincristine (neurotoxic)

❖ Common cause of syncope in older adults
  • Primary Orthostatic Hypotension: time to symptoms from standing 0 to 30 sec
  • Orthostatic hypotension with automatic failure time to symptom 30 sec to 3 min
  • Slowly progressive orthostatic hypotension: time to symptom 3 to 30 min
  • Delayed progressive hypotension: have reflex syncope at 3 to 45 min (pts have progressive drop in BP with no symptoms then develop prodrome followed by complete syncope with drop in BP and or HR
  • Postprandial hypotension (a fall in blood pressure occurring 15 to 90 minutes after meals)
  • POTS: Postural orthostatic tachycardia syndrome: increase in HR of >30 BPM

❖ Evaluation of Orthostatic Hypotension
  • If possible, potentially contributing medications should be discontinued and the patient reevaluated.
  • Laboratory testing for underlying causes should include a complete blood count, basic metabolic panel, vitamin B₁₂ level, and morning cortisol
  • CT Scan or MRI can be used to assess for possible etiologies of neurogenic orthostatic hypotension
  • ECG
  • Telemetry
  • Echocardiogram
  • If the cause still is not apparent, autonomic testing may be indicated. The autonomic test most often used is the head-up tilt-table test.
Treatment of Orthostatic Hypotension

The first steps in treatment of orthostatic hypotension are diagnosis and management of the underlying cause.

Nonpharmacologic Treatments for Orthostatic Hypotension

**Implement**
- Dorsiflex feet several times before standing
- Make slow, careful changes in position
- Eat small, frequent meals
- Increase salt and fluid intake
- Elevate head of bed 5 to 20 degrees
- Schedule activities in the afternoon
- Wear compression stockings

**Avoid**
- Standing motionless
- Rising quickly after prolonged lying/sitting
- Large meals
- Alcohol consumption
- Vigorous exercise
- Heat, hot baths, and hot environment
- Dehydration
- Working with arms above shoulders
- Straining with urination or defecation
- Coughing spells
- Rapid ascent to high altitude
- Hyperventilation
- Fever

Pharmacologic management.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adverse effects</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fludrocortisone</strong></td>
<td>Hypokalemia, headache, supine hypertension, heart failure, edema</td>
<td>Systemic fungal infections, hypersensitivity to drug class</td>
</tr>
<tr>
<td>- Starting dosage of 0.1 mg per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- titrate in increments of 0.1 mg per week, maximum dosage of 1 mg per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Midodrine</strong></td>
<td>Supine hypertension, piloerection, pruritus, paresthesia</td>
<td>Acute renal failure, severe heart disease, urinary retention, thyrotoxicosis, pheochromocytoma</td>
</tr>
<tr>
<td>- Starting dosage of 2.5 mg three times per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- titrate with 2.5-mg increments weekly until maximum dosage of 10 mg three times per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pyridostigmine (Mestinon)</strong></td>
<td>Cholinergic effects, including loose stools, diaphoresis, hypersalivation, fasciculations</td>
<td>Hypersensitivity to pyridostigmine or bromides, mechanical intestinal or urinary obstruction</td>
</tr>
<tr>
<td>- Starting dosage of 30 mg two to three times per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- titrate to 60 mg three times per day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Geriatric / Palliative care

Topics *Click on topics below to go directly to that page

- Admission Addendum for Geriatric Patients
- BEERs List
- Constipation
- Decubitus Ulcer / Pressure Ulcers
- Delirium
- Geriatric Assessment tools
- Pain Management
- Richmond Agitation Sedation Scale (RASS)
- Secretion management
- Wound Care
Use the CAM (Confusion Assessment Method)

❖ The Confusion Assessment Method (CAM) Diagnostic Algorithm
❖ Consider the diagnosis of DELIRIUM if 1 and 2 AND either 3a or 3b are positive

1. Acute Onset and Fluctuating Course:
   - Is there evidence of an acute change in mental status from the pt’s baseline?
   - Did the (abnormal) behavior fluctuate during the day (tend to come and go, or increase and decrease in severity)?

2. Inattention:
   - Did the patient have difficulty focusing attention (e.g. being easily distractible) or have difficulty keeping track of what was being said?

3a. Disorganized Thinking:
   - Was the patient’s thinking disorganized or incoherent: such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?

3b. Altered Level of Consciousness:
   - Overall, how would you rate this patient’s level of consciousness? Positive for any answer other than “alert” (alert: normal, vigilant: hyper-alert, lethargic: drowsy, easily aroused, stupor: difficult to arouse, or coma: un-arousable

*Sensitivity: 94%-100%; Specificity: 90%-95%
Inouye, SK et al Annals Int Med 1990;113:941-48

Find out the cause (Mnemonic)

I WATCH DEATH
Infection
Withdrawal
Acute metabolic
Trauma
CNS pathology
Hypoxia
Deficiencies
Endocrinopathies
Acute vascular
Heavy metals

AEIOU TIPS
Alcohol/Alzheimers
Endocrine
Infection
Opiates
Uremia
Trauma/tumor
Insulin
Poisonings/psychosis
Seizures/Stroke

Provided by Eddie Needham MD
➢ Work up for delirium
- CBC with differential - Helpful to diagnose infection and anemia
- **Electrolytes** - To diagnose low or high levels
- **Glucose** - To diagnose hypoglycemia, diabetic ketoacidosis, and hyperosmolar non-ketotic states
- **Renal and liver function tests** - To diagnose liver and renal failure
- **Thyroid function studies** - To diagnose hypothyroidism
- **UA** - Used to diagnose urinary tract infection
- **Drug screen** - Used to diagnose toxicological causes
- **Vitamin B-12 levels** - Used to detect deficiency states
- **Tests for bacteriological and viral etiologies** - To diagnose infection
- **Sedimentation rate / CRP**
- **HIV tests** - If clinically indicated
- **Serum marker for delirium**: The calcium-binding protein S-100 B could be a serum marker of delirium. Higher levels are seen in patients with delirium when compared to patients without delirium.
- **CT scan of the head or MRI**
- **CXR** - To diagnose pneumonia or congestive heart failure.
- **Lumbar puncture** if CNS infection is suspected as a cause of delirium or when the source for the systemic infection cannot be determined
- **Pulse oximetry** is used to diagnose hypoxia as a cause of delirium
- **Electrocardiogram** is used to diagnose ischemic and arrhythmic causes

➢ Management of delirium
- **Supportive**
  - Reorientation
  - Environment should be stable, quiet, and well-lighted
  - Support from a familiar nurse or family should be encouraged
  - Sensory deficits should be corrected, eyeglasses and hearing aids
  - **Physical restraints** should be avoided – (can worsen delirium)
- **Pharmacological**
  - **Haldol** at low dose (0.25 to 0.5 mg IV) is the first line therapy
    - ❖ **Caution can cause prolong QT, and EPS**
  - **Quetiapine** Initial dosage 12.5–25 mg po daily or q12h, increase q 2d as needed to a max of 100 mg/d
    - ❖ Drug of choice for patients with Lewy body dementia, Parkinson disease, AIDS-related dementia, or EPS
Pressure Ulcers (click on the blue colored stage to view illustration)

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ulcer appears as a defined area of persistent redness in lightly pigmented skin, whereas in darker skin tones, the ulcer may appear with persistent red, blue, or purple hues.</td>
<td>Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.</td>
<td>Full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater w/wo undermining of adjacent tissue.</td>
<td>Full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g., tendon, joint capsule). Undermining and sinus tracts also may be associated with Stage 4 pressure ulcers.</td>
</tr>
</tbody>
</table>

❖ 75% of stage II pressure sores heal with conservative management.
❖ Stage III and IV ulcers are less likely to heal spontaneously and require surgical treatment.

Medical Management of pressure ulcers

- Nutritional evaluation
  - Albumin level
  - Prealbumin level
  - Transferrin level
  - Serum protein level

❖ Nutritional Plan
  - Oral nutritional supplementation enriched with arginine, vitamin C, and zinc
  - Goal: protein intake and the establishment of a positive nitrogen balance, with 1.0-2.0 g/kg/day

- Adequate pain control
- Maintenance of adequate blood volume, and correction of anemia
- Bacterial contamination must be assessed and treated appropriately
- Antibiotics are indicated when accompanying osteomyelitis, cellulitis, bacteremia, or sepsis is present
- Pressure reduction
  - Pts who are capable of shifting their weight every 10 minutes should be encouraged to do so.
- Repositioning should be performed every 2 hours
- Pressure reduction mattress maintain tissue pressures < 30 mm Hg

## Wound dressings

<table>
<thead>
<tr>
<th>Type of Dressing</th>
<th>When to Use it</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DuoDerm</strong> (Hydrocolloid dressings)</td>
<td>Stage I, II, III, and some stage IV ulcers with minimal exudate and no necrotic tissue</td>
<td></td>
</tr>
<tr>
<td><strong>OpSite, Tegaderm</strong> Transparent adhesive dressings</td>
<td>Stage I, II, and shallow stage III ulcers with minimal exudate and no necrotic tissue</td>
<td></td>
</tr>
<tr>
<td><strong>SilvaSorb, Sorbsan</strong> Alginate dressings</td>
<td>Used in light to heavily draining stage II, III, and IV ulcers. May be used in both infected and noninfected wounds</td>
<td>Should not be applied to dry or minimally draining wounds, as it can cause dehydration and delay wound healing</td>
</tr>
<tr>
<td><strong>Wet-To-Dry Dressings with normal saline</strong></td>
<td>Wounds with surface debris or fibrinous exudate</td>
<td>mechanical debridement</td>
</tr>
<tr>
<td><strong>Santyl Collagenase</strong></td>
<td>Wounds with surface debris or fibrinous exudate</td>
<td>enzymatic debridement</td>
</tr>
<tr>
<td><strong>silver sulfadiazine</strong> Antibiotic creams</td>
<td>applied to wounds to decrease bacterial load</td>
<td></td>
</tr>
<tr>
<td><strong>Sulfamylon</strong></td>
<td>can penetrate an eschar and promote autolytic softening of the eschar prior to debridement</td>
<td>Active against Pseudomonas</td>
</tr>
</tbody>
</table>

- Vacuum-assisted closure (VAC) sponges conform to the wound surface by suction and stimulate wound contracture while removing exudate and edema
- Daily whirlpool therapy or pulse lavage therapy may be used to irrigate and mechanically debride the wound
### NSAIDs

- Place patient on one of the following Risk Category (risk for GI bleed)

<table>
<thead>
<tr>
<th>Risk Categories</th>
<th>High Risk</th>
<th>Moderate risk</th>
<th>Low risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>History of GI bleed</td>
<td>1-2 Risk Factors</td>
<td>No Risk Factors</td>
</tr>
</tbody>
</table>

- Risk Factors for GI bleed
  - Age >65
  - High dose NSAID
  - Concurrent ASA
  - Concurrent Systemic Steroids
  - Concurrent Anticoagulant use

- Assess Cardio-vascular risk

- Recommendations based on Risk category and CV risk

<table>
<thead>
<tr>
<th>Gastrointestinal Risk</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low CV Risk (low dose ASA)</td>
<td>NSAID alone (consider meloxicam due to cost and safety)</td>
<td>NSAID + Protective agent</td>
<td>Alternate therapy</td>
</tr>
<tr>
<td>High CV Risk</td>
<td>Naproxen + Protective agent</td>
<td>Naproxen + Protective agent</td>
<td>Avoid NSAIDs or Cox-2</td>
</tr>
</tbody>
</table>

- H-Pylori Recommendations
  - All patients regardless of risk status who are about to start long-term traditional NSAID should be considered for testing for *H. Pylori* and treated if positive.
  - All patients with a history of ulcers who require NSAIDs should be tested for *H. Pylori* and treated if positive.
  - Eradication would not impact the decision to use protective therapy
**PAIN MANAGEMENT in THE HOSPITAL**

✝️ Disclaimer. *First of all, I am not a PAIN SPECIALIST*. I am Family Medicine trained and currently lead our Inpatient service at our FM Residency program. Below are my recommendations for pain management based on CDC recommendations, Journal articles from SHM, and Ohio Medical Board recommendations. (Complete reference at the end).

Most important always do what is best for your patient. What is indicated for one patient may not be appropriate for another patient. Always look at benefit vs risk.

✝️ Quick Summary

1. Try non-pharmacological interventions first
   - PT, Ice, Heating Pad, TENs Unit

2. Try non-opiate pharmacological therapies
   - Acetaminophen 1 gram q 6-8 hrs scheduled, not PRN. (Remember if ordered IV on Cerner this order has to be renewed daily)
   - NSAIDs if no contraindications.
   - Lidocaine gel/patch
   - Capsaicin topical Crm (0.025%, 0.075% apply tid to qid
   - Diclofenac gel 1% (upper ext: 1-2 grams qid. Lower ext 1-4 grams qid)
   - Gabapentin/pre-gabapentin
   - Tricyclic antidepressant, NSRI antidepressant
   - Tramadol

3. When using opiates
   - Use lowest dose needed to reduce pain
   - Outline expectations early on admission
   - Limit IV to those unable to take PO, if started on IV switch to PO as soon as possible
   - Limit opiates to less than 7 days, most people and condition need 3 days or less.

4. On Discharge send home with max of 3 days

❖ Pain Management in the Hospital, 5 scenarios

➢ Scenario 1: Patients have acute pain but no history of chronic pain.
   - Attempt to diagnose and treat the underlying condition
   - Try non-pharmacological modalities and non-opiate pharmacological therapies first
   - Opiates – are appropriate for acute pain
     - Avoid IV if patient can tolerate PO
     - Use lowest effective dose of immediate-release opioids and prescribe no greater quantity than needed for the expected duration of pain severe enough to require opioids. **Three days or less** will often be sufficient; **more than seven days will rarely be needed** (recommendation category: A, evidence type: 4).
Scenario 2: Patients have chronic pain with no history of opioid use and no acute pain.
- Avoid starting opiates in the hospital for chronic pain (with no acute pain) even if patient reports his chronic pain as a 10, if possible
- Investigate how patient copes with their pain at home
- Try non-pharmacological modalities and non-opiate pharmacological therapies first
  - PT, Ice, Heating Pad, TENs Unit
  - Acetaminophen 1 gram q 6-8 hrs scheduled, not PRN. Remember if ordered IV on Cerner this order has to be renewed daily
  - NSAIDs if not contra-indicated
  - Lidocaine gel/patch
  - Capsaicin topical Crm (0.025%, 0.075% apply tid to qid)
  - Diclofenac gel 1% (upper ext: 1-2 grams qid. Lower ext 1-4 grams qid)
  - Gabapentin/pre-gabapentin
  - Tricyclic antidepressant, NSRI antidepressant
  - Tramadol

Scenario 3: Patients have acute pain and a history of chronic pain but no history of opioid use

If the pain is nociceptive—due to tissue injury such as inflammation, trauma or ischemia—patients typically describe it as “sharp, aching or throbbing”. First line is an NSAID or acetaminophen.

If the pain is neuropathic and related to a nerve injury, patients usually describe it as “burning, heavy or numbness. Gabapentin, pregabalin, tricyclic antidepressants or SNRIs, are better choices

“There is a myth out there that opioids are the most effective medications to treat severe pain, “For most pain, in fact, non-opioid analgesics are equally or more effective with less risk for harm.”

*Harvard's Shoshana J. Herzig, MD, MPH*

If opiates are needed remember
- Avoid IV if possible
- Use the lowest effective dose of immediate-release opioids
- Shortest duration needed. Usually **Three days or less** will be sufficient. More than 7 days rarely needed
- Convert to non-opiate pain med as soon as possible
Scenario 4: Patients have no acute pain but have a history of chronic pain and are on chronic opioids.

- Confirm dose of chronic opiate (eForcse, call patients PCP or pain specialist, call pharmacy, check urine drug screen to confirm they are taking meds)
- Determine whether the pre-hospital opioids are “causing imminent harm or contributing to the reason for the hospitalization,” (mental status changes, respiratory distress, constipation and polypharmacy complications)
- If no harm identified, It’s reasonable to continue home therapy and dose.
- If we do see harms, consider if there is also an underlying substance abuse diagnosis.
- If harm or substance abuse identified, discuss with patients If they are willing to consider getting off opioids and offer or arrange evidence-based treatment (usually medication-assisted treatment with buprenorphine or methadone in combination with behavioral therapies) for patients with opioid use disorder (recommendation category: A, evidence type: 2).

* Inform patients at the start of their hospital stay that you will not be prescribing or refilling opioids at discharge. Any post-discharge opioid prescription will have to come from patients’ PCP or pain specialist.

Scenario 5: Patients have both chronic and acute pain and take opioids

- Consider adding a non-opiate pain medication if no contraindication (NSAIDs, acetaminophen, gabapentin, pre-gabapentin, TCA, NSRI)
- If no benefit, or contra-indication to non-opiates, it’s reasonable to consider increasing opioids short-term.

Set expectations early in their admission. Point out to patients that the goal is to make pain tolerable not be pain free.

Conversations also should cover the fact that opioids will be cut back if patients experience a lot of sedation or other side effects

For all patients on opiate pain medication remember to add a Bowel regimen

- Stool softener: Colace (docusate)
- Bowel Stimulants: Senokot (senna)
- Dulcolax (bisacodyl)
- Hyperosmolar: Lactulose, Miralax
- Avoid bulk laxatives

use caution when considering increasing dosage to ≥50 morphine milligram equivalents (MME)/day, and should avoid increasing dosage to ≥90 MME/day or carefully justify a decision to titrate dosage to ≥90 MME/day (recommendation category: A, evidence type: 3)
❖ Calculating morphine milligram equivalent (MME)

Click for conversion table

➢ Conversion table

<table>
<thead>
<tr>
<th>OPIOID</th>
<th>CONVERSION FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codeine</td>
<td>0.15</td>
</tr>
<tr>
<td>Fentanyl transdermal (in mcg/hr)</td>
<td>2.4</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>1</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>4</td>
</tr>
<tr>
<td>Methadone</td>
<td></td>
</tr>
<tr>
<td>1-20 mg/day</td>
<td>4</td>
</tr>
<tr>
<td>21-40 mg/day</td>
<td>8</td>
</tr>
<tr>
<td>41-60 mg/day</td>
<td>10</td>
</tr>
<tr>
<td>≥ 61-80 mg/day</td>
<td>12</td>
</tr>
<tr>
<td>Morphine</td>
<td>1</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>1.5</td>
</tr>
<tr>
<td>Oxymorphone</td>
<td>3</td>
</tr>
</tbody>
</table>

*These dose conversions are estimated and cannot account for all individual differences in genetics and pharmacokinetics.*

---

**PREScribing Opiates on Discharge**

❖ By Florida Law, check E-FORCSE Data base and document date checked on chart.
❖ Up to 3 days pain medication is allowed for acute pain. On special occasion 7 days maybe given. Need to document reason for extended RX.
❖ Patients must be given
  The Information on Nonopioid Alternatives for the Treatment of Pain Pamphlet

❖ Prescription must include. The following wording
  “For Acute Pain”. E-FORCSE checked date checked

References (click on link to view reference)
  CDC Guidelines for prescribing chronic opiates
  State of Ohio Medical Board New Limits for Chronic Pain
  https://www.hospitalmedicine.org/clinical-topics/pain-management/
PATIENT CONTROLLED ANALGESIA (PCA Pump)

➢ Indications
  - Post-operative pain
  - Sickle cell crisis pain
  - Cancer pain
  - Rapid dose titration and dose finding in acute, severe pain

➢ Relative contraindications
  - Patients without the cognitive ability to understand how to use a PCA device
  - Anticipated need for parenteral opioids less than 24 hours

➢ PCA Definitions
  - PCA dose in mg or mcg (‘patient initiated dose,’ ‘patient demand dose’, or ‘bolus dose’)
  - Delay Interval (‘lockout’) – in minutes (period during which the patient cannot obtain additional demand medication)
  - Continuous infusion (CI) Rate in mg/hr or mcg/hr (if CI is used)
  - Hour Limit – maximum amount of drug to be dispensed in a defined period of time.
  - Opioids used include morphine, hydromorphone, fentanyl, and methadone.
  - Drug of choice Morphine
  - Fentanyl reserved for pts who cannot tolerate Morphine or Dilaudid

❖ Patient controlled analgesia (PCA) regimens for opioid naïve adult patients: commonly-prescribed dose ranges

<table>
<thead>
<tr>
<th>Drug</th>
<th>Concentration</th>
<th>Initial loading and rescue loading dose range</th>
<th>Demand (PCA) dose range</th>
<th>Lockout interval</th>
<th>Maximum in four hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>1 mg/mL</td>
<td>0.5 to 2.5 mg*</td>
<td>0.5 to 2.5 mg</td>
<td>5 to 10 minutes</td>
<td>30 mg</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>0.2 mg/mL</td>
<td>0.05 to 0.4 mg‡</td>
<td>0.05 to 0.4 mg</td>
<td>5 to 10 minutes</td>
<td>6 mg</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>10 mcg/mL</td>
<td>5 to 20 mcgΔ</td>
<td>5 to 20 mcg</td>
<td>4 to 10 minutes</td>
<td>300 mcg</td>
</tr>
</tbody>
</table>

Adapted from UpToDate 2017
Dosing in non-opioid naïve patients

- Convert their current total oral/transdermal dose to a total 24 hour IV dose; divide by 24 to give the hourly CI RATE in mg/hour
- PCA DEMAND DOSE is initially calculated at 50% of the hourly rate.

Common Sense Cautions These dosing recommendations are rough guidelines—clinicians need to take into account pain severity, patient age, renal and pulmonary function, co-morbid illness, and other psychoactive medications.

- Use a lower CI rate (with upward dose adjustments of the CI rate no more frequently than every 8 hours), while adjusting the PCA dose at frequent intervals (q30-60 minutes) to effectively control pain.

Other orders

- **Naloxone** (Narcan): If respiratory rate less than 10 and/or RASS sedation level is -4 or -5 and/or patient is unresponsive
  - Administer naloxone 0.4 mg in NS for a total volume of 10 mL. Give IV slowly in 2.5 mL increments (0.1 mg). Titrate to effect—respiratory rate > 10 and RASS sedation level is −3 or more (-2, -1, 0). **Contact physician immediately**

- **Medication to relieve itching:**
  - DiphenhydramINE (Benadryl) 25 mg IV every 6 hr PRN in **patients less than 65 years old**; contact physician if condition persists
  - DiphenhydramINE (Benadryl) 12.5 mg IV every 8 hr PRN **for patients 65 years old or older**; contact physician if condition persists

- **Medication to relieve nausea and/or vomiting:**
  - Prochlorperazine (Compazine) 5 mg IV every 6 hr PRN. IF not effective x 2 doses use ondansetron (Do not push faster than 5 mg per min).
  - Ondansetron (Zofran) 4 mg IV every 6 hr PRN if ondansetron is not effective, contact physician if nausea persists

- **Bowel Management (to prevent constipation):**
  - Senna / docusate sodium (Senokot-S) 2 tablets PO at bedtime; hold for w/ loose stools or diarrhea
  - For NPO patients: bisacodyl 10 mg suppository PR every other day PRN; hold for loose stools or diarrhea
PATIENT CARE:

- Monitoring:
  Monitor and record unstimulated respiratory rate for 1 full minute, oxygenation saturation level (spot check), sedation level, pain intensity score and pain goal at the following intervals:
  Every 15 min x 2, then every 30 min x 2, then every 1 hr x 2, then every 4 hrs thereafter and with any pump setting change.
  Record mg or mcg amount of drug administered every 4 hr on the electronic PCA flow sheet.

NOTIFICATIONS/INSTRUCTIONS:

- Notify physician immediately if naloxone administered
- Notify physician if pain score is greater than 4; not resolved by intervention
- Notify physician if itching persists
- Notify physician if nausea not controlled by medication
- Notify physician if un-stimulated respiratory rate is less than 10 per minute
- Notify Physician & Rapid Response Team STAT for the following:
  - When RASS level -4 or -5 is detected
  - If O2 sat is < 92%


SECRETION MANAGEMENT

- Atropine (1% ophthalmic drops) 1-4 drops sublingual every 2 hours as needed
- Glycopyrolate 1-2 mg by mouth sublingual every 8 hours as needed
- Hyoscyamine 0.125-0.25 mg sublingual every 6 hours as needed
- Scopolamine 1.5 mg transdermal patch behind the ear every 72 hours as needed.
  - May increase up to 3 patches in 72 hours for secretions.
Gastroenterology

Topics

*Click on topics below to go directly to that page

- Abdominal Pain
- Acute GI Bleed
  - Upper GI Bleed
  - Lower GI Bleed
- Cirrhosis
- Clostridium difficile infection = CDI
- Constipation
- Diverticulosis / Diverticulitis
- Functional Abdominal Pain Syndrome
- GERD
- Hyperbilirubinemia
- LFTs (differential)
- Narcotic Bowel Syndrome
- Malnutrition
- MELD Score
- Pancreatitis
- Shaw Protocol for constipation

Table of Content
Distinguishing upper from lower gastrointestinal source for gastrointestinal bleeding: Most predictive findings

- Melena on exam for upper GI bleeding
- Clots in stool for lower GI bleeding

Factors Suggesting Upper GI Bleeding

<table>
<thead>
<tr>
<th>Finding</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of upper GI bleeding</td>
<td>22%</td>
<td>96%</td>
</tr>
<tr>
<td>History of black stool (melena)</td>
<td>77%-95%</td>
<td>81%-87%</td>
</tr>
<tr>
<td>Melenic stool on exam</td>
<td>49%</td>
<td>98%</td>
</tr>
<tr>
<td>Nasogastric lavage with blood or coffee grounds</td>
<td>44%</td>
<td>95%</td>
</tr>
<tr>
<td>Blood urea nitrogen/creatinine ratio</td>
<td>51%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Factors Suggesting Lower GI Bleeding

<table>
<thead>
<tr>
<th>Finding</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of lower GI bleeding</td>
<td>6%</td>
<td>64%</td>
</tr>
<tr>
<td>Clots in stool</td>
<td>15%</td>
<td>99.2%</td>
</tr>
</tbody>
</table>

Upper GI Bleed

Differential Diagnosis

<table>
<thead>
<tr>
<th>Upper GI Bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Peptic Ulcer Disease 40 – 79%</td>
</tr>
<tr>
<td>2. Gastritis/Duodenitis 5 – 30%</td>
</tr>
<tr>
<td>3. Gastroesophageal Varices 6 – 21%</td>
</tr>
<tr>
<td>4. Mallory-Weiss tear 3 – 15%</td>
</tr>
<tr>
<td>5. Esophagitis 2 – 8%</td>
</tr>
<tr>
<td>6. Gastric Carcinoma 2 – 3%</td>
</tr>
<tr>
<td>7. Dieulafoy's Lesion</td>
</tr>
<tr>
<td>8. Gastric Arteriovenous Malformations &lt; 1%</td>
</tr>
<tr>
<td>9. Portal Gastropathy</td>
</tr>
</tbody>
</table>

Management of Upper GI Bleed (click on type of bleed below)
Non-variceal upper gastrointestinal bleeding

Resuscitation and Pre-endoscopy Management

- IVF with 0.9 NS
- Prognostic scales for early stratification into low-risk and high-risk for re-bleeding and mortality (use either one, click to go to calculator)

The GBS is as effective as the admission and full Rockall scores in predicting death after UGIH. It is superior to both the admission and full Rockall scores in predicting need for transfusion, and superior to the admission Rockall score in predicting endoscopic or surgical intervention.

Stanley AJ et al. Multicentre comparison of the Glasgow Blatchford and Rockall scores in the prediction of clinical end-points after upper gastrointestinal haemorrhage. Aliment Pharmacol Ther 2011 Aug; 34:470

- Blood transfusions if hemoglobin ≤ 7.0
- Correct coagulopathy, but correction should not delay endoscopy
  - Vit K (10 mg PO x 1)
  - Fresh Frozen Plasma
  - Platlet transfusion as needed
- Consult GI for endoscopy (endoscopy should be done within 24)
- Pre-endoscopic PPI Omeprazole or Pantoprazole 80 mg IV bolus followed by 8 mg/hour infusion (continue for 72 hours after successful endoscopic therapy in patients with high-risk stigmata)
- H2 blockers are not recommended for patients with acute ulcer bleeding
- Somatostatin and Octreotide not recommended routinely for patients with acute ulcer bleeding

Endoscopic Management

- Indication for endoscopic hemostasis
  - Not indicated if low-risk stigmata (clean-based ulcer or non-protuberant pigmented dot on ulcer bed)
  - Indicated if high-risk stigmata (active bleeding or visible vessel in ulcer bed)
- Epinephrine injection
- Endoscopic thermal coaptive therapy (Clips, thermocoagulation or sclerosant injection) should be used in patients with high-risk lesions, alone or with epinephrine injection
- Routine second-look endoscopy is not recommended
- Second attempt at endoscopic therapy only recommended if rebleeding
- Patients who have failed endoscopic therapy need surgical consultation
- Percutaneous embolization may be an alternative to surgery
- Low-risk patients can be fed within 24 hours of endoscopy

Table of Content

Gastroenterology
Discharge

- Most patients who had endoscopic hemostasis for high-risk stigmata should be hospitalized for at least 72 hours
- Low-risk patients with acute ulcer bleeding may be discharged after endoscopy (Use Roskall score or Glasgow Blatchford Score (GBS))
- Discharge with prescription for single daily-dose oral proton pump inhibitor (duration based on underlying etiology)
- Postdischarge aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs)
- If prior ulcer bleeding and NSAID needed
  - Combination of proton pump inhibitor plus COX-2 inhibitor recommended over COX-2 inhibitor alone
  - Recognize that addition of proton pump inhibitor to COX-2 inhibitor is still associated with clinically important risk for recurrent ulcer bleeding
- If prior ulcer bleeding and patient taking low-dose aspirin, restart aspirin as soon as risk for cardiovascular complication considered to outweigh risk for bleeding
  - if prior ulcer bleeding and need for cardiovascular prophylaxis, recognize that clopidogrel alone has higher risk for rebleeding than aspirin plus proton pump inhibitor

International Consensus Upper Gastrointestinal Bleeding Conference Group international consensus recommendations on management of patients with nonvariceal upper gastrointestinal bleeding (Ann Intern Med 2010 Jan 19;152(2):101)

Acute Variceal Hemorrhage

- Admit to intensive care
- IVF with 0.9 NS
- Blood transfusions as needed to maintain hemoglobin about 8 g/dl (80 g/l)
- Start somatostatin or somatostatin analogs [octreotide, vapreotide] as soon as variceal hemorrhage suspected and continue for 3-5 days after confirmation of diagnosis

- **Somatostatin - 250 mcg IV bolus, then continuous infusion 250 mcg/hr** or
- **Octreotide (50- to 100-μg bolus, followed by infusion at 25 to 50 μg/hr), and continued for 3 to 5 days** (Hepatology 2007;46:922).

- Start short-term antibiotic prophylaxis (maximum 7 days) in any patient with cirrhosis and gastrointestinal hemorrhage
  - Ciprofloxacin IV
  - Ceftriaxone 1 g/day IV may be preferred for patients with advanced cirrhosis
- **Perform esophagogastroduodenoscopy (EGD) within 12 hours**
  - Endoscopic ligation has lower mortality and complications than sclerotherapy for actively or recently bleeding esophageal varices in pts w/ cirrhosis
- In patients with esophageal variceal hemorrhage but no active bleeding at endoscopy, variceal ligation reduces rebleeding within 5 days
- Sclerotherapy appears no better than vasoactive drugs for acute variceal bleeding in cirrhosis, and is associated with more adverse events
- TIPS indicated if esophageal variceal bleeding cannot be controlled or recurs despite pharmacologic and endoscopic therapy
  - TIPS reported to control acute variceal bleeding and reduce recurrence but re-intervention often required to maintain shunt patency
  - emergency TIPS for esophageal or gastric variceal bleeding reported to have high rate of bleeding control and 24%-29% rate of rebleeding
  - emergency portacaval shunt for acutely bleeding esophageal varices in patients with cirrhosis has higher survival than endoscopic sclerotherapy
  - Distal splenorenal shunt may be as effective as TIPS for prevention of recurrence in patients with refractory variceal bleeding
  - Small-diameter prosthetic H-graft portacaval shunt associated with longer time to shunt failure than TIPS in patients with portal hypertension due to cirrhosis, and longer survival in patients with Child-Pugh class A or B cirrhosis

Lower GI Bleed

➢ Differential Diagnosis

<table>
<thead>
<tr>
<th>Lower GI Bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Diverticular Bleed</strong></td>
</tr>
<tr>
<td><strong>2. Arteriovenous Malformations</strong></td>
</tr>
<tr>
<td><strong>3. Ulcerative Colitis</strong></td>
</tr>
<tr>
<td><strong>4. Ischemic Colitis</strong></td>
</tr>
<tr>
<td><strong>5. Infectious Colitis</strong></td>
</tr>
<tr>
<td><strong>6. Colon Cancer</strong></td>
</tr>
<tr>
<td><strong>7. Post-Polypectomy Bleeding</strong></td>
</tr>
<tr>
<td><strong>8. UGIB</strong></td>
</tr>
<tr>
<td><strong>9. Anorectal Causes</strong></td>
</tr>
<tr>
<td><strong>10. Small bowel</strong></td>
</tr>
<tr>
<td><strong>Small bowel</strong></td>
</tr>
<tr>
<td><strong>1. Angiodysplasia</strong></td>
</tr>
<tr>
<td><strong>2. Jejunoileal Diverticula</strong></td>
</tr>
<tr>
<td><strong>3. Meckel Diverticulum</strong></td>
</tr>
<tr>
<td><strong>4. Neoplasms/Lymphomas (Benign And Malignant)</strong></td>
</tr>
<tr>
<td><strong>5. Enteritis/Crohn's Disease</strong></td>
</tr>
<tr>
<td><strong>6. Aortoduodenal Fistula In Patient With Synthetic Vascular graft</strong></td>
</tr>
</tbody>
</table>

➢ UGIB vs Acute LGIB (less then 3 days),
  - LGIB less likely to experience shock (19% versus 35%)
  - LGIB require fewer blood transfusions (36% versus 64%)
  - LGIB stops spontaneously in 80–85% of patients
  - Mortality rate ranges from 2% to 4%
Evaluation and management

• Is patient hemodynamically stable
  ▪ Vital signs w/ postural changes. A drop of >10 mm Hg in BP or an increase of >10 beats/min in pulse is indicative of acute blood loss of >800 ml
  ▪ Marked tachycardia and tachypnea, associated with hypotension and depressed mental status is indicative of a blood loss of >1500 ml

• Stabilize
  ▪ IVF
  ▪ Blood transfusion as need

• Labs: CBC, CMP, PT/INR, Type and cross

• Correct coagulopathy
  ▪ Vit K (10 mg PO x 1)
  ▪ Fresh Frozen Plasma
  ▪ Platlet transfusion as needed

Identifying the source of bleeding

◆ COLONOSCOPY is considered the mainstay for evaluation of acute and chronic colonic bleeding. The diagnostic yield acute LGIB is 89–97%.

• Pts w/ Hematochezia and hemodynamic instability, EGD should be done first to r/o UGI source (up to 11%), then colonoscopy if not bleeding identified.

• Pts w/ hemodynamic instability that can not be stabalized, an urgent angiography is recommended.

• Pts w/ chronic LGIB, colonoscopy and anoscopy should be done first

• Pts w/ scant intermittent hematochezia or iron-deficiency anemia.
  ▪ Colonoscopy then EGD if colonoscopy negative
  ▪ If Colonoscopy and EGD negative additional endoscopic methods can be performed to examine the small intestine.
    ▪ Push enteroscopy visualizes about 50–120 cm of the proximal jejunum.
    ▪ Double-balloon enteroscopy visualizes the whole small intestine
    ▪ Video capsule endoscopy: whole small bowel can be visualized in 80% of cases

• Non-endoscopic test
  ▪ Nuclear Scintigraphy (Technetium-99m-labeled erythrocytes)
    ▪ Detects GI bleeding at a rate of 0.1 ml/min
    ▪ More sensitive, but less specific than angiography
    ▪ Indicated for obscure GI bleeding or recurrent bleeding, when other methods have failed.
      ▪ If positive within 2 hrs, localization is correct 95–100%
      ▪ If positive after more than 2 hrs accuracy decreases to 57–67%.
Visceral Angiography
- Detects GI bleeding if bleeding is at least 0.5–1 ml/min
- Specificity is 100%, but sensitivity varies
  - 47% w/ acute LGIB
  - 30% w/ recurrent bleeding
- Angiography should be reserved for patients
- Indicated for pts w/massive bleeding that precludes colonoscopy, or for whom endoscopies were negative.
- Ct angiography is highly sensitive and specific for diagnosing colonic angiodysplasia.

*Am J Gastroenterol 1998;93:1202-1208. Received Dec. 5, 1997; accepted Apr. 10, 1998*

DIVERTICULOSIS / DIVERTICULITIS

➢ Incidence increases with age
  • 10% at age 40
  • 40% at age 60
  • 80% at age 85

➢ Risk Factors
  • Low fiber diet
  • Obesity
  • Not gender specific, not associated with smoking, caffeine, or alcohol
  • Japanese and Asian > 95% Right sided diverticulosis
  • Western societies > 95% Left sided diverticulosis

➢ Treatment
  • Increase Fiber may prevent advancing disease
    Diets high in fiber, low in fat and red meat, decreases risk of symptomatic disease
    Recommended amount is 14 g per 1000 calories
    Fermentable fiber - promotes stool bulk and laxation
    Oat bran and pectin (found in fruits and veggies)
  • Nuts, corn and popcorn do not have to be avoided

❖ Diverticular Bleed
  ➢ No.1 cause of lower GI bleed

➢ Diagnosis
  • massive bleed: Endoscopy
  • Occult bleed with anemia: consider angiography or nuclear bleeding scan

➢ Treatment
  • Endoscopy w/heater probe, laser or electrocautery, saline or epinephrine
  • Angiography with intraarterial vasopressin
  • Iv vasopressin at 0.1-0.4u/min
  • Uncontrolled bleeding may require surgery

❖ Diverticulitis
  • 25% of those with diverticulosis are expected to develop diverticulitis
  • Risk factors: low-fiber diet, NSAIDs, corticosteroids, and opiate analgesics, increasing age, obesity, lack of exercise, genetic susceptibility

➢ Diagnosis
  • Labs
    ▪ CBC (55% have leukocytosis), BMP, UA, Stools FOB
    ▪ CRP >50
    • (LLQ tenderness + CRP >50 w/no n/v increases likelihood of diverticulitis)
CAT SCAN (with IV and oral contrast)
- Sensitivity of 97%, Specificity of 98%
- Pericolic fat infiltration is diagnostic

Advantages
- Can identify complications including abscess, phlegmon, adjacent organ involvement, fistula and septic complications
- May assist in determining the severity and course of management

Disadvantages
- False negatives in 2-21% of cases
- Inability to exclude dx of carcinoma (upto 5% of cases)
  - Therefore investigation of the colonic lumen by endoscopic means or barium enema after the acute attack is mandatory (4-6 weeks)
- Radiation

Treatment

- **Outpatient Treatment** – if patient able to take PO, vitals stable, no signs of peritonitis (Rebound tenderness, rigidity, and the absence of peristalsis)
  - Clear liquid diet
  - PO broad spectrum antibiotics (Gram-negative rods and anaerobes)

<table>
<thead>
<tr>
<th>Outpatient Antibiotic Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bactrim DS q 12 hrs + Flagyl 500mg q 6 hrs</td>
</tr>
<tr>
<td>Cipro 750mg q 12 hrs + Flagyl 500mg q 6 hrs</td>
</tr>
<tr>
<td>Augmentin XR 1000/62.5 mg 2 tabs twice a day</td>
</tr>
</tbody>
</table>

- Follow up in 3 days
- Treat for 7-10 days
- High fiber diet after resolution

- **Inpatient Treatment** - Hospitalize if signs of peritonitis, vitals unstable, unable to take PO, or if there is no improvement with outpatient treatment
  - NPO (feeding increases pressure in colon)
  - If obstruction; nasogastric tube for decompression
  - IV hydration
  - IV Broad-spectrum antibiotics
  - Consults
    - IR Consult -> Abscess
    - Surgical Consult -> Perforation, Obstruction, involvement of urinary tract
    - GI Consult -> Patient > 40 yrs will need outpatient colonoscopy when carcinoma cannot be excluded
### Inpatient Antibiotic Options

#### Mild to Moderate

<table>
<thead>
<tr>
<th>Antibiotic Options</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Piperacillin/tazobactam (Zosyn)</strong></td>
<td>3.375 g IV q 6 hrs or 4.5 g IV q 8 hrs</td>
</tr>
<tr>
<td><strong>Ticarcillin/clavulanate (Timentin)</strong></td>
<td>3.1 g IV every six hours</td>
</tr>
<tr>
<td><strong>Ertapenem (Invanz)</strong></td>
<td>1 g IV q 24 hrs</td>
</tr>
<tr>
<td><strong>Moxifloxacin</strong></td>
<td>400 mg IV q 24 hrs</td>
</tr>
<tr>
<td><strong>Ciprofloxacin</strong></td>
<td>400 mg IV q 12 hrs + Metronidazole, 500 mg IV q 6 hrs or 1 g IV q 12 hrs</td>
</tr>
</tbody>
</table>

#### SEVERE (life-threatening)

<table>
<thead>
<tr>
<th>Antibiotic Options</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imipenem/cilastatin (Primaxin)</strong></td>
<td>500 mg IV q 6 hrs</td>
</tr>
<tr>
<td><strong>Meropenem (Merrem)</strong></td>
<td>1 g IV q 8 hrs</td>
</tr>
<tr>
<td><strong>Doripenem (Doribax)</strong></td>
<td>500 mg IV q 8 hrs</td>
</tr>
<tr>
<td><strong>Ampicillin</strong></td>
<td>2 g IV q 6 hrs, + metronidazole, 500 mg IV q 6 hrs, + ciprofloxacin, 400 mg IV q 12 hrs, or levofloxacin, 750 mg IV q 24 hrs</td>
</tr>
<tr>
<td><strong>Ampicillin 2g IV q 6 hrs + metronidazole 500mg IV q 6 hrs + gentamicin, or tobramycin</strong></td>
<td></td>
</tr>
</tbody>
</table>

---

#### Hinchey Classification of Perforated Diverticulitis

<table>
<thead>
<tr>
<th>Hinchey stage</th>
<th>Features of disease</th>
<th>Risk of death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I*</td>
<td>Diverticulitis with a pericolic abscess</td>
<td>5%</td>
</tr>
<tr>
<td>Stage II**</td>
<td>Diverticulitis with a distant abscess (this may be retroperitoneal or pelvic)</td>
<td>5%</td>
</tr>
<tr>
<td>Stage III</td>
<td>Purulent peritonitis</td>
<td>13%</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Faecal peritonitis</td>
<td>43%</td>
</tr>
</tbody>
</table>

* Stage I has been divided into Ia Phlegmon and Ib confined pericolic abscess in later modifications

** Stage II has been divided into IIa abscesses amenable to percutaneous drainage and IIb complex abscess with or without fistula in later modifications

---

Lecture by Alexander Fishberg MD, Associate Director Family Medicine Residency at Florida Hospital, given to Family Medicine Residents 2012
GERD Guidelines 2013

➢ **Highlights:**
  ❖ A presumptive diagnosis of GERD can be made in the setting of typical symptoms of heartburn / regurgitation.
  ❖ Empiric medical therapy with a proton pump inhibitor (PPI) is recommended in this setting
  ❖ Patients with non-cardiac chest pain suspected due to GERD should have diagnostic evaluation before institution of therapy
  ❖ An **8-week course of PPIs** is the therapy of choice for symptom relief and healing of erosive esophagitis.
  ❖ There are no major differences in efficacy between the different PPIs.
  ❖ PPI therapy **does not need to be altered in concomitant clopidogrel users** as there does not appear to be an increased risk for adverse cardiovascular events
  ❖ A **cardiac cause should be excluded in patients with chest pain** before the commencement of a gastrointestinal evaluation
  ❖ Endoscopy is recommended in the presence of alarm symptoms and for screening of patients at high risk for complications.

➢ **Red Flags** *(Alarm symptoms)*
  ❖ Dysphagia
  ❖ Odynophagia
  ❖ Bleeding / Anemia
  ❖ Weight Loss

➢ **Summary and strength of recommendations**
  ❖ For a summary of recommendations including strength of recommendation


Philip O. Katz, MD 1, Lauren B. Gerson, MD, MSc 2 and Marcelo F. Vela, MD, MSCR 3
Am J Gastroenterol 2013; 108:308 – 328; doi: 10.1038/ajg.2012.444; published online 19 February 2013
# Abdominal Pain Differential Diagnosis

## Generalized Abdominal Pain DDx

<table>
<thead>
<tr>
<th>1. Gastritis / Ulcer</th>
<th>13. Ruptured spleen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Gastroenteritis</td>
<td>14. Pancreatitis</td>
</tr>
<tr>
<td>3. Irritable bowel syndrome</td>
<td>15. Abdominal aortic aneurysm</td>
</tr>
<tr>
<td>4. Inflammatory bowel disease</td>
<td>16. Diabetic ketoacidosis</td>
</tr>
<tr>
<td>5. Peritonitis</td>
<td>17. Uremia</td>
</tr>
<tr>
<td>6. Intestinal ischemia</td>
<td>18. Parasitic infection</td>
</tr>
<tr>
<td>7. Constipation</td>
<td>19. Adrenal insufficiency</td>
</tr>
<tr>
<td>8. UTI / Renal colic</td>
<td>20. Lead poisoning / Iron toxicity</td>
</tr>
<tr>
<td>11. Abdominal abscess</td>
<td>23. Porphyria</td>
</tr>
<tr>
<td>12. Ruptured ectopic pregnancy</td>
<td></td>
</tr>
</tbody>
</table>

## Epigastric Pain (Dyspepsia) DDx

<table>
<thead>
<tr>
<th>1. Functional dyspepsia</th>
<th>11. Gastric cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Gastritis / Peptic ulcer disease</td>
<td>12. Cholelithiasis</td>
</tr>
<tr>
<td>5. Pancreatic cancer</td>
<td>15. Pneumonia</td>
</tr>
<tr>
<td>6. &quot;Indigestion&quot;</td>
<td>17. Abdominal hernia</td>
</tr>
<tr>
<td>7. Drugs: aspirin, antibiotics, corticosteroids, digoxin tox</td>
<td>18. Intestinal ischemia</td>
</tr>
<tr>
<td>10. Malabsorption</td>
<td>20. Gastric volvulus</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Right Upper Quadrant DDx

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Hepatitis</td>
<td>10. Urinary calculi</td>
</tr>
<tr>
<td>3. Peptic ulcer disease (duodenal)</td>
<td>11. Appendicitis (retrocecal)</td>
</tr>
<tr>
<td>4. Pancreatitis</td>
<td>12. Herpes zoster</td>
</tr>
<tr>
<td>5. Liver abscess / abdominal abcess</td>
<td>13. Trauma or musculoskeletal pain</td>
</tr>
<tr>
<td>7. Hepatic vein obstruction</td>
<td>15. Intestinal ischemia</td>
</tr>
<tr>
<td>8. Right lower lobe pneumonia</td>
<td>16. Psychological</td>
</tr>
</tbody>
</table>

---

**Table of Content**

- Abdominal Pain
- Gastroenterology
### Left Upper Quadrant DDx

1. Gastritis / Peptic ulcer disease
2. Gastroenteritis
3. Pancreatitis
4. Splenomegaly
5. Left lower lobe pneumonia
6. Pyelonephritis
7. Myocardial ischemia / pericarditis
8. Ruptured spleen
9. Urinary calculi
10. Functional dyspepsia
11. Gastric cancer
12. Diverticulitis
13. Herpes zoster
14. Intestinal ischemia
15. Trauma or musculoskeletal pain
16. Herniated disk
17. Abdominal abscess
18. Psychological

### Right Lower Quadrant DDx

1. Appendicitis
2. **Gynecologic**: pelvic inflammatory ds, ovarian torsion, ruptured ovarian cyst, ovarian abscess, endometriosis, ectopic pregnancy, mittelschmerz
3. Gastroenteritis or colitis
4. Cystitis
5. Hernia
6. Testicular etiology: epididymitis, testicular torsion
7. Prostatitis
8. Diverticulitis
9. Intestinal obstruction
10. Urinary calculi
11. Intestinal ischemia
12. Abdominal aortic aneurysm
13. Irritable bowel syndrome
14. Meckel's diverticulitis
15. Herpes zoster
16. Trauma or musculoskeletal pain
17. Colon cancer
18. Abdominal abscess
19. Psychological

### Left Lower Quadrant DDx

1. Diverticulitis
2. Gastroenteritis or colitis
3. Constipation
4. **Gynecologic**: pelvic inflammatory ds, ovarian torsion, ruptured ovarian cyst, ovarian abscess, endometriosis, ectopic pregnancy, mittelschmerz
5. Intestinal ischemia
6. Cystitis
7. Hernia
8. Testicular, eg, epididymitis, testicular torsion
9. Prostatitis
10. Urinary calculi
11. Inflammatory bowel disease
12. Irritable bowel syndrome
13. Colon cancer
14. Intestinal obstruction
15. Abdominal aortic aneurysm
16. Herpes zoster
17. Trauma or musculoskeletal pain
18. Herniated disk
19. Abdominal abscess
20. Psychological
### Periumbilical DDx

| 1. Early Appendicitis                      | 7. Small-Bowel Mass       |
| 2. Esophagitis                            | 8. Small-Bowel Obstruction|
| 4. Pancreatitis                           | 10. Mesenteric Ischemia   |
| 5. Peptic Ulcer                           |                            |
| 6. Functional dyspepsia                   |                            |

### Suprapubic DDx

| 2. Ectopic pregnancy                     | 10. Degeneration of leiomyoma|
| 3. Appendicitis                           | (fibroid)                  |
| 4. Urinary calculi                        | 11. Endometriosis          |
| 5. Primary dysmenorrhea                   | 12. Diverticulitis         |
| 6. Septic abortion                        | 13. Cystitis Psychological |
| 7. Ruptured ovarian cyst or tumor         |                            |
| 8. Ovarian torsion                        |                            |

### Elevated LFT's Differential Diagnosis

#### Elevated AST/ALT DDx

| 1. Acute viral hepatitis (ALT > AST)      | 9. HF= right sided         |
| 2. Alcoholic hepatitis (AST < ALT)        | 10. Hemochromatosis        |
| 3. Cirrhosis (AST > ALT)                  | 11. Wilson's Ds            |
| 4. Drugs: STATINs, INH                    | 12. Liver abscess          |
| 5. Toxic hepatitis                        | 13. Liver Cancer           |
| 6. Nonalcoholic fatty liver disease       | 14. Celiac sprue (ALT)     |
| 7. Shock liver                            | 15. Non-hepatic: Heart or skeletal muscle injury |
| 8. Biliary tract obstruction              |                            |
Highly Elevated AST/ALT > 500-1000 DDx

1. Toxic hepatitis: Acetaminophen, other toxins
2. Viral, especially hepatitis A
3. Shock liver (ischemia)
4. Budd-Chiari syndrome
5. Right-sided heart failure

Elevated Alkaline Phosphatase DDx

1. Obstructive Liver disease (GGT increased)
2. Bone metastases
3. Paget's disease
4. Hyperparathyroidism
5. Osteomalacia
6. Osteosarcoma
7. Hemochromatosis
8. Gastrointestinal disease: bowel infarction or perforated viscus
9. Hepatitis, viral, alcoholic, toxic
10. Sarcoidosis
11. Lymphoma
12. Amyloidosis
13. Pregnancy (third trimester)
14. TB

List of differentials was composed during PICOs presentation at CFM on 12/2012, and provided by MS3 from UCF and MS4 from FSU

➢ Workup of Elevated LFTs
  ▪ If AST/ALT elevated <5 x normal
    - H&P, confirm abnormality and add CMP (AST, ALT, Albumin), PT, CBC with Platelets,
    - Hep A/B/C, Serum Iron, TIBC, Ferritin (Wilson’s)
      ▪ If neg serology and no evidence chronic liver disease or hepatic decompensation
        ▪ Lifestyle and med modification, weight loss, diabetes control
        ▪ 6 month repeat LFTs
          ▪ If LFTs normal follow
            ♦ If LFTs still abnormal: US, ANA, AsMA, Ceruloplasmin, alpha Anti-trypsin, antigliadin, antiendomysial antibody
            ♦ Referral to GI
          ▪ If positive serology or decompensated CLD
            ♦ Referral to GI
  ▪ If AST/ALT elevated >5 x normal
    ♦ Referral to GI
HYPERBILIRUBINEMIA

➢ Hyperbilirubinemia
❖ Plasma elevation of both unconjugated and conjugated (direct) bilirubin. May be due to hepatocellular disease, impaired canalicular excretion of bilirubin, or biliary obstruction. Often referred to as conjugated hyperbilirubinemia, even though both fractions are elevated.
   ➥ Biliary obstruction (eg, gallstones, pancreatic or biliary malignancy, AIDS cholangiopathy, parasites)
   ➥ Viral hepatitis
   ➥ Alcoholic hepatitis
   ➥ Nonalcoholic steatohepatitis
   ➥ Primary biliary cholangitis
   ➥ Drugs and toxins
   ➥ Ischemic hepatopathy
   ➥ Liver infiltration
   ➥ Inherited disorders (eg, Dubin-Johnson syndrome, Rotor syndrome, progressive familial intrahepatic cholestasis)
   ➥ Total parenteral nutrition
   ➥ Postoperative jaundice
   ➥ Intrahepatic cholestasis of pregnancy
   ➥ End-stage liver disease
   ➥ Organ transplantation (eg, bone marrow, liver)
   ➥ Plasma elevation of predominantly unconjugated (indirect) bilirubin. May be due to the overproduction of bilirubin, impaired bilirubin uptake by the liver, or abnormalities of bilirubin conjugation
      ➥ Hemolysis
      ➥ Extravasation of blood into tissue
      ➥ Dyserythropoiesis
      ➥ Stress situations (eg, sepsis) leading to increased production of bilirubin
      ➥ Impaired hepatic bilirubin uptake
      ➥ Impaired bilirubin conjugation

➢ Diagnostic Evaluation
❖ Step 1: History and physical
   ➥ medications, herbal medications, dietary supplements, and recreational drugs, alcohol
   ➥ Hepatitis risk factors (eg, travel, possible parenteral exposures)
   ➥ HIV status
   ➥ History of abdominal surgery
   ➥ History of inherited disorders, liver diseases, hemolytic disorders
Exposure to toxic substances

**Step 2: Initial lab tests**
- CBC, CMP (albumin, AST)
- total and unconjugated bilirubin
- PT/INR

**Step 3: Further testing based on findings from the history, physical and labs**

- **Suspected biliary obstruction or intrahepatic cholestasis** (elevated conjugated bilirubin and alkaline phosphatase)
  - Hepatic imaging ultrasound or CT scan is the first imaging test obtained in patients with suspected biliary obstruction with unknown etiology
  - No obstruction evaluate for hepatocellular disease.
  - If dilated biliary ducts are visualized, direct imaging of the biliary tree (eg, with MRCP or ERCP) should be performed.

- **Predominant aminotransferase elevation** — A predominant elevation of serum aminotransferase activity suggests that jaundice is caused by hepatocellular injury
  - Alcoholic hepatitis is associated with a disproportionate elevation of the AST compared with the ALT.
  - Testing to evaluate for causes of hepatocellular injury should include:
    - Serologic tests for viral hepatitis
    - Measurement of antimitochondrial antibodies (for primary biliary cholangitis)
    - Measurement of antinuclear anti-smooth muscle and liver-kidney microsomal antibodies (for autoimmune hepatitis)
    - Serum levels of iron, transferrin, and ferritin (for hemochromatosis)
    - Thyroid function tests
    - Antibody screening for celiac disease
    - Additional testing may also include (based on the clinical scenario):
      - Serum levels of ceruloplasmin (for Wilson disease)
      - Measurement of alpha-1 antitrypsin activity (for alpha-1 antitrypsin deficiency)
      - Testing for adrenal insufficiency
    - In some cases, liver biopsy may be required to confirm the diagnosis.

- **Normal alkaline phosphatase and aminotransferases**
  - In these pts jaundice is probably not due to hepatic injury or biliary tract
  - In these pts, hemolysis or inherited disorders of bilirubin metabolism may be responsible for the hyperbilirubinemia.
  - LDH-elevated
  - **Haptoglobin**-decreased
  - **Peripheral smear**
The inherited disorders associated with isolated unconjugated hyperbilirubinemia are Gilbert and Crigler-Najjar syndromes.

The inherited disorders associated with isolated conjugated hyperbilirubinemia are Rotor and Dubin-Johnson syndromes.

**Predominant alkaline phosphatase elevation** — Elevation of the serum alkaline phosphatase out of proportion to the serum aminotransferases suggests biliary obstruction or intrahepatic cholestasis.

Serum GGT can help confirm the hepatic origin (alk phos can be extra-hepatic).

### GENERAL PRINCIPLES OF CIRRHOSIS MANAGEMENT INPATIENT

**Diet:**
- High protein diet is associated with decreased severity of hepatic encephalopathy.
- Na restriction- 2 Gms per day.
- Fluid restrict when serum Na levels <120 or when sx of fluid overload are present.
- Overnight fasting can contribute to muscle depletion; consider pm nutritional supplement or snack order.

**Blood pressure:**
- Goal MAP >80.
- Hold BP medications if BP is lower in an inpatient setting.

**Ascites:**
- Fluid and salt restriction are key.
- Hold antihypertensives during acute decompensation. Only re-introduce if MAP consistently >82 mm/hg.
- In paracentesis of >5L of abdominal fluid, recommend Albumin replacement: 6-8 grams per liter of fluid removed.
- Patients should be recommended to maintain fluid restriction and salt restriction.
- In early cirrhosis, ascites can be reduced with diuretics.
- In late stage cirrhosis, patients with ascites refractory to diuretics should schedule bi-weekly paracentesis.

**SBP-** develops secondary to gut bacterial translocation.
- For first time paracentesis, always do cell analysis.
- Patients typically present with fever, abdominal pain, or leukocytosis.

**Diagnosis is made with fluid analysis:** order culture, gram stain, cell counts, albumin level, total protein level, glucose, LDH, amylase.
- Absolute PMN =Total WBC x % of PMN. **Diagnosis of SBP >250 absolute PMN**
- If Bloody tap: One PMN is subtracted from absolute PMN for every 250 RBCs.
Treatment:
- Start with broad spectrum antibiotics.
- For septic patients, start Cefotaxime 2 gm IV q8h - you will need to consult ID for access to this antibiotic.
- Alternative therapy for severe sepsis 2/2 SBP: ampicillin + tobramycin.
- For stable patients, start Ceftriaxone 2 g q24H.

Hepatic Encephalopathy:
- Check Ammonia level.
- Lactulose, titrate to 2-3 BMs per day

Variceal Surveillance/Bleeding:
- Beta blockers are only found to be beneficial within a “window period” defined as prophylaxis or secondary prevention of moderate-to-large esophageal varices with or without bleeding in the absence of SBP, refractory ascites, hepatorenal syndrome, severe alcoholic cirrhosis, and sepsis.
- It is recommended to discontinue B-blockers in patients with systolic BP <100, Na <120, or AKI.
- Beta-blockers are not found to prevent the development of varices in early cirrhosis without the presence of moderate-to-large varices

Hepatorenal syndrome: No effective medical treatment-
- Pt should be evaluated by hepatology for transplant.
- Can use midodrine for hypotension associated with HRS- has been associated with reduction in mortality.
- Consult GI- consider adding octreotide and albumin to maintain MAP.
- Pt should also be evaluated for TIPS candidacy.

Hepatocellular Carcinoma- screening with Liver US +/- AFP level every 6 months

Pain control:
- Recommended to use Tylenol 2 gm q day
- Tramadol
- Avoid NSAIDS entirely.
- Opiates can precipitate or aggravate hepatic encephalopathy.
- Aspirin should only be continued in patients whose cardiovascular mortality outweighs mortality of cirrhosis.

Insomnia
- Safe medications for insomnia: Trazodone up to 100 mg, hydroxyzine

Statins should be continued in patients with cirrhosis, especially those who have NAFLD
- PPI associated with increased risk of bacterial infections in patients with cirrhosis - only use for specific indication
CLOSTRIDIUM DIFFICILE INFECTION = CDI

Documentation and Interpretation of C. difficile Testing

<table>
<thead>
<tr>
<th>Testing Scenario</th>
<th>EIA Antigen Result</th>
<th>EIA Toxin Result</th>
<th>Toxin PCR</th>
<th>Document in patient record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>Positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient 2</td>
<td>Negative</td>
<td>Negative</td>
<td>Not indicated</td>
<td>If PCR: Positive = Positive C. diff Negative = Negative C. diff</td>
</tr>
<tr>
<td>Patient 3</td>
<td>Positive</td>
<td>Negative</td>
<td>Perform PCR</td>
<td>If clinically indicated order clostridium difficile tcdB Gene PCR feces</td>
</tr>
<tr>
<td>NEW 12-2015</td>
<td>Positive</td>
<td>Negative</td>
<td>Perform PCR</td>
<td>If PCR: Positive = Positive C. diff Negative = Negative C. diff</td>
</tr>
<tr>
<td>Patient 4</td>
<td>Negative</td>
<td>Positive</td>
<td>Perform PCR</td>
<td>If clinically indicated order clostridium difficile tcdB Gene PCR feces</td>
</tr>
</tbody>
</table>

- **Negative PCR** result indicates the patient has colonization and **NOT INFECTION**
- Repeat testing, during the same diarrheal illness or “test for cure” is not recommended

Vincent Hsu, MD, MPH, CIC, FACP
Hospital Epidemiologist & Exec Director, Infection Prevention

C. difficile infection/severity

<table>
<thead>
<tr>
<th>symptoms</th>
<th>Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal cramping/tenderness</td>
<td>Previous antibiotic use (90 d)</td>
</tr>
<tr>
<td>Diarrhea (&gt;3 unformed stools/day)</td>
<td>Previous hospitalization</td>
</tr>
<tr>
<td></td>
<td>Immuno compromised</td>
</tr>
<tr>
<td></td>
<td>Advanced age (65)</td>
</tr>
<tr>
<td>Non-severe:</td>
<td>Severe:</td>
</tr>
<tr>
<td>WBC: &lt;15,000 AND</td>
<td>WBC &gt; 15,000 OR</td>
</tr>
<tr>
<td>Cr &lt; 1.5 mg/dl</td>
<td>SCR &gt; 1.5 mg/dl</td>
</tr>
<tr>
<td>Fulminant:</td>
<td>(Hypotension, shock, ileus or toxic megacolon)</td>
</tr>
</tbody>
</table>

Treatment of Acute CDI

<table>
<thead>
<tr>
<th>Severity</th>
<th>1st line</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-severe:</td>
<td>VAN 125 mg PO q6h x 10 days</td>
<td>Fidaxomicin 200 PO BID x 10d</td>
</tr>
<tr>
<td>Severe:</td>
<td>VAN 125 mg PO q6h x 10 days</td>
<td>Fidaxomicin 200 PO BID x 10d</td>
</tr>
<tr>
<td>Fulminant:</td>
<td>VAN 500 mg PO or NGT q6h PLUS Metronidazole 500 mg IV q8hr</td>
<td></td>
</tr>
</tbody>
</table>
Consider ID and surgery consult

If ileus, consider Retention enema containing Vancomycin 500 mg in 100 mL of normal saline q 6 hrs

❖ Surgical Evaluation
- WBC count ≥20,000 cells/microL and/or a plasma lactate between 2.2 and 4.9
- Peritoneal signs
- Severe Ileus or Toxic Megacolon

❖ Recurrent disease
- Defined as complete resolution of symptoms while on appropriate therapy, followed by reappearance of diarrhea and other symptoms after treatment has been stopped
- Risk factors for recurrence include
  - age >65 years
  - severe underlying medical disorders,
  - Need for ongoing antibiotics during CDI treatment
  - Patients with at least one episode of recurrent C. difficile have a 45% to 65% chance of additional episodes

❖ Management of Recurrent disease

<table>
<thead>
<tr>
<th>First recurrence</th>
<th>1st line</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin 125 QID x 10d (if metro initially used) OR Prolonged vancomycin taper/pulse</td>
<td>Fidaxomicin 200 mg BID (if vancomycin initially used)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second or subsequent recurrence</th>
<th>1st line</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged vancomycin taper/pulse</td>
<td>Vancomycin taper/pulsed regimen OR Fidaxomicin 200 mg BID x 10d Vancomycin 125 QID x10d followed by rifaximin 400 TID x 20d Fecal transplant (rec only after ≥3 recurrence)</td>
<td></td>
</tr>
</tbody>
</table>

Vancomycin Taper Regimen

- **125 mg 4 times daily x 10-14 days**
- **125 mg BID x 7 days**
- **125 mg daily x 7 days**
- **125 mg every 2-3 days for 2-8 weeks (pulse dosing)**

Adapted from HM18 Hospital medicine updates and Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA) Clinical Infectious Diseases, Volume 66, Issue 7, 19 March 2018, Pages e1–e48
FUNCTIONAL ABDOMINAL PAIN SYNDROME (FAPS)

➢ Diagnosis of FAPS is based on the Rome III criteria
➢ Diagnostic criteria for FAPS must include all of the following:
  • Continuous or nearly continuous abdominal pain
  • No or only an occasional relationship of pain with physiological events (e.g., eating, defecation, or menses)
  • Some loss of daily functioning
  • An indication that the pain is not feigned (e.g., malingering)
  • Insufficient symptoms to meet criteria for another FGD that would explain the pain
  • Criteria fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis
➢ Structural, organic, or chemical diseases should be excluded.
➢ Differential diagnosis include
  • Cancer
  • Ulcerative colitis
  • Crohn’s disease
  • Peptic ulcer
  • Ulcer of the small intestine
  • Stenosis of the gastrointestinal tract
  • Diverticulitis
  • Ischemic colitis
  • Cholelithiasis
  • Cholangitis
  • Cholecystitis
  • Pancreatitis
  • Chronic intestinal pseudo-obstruction
  • Megacolon
  • Colonic inertia
  • Food allergy
  • Allergic or eosinophilic gastroenteritis
  • Parasites
  • Mesenteric ischemia
  • Aortic aneurysm
  • Peritonitis
  • Fitz-Hugh-Curtis syndrome
  • Henoch-Schoenlein purpura
  • Porphyria
  • Abdominal wall pain
  • Gynecological
  • Urological diseases
➢ A precise History and thorough physical examination along with lab, imaging and GI procedures as guided by the clinical situation should be performed and documented
➢ Treatment
  • A cure is not possible
  • Aim of treatment is to reduce suffering and improve the quality of life
  • Treatment relies on a biopsychosocial approach with a therapeutic patient-physician partnership at its base
Pharmacotherapy for FAPS is centered on antidepressants

- Antidepressants suppress the activities of the pain matrix, facilitate descending pain modulation systems, and possibly help neurogenesis via brain-derived neurotrophic factor

- **Tricyclic antidepressants**
  - Amitriptyline
  - Imipramine
  - Desipramine

- **Tetracyclic antidepressants**
  - Mianserin

- **Selective Serotonin Reuptake Inhibitors**
  - Fluoxetine
  - Fluvoxamine
  - Escitalopram
  - Paroxetine
  - Sertraline

- **Serotonin-Norepinephrine Reuptake Inhibitors**
  - Duloxetine
  - Milnacipran
  - Venlafaxine

- **Noradrenergic and specific serotonergic antidepressant**
  - Mirtazapine

Antipsychotics

- Quetiapine (Seroquel; 25-100 mg)

Psychotherapy is a reasonable approach for FAPS patients

- If patients with FAPS have narcotic bowel syndrome due to a paradoxical increase in abdominal pain associated with continued or escalating dosages of opioids, detoxification treatment is beneficial for patients
NARCOTIC BOWEL SYNDROME

➢ Characterized by chronic or periodic abdominal pain that gets worse when the effect of the narcotic drug wears down.

➢ In addition to pain other symptoms may include
  - Nausea
  - Bloating
  - Periodic vomiting
  - Abdominal distension
  - Constipation

➢ Diagnostic criteria for narcotic bowel syndrome:
  - Chronic or frequently recurring abdominal pain that is treated with acute high-dose or chronic narcotics and all of the following:
  - The pain worsens or incompletely resolves with continued or escalating dosages of narcotics;
  - There is marked worsening of pain when the narcotic dose wanes and improvement when narcotics are re-instituted (soar and crash);
  - There is a progression of the frequency, duration, and intensity of pain episodes;
  - The nature and intensity of the pain is not explained by a current or previous GI diagnosis.
  - The key to diagnosis is the recognition that long-term or increasing dosages of narcotics lead to continued or worsening symptoms rather than benefit.

➢ Treatment  Treatment protocol developed by UNC GI group

<table>
<thead>
<tr>
<th>Antidepressant</th>
<th>TCA Desipramine 25-150 mg/qhs Nor triptyline 25-150 mg/qhs SNRI Duloxetine 30-90 mg/qd Mirtazepine 15-30 mg/qhs</th>
<th>• Started for immediate and long term pain control and to help manage psychological co-morbidities • Can be initiated at a low dose with dose escalation over the duration of the detoxification process and afterwards. • If possible this should be started at least a week prior to the detoxification program and continued indefinitely for pain management.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antipsychotic</td>
<td>Seroquel; 25-100 mg.</td>
<td>• can be used as a single night time dose for adjunct treatment of pain • This agent is also helpful to treat sleep disturbance and anxiety as well as to augment the pain benefit</td>
</tr>
</tbody>
</table>
| **Narcotic Withdrawal** | • Total narcotic daily dose should be converted to morphine equivalents using an appropriate calculator  
• This should be administered on day #1 of detoxification.  
• Intravenous morphine (or hydromorphone in the case of a morphine allergy) as a continuous drip should be used  
• Giving the appropriate dose on day #1 is essential as a lower dose could lead to preliminary withdrawal symptoms, potentially sabotaging the process.  
• **THE NARCOTICS MUST BE ADMINISTERED CONTINUOUSLY, NOT PRN AND PREFERABLY NOT SCHEDULED.**  
• A PCA pump is used to minimize the likelihood of withdrawal symptoms.  
• The narcotic dose should be weaned gradually with a reduction of 10 to 33% of the dose given on day #1 every 24 hours.  
• In general, slower tapers should be used for patients with more chronic and entrenched narcotic use.  
• it is not the initial dose but the continuity of the dosing that avoids “soar crash or withdrawal effects.”  
• The detoxification duration is between 4 and 11 days  
❖ For outpatients, taper can occur using oral medications, reduce by one dose (about 10-20%) each week. |
| **Clonidine** | • It should be initiated when there is **50%** reduction in narcotic dosage, or earlier to help control withdrawal symptoms.  
• Start 0.1mg po BID or TID  
• Increased up to a total daily dose of 0.6mg for desired effect.  
• Acts to block withdrawal effects and reduce diarrhea, anxiety and bowel related pain.  
• Monitored closely for hypotension and orthostasis. |
| **Constipation** | Polyethylene glycol  
Methylnaltrexone (Relistor) given SQ 6 or 12 mg. q 2 days |
| **Anxiety reduction** | lorazepam  
1mg po q 6 hrs and prn  
• Should be started on day #1 for anxiety  
• Should be discontinued at the end of the narcotic taper. |
| **Psychological Treatment** | • Provide supportive care  
• Help to institute pain management strategies. |
The main obstacles to successful detoxification are:

- Poor physician-patient communication e.g. perceived lack of empathy, failure to validate pain, or poor explanation of rationale and benefits of detoxification.
- An unmotivated patient (may need better education from physician).
- Starting with too little narcotic on day #1 (make sure opioid-equivalence conversion is accurate).
- Reducing dosage too fast or going up and down in negotiation.
- Administering the narcotics PRN instead of scheduled (can precipitate withdrawal symptoms).
- Failure to recognize and adequately address exacerbating factors e.g. anxiety and withdrawal symptoms.

The UNC group presented their results of their detoxification of 30 patients who had narcotic bowel syndrome.

- Most (almost 90%) had clinically significant reduction in bowel and other bodily pains at the end of the detoxification.
- However about 50% of these patients were back on narcotics 6 weeks later.

*The Narcotic Bowel Syndrome: Clinical Features, Pathophysiology and Management*
David M.S. Grunkemeier, MD, Joseph E. Cassara, MD, Christine B. Dalton, PA-C, and Douglas A. Drossman, MD, FACP
Revised Atlanta classification of acute pancreatitis requires at least two of three features:

- **Abdominal pain suggestive of pancreatitis** (epigastric pain often radiating to the back), with the start of such pain considered to be the onset of acute pancreatitis
- **Serum amylase and lipase levels three or more times normal**
- **Characteristic findings on imaging (CT, MRI or US)**
  - If acute pancreatitis is diagnosed on the basis of the first two criteria with no systemic sign of severe systemic inflammatory response syndrome or persistent organ failure, CT may not be necessary for determining patient care
  - Best imaging modality is CT using the Balthazar pancreatic protocol
  - 3 fold elevation of alanine transaminase has a 95% predictive value for gallstone pancreatitis
  - Elevated CRP is associated with pancreatic necrosis

- **80% cases of acute pancreatitis are mild and usually edematous.**
- **The other 20% are severe and usually necrotic.**
- **Mortality is 3% or less with edematous cases**
- **15%-25% or more with necrotic pancreatitis.**

The **HAPS and BISAP scores** are helpful in assessing severity early on unlike the Ranson criteria and APACHE-II score, which are tedious and complicated, and take up to 48 hours to complete,

- **The HAPS (Harmless Acute Pancreatitis Score)** can be measured w/in 30 min of adm.
  - There are three criteria for a "harmless" HAPS score (score of 0)
  - **Normal hematocrit** (Hematocrit ≥ 43% (male) or 39.6% (female))
  - **Normal serum creatinine** (Creatinine ≥2 mg/dl (177 µmol/L))
  - **NO rebound tenderness.**
  - The presence of all three criteria has 96% specificity and 99% positive predictive value for a nonsevere disease course

- **The BISAP (Bedside Index for Severity in Acute Pancreatitis)** Data should be taken from the first 24 hours of the patient's evaluation.
  - awards 1 point each for the presence of five possible findings
  - **BUN level in excess of 25 mg/dL**
  - **Impaired mental status** defined by a Glasgow Coma Score of less than the normal (15)
  - **Age over 60**
  - **Pleural effusion**
  - **2 or more SIRS criteria**
  - A patient with a BISAP score of 1 has less than a 2% risk of mortality. In contrast, a BISAP score of 3 is associated with a 22% mortality rate
60% of patients with acute pancreatitis have SIRS on admission. It resolves within 24 hrs in half of cases. Persistent or worsening SIRS is associated with an 11%-25% mortality rate.

Apache II score
- Performed 24 to 48 hrs from admission
- APACHE II uses a point score based upon initial values of 12 routine physiologic measurements, age, and previous health status to provide a general measure of severity of disease.
- An increasing score (range 0 to 71) was closely correlated with the subsequent risk of hospital death
- Interpretation of Score:

<table>
<thead>
<tr>
<th>Score</th>
<th>Death Rate (%)</th>
</tr>
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<tbody>
<tr>
<td>0-4</td>
<td>4</td>
</tr>
<tr>
<td>5-9</td>
<td>8</td>
</tr>
<tr>
<td>10-14</td>
<td>15</td>
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<td>15-19</td>
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<td>20-24</td>
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<td>25-29</td>
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<tr>
<td>30-34</td>
<td>75</td>
</tr>
<tr>
<td>&gt;34</td>
<td>85</td>
</tr>
</tbody>
</table>

Causes of Pancreatitis
- Choledocholithiasis (40% of cases)
- Chronic alcohol use or abuse (35% of cases)
- Endoscopic retrograde cholangiopancreatography (4% of cases)
- Medications (2% of cases; e.g., azathioprine, didanosine, estrogens, furosemide, pentamidine, sulfonamides, tetracycline, valproic acid)
- Abdominal trauma (1.5% of cases)
- Other less common
  - Abnormalities of the pancreas (annular pancreas, pancreas divisum, sphincter of Oddi dysfunction)
  - Autoimmune disorders
  - Hypercalcemia (excessive vitamin D therapy, hyperparathyroidism, TPN)
  - Hypertriglyceridemia
  - Infections (viral, bacterial, fungal, and parasitic)
    - Surgical procedures
  - Toxins (scorpion or snake bites)
  - Tumors
• Vascular abnormalities (ischemia, vasculitis)

• **Treatment: fluid resuscitation, pain control, and nutritional support**

• **Fluid resuscitation**
  ❖ IVF with *Lactated Ringer’s solution*
    ➢ Exception if pancreatitis 2nd to hypercalcemia then use .9 NS
  ❖ Usually give a 1- to 2-L bolus of intravenous following up at an infusion rate of 250-300 mL/hr.
  ❖ Vigorous fluid therapy is most critical in the first 12–24 hours after symptoms begin but is not very useful after 24 hours.

  • Aggressive hydration at a rate of **5 to 10 ml/kg per hour** to all patients with acute pancreatitis
  • Patients with severe volume depletion (hypotension and tachycardia) **20 ml/kg** of intravenous fluid given over 30 min followed by 3 ml/kg/hour for 8 to 12 hr.
  • Fluid requirements should be reassessed at frequent intervals in the first six hours of admission and for the next 24 to 48 hours.
  • The rate should be adjusted based on improvement in vital signs (goal heart rate <120 beats/minute, mean arterial pressure between 65 to 85 mmhg), urine output (>0.5 to 1 cc/kg/hour) and reduction in hematocrit (goal 35 to 44 percent) and BUN over 24 hours, particularly if they were high at the onset.
  • Monitoring the BUN may be particularly important, as both the BUN at the time of admission and the change in BUN during the first 24 hours of hospitalization predict mortality
  • Increased fluid resuscitation should be considered in patients whose BUN levels stay the same or increase.
  • In the initial stages (within the first 12 to 24 hours) of acute pancreatitis, fluid replacement has been associated with a reduction in morbidity and mortality
  • Persistent hemoconcentration at 24 hours has been associated with development of necrotizing pancreatitis
  • It is important to limit fluid resuscitation mainly to the first 24 to 48 hours after onset of the disease.
  • Aggressive fluid resuscitation after 48 hours may not be advisable as overly-vigorous fluid resuscitation is associated with an increased need for intubation and increased risk of abdominal compartment syndrome.

• **Pain control**
  ❖ Opioids are safe and effective at providing pain control in patients with acute pancreatitis
  ❖ Adequate pain control requires the use of intravenous opiates, usually in the form of a patient-controlled analgesia pump.
Hydromorphone or fentanyl (intravenous) may be used for pain relief in acute pancreatitis. Fentanyl is being increasingly used due to its better safety profile, especially in renal impairment.

Morphine can cause an increase in sphincter of Oddi pressure, however, there are no clinical studies to suggest that morphine can aggravate or cause pancreatitis or cholecystitis.

- **Nutrition: initially NPO**
- **Oral feeds:** time to reinitiate oral feedings depends on the severity

- **In mild pancreatitis**, in the absence of ileus, nausea or vomiting
  - Start refeeding when patients are subjectively hungry, regardless of resolution of abdominal pain and normalization of pancreatic enzymes.
  - Starting first with a solid, low fat diet is associated with shorter hospital stays compared with a clear liquid advance plan may also be safe.

- **In moderately severe to severe pancreatitis**
  - Oral feeding may not be tolerated due to postprandial pain, nausea or vomiting related to gastroduodenal inflammation and/or extrinsic compression from fluid collections leading to gastric outlet obstruction.
  - Patients may require enteral or parenteral when the local complications start improving, oral feeds can be initiated and advanced as tolerated.

- **Enteral:**
  - Enteral feeding rather than parenteral nutrition is recommended in patients with moderately severe and severe acute pancreatitis who cannot tolerate oral feeding.
  - Recommendation from **uptodate** is to initiate enteral feeding when it becomes clear that the patient will not be able to consume nourishment by mouth (eg, transfer to an intensive care unit, development of organ failure, or systemic inflammatory response syndrome [SIRS] persisting for 48 hours). This assessment can usually be made within the first three to four days of illness.
  - Enteral feeding requires radiologic or endoscopic placement of a jejunal feeding tube beyond the ligament of Treitz.
  - If placement of a nasojejunal feeding tube is not possible, nasogastric feeding should be initiated.
  - Use high protein, low fat, semi-elemental feeding formulas (eg, Peptamen AF) because of a reduction in pancreatic digestive enzymes.
  - Start at 25 cc per hour and advance as tolerated to at least 30% of the calculated daily requirement (25 kcal/kg ideal body weight), even in the presence of ileus.
  - Signs that the formula is not tolerated include increased abdominal pain, vomiting (with nasogastric feeding), bloating, or diarrhea (>5 watery stools or >500 ml per 24 hours with exclusion of Clostridium difficile toxin and medication-induced diarrhea) that resolves if the feeding is held.
• **Parenteral**
 ➢ Parenteral nutrition should be initiated only in patients who do not tolerate enteral feeding as the use of parenteral nutrition as an adjunct to enteral feeding may be harmful

• **Monitoring**
 ➢ Patients should be monitored closely in the first 24 to 48 hours.
 ➢ Vital signs including oxygen saturation should be monitored and supplemental oxygen administered to maintain arterial oxygen saturation of greater than 95%
 ➢ Urine output should be measured hourly and fluids should be titrated to maintain urine output (>0.5 to 1 cc/kg/hour)
 ➢ Electrolytes should be monitored frequently in the first 48 to 72 hours especially with aggressive fluid resuscitation.
 ➢ Serum glucose levels should be monitored hourly in patients with severe pancreatitis and hyperglycemia (blood glucose greater than 180 to 200 mg/dL)
 ➢ Patients in the intensive care unit should be monitored for potential abdominal compartment syndrome with serial measures of urinary bladder pressures

• **Antibiotics** Up to 20 percent of patients with acute pancreatitis develop an infection (eg, bloodstream infections, pneumonia, and urinary tract infections)
 ➢ If an infection is suspected, antibiotics should be started while the source of the infection is being determined. If cultures are negative and no source of infection is identified, antibiotics should be discontinued.
 ➢ Prophylactic antibiotics are not beneficial for prevention of infected pancreatic necrosis, which is rare in first 2 weeks.
 ➢ About one-third of patients with pancreatic necrosis develop infected necrosis, no correlation between the extent of necrosis and the risk of infection
 ➢ Majority of infections 75% are monomicrobial with gut-derived organisms (eg, *Escherichia coli*, *Pseudomonas*, *Klebsiella*, and *Enterococcus*).
 ➢ If empiric antibiotics are initiated, antibiotics known to penetrate pancreatic necrosis (eg, carbapenems or quinolones and metronidazole) should be used.
- **Complications**
- Early within 24-48 hrs
  - SIRS
  - Abdominal compartment syndrome
  - Gastrointestinal Bleeding (including from gastric Varices)
  - Common bile duct obstruction
  - Ileus
  - Bowel infarction
  - Abdominal Compartment Syndrome
  - Mesenteric Venous Thrombosis
- Later usually 1-2 weeks or later
  - Pancreatic Abscess
  - Pancreatic Phlegmon
  - Pancreatic Pseudocyst
  - Pancreatic venous thrombosis (Splenic infarction)
  - Pancreatic arterial pseudoaneurysm
  - Splenic Rupture
  - Disseminated Intravascular Coagulation (DIC)
  - Adult Respiratory Distress Syndrome (ARDS)
  - Pleural Effusion
  - Acute Renal Failure
  - Pancreatic necrosis
  - Chronic Pancreatitis
- Physical findings
  1. Periumbilical ecchymosis (Cullen’s sign)
  2. Ecchymosis of the flank (Grey Turner’s sign)
  3. These signs, are associated with severe acute pancreatitis and high mortality


*UpToDate Management of Acute Pancreatitis Accessed October 23, 2016*
CONSTITUTION IN ADULTS

❖ Constipation is defined as infrequent, incomplete or difficult evacuation of the bowels and is subjectively defined in comparison to what is normal for that individual.

❖ Prevention of constipation in hospitalized patients
❖ Step 1: Does patient have risk factors for Inpatient Constipation
  • Age > 60 yrs
  • Hx of outpatient constipation
  • Need for ICU
  • Intra-abdominal surgery within the last week
  • Planned greater than 24 hours use of a known constipation causing medication
❖ Step 2: If 1 or more risk factor present => High Risk for constipation => 17g polyethylene glycol (Miralax) daily
❖ Step 3: No risk factor present as needed osmotic or stimulant laxative
  • Colace 100 mg q hs
  • Senokot-S 2 tabs at hs
  • 30 ml MOM Dulcolax 10-15mg at HS
  • Lactulose 15 – 30
  • 17g polyethylene glycol daily

❖ Treatment of constipation in hospitalized patients
❖ Step 1: If patient No BM or decrease BM in 2-3 days
  • Assess patient (Physical exam for bowel sounds, bleeding, distension, • consider Abdominal radiograph for obstruction • Review of medications)
  • If assessment is unremarkable, Has patient been on laxatives?
    • No => 17g polyethylene glycol and 10mg oral bisacodyl OR 17.2mg oral Senna
    • Yes =>34g polyethylene glycol and 10mg oral bisacodyl OR 17.2mg oral senna
      ➢ if no response 34g polyethylene glycol and 10mg rectal bisacodyl
❖ Step 2: Reassess in 24-48 hrs
  • If still exam still unremarkable consider Enema, or Bowel preparation doses of magnesium citrate or polyethylene glycol.
  • If on opiates consider MethylNaltrexone (Usual dosage: 8 kg-62 kg (84 lbs-136 lbs) → 8 mg sc; 62 kg-114 kg (136-251 lbs) → 12 mg sc; administer every 2 days. In severe renal failure, reduce dose by half.)

The Shaw (Please make it Stop) Protocol: for constipation use after assessment of patient’s constipation
Musher: Senokot 2-4 tabs qhs
plus pusher: Ducolax 20 mg qam or Lactulose 30 g qd titrate to BM

Table of Content
  Gastroenterology
  Geriatric / Palliative care
Common causes of constipation
- Poor appetite, low oral intake of fiber and fluids
- Lack of privacy, cultural sensitivities, inability to toilet independently, delayed defecation
- Advanced age, decreased mobility, depression, sedation
- Pharmacological agents such as opioids, anticholinergics, 5-HT3 antagonists, antidepressants, antiepileptics, oral iron supplements, antacids
- Metabolic disturbances such as dehydration (e.g. secondary to fever, vomiting, polyuria, poor fluid intake, diuretics), hypercalcemia, renal failure, hypokalemia, hypothyroidism, diabetes
- Neurological disorders, as with cerebral tumors, spinal cord involvement, sacral nerve infiltration, autonomic failure (primary as in Parkinson’s disease, multiple sclerosis, motor neuron disease, or secondary as in cancer, diabetes)
- Structural abnormalities (pelvic tumor mass, radiation fibrosis, painful anorectal conditions/ hemorrhoids, fissures, perianal abscess)

Red flags suggestive of Organic Constipation (requires Colonoscopy)
- Age over 50 years old and no prior Colorectal Cancer Screening
- Acute or recent onset Constipation
- Weight loss (especially more than 10 pounds or 4.5 kg)
- Abdominal Pain or cramping
- Rectal bleeding, Melena, heme-positive stool (Iron Deficiency Anemia)
- Nausea or Vomiting
- Rectal Pain
- Fever
- Change in stool caliber

The Bristol stool scale. The seven types of stool are:
- Type 1: Separate hard lumps, like nuts (hard to pass)
- Type 2: Sausage-shaped, but lumpy
- Type 3: Like a sausage but with cracks on its surface
- Type 4: Like a sausage or snake, smooth and soft
- Type 5: Soft blobs with clear cut edges (passed easily)
- Type 6: Fluffy pieces with ragged edges, a mushy stool
- Type 7: Watery, no solid pieces, entirely liquid
- Types 1 and 2 indicate constipation, with 3 and 4 being the ideal stools (especially the latter), as they are easy to defecate while not containing excess liquid, and 5, 6 and 7 tending towards diarrhea.
Pharmacological management (more in depth)

Laxatives are the primary pharmacological intervention for treating constipation.

Laxatives are categorized into four classes:

- **Osmotic agents**: OoA: 24-48 hours.
  - Lactulose 15-30 ml daily to tid may cause increased gas, cramping and abdominal distension
  - PEG 3350 (Miralax) 17 g daily to 75 g daily
- **Stool softeners**: OoA: 24-72 hours. they do not stimulate peristalsis and therefore can be utilized in a subacute bowel obstruction
  - Docusate sodium (Colace) 100-200 mg or docusate calcium 240-480 mg bid to start, and then increase to tid or qid
- **Stimulants**: OoA: ~12 hours. Induce peristalsis. Side effects include colic.
  - Sennosides 8.6 mg (Senokot) or 12 mg (Glysennid) at hs, trate up to 2-4 tabs bid to qid
  - Bisacodyl 5-15 mg daily
- **Bulking agents/Fiber**: OoA: 10-24 hours
  - Examples: psyllium, methylcellulose, bran, aloe vera

Rectal Interventions. stimulation or softening determined by DRE

- Hard feces at anus Give stool softener e.g. glycerin suppository
- Soft stool ± poor anal tone Give stimulant e.g. bisacodyl suppository
- Hard stool throughout the lower rectum Give stool softener e.g. glycerin suppository, followed by stimulant e.g. bisacodyl suppository
- Normal stool Give stimulant e.g. bisacodyl suppository

Purgative routine for symptomatic patients with constipation score > 7/12

- If there is distal stool, try enemas first (mineral oil and tap water/soap suds), then give oral PEG 3350.
- Proximal stool Consider PEG 3350, magnesium citrate or Picosalax.
- If no distal stool evident, then no enemas are required.

Prokinetic agents; Autonomic dysfunction, thought to be common in advanced cancers, can result in impaired gastrointestinal motility, leading to anorexia, nausea and early satiety. Promotility drugs such as metoclopramide and domperidone enhance emptying of the stomach and improve contractions and coordination of the gut.

- Metoclopramide 10 mg po/sc every 4 hours around the clock; reduce by half for impaired renal function; if the patient experiences extrapyramidal side effects with metoclopramide (e.g. tremor, rigidity, akathisia), trial domperidone (10 mg po qid) as it does not cross the blood-brain barrier.
Hematology / Oncology

Topics

*Click on topics below to go directly to that page

- Anemia
  - Macrocyclic Anemia
- Blood Transfusion
- Bleeding Risk (HASBled score)
- D Dimer (causes of elevated)
- Hemolysis
- Heparin Induced Thrombocytopenia
- Iron IV
  - Inpatient IV Iron
  - Outpatient IV Iron
  - PO Iron
- Metastasis Common sites
- Neutrapenic fever
- Platelet transfusion
- Transfusion Reaction
- Thrombocytopenia
- Tumor Markers
- Hypercoagulable States
- Thromboembolism
  - Wells Criteria DVT
  - Wells Criteria PE
  - DVT Arm
  - DVT Leg
  - DVT prophylaxis (Padua Score)
  - Pulmonary embolism
  - Superficial Venous Thrombosis
- Thromboembolism and Cancer
- Anticoagulation
  - Comparison of Anticoagulation medications
  - New Anticoagulants doses and indications
    - Pradaxa
    - Xarelto
    - Eliquis
  - Heparin protocol
- Warfarin
  - Warfarin Initiation 5 mg
  - Warfarin Initiation 10 mg
  - Warfarin Management
  - Warfarin Toxicity
- Perioperative Anticoagulation Management
  - Peri-op warfarin mgnt
  - Peri-op anticoagulation mgnt
  - Peri-op mgnt NOACs
- Antiplatelet therapy
- Restarting Anticoagulation After Major GI Bleed in AFIB
- Open
  - Open
  - open
**ANEMIA**

**Labs:**
- CBC with diff
- Retic count
- Peripheral smear
- MCV

### Anemia

<table>
<thead>
<tr>
<th>MCV</th>
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<th>MCV</th>
<th>Retic Index</th>
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<tbody>
<tr>
<td>&gt;100</td>
<td>80-100</td>
<td>&lt; 80</td>
<td>&lt; 2.0 (normal)</td>
<td>&gt; 2.0</td>
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</tbody>
</table>

**Macrocytic**
- Megaloblastic anemias
- Liver ds alcohol
- Hgbopathies
- Metabolic disorders
- Primary marrow disorders
- Increased destruction

**Normocytic**
- Anemia of chronic disease
- Early iron def.
- Hgbopathies
- Primary marrow disorders
- Combined def.
- Increased destruction

**Microcytic**
- Iron Deficiency
- Anemia of Chronic Disease
- Thalassemias
- Hgbopathies
- Sideroblastic Anemia

**Order:**
- B12 level
- Haptoglobin
- Urine hemosiderin
- Low /nml
- Hemoglobinuria

**Hemolytic Process**
- Acute Blood Loss

### Log

<table>
<thead>
<tr>
<th>Iron</th>
<th>TIBC</th>
<th>Ferritin</th>
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<tr>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Low /nml</td>
<td>Low /nml</td>
<td>High</td>
</tr>
<tr>
<td>Chronic Ds Inflammation</td>
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**Also helpful:**
- Serum bilirubin
- Serum LDH
- Hemoglobinuria

[Table of Content]
[Hematology]
### MACROCYTIC ANEMIA

<table>
<thead>
<tr>
<th>Macrocytic Anemia</th>
<th>Order B12 Level</th>
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<tr>
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<td>&gt; 100</td>
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<tr>
<td>MMA, Homocysteine (HC)</td>
<td>Order: MMA, MMA High</td>
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<tr>
<td></td>
<td>MMA level</td>
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<tr>
<td></td>
<td>Low</td>
</tr>
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</table>

- B12 Deficiency
- Folic Acid Deficiency

### HEMOLYSIS

**Findings Consistent with Hemolysis**

<p>| | |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Reticulocyte count</td>
<td>Increased</td>
</tr>
<tr>
<td>Cr51-RBC lifespan</td>
<td>Decreased</td>
</tr>
<tr>
<td>Urine urobilinogen</td>
<td>Increased</td>
</tr>
<tr>
<td>Urine hemosiderin</td>
<td>Present</td>
</tr>
<tr>
<td>Urine hemoglobin</td>
<td>Present</td>
</tr>
<tr>
<td>Serum haptoglobin</td>
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</tr>
<tr>
<td>Serum LDH (and LDH1:LDH2)</td>
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</tr>
<tr>
<td>Serum bilirubin</td>
<td>Increased</td>
</tr>
</tbody>
</table>
BLOOD TRANSFUSION

➢ Indications for Transfusion
❖ Actively bleeding patient
● Acute hemorrhage w/out immediate control
● Acute loss of at least 15% estimated blood volume w evidence of inadequate O2 delivery following volume resuscitation
❖ If hemodynamically unstable – stabilize or transfuse emergently
❖ Evaluate for underlying cause
❖ If hemodynamically stable, Then transfuse if indicated
❖ **Hgb <7 g/dL**: RBC transfusion indicated. If the patient is otherwise stable, the patient should **receive 1 unit of packed RBC** unless actively bleeding
❖ **Hgb < 8 Pre-existing CV disease but hemodynamically stable**
● Hgb ≤ 8 med/surg including post op period
● Hgb 7 to 10 g/dL: Correct strategy is unclear
● Hgb >10 g/dL: RBC transfusion not indicated

➢ Special situations
❖ Sickle cell anemia
● Do not transfuse unless symptomatic or **Hgb under 5.0**
❖ High risk patients:
● Patients >65
● Pts with cardiovascular disease
● Pts with respiratory disease

Consider IV iron if iron is low and anemia is between 7 to 10g/dl


PLATELET TRANSFUSION

Platelet transfusion Guidelines
➢ Platelet count < 10,000ul
➢ Platelet count < 20,000ul and risk factor for bleeding
➢ Platelet count < 50,000ul in a pt with active hemorrhage
➢ Platelet count < 50,000ul in pt undergoing invasive procedure
➢ Platelet count < 100,000ul in a pt bleeding into a closed anatomical space (CNS, eye, etc)
➢ Platelet dysfunction with active or anticipated hemorrhage

*Evidence-Based Platelet Transfusion Guidelines
ASH Education Book January 1, 2007 vol. 2007 no. 1 172-178*
Thrombocytopenia

- normal platelet count is between 150,000 and 450,000 platelets
- Thrombocytosis: platelet count over 450,000
- Thrombocytopenia: A platelet count below 150,000.
- Differential Diagnosis of thrombocytopenia

Differential Diagnosis of thrombocytopenia

Work up
- CBC with platelet and differential
- B12, Folate
- Peripheral smear
  - Decreased production vs increased destruction (large plts, shistocytes), r/o plt clumping
- CMP
- Bilirubin
- Haptoglobin
- LDH
- Coagulation testing (PT, aPTT, fibrinogen)
- ADAMTS13 activity

Presented by Sarah Campbell MD during Cool Case presentation Sept 2017
Estimate IV Iron requirement

- Calculate IBW
  - Male: IBW in kg = 50kg + 2.3kg/inch over 60 inches
  - Female: IBW in kg = 45.5kg + 2.3kg/inch over 60 inches
- Calculate iron dose

\[ MG \text{ of Iron} = 0.66 \times IBW \text{ in kgm} \times \frac{100 - (\text{Observed Hgb X 100})}{\text{Desired Hgb}} \]

Indications of Inpatient Iron infusion

- T Sat (Serum iron/total iron binding capacity) is less than 20%
- reticulocyte hemoglobin less than 30pg AND Ferritin less than 100 ng/mL

Iron Preparation

- Venofer (Iron sucrose)
  - Venofer 200 mg, Injection, IV, q24h, x 5 dose, Slow IV over 2-5 min.
  - Venofer 300 mg, Injection, IVPB, q 48hr, x 3 dose, Infuse over 90 min.
- Iron Dextran (Infed):
  - Requires a test dose
    - Test dose Iron Dextran: 25mg IV in 50mL NS over 15 minutes X 1, observe for adverse reactions for one hour
    - Subsequent treatments do not require a test dose if no previous reaction noted
  - Dosing / Suggested infusion time
    - 900 mg, IVPB, Once, mix in 100 mL NS and infuse over 2 hr (DEF)
    - 1,200 mg, IVPB, Once, mix in 100 mL NS and infuse over 3 hr
    - 1,500 mg, IVPB, Once, mix in 100 mL NS and infuse over 3 hr
  - Have the following medications available prior to infusing Iron Dextran:
    - Epinephrine 1:1000 (1mg/1mL) injectable
    - Diphenhydramine 50mg injectable
    - Hydrocortisone 100mg injectable
  - Vital signs: q 15 minutes X 1 h, then q 1 h during each infusion
- Ferric Gluconate (Ferrlecit):
  - Recommend no more than 125mg per day
  - Suggested infusion time is 1 hour
- Feraheme® dosage: 510 mg diluted in 50 mL NS by IV infusion over 15 min
➢ Total dose iron replacement is not an inpatient therapy - arrange for outpatient administration by consulting Care Management Maintenance

➢ **Indications for out-patient IV Iron**

<table>
<thead>
<tr>
<th>Indications &amp; Criteria</th>
<th>Venofer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate response to an adequate trial of oral iron</td>
<td>1 dose and reassess in 4 wks</td>
</tr>
<tr>
<td>Nephrology: inadequate response to an adequate trial of oral iron</td>
<td>300 mg IV weekly x 3 doses</td>
</tr>
<tr>
<td>Inability to absorb oral iron resulting in severe iron deficiency (ferritin &lt; 30) caused by GI disease (celiac) or surgery (gastrectomy) (maintain ferritin &gt; 50 with IV iron)</td>
<td>Typically 1 dose per month</td>
</tr>
<tr>
<td>Severe intolerance to oral iron (vomiting and/or diarrhea)</td>
<td>1 dose and reassess in 4 wks</td>
</tr>
<tr>
<td>Chronic GI bleeding with inadequate response to an adequate trial of oral iron* and GI interventions (as needed to maintain hemoglobin &gt; 110 g/L)</td>
<td>Typically 1 dose per month. Titrate to lowest possible frequency</td>
</tr>
<tr>
<td>Rapid correction of anemia in patients with severe symptomatic iron deficiency anemia (Hb &lt; 90 g/L) in whom avoidance of RBC transfusion is important</td>
<td>1 dose and reassess in 4 wks 1</td>
</tr>
<tr>
<td>Preoperative iron deficiency anemia before elective high blood loss surgery</td>
<td>Hb &lt;13.0 – 1 dose Hb &lt; 11.0 – 2 doses given 1-2 weeks apart</td>
</tr>
<tr>
<td>During chemotherapy or radiation therapy for cancer</td>
<td>Hb 9.0-10.9– 1 dose Hb &lt; 9.0 – 2 doses given 2-4 weeks apart</td>
</tr>
</tbody>
</table>

➢ **PO Iron**

❖ An adequate trial of oral iron therapy consists of the duration of 3 months and adequate dose
❖ **Ferrous Fumarate** 300 mg po BID;
❖ **Iron Polysaccharide** 150 mg, PO, q12h
❖ **Ferrous Sulfate** 325 mg, Tab, PO, with meals, 2-3 times daily;
   ❖ 325 mg = 65 mg elemental iron
❖ if not tolerated, consider **Proferrin** (heme iron polypeptide) 11 mg po BID
❖ **Vitamin C** to enhance iron absorption – 500 mg with each dose of iron
❖ Optimal time of administration: on an empty stomach (1 hr before breakfast and at bedtime)
All patients receiving blood products should have continuous cardiac monitoring and pulse oximetry

Stop transfusion as soon as a reaction is suspected

Examine the blood to determine if the patient was the intended recipient and then send the unit back to the blood bank

Furosemide may be administered to increase renal blood flow

Low-dose dopamine may be considered to improve renal blood flow

Make efforts to maintain urine output at 30-100 mL/h

Massive transfusion

To decrease the risk of hypothermia in patients receiving massive transfusion, administer the blood through a blood warmer

Do not place blood in a microwave oven to warm, as this causes hemolysis.

Treat symptomatic Hypocalcemia with calcium chloride or calcium gluconate

Common Adverse Reactions

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms</th>
<th>Possible Diagnosis</th>
<th>Work Up</th>
<th>Clinical Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever &gt;1 °C over baseline or &gt;38 Chills, rigors</td>
<td>Bacterial contamination</td>
<td>Blood and bag culture</td>
<td>Stop transfusion Supportive care Give IV antibiotics</td>
</tr>
<tr>
<td>Rash, hives, wheeze, dyspnea, hypotension</td>
<td>Allergy</td>
<td>None</td>
<td>Slow transfusion Give antihistamine</td>
</tr>
<tr>
<td></td>
<td>Anaphylaxis</td>
<td>Patient IgA level Anti-IgA antibodies</td>
<td>ABC resuscitation Give adrenaline and steroids IgA-deficient or washed components in future</td>
</tr>
</tbody>
</table>
### Common Adverse Reactions to Blood Products and Guide to Appropriate Clinical Action

<table>
<thead>
<tr>
<th>Condition</th>
<th>ABO Incompatibility</th>
<th>Check ABO Type DAT IAT</th>
<th>Stop Transfusion and Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chills, hypotension, back pain, Hemoglobinuria, Ooze from IV sites</td>
<td>Stop transfusion</td>
<td>Emergency (code or MET) call</td>
<td>Maintain BP and renal function</td>
</tr>
<tr>
<td>Hemolysis</td>
<td>EUC, Coag, Hb Hemolysis tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial contamination</td>
<td>Monitor oxygen saturation.</td>
<td></td>
<td>Give IV antibiotics if sepsis possible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Circulatory overload</th>
<th>Provide O2 to maintain O2 saturation &gt; 92%</th>
<th>Slow or stop transfusion</th>
<th>Give O2, diuretics, Position pt upright</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea, productive cough, Pink frothy sputum, Pulmonary edema, Hypotension with TRALI</td>
<td>TRALI* occurs within 6 hours of transfusion</td>
<td>Hypoxemia severe enough to require endotracheal intubation 70-75% of pts.</td>
<td>Stop transfusion</td>
<td>Provide supportive care, No Diuretics. Consider steroids</td>
</tr>
</tbody>
</table>

**Notes:** *TRALI = Transfusion-related acute lung injury*
HYPERCOAGULABLE STATES

➢ Increase risk of inherited hypercoagulable states
  • Mean age at first thrombosis 35–40 yr
  • Spontaneous, idiopathic thrombosis, especially in a younger person
  • Venous thromboembolism before 50 yr of age in a first-degree relative
  • Recurrent thrombosis suggests hypercoagulable state (inherited or acquired)

➢ Relative risk of venous thrombosis and frequency of hypercoagulable states
  ❖ High risk
    • Antithrombin deficiency (2%)
    • Protein C deficiency (3%–4%)
    • Protein S deficiency (2%–3%)
    • Antiphospholipid antibody syndrome (unknown)
    • Trousseau syndrome (NA)
  ❖ Modest risk
    • Factor V Leiden (20%–25%)
    • Prothrombin mutation G20210A (10%)
    • Hyperhomocysteinemia (10%)
    • Oral contraceptive use (NA)

➢ Best Tests
  • Factor V Leiden
  • Homocysteine
  • Antiphospholipid Antibody
  • Anticardiolipin Antibodies Igg And Igm
  • Prothrombin Mutation G20210a
  • Antithrombin
  • Protein C
  • Protein S
  • If inherited hypercoagulable state is strongly suspected:
    • Fibrinogen Level

Postpone measurement of antithrombin, protein C, and protein S until resolution of acute thrombotic episode (e.g., ≥ 4 wk after termination of oral anticoagulation therapy)
PULMONARY EMBOLISM (PE)

Is a common condition that at times can be missed due to its atypical presentation. The risk of DVT/PE increases exponentially with age, so it’s important to keep a high level of suspicion in elderly patients with atypical symptoms.

**Most Common Signs and symptoms**

<table>
<thead>
<tr>
<th>Signs</th>
<th>%</th>
<th>Symptoms</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea</td>
<td>73</td>
<td>Tachypnea (respiratory rate ≥20 breaths/min)</td>
<td>70</td>
</tr>
<tr>
<td>Pleuritic pain</td>
<td>66</td>
<td>Rales/crackles</td>
<td>51</td>
</tr>
<tr>
<td>Cough</td>
<td>37</td>
<td>Tachycardia (heart rate &gt;100 beats/min)</td>
<td>30</td>
</tr>
<tr>
<td>Leg swelling</td>
<td>28</td>
<td>Fourth heart sound</td>
<td>24</td>
</tr>
<tr>
<td>Leg pain</td>
<td>26</td>
<td>Increased pulmonary component 2nd Heart sound</td>
<td>23</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>13</td>
<td>DVT</td>
<td>11</td>
</tr>
<tr>
<td>Palpitations</td>
<td>10</td>
<td>Diaphoresis</td>
<td>11</td>
</tr>
<tr>
<td>Wheezing</td>
<td>9</td>
<td>Temperature &gt;38.5°C</td>
<td>7</td>
</tr>
<tr>
<td>Angina-like pain</td>
<td>4</td>
<td>Wheezes</td>
<td>5</td>
</tr>
</tbody>
</table>

*Adapted from Stein PD, Terrin ML, Hales CA, Palevsky HI, Saltzman HA, Thompson BT, Weg JG: Clinical, laboratory, roentgenographic, and electrocardiographic findings in patients with acute pulmonary embolism and no pre-existing cardiac or pulmonary disease. Chest. 1991, 100:598–603*

The PIOPED II study listed the following indicators for pulmonary embolism:

- Air travel of 4 hours or more in the past month
  - Air travel for > 4 hours doubles your risk for a venous thromboembolism
  - Incidence in healthy individuals of VTE due to air travel is 1:6000
- Surgery within the last 3 months
- Malignancy, especially lung cancer
- Current or past history of thrombophlebitis
- Trauma to the lower extremities and pelvis during the past 3 months
- Smoking
- Central venous instrumentation within the past 3 months
- Stroke, paresis, or paralysis
- Prior pulmonary embolism
- Heart failure
- Chronic obstructive pulmonary disease
In patients with suspected pulmonary embolism use **Wells Score** or **Geneva Score** to risk stratify.

### Well Score for PE

| Clinical signs and sx of DVT: (Leg swelling and pain w/ palpation) | 3 |
| PE likely or more likely than alternative dx on basis of Hx, PE, CXR, ECG, and blood tests | 3 |
| Pulse > 100 | 1.5 |
| Immobile >= 3 consecutive days or Surgery in previous 4 weeks: | 1.5 |
| Previous PE or DVT | 1.5 |
| Hemoptysis | 1 |
| Cancer (with Rx w/in past 6 mos or palliative RX) | 1 |

**Score:**
- < 2.0: low probability
- 3-6: moderate/intermediate probability
- > 6.0: high probability

*Wells PS et al, Ann Int Med 2001; 135: 98-10*

### Geneva Score

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt;65</td>
<td>1</td>
</tr>
<tr>
<td>Previous DVT or PE</td>
<td>3</td>
</tr>
<tr>
<td>Surgery or fracture within 1 month</td>
<td>2</td>
</tr>
<tr>
<td>Active malignancy</td>
<td>2</td>
</tr>
<tr>
<td>Unilateral lower limb pain</td>
<td>3</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>2</td>
</tr>
<tr>
<td>Pain on deep vein palpation of lower limb and unilateral edema</td>
<td>4</td>
</tr>
<tr>
<td>Heart rate 75 to 94 bpm</td>
<td>3</td>
</tr>
<tr>
<td>Heart rate greater than 94 bpm</td>
<td>5</td>
</tr>
</tbody>
</table>

**Pretest probability:**
- <4: Low
- 4-10: Intermediate
- >10: High
➢ To go to online calculator click on corresponding calculator (MDcalc)

Wells Score

Geneva Score

➢ Click below Diagnostic and therapeutic approach (ACP Sept 2015 Guidelines)

Low Risk for PE

Intermediate Risk for PE

High Risk for PE

❖ Low Risk for PE
  • Perform PERC Score if negative (score 0) less than 1% chance of PE work up completed

<table>
<thead>
<tr>
<th>PERC Score</th>
<th>Meets Criterion</th>
<th>Does Not Meet Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Characteristic</td>
<td>Age &lt; 50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Initial heart rate &lt; 100 beats/min</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Initial oxygen saturation &gt; 94% on room air</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No unilateral leg swelling</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No hemoptysis</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No surgery or trauma within 4 wk</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No history of venous thromboembolism</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No estrogen use</td>
<td>0</td>
</tr>
</tbody>
</table>

• Low risk with PERC Score of 1 or more order D. Dimer
  • If D. Dimer negative work up completed no PE
  • If D. Dimer positive order Pulmonary CTA or V/Q scan
**Moderate / intermediate risk for PE**
- Check a D.Dimer
  - If positive order Pulmonary CTA or V/Q scan.
  - If negative workup completed no PE

**High probability for PE**
- With low perceived bleeding risk, start anticoagulation, order pulmonary CTA or V/Q scan.
  - With high perceived bleeding risk, order pulmonary CTA or V/Q scan.
    - High probability and negative CTA order lower extremity US for DVT.
    - High probability and negative V/Q scan order pulmonary CTA
- Pulmonary Angiography remains the Gold standard for diagnosing acute PE

**Treatment**

**Hemodynamically Stable Patients**
- Patients w/ high clinical suspicion for acute PE, begin treatment w/ anticoagulants while waiting for test results (**Grade 2C**)
- Patients being considered for thrombolytics. Use heparin in these patients

**Hemodynamically Unstable Patients**
- Thrombolytic therapy is recommended, unless there are major contraindications due to bleeding risk (**Grade 1B**).
- In selected high-risk patients without hypotension, and with a low risk of bleeding, administration of thrombolytic therapy is suggested (**Grade 2B**).

- **Submassive PE** New study shows **low dose TPA to be safe and effective**
PE Treatment at Home (Patients must have all the below)

- Patients with low-risk PE* Use PESI for risk stratification
- Good support at home
- Good follow up
- Write scripts for anticoagulation medication so the case management can verify if treatment is covered by patients insurance

*Risk Stratification: The Pulmonary Embolism Severity Index (PESI) is a validated tool for identifying pts with low-risk PE.

Calculate PESI click here

NEUTROPHIL-to-LYMPHOCYTE RATIO (NLR) and PLATELET-to-LYMPHOCYTE RATIO (PLR)

- A new, simple, inexpensive DVT diagnostic aid
- Neutrophil-to-Lymphocyte ratio (NLR) and the Platelet-to-Lymphocyte ratio (PLR) as a dx aid for DVT
  - A positive NLR = a ratio of 3.4 or higher
  - A positive PLR = a ratio of 230 or more

**DVT diagnosis showdown: CBC vs. D-dimer**

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive predictive value</th>
<th>Negative predictive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLR</td>
<td>90.2%</td>
<td>80.4%</td>
<td>82.1%</td>
<td>89.1%</td>
</tr>
<tr>
<td>PLR</td>
<td>62.7%</td>
<td>89%</td>
<td>97%</td>
<td>72.5%</td>
</tr>
<tr>
<td>Double-ratio positive</td>
<td>88.6%</td>
<td>100%</td>
<td>100%</td>
<td>90.9%</td>
</tr>
<tr>
<td>D-dimer</td>
<td>88.2%</td>
<td>35.3%</td>
<td>57.7%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Notes: Based on data from a single-center retrospective study involving 102 patients. Positive NLR = 3.4 or higher, positive PLR = 230 or more, positive D-dimer = 500 ng/mL or greater.
Source: Dr. Mouabbi

Jason Mouabbi, MD. ACP meeting in New Orleans, August 20, 2018
DEEP VENUS THROMBOSIS (DVT) PROPHYLAXIS

❖ Chest guidelines recommend using a risk score to determine VTE risk in all patients admitted
❖ I recommend using Padua risk score to calculate risk

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior episode of VTE</td>
<td>3</td>
</tr>
<tr>
<td>Thrombophilia</td>
<td>3</td>
</tr>
<tr>
<td>Decreased mobility</td>
<td>3</td>
</tr>
<tr>
<td>Active malignancy</td>
<td>3</td>
</tr>
<tr>
<td>Previous trauma or surgery within that last month</td>
<td>2</td>
</tr>
<tr>
<td>Age ≥70 years infarction</td>
<td>1</td>
</tr>
<tr>
<td>Heart and/or respiratory failure</td>
<td>1</td>
</tr>
<tr>
<td>Ischemic stroke or acute myocardial</td>
<td>1</td>
</tr>
<tr>
<td>Acute rheumatologic disorder and/or acute infection</td>
<td>1</td>
</tr>
<tr>
<td>Obesity</td>
<td>1</td>
</tr>
<tr>
<td>Hormonal therapy</td>
<td>1</td>
</tr>
</tbody>
</table>

Interpretation
• Score < 4: Low risk for VTE
• Score ≥ 4: High risk for VTE

❖ For Padua online calculator click here
❖ Recommendations
  • Acutely ill hospitalized medical patients at low risk of thrombosis: No VTE prophylaxis
  • Acutely ill hospitalized medical patients at increased risk of thrombosis: Pharmacological VTE prophylaxis
  • Acutely ill hospitalized medical patients at increased risk of thrombosis who are bleeding or at high risk major bleeding: Suggest intermittent pneumatic compression
When bleeding risk decreases, and if VTE risk persists, suggest that pharmacologic prophylaxis be substituted for mechanical thromboprophylaxis

VTE lecture at CFM on Oct 2017 by Dr Dumois
## DEEP VENUS THROMBOSIS (DVT) OF THE LEG

### Diagnostic Approach

➢ **ACCP Recommends Risk-Stratify Patients for Likelihood of DVT using Wells Criteria (Grade 2B)**

 For Online calculator click here

#### Well's criteria for DVT

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis or recent plaster immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden &gt; 3 days or major surgery w/in 4 weeks</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Entire leg swollen</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling 3 cm &gt; than other leg (measured 10cm below tibial tuberosity)</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema &gt; than other leg</td>
<td>1</td>
</tr>
<tr>
<td>Collateral superficial veins (non-varicose)</td>
<td>1</td>
</tr>
<tr>
<td>Alternative Dx as likely or greater than that of DVT</td>
<td>-2</td>
</tr>
</tbody>
</table>

**Score:**

- 0 pts ---> low probability
- 1 pt ---> moderate probability
- >2 pts ---> high probability

*Wells PS et al, Ann Int Med 2001; 135: 98-10*

➢ **Low pretest probability for a first DVT of the leg**, order d-dimer

- If D-dimer is negative no further testing is recommended (Grade 1B)
- If D-dimer is positive recommendations are to check compression ultrasound of the proximal leg veins, rather than whole-leg ultrasound (Grade 2C)
  - If negative no further testing
  - If compression ultrasound of the proximal leg veins is positive for DVT, treat for DVT without further testing (Grade 2C)
➢ **Moderate pretest probability for a first DVT of the leg** ACCP suggests using **highly-sensitive D-dimer** over ultrasound as the initial test, unless the patient has a comorbid condition that would likely elevate the D-dimer level*
  - If a highly sensitive D-dimer is NEGATIVE, no further testing (Grade 1B)
  - If D-dimer is POSITIVE order ultrasound of the whole-leg. (Grade 1B)
  - If whole-leg ultrasound is NEGATIVE no further testing Grade 1B
  - If whole-leg ultrasound is POSITIVE. Treat for DVT

➢ **HIGH pretest probability for a first DVT of the leg** order either
  - Whole-leg ultrasound
    - Negative whole-leg US for DVT, no further testing (Grade 2B)
    - If whole-leg ultrasound is POSITIVE. Treat for DVT  OR
  - Compression ultrasound of the proximal leg veins
    - If negative repeat ultrasound in one week (either compression ultrasound of the proximal leg veins, or whole-leg ultrasound).
      - If repeat is negative, no further testing
    - If ultrasound is positive at any time, treat for DVT

<table>
<thead>
<tr>
<th><em>Causes of elevated d-dimer</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>PE/DVT</td>
</tr>
<tr>
<td>Sepsis/infection</td>
</tr>
<tr>
<td>Malignancy</td>
</tr>
<tr>
<td>Renal disease</td>
</tr>
<tr>
<td>Pregnancy</td>
</tr>
</tbody>
</table>

**Treatment**

- **WARFARIN therapy**
- **NOACs/DOACs**

➢ Compression stockings may help prevent post-thrombotic syndrome (2016 guidelines showed no benefit)

DEEP VENOUS THROMBOSIS (DVT) OF THE ARM

Acute deep venous thrombosis of the upper extremity involve the **brachial**, **axillary**, or **subclavian** veins, and can extend more proximally to the brachiocephalic vein, internal jugular, or superior vena cava.

- Up to 5% of patients with arm DVT will experience a pulmonary embolism (PE)
- Up to 20% will experience post-thrombotic syndrome in the arm
- Up to 8% will experience recurrence of their arm DVT if untreated

**Risk Factors**

- Effort thrombosis (the so-called Paget-Schroetter Syndrome) spontaneous DVT usually in their dominant arm, after strenuous activity such as rowing, wrestling, weight lifting, or baseball pitching
- Thoracic outlet obstruction refers to compression of the neurovascular bundle (brachial plexus, subclavian artery, and subclavian vein)
- Ideopathic
- Cancer (most commonly lung cancer or lymphomas) 1/4 of pt’s w/idiopathic DVT Dx w/ CA
- Central Venous Catheters
- Pacemakers

**Signs and symptoms**

<table>
<thead>
<tr>
<th>Axillary or subclavian vein thrombosis</th>
<th>Symptoms</th>
<th>Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vague shoulder or neck discomfort</td>
<td>Supraclavicular fullness</td>
<td></td>
</tr>
<tr>
<td>Arm or hand edema</td>
<td>Palpable cord</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arm or hand edema</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extremity cyanosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dilated cutaneous veins</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jugular venous distension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unable to access central venous catheter</td>
<td></td>
</tr>
<tr>
<td>Thoracic outlet syndrome</td>
<td>Pain radiating to arm/forearm</td>
<td>Brachial plexus tenderness</td>
</tr>
<tr>
<td></td>
<td>Arm or hand atrophy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive Adson* or Wright† maneuver</td>
<td></td>
</tr>
</tbody>
</table>

Table of Content

Hematology
Diagnosis
- **Duplex ultrasound** is the initial imaging test of choice has high sensitivity and specificity for peripheral (jugular, distal subclavian, axillary)
- **Contrast Venography** may be required to confirm the diagnosis if suspicion for clot remains high despite a negative ultrasound
- **Magnetic Resonance Angiography** is an accurate, noninvasive method for detecting thrombus in the central thoracic veins, such as the SVC and brachiocephalic veins

Treatment
- **Treat as you would treat a lower extremity DVT**
- Treat Most Upper Extremity DVTs for 3 Months
- INR goal 2-3
- If a central venous catheter is responsible for an acute DVT and the central line is not needed or is not working, it should be removed.
- If a central venous catheter is responsible for an acute DVT and there is a good reason to keep a working central line in, systemic anticoagulation and continuing to use the central line is appropriate (Grade 2C)
- Thrombolysis should only be considered in selected patients with:
  - severe symptoms,
  - large thrombus burden involving the subclavian and axillary veins
  - life expectancy > 1 year,
  - good functional status and
  - low bleeding risk.
- If thrombolysis is elected, anticoagulate afterward as long as you would have without thrombolysis (Grade 1B)

Management of Isolated Brachial Vein DVT
- Authors advise full anticoagulation for DVT isolated to the brachial vein if it is causing symptoms, associated with cancer or a central line that will remain
- Asymptomatic brachial DVT not meeting these criteria, they endorse serial examination, ultrasound surveillance for extension to the axillary vein (while withholding anticoagulation), or therapeutic doses of anticoagulation for less than 3 months, or prophylactic-only doses of anticoagulation

SUPERFICIAL VENOUS THROMBOSIS (SVT)

❖ Anticoagulate patients with SVT with increase risk for DVT
  ❖ extensive thrombosis ≥5 cm
  ❖ proximity of thrombus to the deep venous system (≤5 cm from the saphenofemoral or saphenopopliteal junction)
  ❖ medical risk factors for DVT (eg, prior DVT, thrombophilia, malignancy, estrogen therapy).

❖ Anticoagulation for 45 days (Grade 2B).
❖ Fondaparinux, low-molecular-weight heparin, unfractionated heparin, direct oral anticoagulants, and vitamin K antagonists appear to be equally effective.
❖ Treatment of SVT not meeting above criteria for anticoagulation, supportive care alone (ie, nonsteroidal anti-inflammatory drugs and compression stockings)
❖ Treatment algorithm

UpToDate 7/2017
HEPARIN LOW DOSE WEIGHT-BASED POWERPLAN & WORKSHEET

959-1317 Heparin Low Dose Weight-Based PowerPlan & Worksheet

VITAL SIGNS: Weight in kg required for order to be processed: All Weights Rounded to the Nearest 10 kg

PATIENT CARE:
- Neuro check when infusion begins, repeat in 2 hrs x 1, and then every 4 hrs while on heparin
- Nursing to Order: Obtain APTT 6 hrs after rate change
- Nursing to Order: Once APTT is 62 to 79 seconds for 2 consecutive times, change APTT to daily
- Discontinue APTT and Hemogram with platelets once heparin drip is discontinued

MEDICATIONS:

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<tr>
<th>BOLUS DOSE</th>
<th>Heparin Bolus x 1 (60 units/kg)</th>
<th><strong>Round WEIGHT To Nearest 10 kg</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIATION ONLY</td>
<td>Only Use Heparin 1,000 u/mL vial <strong>DO NOT Bolus from Heparin Bag</strong></td>
<td>WEIGHT → BOLUS</td>
</tr>
<tr>
<td></td>
<td>Maximum = 5,000 units</td>
<td>40 kg → 2,400 u</td>
</tr>
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<td>50 kg → 3,000 u</td>
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</tr>
<tr>
<td></td>
<td>or ≥</td>
<td>90 kg → 5,000 u</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INITIAL INFUSION ONLY</th>
<th>Heparin Infusion (12 units/kg per hour)</th>
<th><strong>Round DOSE to Nearest 100 units</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only Use</td>
<td>WEIGHT → INITIAL INFUSION</td>
</tr>
<tr>
<td></td>
<td>Heparin 25,000 units/250 mL 0.45% NaCl</td>
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</tr>
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<td>or ≥</td>
<td>80 kg → 1,000 units/hr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAINTENANCE INFUSION</th>
<th>Adjust Heparin Infusion Rate per APTT Values</th>
</tr>
</thead>
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<tr>
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<td><strong>62 – 79 sec Continue current rate</strong></td>
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<td>80 – 88 sec Decrease rate by 100 units/hr</td>
</tr>
<tr>
<td></td>
<td>89 – 97 sec Hold heparin for 30 min and decrease rate by 200 units/hr</td>
</tr>
<tr>
<td></td>
<td>98 sec or greater Hold heparin for 60 min and decrease rate by 300 units/hr</td>
</tr>
</tbody>
</table>

Adapted from Florida Hospital PowerPlans
VKA (vitamin K antagonist) ANTICOAGULATION THERAPY

➢ For DVT / PE

❖ Patients w/ high clinical suspicion for acute PE, begin treatment w/ anticoagulants while waiting for test results (Grade 2C)

❖ Low molecular weight heparin (enoxaparin 1mg/kg BID or 1.5mg/kg q day) or

❖ Unfractionated heparin bolus and IV drip weight-based. See sample Heparin protocol order or

❖ Fondaparinux (<50 kg: 5mg; 50-100 kg: 7.5mg; .100 kg: 10 mg) SC, q d

❖ Begin warfarin the same day as anticoagulation is started; (Grade 1B)

❖ Continue parenteral anticoagulation for at least 5 days, even if the INR reaches 2.0 earlier (Grade 1B)

❖ Continue parenteral anticoagulation until the INR is at least 2.0 for 24 hours or more (Grade 1B)

❖ INR goal 2-3

➢ For A.fib

❖ INR goal 2-3

WARFARIN THERAPY

➢ Mechanism of Action

• Inhibits reduction of vitamin K epoxide, thereby limiting activation of vitamin K dependent clotting factors: II (prothrombin), VII, IX, X.

• Antithrombotic effect primarily due to reduction in prothrombin.

❖ NOTE: Anticoagulation may be seen within 24 hours due to inhibition of Factor VII, but peak anticoagulant activity is delayed for 72-96 hours due to Factor II inhibition (2-3 days after 1st therapeutic INR)

Initiation of Warfarin

Loading dose 5mg vs 10 mg: No difference in Bleeding, 10 mg quicker to goal

• Note: 10 mg loading not recommended by Bob Vandervoort pharmD


➢ Contraindications to anticoagulation therapy  Click here
## INITIATION OF WARFARIN w/ 5 mg

<table>
<thead>
<tr>
<th>Day</th>
<th>INR</th>
<th>Dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>—</td>
<td>5.0</td>
</tr>
<tr>
<td>2</td>
<td>—</td>
<td>5.0</td>
</tr>
<tr>
<td>3</td>
<td>&lt; 1.5</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>1.5 to 1.9</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>2.0 to 3.0</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>&gt; 3.0</td>
<td>0.0</td>
</tr>
<tr>
<td>4</td>
<td>&lt; 1.5</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>1.5 to 1.9</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>2.0 to 3.0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>&gt; 3.0</td>
<td>0.0</td>
</tr>
<tr>
<td>5</td>
<td>&lt; 2.0</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>2.0 to 3.0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>&gt; 3.0</td>
<td>0.0</td>
</tr>
<tr>
<td>6</td>
<td>&lt; 1.5</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>1.5 to 1.9</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>2.0 to 3.0</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>&gt; 3.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

❖ **If loading with 5 mg, for maintenance dose check INR on Day 5**

<table>
<thead>
<tr>
<th>Day 5</th>
<th>INR</th>
<th>Dose Mg per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>1.8</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>2.2</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>2.4</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>2.8</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>3.0</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>3.2</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>3.4</td>
<td>13</td>
</tr>
</tbody>
</table>

Algorithm for the initiation of 10-mg warfarin therapy. Tested in outpatients with venous thromboembolism who were also receiving low-molecular-weight heparin. Patients are given 10 mg of warfarin on days 1 and 2. (INR = International Normalized Ratio)

**GUIDELINES FOR MAINTENANCE DOSE ADJUSTMENT AND MONITORING**

- **Guidelines to maintain a therapeutic INR range of 2.0-3.0**

<table>
<thead>
<tr>
<th>INR &lt; 2.0</th>
<th>INR 2-3</th>
<th>INR 3.1-3.7</th>
<th>INR 3.8-4.4</th>
<th>INR 4.5-5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase weekly dose by 10%-20%</td>
<td>Continue the same dose</td>
<td>Decrease weekly dose by 10% to 20%</td>
<td>Hold dose for 1-2 d Then recheck INR before decreasing weekly dose by 15%-20%</td>
<td>Hold two doses Then recheck INR before decreasing weekly dose by 20%</td>
</tr>
<tr>
<td>Monitor INR within 2 weeks</td>
<td>Follow-up appointment w/in 2-4 wks</td>
<td>Monitor INR w/in 2 wks of changed dose</td>
<td>Monitor INR w/in 1 wk of changed dose</td>
<td>Monitor INR w/in 1 wk of changed dose</td>
</tr>
</tbody>
</table>

- **Guidelines to Maintain a Therapeutic INR Range of 2.5-3.5**

<table>
<thead>
<tr>
<th>INR &lt; 2.5</th>
<th>INR 2.5-3.5</th>
<th>INR 3.6-4.0</th>
<th>INR 4.1-4.5</th>
<th>INR 4.6-5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase weekly dose by 10%-20%</td>
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</tr>
</tbody>
</table>
### WARFARIN TOXICITY

<table>
<thead>
<tr>
<th>INR</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>INR &lt;5</td>
<td>• Lower coumadin dose &lt;br&gt; • or omit a dose &amp; resume coumadin at lower dose by 10% when INR therapeutic</td>
</tr>
<tr>
<td>INR 5-9</td>
<td>• skip 1-2 doses coumadin and lower dose by 10% &lt;br&gt; • or omit one dose and give 1-2mg vit K po (preferred in pts at risk for bleeding)</td>
</tr>
<tr>
<td>INR &gt;9</td>
<td>• Hold coumadin &lt;br&gt; • Give 5-10 mg vit k po &lt;br&gt; • Monitor inr &lt;br&gt; • Resume coumadin when inr therapeutic lower dose by 20%</td>
</tr>
<tr>
<td>Any bleeding</td>
<td>• FFP &lt;br&gt; • 10 mg vit K PO</td>
</tr>
</tbody>
</table>

_Chest 04;126:204S_  
_Provided by Eddie Needham, Program Director Family Medicine Residency_

### RESTARTING ANTICOAGULATION AFTER MAJOR GI BLEED IN AFIB

- Restarting warfarin after **7 days** was not associated with increased risk of GIB but was associated with decreased risk of mortality and thromboembolism compared with resuming after 30 days of interruption.
- A retrospective cohort study that enrolled subjects who developed GIB while on anticoagulation from 2005 to 2010.
- Overall, 1,329 patients developed major GIB. Warfarin was restarted in 653 cases
- Atrial fibrillation was defined by history and electrocardiography on presentation.
- GIB was defined as a decrease in hemoglobin by 2 g, visible bleeding, or positive endoscopic evaluation.
- Restarting warfarin was associated with decreased thromboembolism (hazard ratio [HR] 1.18, 95% confidence interval [CI] 0.75 to 1.84, p = 0.47) [corrected] and reduced mortality (HR 0.67, 95% CI 0.56 to 0.81, p <0.0001) but not recurrent GIB (HR 1.18, 95% CI 0.94 to 1.10, p = 0.47).
Low-molecular-weight heparin (LMWH) is the guideline-recommended anticoagulation strategy for patients with cancer and venous thromboembolism (VTE).

Warfarin is not as effective in this population.

A prospective data from a single-center registry support the use of rivaroxaban in cancer patients who have associated VTE and want to avoid subcutaneous inj.

Patients with cancer and VTE who wish to avoid subcutaneous LMWH injections should be informed, before choosing rivaroxaban, that it is not yet approved for this indication but that some data support its use.

Mayo Clinic researchers prospectively followed 296 consecutive patients who received the direct oral anticoagulant rivaroxaban for VTE (deep venous thrombosis or pulmonary embolism): 118 (40%) with active cancer and 178 controls without cancer. The three most common cancer locations were genitourinary (24%), gastrointestinal (20%), and lung (13%). During a mean follow-up of 1.4 years, VTE recurred in 3.3% of cancer patients and 2.8% of controls (a nonsignificant difference). A higher rate of major bleeding in cancer than noncancer patients approached but did not reach statistical significance.
**HEPARIN LOW DOSE WEIGHT-BASED POWERPLAN & WORKSHEET**

959-1317  Heparin Low Dose Weight-Based PowerPlan & Worksheet

**VITAL SIGNS:** Weight in kg required for order to be processed: All Weights Rounded to the Nearest 10 kg

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<th><strong>Round WEIGHT To Nearest 10 kg</strong></th>
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**MAINTENANCE INFUSION**

Adjust Heparin Infusion Rate per APTT Values

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<tr>
<td>98 sec or greater Hold heparin for 60 min and decrease rate by 300 units/hr</td>
</tr>
</tbody>
</table>

Adapted from Florida Hospital PowerPlans
HEPARIN INDUCED THROMBOCYTOPENIA (HIT)

➢ HIT should be suspected if blood tests show a falling platelet count in a pt receiving heparin, or who recently received heparin even if the heparin has been discontinued.

➢ The "4 Ts" score is commonly used to calculate the pre-test probability of HIT

<table>
<thead>
<tr>
<th>The 4T score for heparin-induced thrombocytopenia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thrombocytopenia</strong></td>
</tr>
<tr>
<td>•  <strong>2 points</strong>: if the fall in plt ct is &gt;50% of the previous value, or the lowest ct is 20–100 × 10^9/liter</td>
</tr>
<tr>
<td>•  <strong>1 point</strong>: if the fall is 30–50% or lowest ct is 10–19 × 10^9/liter</td>
</tr>
<tr>
<td>•  <strong>0 points</strong>: if the fall is less than 30% or lowest ct is &lt;10 × 10^9/liter</td>
</tr>
</tbody>
</table>

| **Timing**                                      |
| •  **2 points** if the fall is b/n days 5–10 |
| •  **1 point** if the fall is after day 10. |
| •  **2 points** If pt has been on heparin w/in the last 30 d & has a drop in platelet count within a day of re-exposure |
| •  **1 point** If the previous exposure was 30–100 d ago |
| •  **0 points** If the fall is early <5, but there has been no previous heparin exposure |

| **Thrombosis**                                  |
| •  **2 points** in new thrombosis, skin necrosis |
| •  **1 point** if progressive or recurrent thrombosis, silent thrombosis or red skin lesions |
| •  **0 points** if no symptoms |

| **AltErnative cause possible**                  |
| •  **2 points** if no other cause |
| •  **1 point** if there is a possible alternative cause |
| •  **0 points** if there is a definite alternative cause |


<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
</tr>
<tr>
<td>HIT is unlikely</td>
</tr>
<tr>
<td>4-5</td>
</tr>
<tr>
<td>intermediate probability</td>
</tr>
<tr>
<td>6-8</td>
</tr>
<tr>
<td>highly likely</td>
</tr>
</tbody>
</table>

❖ A low score has a negative predictive value of 0.998
**Diagnosis**

- **Low probability for HIT**
  - Do not obtain Hep-PF4 Antibody ELISA
  - Consider alternative causes of Thrombocytopenia

- **Moderate probability for HIT**
  - Obtain Hep-PF4 Antibody ELISA
    - Treat if Hep-PF4 Antibody ELISA positive and Platelet SRA positive
    - Consider other causes of Thrombocytopenia if test negative

- **High probability for HIT**
  - Obtain Hep-PF4 Antibody ELISA and Platelet SRA
    - Treat if Hep-PF4 Antibody ELISA positive and Platelet SRA positive
    - Consider other causes of Thrombocytopenia if testing negative

**Treatment**

- Stop all heparin forms
- Screen for **Deep Vein Thrombosis** with all four limbs
- Consult hematology
- Start non-Heparin anticoagulant (consult with hematology regarding agent)
  - Lepirudin; FDA-approved for HIT
  - Argatroban; FDA-approved for HIT, also for PCI
  - Bivalirudin PCI (including HIT patients)
  - Fondaparinux
- Do not transfuse platelets unless bleeding (bleeding is rare in HIT)
- Do not use Warfarin alone (prothrombotic)
- Only start Warfarin after Platelet Count has recovered to >100,000 and preferably 150,000
- When Warfarin started, do not exceed 5 mg daily dose initially
- Overlap non-Heparin anticoagulant and Coumadin concurrent use
  - Use together for at least 5 days and
  - Platelet Count should be constant and stable and
  - INR therapeutic for at least 2 days
- Duration of Warfarin therapy
  - Thrombosis present: Set duration based on site and Thrombophilia risks
  - Thrombosis absent: Variable recommendations (1-6 months)
## DOSAGE / INDICATION: DOACs

<table>
<thead>
<tr>
<th></th>
<th>Eliquis (apixaban)</th>
<th>Pradaxa (dabigatran)</th>
<th>Xarelto (rivaroxaban)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrial Fibrillation</strong></td>
<td>5 mg twice daily.</td>
<td>For patients with CrCl &gt;30 mL/min: 150 mg orally, twice daily</td>
<td>20 mg once daily.</td>
</tr>
<tr>
<td></td>
<td>2.5 mg twice daily if at least 2 of the 3 following factors: a) ≥80 years; b) ≤60 kg; c) serum cr ≥1.33</td>
<td>For patients with CrCl 15-30 mL/min: 75 mg orally, twice daily</td>
<td></td>
</tr>
<tr>
<td><strong>DVT / PE</strong></td>
<td>10 mg (2, 5mg tabs) twice daily for 7 days then 5mg twice daily</td>
<td>150 mg orally, twice daily after 5-10 days of parenteral anticoagulation</td>
<td>15 mg twice daily for 21 days then 20 mg once daily</td>
</tr>
<tr>
<td><strong>VTE prophylaxis following knee/hip replacement</strong></td>
<td>2.5 mg twice daily</td>
<td>10 mg once daily</td>
<td>10 mg once daily</td>
</tr>
<tr>
<td></td>
<td>Knee: 12 days Hip: 35 days</td>
<td>Knee: 12 days Hip: 35 days</td>
<td>Knee: 12 days Hip: 35 days</td>
</tr>
<tr>
<td></td>
<td>Start: 12 – 24 hrs post surgery</td>
<td>Start: 6-10 hrs post surgery</td>
<td>Start: 6-10 hrs post surgery</td>
</tr>
</tbody>
</table>

➢ Switching between anticoagulants

*Click on tool box*
## COMPARISON: ANTICOAGULANTS

<table>
<thead>
<tr>
<th>Mechanism of action</th>
<th>Coumadin (warfarin)</th>
<th>Eliquis (apixaban)</th>
<th>Pradaxa (dabigatran)</th>
<th>Xarelto (rivaroxaban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>inhibits synthesis of Clotting Factors II, VII, IX, X and Proteins C and S</td>
<td>Direct factor Xa inhibitor</td>
<td>Direct thrombin inhibitor</td>
<td>Direct factor Xa inhibitor</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>Food interaction</td>
<td>With or without food</td>
<td>With or without food</td>
<td>With food</td>
</tr>
<tr>
<td>Tmax</td>
<td>72–120</td>
<td>3 hours</td>
<td>2-3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Half-life</td>
<td>20–60</td>
<td>9-14 hours</td>
<td>12-17 hours</td>
<td>7-11 hours</td>
</tr>
<tr>
<td>Clearance</td>
<td>100% metabolized liver, Metabolites excreted in urine 92%</td>
<td>25% renal, 56% feces</td>
<td>80% renal</td>
<td>66% renal, 33% feces</td>
</tr>
<tr>
<td>Monitoring required</td>
<td>Yes, INR</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Warnings</td>
<td><strong>Spinal anesthesia or puncture, liver ds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reversal Agent</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Drug Interactions</td>
<td>*Anticoagulants *Platelet Inhibitors *NSAIDs *SSRIs/SNRIs *Antifungals (Ketoconazole, etc) Antiretrovirals *Diltiazem/Verapamil *Amiodarone *Bactrim Fluoroquinolones</td>
<td>*Anticoagulants *Platelet Inhibitors *NSAIDs *Dipyridamole *Ritonavir *Antifungal Agents (Ketoconazole, Posaconazole, etc)</td>
<td>*Anticoagulants *Platelet Inhibitors *Rifampin *Dronedarone/Amiodarone *Diltiazem/Verapamil *Quinidine *Clarithromycin</td>
<td>*Anticoagulants *Platelet Inhibitors *Macrolide Antibiotics *Prostacyclin Analogues *NSAIDs *Diltiazem/Verapamil *Rifampin/Phenytoin *Amiodarone/Dronedarone *Ranolazine/Quinidine</td>
</tr>
</tbody>
</table>

---

| Table of Content | Cardio-Vascular Disorders | Hematology |
## Switching Anticoagulants

<table>
<thead>
<tr>
<th>From parenteral anticoagulant to anticoagulant</th>
<th>Dabigatran</th>
<th>Rivaroxaban</th>
<th>Apixaban</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MPM:</strong> Start dabigatran 0-2 hours before the next dose of parenteral anticoagulant would have been due or at the time of discontinuation of intravenous heparin.</td>
<td><strong>MPM:</strong> If full anticoagulation dose: Start rivaroxaban 0-2 hours before the next dose of parenteral anticoagulant If prophylactic dose: Start rivaroxaban 6 hours or more after the last prophylactic dose.</td>
<td><strong>MPM:</strong> Start apixaban when the next dose of parenteral anticoagulant would have been due.</td>
<td></td>
</tr>
<tr>
<td>From anticoagulant to parenteral anticoagulant:</td>
<td><strong>MPM:</strong> If dabigatran is used for VTE prophylaxis after orthopedic surgery, start parenteral anticoagulant 24 hours after the last dose of dabigatran. If dabigatran is used for AFib, start parenteral anticoagulant 12 hours after the last dose of dabigatran.</td>
<td><strong>MPM:</strong> Stop rivaroxaban and give first dose of parenteral anticoagulant when the next dose of rivaroxaban would have been due.</td>
<td><strong>MPM:</strong> Start parenteral anticoagulant when the next dose of apixaban would have been due.</td>
</tr>
<tr>
<td>From warfarin to anticoagulant</td>
<td><strong>MPM:</strong> Start dabigatran after warfarin has been stopped and INR &lt;2.0. <strong>LIT:</strong> Start dabigatran after warfarin has been stopped and INR &lt;2.3.</td>
<td><strong>MPM:</strong> Start rivaroxaban after warfarin has been stopped and INR ≤2.5. <strong>LIT:</strong> Start rivaroxaban after warfarin has been stopped and INR &lt;2.3.</td>
<td><strong>MPM:</strong> Start apixaban after warfarin has been stopped and INR &lt;2.0.</td>
</tr>
<tr>
<td>From anticoagulant to warfarin:</td>
<td><strong>MPM:</strong> a) CrCl &gt;50 mL/min: Start warfarin 3 days before discontinuing dabigatran b) CrCl 31-50 mL/min: Start warfarin 2 days before discontinuing dabigatran <strong>Note:</strong> INR will not reflect warfarin activity until at least 2 days after discontinuation of dabigatran. <strong>LIT:</strong> same as a) and b) above, plus: c) CrCl 15-30 mL/min: Start warfarin 1 day before discontinuing dabigatran</td>
<td><strong>MPM:</strong> Start warfarin and discontinue rivaroxaban when INR ≥2.0. <strong>Note:</strong> Do not request an INR in the first 2 days following warfarin initiation. Blood for INR testing should be drawn just before dose of rivaroxaban to get an accurate result. <strong>LIT:</strong> a) CrCl &gt;50 mL/min: Start warfarin 4 days before discontinuing rivaroxaban b) CrCl 31-50 mL/min: Start warfarin 3 days before discontinuing rivaroxaban c) CrCl 15-30 mL/min: Start warfarin 2 days before discontinuing rivaroxaban</td>
<td><strong>MPM:</strong> Start warfarin and discontinue apixaban when INR ≥2.0. <strong>Note:</strong> Do not request an INR in the first 2 days following warfarin initiation. Blood for INR testing should be drawn just before dose of apixaban to get an accurate result.</td>
</tr>
</tbody>
</table>
### COMMON SITES OF METASTASIS

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Main Sites of Metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladder</td>
<td>Bone, liver, lung</td>
</tr>
<tr>
<td>Breast</td>
<td>Bone, brain, liver, lung</td>
</tr>
<tr>
<td>Colon</td>
<td>Liver, lung, peritoneum</td>
</tr>
<tr>
<td>Kidney</td>
<td>Adrenal gland, bone, brain, liver, lung</td>
</tr>
<tr>
<td>Lung</td>
<td>Adrenal gland, bone, brain, liver, other lung</td>
</tr>
<tr>
<td>Melanoma</td>
<td>Bone, brain, liver, lung, skin, muscle</td>
</tr>
<tr>
<td>Ovary</td>
<td>Liver, lung, peritoneum</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Liver, lung, peritoneum</td>
</tr>
<tr>
<td>Prostate</td>
<td>Adrenal gland, bone, liver, lung</td>
</tr>
<tr>
<td>Rectal</td>
<td>Liver, lung, peritoneum</td>
</tr>
<tr>
<td>Stomach</td>
<td>Liver, lung, peritoneum</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Bone, liver, lung</td>
</tr>
<tr>
<td>Uterus</td>
<td>Bone, liver, lung, peritoneum, vagina</td>
</tr>
</tbody>
</table>

### TUMOR MARKERS

<table>
<thead>
<tr>
<th>Marker</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-fetoprotein (AFP)</td>
<td>Hepatocellular carcinoma and germ cell tumors</td>
</tr>
<tr>
<td>Beta-2-microglobulin (B2M)</td>
<td>Multiple myeloma, chronic lymphocytic leukemia, and some lymphomas</td>
</tr>
<tr>
<td>Beta-human chorionic gonadotropin (Beta-hCG)</td>
<td>Choriocarcinoma and germ cell tumors</td>
</tr>
<tr>
<td>BRCA1 and BRCA2</td>
<td>Breast and Ovarian cancer</td>
</tr>
<tr>
<td>CA15-3</td>
<td>Breast cancer</td>
</tr>
<tr>
<td>CA27-29</td>
<td>Breast cancer</td>
</tr>
<tr>
<td>CA19-9</td>
<td>Pancreatic cancer, gallbladder cancer, bile duct cancer, and gastric cancer, colonrectal cancer</td>
</tr>
<tr>
<td>CA-125</td>
<td>Ovarian cancer but may also be elevated in endometrial cancer, fallopian tube cancer, lung cancer, breast cancer and gastrointestinal cancer. May also increase in endometriosis</td>
</tr>
<tr>
<td>Calretinin</td>
<td>Mesiorthelioma, sex cord-gonadal stromal tumor, adrenocortical carcinoma, synovial sarcoma</td>
</tr>
<tr>
<td>Carcinoembryonic antigen (CEA)</td>
<td>Colorectal cancer and some other cancers cervix cancer, lung cancer, ovarian cancer, breast cancer, urinary tract cancer</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CD20</td>
<td>Non-Hodgkin lymphoma</td>
</tr>
<tr>
<td>Chromogranin A (CgA)</td>
<td>Neuroendocrine tumors</td>
</tr>
<tr>
<td>Prostate-specific antigen (PSA)</td>
<td>Prostate cancer</td>
</tr>
</tbody>
</table>

❖ Test combinations that may be helpful  (most common bolded)

<table>
<thead>
<tr>
<th>Colorectal cancer</th>
<th>CEA, CA 19-9, CA 125  (M2-PK;indevelopment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>CEA, CA 15-3, CA25-27</td>
</tr>
<tr>
<td>Ovary</td>
<td>CEA, CA 19-9, CA 125, AFP, BHCG</td>
</tr>
<tr>
<td>Uterine</td>
<td>CEA, CA 19-9, CA 125, Cyfra 21-1, SCC</td>
</tr>
<tr>
<td>Prostate</td>
<td>PSA, FreePSA and ratio</td>
</tr>
<tr>
<td>Testicle</td>
<td>AFP, BHCG</td>
</tr>
<tr>
<td>Liver</td>
<td>CEA, AFP</td>
</tr>
<tr>
<td>Pancreas/Stomach</td>
<td>CEA, CA 19-9, CA 72-4</td>
</tr>
<tr>
<td>Thyroid</td>
<td>CEA, NSE</td>
</tr>
<tr>
<td>Lung</td>
<td>CEA, CA 19-9, CA 125, NSE, Cyfra 21-1 (Sensitivity at 95 percent percentile for Cyfra 21-1 is 79 percent, while for SCC and CEA are 41 and 31 percent respectively)</td>
</tr>
<tr>
<td>Bladder</td>
<td>CEA, Cyfra 21-1, TPA</td>
</tr>
</tbody>
</table>
Intensive care/Critical care

Topics *Click on topics below to go directly to that page

- ABG Interpretation Made Simple
- APACHE – II Score
- Basics of Vent Management
- Glasgow Coma Scale
- ICU Note
- MELD (Model for End-Stage Liver Disease) Score
- Sepsis
  - 3, 6 Hour bundle
  - New 1 hour bundle
  - Sepsis Antibiotic
APACHE – II SCORE

➢ Provides an estimate of ICU mortality based on a number of laboratory values and patient signs.

➢ **Note:** The data used should be from the initial 24 hours in the ICU, and the worst value should be used.

Online calculator at [mdcalc.com](http://mdcalc.com)

### The APACHE II Severity of Disease Classification System

<table>
<thead>
<tr>
<th>Temp</th>
<th>&gt;41</th>
<th>39 - 40.9</th>
<th>38.5 - 38.9</th>
<th>36 - 38.4</th>
<th>34 - 35.9</th>
<th>32 - 33.9</th>
<th>30 - 31.9</th>
<th>&lt;29.9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+1</td>
<td>0</td>
<td>+1</td>
<td>+2</td>
<td>+3</td>
<td>+4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean Arterial Pressure</th>
<th>&gt;160</th>
<th>130 to 159</th>
<th>110 to 129</th>
<th>70 to 109</th>
<th>50 to 69</th>
<th>&lt;49</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
<td>0</td>
<td>+2</td>
<td>+4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heart Rate</th>
<th>&gt;180</th>
<th>140 to 179</th>
<th>110 to 139</th>
<th>70 to 109</th>
<th>55 to 69</th>
<th>40 to 54</th>
<th>&lt;39</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
<td>0</td>
<td>+2</td>
<td>+3</td>
<td>+4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resp Rate</th>
<th>&gt;50</th>
<th>35 to 49</th>
<th>25 to 34</th>
<th>12 to 24</th>
<th>10 to 11</th>
<th>6 to 9</th>
<th>&lt;5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+1</td>
<td>0</td>
<td>+1</td>
<td>+2</td>
<td>+4</td>
</tr>
</tbody>
</table>

**Oxygenation:** A-aDO₂ or PaO₂ (mm Hg)

a. if FiO₂ < 50%: use PaO₂

b. if FiO₂ < 50%: use **A-a gradient**

<table>
<thead>
<tr>
<th>PaO₂</th>
<th>&gt;70</th>
<th>61-70</th>
<th>55-60</th>
<th>&lt;55</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>+1</td>
<td>+3</td>
<td>+4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A-a gradient</th>
<th>&gt;499</th>
<th>350-499</th>
<th>200-349</th>
<th>&lt;200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
<td>0</td>
</tr>
</tbody>
</table>
# The APACHE II Severity of Disease Classification System

<table>
<thead>
<tr>
<th>Arterial pH</th>
<th>≥7.7</th>
<th>7.6 to 7.69</th>
<th>7.5 to 7.59</th>
<th>7.33 to 7.49</th>
<th>7.25 to 7.32</th>
<th>7.15 to 7.24</th>
<th>&lt;7.15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+1</td>
<td>0</td>
<td>+2</td>
<td>+3</td>
<td>+4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serum Na</th>
<th>&gt;180</th>
<th>160 to 179</th>
<th>155 to 159</th>
<th>150 to 154</th>
<th>130 to 149</th>
<th>120 to 129</th>
<th>≤110</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>+2</td>
<td>+3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serum K</th>
<th>≥7</th>
<th>6 to 6.9</th>
<th>5.5 to 5.9</th>
<th>3.5 to 5.4</th>
<th>3 to 3.4</th>
<th>2.5 to 2.9</th>
<th>&lt;2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+1</td>
<td>0</td>
<td>+1</td>
<td>+2</td>
<td>+4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serum Cr</th>
<th>≥3.5</th>
<th>2 to 3.4</th>
<th>1.5 to 1.9</th>
<th>0.6 to 1.4</th>
<th>&lt;0.6</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
<td>0</td>
<td>+2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Double point score for acute renal failure

<table>
<thead>
<tr>
<th>Hct</th>
<th>≥60</th>
<th>50 to 59.9</th>
<th>46 to 49.9</th>
<th>30 to 45.9</th>
<th>20 to 29.9</th>
<th>&lt;20</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>+2</td>
<td>+4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WBC</th>
<th>≥40</th>
<th>20 to 39.9</th>
<th>15 to 19.9</th>
<th>3 to 14.9</th>
<th>1 to 2.9</th>
<th>&lt;1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>+2</td>
<td>+4</td>
<td></td>
</tr>
</tbody>
</table>

Score = 15 minus actual GCS

<table>
<thead>
<tr>
<th>Age</th>
<th>≤44</th>
<th>45 to 54</th>
<th>55 to 64</th>
<th>65 to 74</th>
<th>≥75</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>+2</td>
<td>+3</td>
<td>+5</td>
<td>+6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chronic Health Points</th>
<th>Non-operative or emergency postoperative patients</th>
<th>Elective postoperative patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+5</td>
<td>+2</td>
</tr>
</tbody>
</table>
Chronic Health Points: If the patient has a history of severe organ system insufficiency or is immunocompromised as defined below:

- Liver – biopsy proven cirrhosis and portal hypertension; pHx upper GI bleeding attributed to portal hypertension; or prior episodes of hepatic failure/encephalopathy/coma.
- Cardiovascular – New York Heart Association Class IV.
- Respiratory – Chronic restrictive, obstructive, or vascular disease resulting in severe exercise restriction (i.e., unable to climb stairs or perform household duties; or documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (>40 mmHg), or respirator dependency.
- Renal – receiving chronic dialysis.
- Immunocompromised: immunosuppression, chemotherapy, radiation, long term or recent high dose steroids, or has a disease that is sufficiently advanced to suppress resistance to infection, e.g., leukemia, lymphoma, AIDS).

**Interpretation of Score:**

<table>
<thead>
<tr>
<th>Score</th>
<th>Death Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
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</tr>
<tr>
<td>5-9</td>
<td>8</td>
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<tr>
<td>10-14</td>
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<tr>
<td>15-19</td>
<td>25</td>
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<tr>
<td>20-24</td>
<td>40</td>
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<td>25-29</td>
<td>55</td>
</tr>
<tr>
<td>30-34</td>
<td>75</td>
</tr>
<tr>
<td>&gt;34</td>
<td>85</td>
</tr>
</tbody>
</table>

GLASGOW COMA SCALE

➢ Used for assessing impaired consciousness and coma.

➢ Eye Opening Response
  • Spontaneous--open with blinking at baseline 4 points
  • To verbal stimuli, command, speech 3 points
  • To pain only (not applied to face) 2 points
  • No response 1 point

➢ Verbal Response
  • Oriented 5 points
  • Confused conversation, but able to answer questions 4 points
  • Inappropriate words 3 points
  • Incomprehensible speech 2 points
  • No response 1 point

➢ Motor Response
  • Obey commands for movement 6 points
  • Purposeful movement to painful stimulus 5 points
  • Withdraws in response to pain 4 points
  • Flexion in response to pain (decorticate posturing) 3 points
  • Extension response in response to pain (decerebrate posturing) 2 points
  • No response 1 point

➢ Head Injury Classification:
  • Severe Head Injury: GCS score of 8 or less
  • Moderate Head Injury: GCS score of 9 to 12
  • Mild Head Injury: GCS score of 13 to 15

Online calculator

Teasdale G, Jennett B. Assessment of coma and impaired consciousness. Lancet 1974; 81-84.
MODEL FOR END-STAGE LIVER DISEASE (new MELD) SCORE 2016

➢ Prioritize allocation of liver transplants
➢ Predict survival in patients with chronic liver failure
➢ In January 2016, serum sodium level was added to calculation
➢ The MELD score relies on laboratory values (serum sodium and creatinine, total bilirubin, and INR)

Online Calculator

<table>
<thead>
<tr>
<th>MELD Score</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;9</td>
<td>1.9%</td>
</tr>
<tr>
<td>10–19</td>
<td>6.0%</td>
</tr>
<tr>
<td>20–29</td>
<td>19.6%</td>
</tr>
<tr>
<td>30–39</td>
<td>52.6%</td>
</tr>
<tr>
<td>≥40</td>
<td>71.3%</td>
</tr>
</tbody>
</table>

➢ Consider referral to hepatologist or liver transplant center for patients with MELD Score ≥10
➢ Other important prognostic variables
  • The hepatorenal syndrome (HRS)
    • Most patients with type-1 HRS (rapid and severe renal failure) die within 8-10 weeks even with therapy.
    • Median survival with type-2 HRS (chronic, less severe renal failure with serum creatinine usually 1.5-2 mg/dL) is around 6 months.
➢ Pts with cirrhosis should be periodically screened for hepatocellular carcinoma with serum alpha-fetoprotein


Approach Considerations
The treatment of patients with septic shock consists of the following 3 goals:

1. Resuscitate the patient from septic shock using supportive measures to correct hypoxia, hypotension, and impaired tissue oxygenation. Pts with severe sepsis usually require about 6 liters saline.
2. Identify the source of infection and treat. Antibiotics started w/in 1 hr
3. Maintain adequate organ system function guided by cardiovascular monitoring and interrupt the pathogenesis of multiple organ dysfunction syndrome (MODS).

❖ My recommended approach to identifying Sepsis

### Sepsis-Possible, Early

<table>
<thead>
<tr>
<th>SIRs +</th>
<th>SIRs + plus Inf or suspected inf.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td>96.8/100.4</td>
</tr>
<tr>
<td>P:</td>
<td>90 +</td>
</tr>
<tr>
<td>R:</td>
<td>20+</td>
</tr>
<tr>
<td>WBC:</td>
<td>&lt;4, &gt;12, &gt;10% Bands</td>
</tr>
</tbody>
</table>

### Sepsis

- Respiratory
- Urinary
- Abdominal
- CNS
- Line infection
- Soft tissue
- Bone/Joint
- Neutropenic

### Sepsis-3

*Released Feb 22, 2016*

**Severe Sepsis**

- Sepsis plus organ dysfunction
- SOFA (Sepsis-related Organ Failure assessment)
- **Calculator**
  - ≥ 2 SOFA points
  - **qSOFA**
    - 2/3 ass with increase mortality
      - R: ≥22
      - SBP≤100 mmHg
      - Altered mental status (GCS <11)

**Septic Shock**

- Severe sepsis plus hypotension (requiring vasopressor therapy to elevate MAP >65) and lactate >2* despite adequate fluid resuscitation

*Per Sepsis 3 criteria

- Others mention lactate >4

- Associated with 40%+ mortality
Surviving Sepsis Campaign

3 hour bundle (to be completed within 3 hours of time of presentation)
“Time of presentation” is defined as the time of triage in the emergency department
- Measure lactate level
- Obtain blood cultures prior to administration of antibiotics
- Administer broad spectrum antibiotics w/in 1 hr
- Administer 30ml/kg IVF for hypotension or lactate ≥4mmol/L

Lactated Ringers (LR) slight benefit over Normal saline (NS)
*SALT-ED and STAR studies

6 hour bundle (to be completed within 6 hours of time of presentation)
- Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65mmHg
- In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, re-assess volume status and tissue perfusion and document findings
- Document reassessment of volume status and tissue perfusion with either
  - Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including
    - vital signs, pulse
    - capillary refill
    - cardiopulmonary
    - skin findings.
  - Or two of the following:
    - Measure CVP
    - Measure ScvO2
    - Bedside cardiovascular ultrasound
- Re-measure lactate if initial lactate elevated.

Septic Shock: Sepsis and vasopressor therapy needed to elevate MAP ≥ 65 mm Hg and lactate > 2 mmol/L (18 mg/dL) after adequate fluid resuscitation

Surviving Sepsis Campaign Hour-1 Bundle of Care Elements:
- Measure lactate level*
- Obtain blood cultures before administering antibiotics.
- Administer broad-spectrum antibiotics.
- Begin rapid administration of 30mL/kg crystalloid for hypotension or lactate level ≥ 4
- Vasopressors if hypotensive during or after fluid resuscitation to maintain MAP ≥ 65
- Remeasure lactate if initial lactate is elevated (> 2 mmol/L).
# SEVERE SEPSIS QUICK REFERENCE PROTOCOL

## Pts w Suspected or confirmed infection
- Evidence of > 1 organ dysfunction
- Septic Patient with Lactate ≥ 4 mmol/L or MAP < 65 after 2 liters crystalloid

## INITIAL RESUSCITATION

**Peripheral IV**
- Administer 20-30 ml/kg balance **crystalloid bolus** over 20 minutes Normal saline 500 mL bolus until CVP 8-12 mmHg, then continue at 150 ml/hr
- cardiac monitor, oxygen, pulse oximetry
- Obtain Sepsis panel (Blood culture, sputum culture, urine culture, sensitivities, urine analysis, CBC w/differential, comprehensive metabolic panel, PT/PTT, D-Dimer, Troponin I, Lactate) consider DIC panel
- Think of **source control** (Infected catheter? Operative intervention for infection? Drainable pus?)
- Check CXR, ECG
- **Broad Spectrum Antibiotics within 1 hr**
- Place **central line** in the IJ (preferably with ultrasound) or subclavian vein

## SpO2
- If patient’s O2 saturation is < 90% on high fiO2 supplemental oxygen (non-rebreather mask), consider:
  - **Intubation** with mechanical ventilation
    - Maintain low tidal volume to achieve peak inspiratory plateau pressure < 30 cm H2O
  - Place on lung protective ventilation
  - Place on pain control regimen, administer sedation after pain controlled

## FLUIDS
- Choose 1 of the Strategies listed below
  - **Dynamic IVC Ultrasound**-Keep giving 500-1000 ml boluses of isotonic crystalloid until there is < 30% change in IVC size if not intubated or > 12 % if intubated.
  - **CVP**-Administer fluids until CVP > 10 mm Hg in non-intubated patients and > 14 mm Hg in intubated patients.
  - **Empiric Fluid Loading**-Patients with severe sepsis/septic shock may require at least 6 liters of fluid during their acute resuscitation (first 6 hours of care).
### RE-CHECKING MAP

MAP = (CO \( \times \) SVR) + CVP

Online Calc

Estimated

MAP \( \approx \) DP + \( \frac{1}{3} \) PP

- MAP < 65 (or SBP < 90) mmHg after 2 liters of crystalloid
- Initiate vasopressors in the order below, titrate vasopressors to achieve a MAP ≥ 65 until MAP > 65 (or SBP > 90)
  - Norepinephrine 2-20 mcg/min (first line therapy in severe sepsis)
  - Dopamine 5-20 mcg/kg/min
  - Phenylephrine 40-200 mcg/min (preferred if HR > 120 bpm)
  - Vasopressin 0.01-0.04 U/min 10-12 (if on another vasopressor)
  - Epinephrine 2-10 mcg/min (may increase lactate)

### TISSUE OXYGENATION

- Repeat lactate at 6 hours after 1st draw and ScvO2
  - If lactate has cleared by ≥ 10% and ScvO2 ≥ 70%, go to disposition
  - If ScvO2 < 70 or lactate hasn’t cleared by ≥ 10%
    - Choose 1 option from below:
      - If Hb < 7: transfuse 1 unit of PRBC
      - **Additional Fluids**: if using CVP to determine fluid status, administer an additional liter of isotonic crystalloid
      - **Inotropes**: especially if heart appears hypodynamic on echo. If calcium is low, replete that first. If not, administer dobutamine 5-20 mcg/kg/min.
      - **Intubate**: to decrease pulmonary metabolic load
      - If Hb 7-10: consider transfusion. Especially in elderly patients or patients with coronary artery disease

- Repeat lactate and ScvO2.
  - If ScvO2 < 70 or if lactate still has not cleared by ≥10%, continue with the above, trending lactates and ScvO2 every 1 hour until these two goals are met.

### DISPOSITION

- Patients should get ICU consultation.
- Periodically recheck patient for MAP ≥ 65, good mental status, and good urine output.
- Consider trending lactate every Q 2-4 hours. If it starts rising again, restart protocol.

To view complete Guidelines click here
# Antibiotics in Severe Sepsis

## Recommendations for Empiric Antibiotics in Severe Sepsis

<table>
<thead>
<tr>
<th>Infection Source</th>
<th>Microbiology</th>
<th>Antibiotic Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe CAP in ICU (no risk of multidrug-resistant organism)</td>
<td><em>Streptococcus pneumoniae</em>&lt;br&gt;<em>Haemophilus influenzae</em>&lt;br&gt;<em>Moraxella catarrhalis</em>&lt;br&gt;<em>Chlamydia pneumoniae</em>&lt;br&gt;<em>Mycoplasma</em>&lt;br&gt;<em>Staphylococcus aureus</em></td>
<td>• Beta-lactam* AND&lt;br&gt;• Resp Fluoroquinolone† or Macrolide AND&lt;br&gt;• Vancomycin or Linezolid</td>
</tr>
<tr>
<td>Severe CAP in ICU (risk of multidrug-resistant organism or Nosocomial pneumonia or HCAP)</td>
<td>Typical organisms as above AND SPACE organisms</td>
<td>• Antipseudomonal agent§ AND&lt;br&gt;• Resp Fluoroquinolone† AND&lt;br&gt;• Vancomycin or Linezolid</td>
</tr>
<tr>
<td>Intra-Abdominal Infection (Community Acquired)</td>
<td><em>Enterobacteriaceae</em>&lt;br&gt;<em>Bacteroides fragilis</em>&lt;br&gt;Enterococci</td>
<td>• Piperacillin-Tazobactam or Imipenem-Cilastatin or Cefepime&lt;br&gt;• +/- Vancomycin¶</td>
</tr>
<tr>
<td>Intra-Abdominal Infection (Hospital Acquired)</td>
<td><em>Enterobacteriaceae</em>&lt;br&gt;<em>Bacteroides fragilis</em>&lt;br&gt;Enterococci SPACE organisms</td>
<td>• Piperacillin-Tazobactam or Imipenem-Cilastatin or Cefepime AND&lt;br&gt;• Aminoglycoside</td>
</tr>
<tr>
<td>Urosepsis (Community Acquired)</td>
<td><em>Enterobacteriaceae</em>&lt;br&gt;Enterococci</td>
<td>• Levofloxacin or Ciprofloxacin or Aminoglycoside</td>
</tr>
<tr>
<td>Urosepsis (Hospital Acquired)</td>
<td><em>Enterobacteriaceae</em>&lt;br&gt;Enterococci <em>Pseudomonas</em></td>
<td>• Levofloxacin or Ciprofloxacin or Ceftazidime or Cefepime or Piperacillin-Tazobactam AND&lt;br&gt;• Aminoglycoside</td>
</tr>
<tr>
<td>Skin/soft tissue (community or hospital acquired), Skin/soft tissue (cont)</td>
<td><em>Streptococcus</em>&lt;br&gt;<em>Staphylococcus aureus</em>&lt;br&gt;<em>Enterobacteriaceae</em>&lt;br&gt;<em>Clostridium perfringens</em> (if gas gangrene)</td>
<td>• Vancomycin AND&lt;br&gt;• Imipenem-Cilastatin or Meropenem or Piperacillin-Tazobactam or Ampicillin-Sulbactam or Cefepime</td>
</tr>
<tr>
<td>Condition</td>
<td>Organisms</td>
<td>Treatment Options</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Catheter-related bloodstream infection</td>
<td><em>Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus</em> +/- Gram-negative rods</td>
<td>• Vancomycin AND&lt;br&gt;• Ceftazidime or Cefepime (if hospital acquired)</td>
</tr>
<tr>
<td>Primary bacteremia (community or hospital acquired)</td>
<td><em>Streptococcus</em>&lt;br&gt;<em>Staphylococcus aureus</em>&lt;br&gt;Enterobacteriaceae</td>
<td>• Vancomycin AND&lt;br&gt;• Aminoglycoside</td>
</tr>
<tr>
<td>Bacterial meningitis (community acquired)</td>
<td><em>Streptococcus pneumoniae</em>&lt;br&gt;<em>Haemophilus influenzae</em>&lt;br&gt;<em>Neisseria meningitides</em>&lt;br&gt;<em>Listeria</em> (age &gt;50 years)</td>
<td>• Vancomycin AND&lt;br&gt;• Ceftriaxone 2 g IV every 12 hours&lt;br&gt;• +/- Ampicillin (if <em>Listeria</em> risk)</td>
</tr>
<tr>
<td>Bacterial meningitis (hospital acquired)</td>
<td><em>Pseudomonas aeruginosa</em>&lt;br&gt;Enterobacteriaceae&lt;br&gt;<em>Staphylococcus aureus</em></td>
<td>• Vancomycin AND&lt;br&gt;• Antipseudomonal agent§</td>
</tr>
<tr>
<td>Unknown source</td>
<td>SPACE organisms&lt;br&gt;<em>Staphylococcus aureus</em>&lt;br&gt;<em>Streptococcus</em>&lt;br&gt;Enterobacteriaceae</td>
<td>• Antipseudomonal agent§ AND&lt;br&gt;• Aminoglycoside</td>
</tr>
</tbody>
</table>

*Cefotaxime, ceftriaxone (Rocephin), ampicillin-sulbactam (Unasyn), ertapenem.*<br>†Levofloxacin, moxifloxacin, or gemifloxacin.<br>§Piperacillin-tazobactam, imipenem-cilastatin, meropenem, cefepime, ceftazidime, or aztreonam.<br>||Gentamicin, tobramycin, or amikacin.<br>*SPACE* = Serratia, Pseudomonas, Acinetobacter, Citrobacter, and Enterobacter.<br>


Click here to play Septris an online game that help you Identify and treat patients with sepsis. It was developed by **Stanford University School of Medicine.** Or go to [http://med.stanford.edu/septris/](http://med.stanford.edu/septris/).
6 Steps

Step 1: Analyze the pH
- Normal blood pH is 7.4
- Normal pH range is 7.35 - 7.45
- pH Between 7.35 and 7.4 = normal / acidic
- pH Between 7.4 and 7.45 = normal / alkalotic
- pH Below 7.35 = acidic
- pH Above 7.45 = alkalotic

Step 2: Analyze the CO2
- Look at the pCO2
- Normal pCO2: 35 - 45 mmHg.
- pCO2 Below 35 = alkalotic
- pCO2 Above 45 = acidic

Step 3: Analyze the HCO3
- Look at the HCO3 level.
- Normal HCO3: 22-26 mEq/L.
- HCO3 below 22 = acidotic
- HCO3 above 26 = alkalotic

Step 4: Match the CO2 or the HCO3 with the pH
- Match either the pCO2 or the HCO3 with the pH to determine the acid-base disorder.
  - If the pH is acidotic and the CO2 is acidotic = respiratory acidosis
  - If the pH is alkalotic and the CO2 is alkalotic = respiratory alkalosis
  - If the pH is alkalotic and the HCO3 is alkalotic = metabolic alkalosis
  - If the pH is acidotic and the HCO3 is acidotic = metabolic acidosis

Step 5: Compensation
- If the CO2 or HCO3 go the opposite direction of the pH = compensation by that system
  - Example, the pH is acidotic, the CO2 is acidotic, and the HCO3 is alkalotic.
  - The CO2 matches the pH making the primary acid-base disorder respiratory acidosis.
  - The HCO3 is opposite of the pH and so it would be evidence of metabolic compensation.
  - Note since the pH is acidotic and not normal it is called partial compensation.

Step 6: Analyze pO2 and the O2 saturation.
- Normal O2 Saturation: 95 - 100%
- Normal pO2: 80 - 100 mmHg
  - hypoxemia = pO2 and the O2 saturation below normal
ICU Notes Should include
❖ Hospital day / Post-operative day
❖ Lines (NGT, urinary foley, drains ex. Jackson Pratt), document amounts and describe contents (serous/blood/sero-sanguinous/bilious)
❖ Drips
❖ I’s and O’s
❖ Vital signs
❖ Organized by body system.
  ➢ Neurological
    ❖ Level of alertness and orientation
    ❖ Glasgow coma scale (GCS) score
    ❖ Neurological exam (ie: cranial nerves, strength, reflexes, sensation, etc.)
    ❖ Neurological medicines
      ❖ Sedatives (ie: propofol, midazolam, etc.)
      ❖ Pain medications
      ❖ Treatment specific medications
  ➢ Cardiovascular
    ❖ Heart rate, rhythm (from telemetry)
    ❖ Blood pressure
    ❖ Central venous pressure (from central line or Swan Ganz catheter)
    ❖ Pulmonary artery pressure (from Swan Ganz catheter)
    ❖ Pulmonary artery wedge pressure (from Swan Ganz catheter)
    ❖ Cardiac output and index (from Swan Ganz catheter)
    ❖ Chest tube output (if present)
    ❖ Cardiac specific medications
      ❖ Presors
      ❖ β-blocker, ACEI, ARB, calcium blocker.
      ❖ Anticoagulants: ASA, Coumadin, Lovenox
  ➢ Pulmonary
    ❖ Physical exam findings
      ❖ Patient’s respiratory rate
      ❖ Oxygen saturation
    ❖ Ventilator settings
      ❖ Mode
      ❖ FiO₂
      ❖ Tidal volume
      ❖ Ventilator’s respiratory rate
- Peak end expiratory pressure (PEEP)
- Pressure support
- Peak airway resistance
- Arterial blood gas results (pH, PaO₂, PaCO₂, and HCO₃⁻)
- Chest x-ray results
- Pulmonary medications

- Renal
  - IV Fluids
  - Laboratory data
    - Creatinine/Blood urea nitrogen (BUN)/GFR
    - electrolytes
    - Urinalysis

- Infectious Diseases
  - Maximum temperature
  - Current temperature
  - Laboratory data
    - White blood cell count
    - Culture results
  - Antibiotics

- Hematology
  - Physical exam findings (bruising, oozing, petechiae, etc.)
  - Laboratory data
    - Hemoglobin and hematocrit
    - Platelet count
    - PT, INR, PTT
  - Lower extremity doppler results
  - Chest CT or ventilation/perfusion scan

- Gastrointestinal
  - Physical exam findings (ie: distended, peritoneal signs, blood in the stool, etc.)
  - Laboratory data
    - Liver function tests
    - Amylase and lipase

- Endocrine
  - Blood glucose levels (fingerstick, metabolic panel)
  - Medications
    - Insulin drip and rate (if any)
    - Sliding scale insulin
    - Subcutaneous insulin
Skin
❖ Rashes
❖ Pressure Ulcers, Stage, location

Psychiatric
❖ Any psychiatric issues

Nutrition (FEN) the patient's diet, either orally or intravenously, along with their nutritional status (usually measured by albumin or prealbumin levels).

Prophylaxis
❖ Ulcer prophylaxis
   ✷ H2 or proton pump inhibitor
❖ Deep venous thrombosis prophylaxis
   ✷ Subcutaneous heparin / low molecular heparin
   ✷ Compression boots (SCDs)
   ✷ Graduated/compression stockings

Assessment

Plan

DNR status
BASICS of VENT MANAGEMENT

Mechanical ventilation is used to treat patients with respiratory failure from inadequate ventilation or oxygenation (or both), as evidenced by hypoxemia with or without hypercapnia.

❖ The 50/50 rule states that mechanical ventilation is indicated if a patient's partial-pressure of oxygen (PaO₂) falls below 50 mm Hg and/or partial-pressure of carbon dioxide (PaCO₂) rises above 50 mm Hg.
  • The 50/50 rule is only a guideline.
  • Many patients need ventilatory support before they reach those critical values.

Quick Guide
❖ Initial Ventilator Settings in Acute Respiratory Distress Syndrome (ARDS) and Acute Lung Injury (ALI)
  • Mode: Assist-Control Mode
  • Tidal Volume 6 mL/kg ideal body weight
  • Rate: respiratory rate 25/min
  • Flow Rate 60 L/min
  • FiO₂ = 1.0
  • PEEP 15 cm H₂O

❖ Ventilator settings are adjusted to meet these goals:
  • Pa O₂: 60-90 mm Hg
  • Pa CO₂: 40 mm Hg, patient normal baseline
  • pH: 7.35-7.45
  • Inspiratory pressure < 35 cm H₂O
  • Minimized work of breathing

❖ Titration
  • Once O₂ saturation is > 90%, FiO₂ is decreased.
  • Then, PEEP is decreased in 2.5-cm H₂O increments as tolerated to find the least PEEP associated with an arterial O₂ saturation of 90% on an FiO₂ of ≤ 0.6.
  • The respiratory rate is increased up to 35/min to achieve a pH of > 7.15, or until the expiratory flow tracing shows end-expiratory flow.
Ventilator Mode

❖ **Volume control**: Traditionally, mechanical ventilation is volume controlled. This setting means the ventilator is programmed to deliver a preset volume of oxygen and air, called the tidal volume (VT), regardless of the amount of pressure required to deliver the volume (a positive pressure alarm protects patients from dangerously high pressures).

❖ **Pressure control**: Pressure control simply means that pressure is the endpoint rather than volume. Thus, inspiration ends when a preset pressure is reached, regardless of the volume delivered. The advantage of this mode is that it allows the volume to change in response to intrathoracic pressure. The goal is to increase mean airway pressure by prolonging inspiration, ideally recruiting more alveoli than volume control ventilation. By limiting pressure, there is less risk of pressure-related injury.

❖ **Pressure-regulated volume control (PRVC)**: This type of mechanical ventilation is an alternative to strict pressure control, representing an attempt to obtain the best of both volume and pressure control. PRVC adapts to changing compliance of the lungs to adjust inspiratory time and pressure to maintain a preset tidal volume.

❖ **Assist control (AC)**: In this mode, the ventilator supports every breath, whether it's initiated by the patient or the ventilator. AC is often used to allow the patient to rest, because the ventilator does all the work. This high level of respiratory support is frequently required in patients who have been resuscitated, have acute respiratory distress syndrome (ARDS), or are paralyzed or sedated. Because AC mode results in the highest level of positive pressure in the chest, it increases the risk of barotrauma to the lungs. Anxious patients who frequently trigger the ventilator can easily hyperventilate.

❖ **Synchronized intermittent mandatory ventilation (SIMV)**: In this mode, not all spontaneous breaths are assisted, leaving the patient to draw some breaths on her own. For example, if your patient's ventilator is set on SIMV mode with a respiratory rate of 10 bpm, she will receive a breath roughly once every six seconds. She can also breathe on her own in between the machine-assisted breaths. There are several advantages to this mode for patients who can tolerate it. SIMV helps preserve the strength of the respiratory musculature, decreases the risk of hyperventilation and barotrauma, and facilitates weaning. Weaning can be done by gradually decreasing the percentage of machine-assist ventilation. Patients who need short-term ventilation benefit most from SIMV.
Two adjuncts
❖ **PEEP**: In patients at risk for alveolar collapse on exhalation, a small amount of pressure can be maintained in the alveoli to hold them open. This is called positive-end expiratory pressure (PEEP), and it can improve alveolar recruitment and increasing oxygenation. Positive end-expiratory pressure (PEEP): PEEP can be used to increase oxygenation in either AC or SIMV mode. The effect of PEEP on the lungs is similar to blowing up a balloon and not letting it completely deflate before blowing it up again.
   • Most pts are started on 5 cm H2O of PEEP.
   • Pts w/ ARDS or other conditions that make lungs stiff, require higher levels of PEEP to keep alveoli from collapsing and to decrease intrapulmonary shunting. It's not unusual to use 8 - 12 cm H2O in these patients.
   • PEEP should not exceed 20 cm H2O; higher settings increase the risk of severe lung damage, subcutaneous emphysema, and pneumothorax.
❖ **Pressure support**: Used alone or added to SIMV, this provides a small amount of pressure during inspiration to help the patient draw in a spontaneous breath. Pressure support makes it easier for the patient to overcome the resistance of the ET tube and is often used during weaning because it reduces the work of breathing. It's not necessary during AC ventilation because in that setting, the ventilator supports all of the breaths.

Settings
❖ **Respiratory Rate**: refers to the number of breaths per min the ventilator delivers.
   • **Usually: 8 to 12 bpm**
   • Depending on the mode selected, the ventilator can provide all of the patient's ventilation, or the patient may be able to breathe spontaneously between ventilator breaths.
❖ **Fraction of Inspired Oxygen (FiO2)**: This indicates the amount of oxygen the ventilator delivers.
   • Its expressed as a percentage or a number between zero and one.
   • ABGs and pulse oximetry values help determine FiO2 settings.
   • Room air = FiO2 of 21% (0.21).
   • Some patients might be adequately oxygenated with an FiO2 of less than 40% (0.40)
   • Someone with severe hypoxemia, for example, might need an initial FiO2 setting of 100% (1.00)

❖ **Weaning from vent**
   • Step 1. Identify and eliminate the precipitants of respiratory failure.
• Step 2. **Spontaneous breathing trials.** If patients have an adequate arterial saturation on a fractional inspired O₂ (Fio₂) ≤ 0.5 with a positive end-expiratory pressure (PEEP) ≤ 7.5 cm H₂O and does not have an obviously unsustainable respiratory load (e.g., minute ventilation > 20 L/min), a daily spontaneous breathing trial is done using a T-piece or continuous positive airway pressure (CPAP) of 5 cm H₂O.
  - Daily spontaneous breathing trials on a T-piece reduce the duration of mechanical ventilation
  - Patients capable of sustaining spontaneous breathing generally breathe slowly and deeply, instead of rapidly and shallowly.
  - The rapid shallow breathing (RSB) index, determined by dividing the patient's unassisted respiratory rate (in breaths/min) by the tidal volume (in L).
  - A value < 105 suggests that spontaneous breathing is likely to be successful.
  - Recently, the decision of whether to extubate a patient after a spontaneous breathing trial has shifted away from the use of the RSB index and has relied more on clinical assessment during the course of the trial, and measuring ABGs.

• The decision to extubate requires evaluation of the patient's mentation and airway protective reflexes, as well as the patency of the airway.


---

**GLASGOW COMA SCALE**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eye</strong></td>
<td>Does not open eyes</td>
<td>Opens eyes in response to pain</td>
<td>Opens eyes in response to voice</td>
<td>Opens eyes spontaneously</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Verbal</strong></td>
<td>Makes no sounds</td>
<td>Makes sounds</td>
<td>Words</td>
<td>Confused, disoriented</td>
<td>Oriented, converses normally</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td>Makes no movements</td>
<td>Extension to painful stimuli (de cerebrate response)</td>
<td>Abnormal flexion to painful stimuli (decorticate response)</td>
<td>Flexion / Withdrawal to painful stimuli</td>
<td>Localizes to painful stimuli</td>
<td>Obeys commands</td>
</tr>
</tbody>
</table>

Note that a motor response in any limb is acceptable. The scale is composed of three tests: eye, verbal and motor responses. The three values separately as well as their sum are considered. The lowest possible GCS (the sum) is 3 (deep coma or death), while the highest is 15 (fully awake person).
Pulmonology

Topics

*Click on topics below to go directly to that page

- A-a gradient
- ABG Interpretation Made Simple
- ABG vs VBG
- Asthma
- Basics of Vent Management
- COPD
- CURB65
- FiO2
- Lung Nodule
- Pneumonia
- Pneumonia Severity Index
- Pneumococcal vaccination in adults
- Procalcitonin
- Pulmonary embolism
- Steroids in CAP
- Thoracentesis
Severity of an exacerbation should be classified by symptoms, signs, and measurements of lung function

**Classification of Asthma Exacerbation Severity**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Moderate</th>
<th>Severe</th>
<th>Impending Respiratory Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peak Flow</strong></td>
<td>40%–69%</td>
<td>&lt;40%</td>
<td>&lt;25% or unable to measure</td>
</tr>
<tr>
<td>% of personal best (or predicted)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td>While walking and some at rest</td>
<td>While at rest</td>
<td>While at rest</td>
</tr>
<tr>
<td></td>
<td>Prefers sitting</td>
<td>Sits upright</td>
<td>Sits upright</td>
</tr>
<tr>
<td><strong>Talks in</strong></td>
<td>Phrases</td>
<td>Words</td>
<td>Words</td>
</tr>
<tr>
<td><strong>Alertness</strong></td>
<td>Usually agitated</td>
<td>Agitated</td>
<td>Drowsy or confused</td>
</tr>
<tr>
<td><strong>Physical Exam</strong></td>
<td>Loud, throughout exhalation</td>
<td>Usually loud, inhalation and exhalation</td>
<td>Wheeze absent</td>
</tr>
<tr>
<td><strong>Wheeze</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pulse</strong></td>
<td>100-120/minute</td>
<td>&gt; 120/minute</td>
<td>Bradycardia</td>
</tr>
<tr>
<td><strong>Pulsus paradoxus</strong></td>
<td>May be present 10-25 mm Hg</td>
<td>Often present &gt; 25 mm Hg</td>
<td>Absence suggests respiratory muscle fatigue</td>
</tr>
<tr>
<td><strong>Blood Gas</strong></td>
<td>Normal to hypocapnia</td>
<td>&gt;42 mm Hg</td>
<td>Hypercapnia is a late sign</td>
</tr>
<tr>
<td><strong>PaCO₂</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Treatment of Exacerbation (Inpatient)

<table>
<thead>
<tr>
<th>Inhaled Beta Agonist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Albuterol</strong> 2.5 to 5 mg q 20 min x 3, by nebulization in the ED</td>
</tr>
<tr>
<td><strong>Albuterol</strong> 2.5 to 5 mg q 1-4 hrs as needed by nebulization – Hospital Inpatient</td>
</tr>
<tr>
<td>Add</td>
</tr>
<tr>
<td><strong>Ipratropium bromide</strong> .5 mg by nebulization q 20 min x 3 doses for upto 3 hrs in the ED</td>
</tr>
<tr>
<td>• Not recommended for inpatient treatment no added benefit demonstrated</td>
</tr>
</tbody>
</table>

### Systemic Glucocorticosteroids

- Oral equivalent to IV
- change to PO when patient can tolerate and absorb oral medications
- Steroids should be continued for 5-10 days or when patients PEP is over 70% personal best

<table>
<thead>
<tr>
<th>Methylprednisolone</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 to 80 mg every 6 to 12 hours for patients who are admitted to the ICU</td>
</tr>
<tr>
<td>40 to 60 mg every 12 to 24 for patients do not require ICU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prednisone</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 to 80 mg orally (in 1 – 2 divided doses)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dexamethasone</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 10 mg IV</td>
</tr>
<tr>
<td>hydrocortisone 150 to 200 mg IV</td>
</tr>
</tbody>
</table>

### Magnesium sulfate

- **Magnesium sulfate: give 2 g (8 mmol) IV over 20 minutes x once**
- For life-threatening exacerbations and exacerbations that remain severe after one hour of intensive bronchodilator therapy (peak expiratory flow <40 percent of baseline)
- Intravenous magnesium sulfate has bronchodilator activity in acute asthma, possibly due to inhibition of calcium influx into airway smooth muscle cells

### Oxygen

- O2 to maintain SpO₂ ≥92 percent (>95 percent in pregnancy)

### Empiric antibiotics

- **Not recommended**
- Reserved for suspected sinusitis or pneumonia complicating an exacerbation
Epinephrine

- Patients suspected of having an anaphylactic reaction
  - **Epinephrine** 0.3 to 0.5 mg IM (eg, 0.3 to 0.5 mL of 1 mg/mL [also labeled 1:1000])
- If severe asthma but no evidence of anaphylaxis
  - **Epinephrine** 0.3 to 0.5 mg SC (eg, 0.3 to 0.5 mL of 1 mg/mL [also labeled 1:1000])
  - or
  - **Terbutaline**: may give 0.25 mg by SC injection every 20 minutes times 3 doses

- **Endotracheal intubation and ventilation**
  - The decision to intubate the during a severe asthma attack is clinical
    - Slowing of the respiratory rate
    - Depressed mental status
    - Inability to maintain respiratory effort
    - Severe hypoxemia during an exacerbation
  - The goal of mechanical ventilation is to maintain adequate oxygenation and ventilation while minimizing elevated airway pressures.
  - This is accomplished by using
    - High inspiratory flow rates (80 to 100 L/min)
    - Low tidal volumes (6 to 8 ml/kg)
    - Low respiratory rates (10 to 14/minute)
    - In some patients, elevations in paco$_2$ must be tolerated to avoid barotrauma

- **Risk factors for a fatal asthma attack include**
  - Previous severe exacerbation (eg, intubation or intensive care unit admission)
  - Hospitalization or emergency department visit for asthma in the past year
  - Three or more emergency department visits for asthma in the past year
  - Not currently using inhaled glucocorticoids
  - Recent or current course of oral glucocorticoids
  - Use of more than one canister of short-acting beta agonist per month
  - Difficulty perceiving asthma symptoms or severity of exacerbations
  - History of poor compliance with medications and/or written asthma action plan
  - Illicit drug use and major psychosocial problems, including depression
  - Comorbidities, such as cardiovascular or chronic lung disease
Indications for hospitalization

- Patients who have not experienced substantial improvement after four to six hours of urgent care management including frequent inhaled beta-agonist bronchodilator treatments and oral glucocorticoids
- Patients with severe symptoms of coughing, wheezing, and shortness of breath that preclude self-care
- Peak flow parameters can help guide disposition decisions:
  - Peak expiratory flow less than 40 percent of predicted or of the patient's personal best value should be admitted, and consideration for ICU
  - Patients with a peak expiratory flow 40 to 70 percent of predicted, who also demonstrate improving lung function, good asthma self-care skills, and a supportive home environment, can often be discharged home.
  - Most patients with a peak expiratory flow above 70 percent of normal or their personal best can safely continue their care at home

PROCALCITONIN (PCT)

Procalcitonin (PCT)

- Helpful in guiding when to initiate and stop antibiotic therapy
- Its an amino acid precursor of calcitonin, normaly produced by thyroid C-cells
- Serum concentrations normally <0.05 ng/mL
- In bacterial infection its produced in large quantities by many tissues in the body.
- Detectable within 2-4 hrs, peaks within 6-24 hrs
- PCT levels parallel the severity of the inflammatory insult

Clinical situations in which PCT may be helpful

- Useful in diagnosing pneumonia when chest radiographs are indeterminate
- Differentiation of bacterial versus viral respiratory infections
- Guidance of antibiotic treatment length
- Diagnosis, risk stratification, and monitoring of sepsis and septic shock
- Monitoring response to antibacterial therapy
- Diagnosis of systemic secondary infection post-surgery, post-organ transplant, and in severe burns, multiorgan failure, and severe trauma
- Differentiating bacterial versus viral meningitis
- Diagnosis of renal involvement in pediatric urinary tract infections
- Diagnosis of bacterial infection in neutropenic patients
- Diagnosis of septic arthritis
### Procalcitonin PCT Values

#### Lower Respiratory Tract Infections

<table>
<thead>
<tr>
<th>PCT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.1 ng/mL</td>
<td>Indicates absence of bacterial infection.</td>
</tr>
<tr>
<td></td>
<td><strong>Use of antibiotics strongly discouraged.</strong></td>
</tr>
<tr>
<td>≥ 0.1 and &lt; 0.25</td>
<td>Bacterial infection unlikely.</td>
</tr>
<tr>
<td></td>
<td><strong>The use of antibiotics is discouraged.</strong></td>
</tr>
<tr>
<td>≥ 0.25 and &lt; 0.5</td>
<td>Bacterial infection is possible.</td>
</tr>
<tr>
<td></td>
<td><strong>Recommended to initiate antimicrobial therapy.</strong></td>
</tr>
<tr>
<td>≥ 0.5 ng/mL</td>
<td>Suggests the presence of bacterial infection.</td>
</tr>
<tr>
<td></td>
<td><strong>Antibiotic treatment strongly recommended.</strong></td>
</tr>
</tbody>
</table>

#### Sepsis

**Suspected Sepsis: Strongly consider initiating antibiotics in all unstable patients**

<table>
<thead>
<tr>
<th>PCT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 0.1 to 0.5</td>
<td>Sepsis unlikely.</td>
</tr>
<tr>
<td></td>
<td><strong>The use of antibiotics is discouraged.</strong></td>
</tr>
<tr>
<td>≥ 0.5</td>
<td>Increased likelihood sepsis;</td>
</tr>
<tr>
<td></td>
<td><strong>Antibiotics encouraged.</strong></td>
</tr>
<tr>
<td>≥ 2</td>
<td>High risk of sepsis/septic shock;</td>
</tr>
<tr>
<td></td>
<td><strong>Antibiotics strongly encouraged</strong></td>
</tr>
</tbody>
</table>

---

**Decisions regarding antibiotic therapy should NOT be based solely on procalcitonin levels. Procalcitonin should be placed into the clinical context of each patient**
Causes of elevated Procalcitonin not associated with bacterial infections

➢ Newborns (< 48-72 hours)
➢ Massive stress (severe trauma, surgery, cardiac shock, burns)
   • In absence of infection PCT levels trend down after inciting event
➢ Treatment with agents which stimulate cytokines
   • (OKT3, anti-lymphocyte globulins, alemtuzumab, IL-2, granulocyte transfusion)
➢ Malaria and some fungal infections
➢ Prolonged, severe cardiogenic shock or organ perfusion abnormalities
➢ Some forms of vasculitis
➢ Acute graft vs. host disease
➢ Paraneoplastic syndromes due to medullary thyroid and small cell lung cancer
➢ Significantly compromised renal function, especially ESRD/hemodialysis

Key Principles for PCT Interpretation

➢ Interpret in the clinical context of the patient Most Important
➢ Order on admission and recheck in 2-3 days
➢ Serial measurements are preferred and provide more useful information
   • Patients very early in the onset of infection may have a normal PCT
➢ Consider the dynamics of the disease.
   • Patients with severe trauma without infection should have PCT levels which steadily decline.
   • Patients with rising PCT suggested there is a lack of control of the infection
➢ Be aware of conditions which may affect PCT levels


Journal of Hospital Medicine 2013;8:61–67
❖ **CAP** Community-acquired pneumonia is defined as pneumonia not acquired in a hospital or a long-term care facility

❖ **HAP** is defined as pneumonia that occurs 48 hours or more after admission, which was not present at the time of admission

❖ **VAP** refers to pneumonia that arises more than 48–72 hours after endotracheal intubation

❖ The new guidelines have removed the entity previously known as health care–associated pneumonia (HCAP), as these patients are not necessarily at high risk for resistant organisms, and most will present with their illness directly from the community

➢ **The most common CAP pathogens are:**
  - Strep pneumoniae (Pneumococcus) 25%
  - Respiratory viruses 10%
  - Mycoplasma pneumoniae 6%
  - Hemophiles’ influenzae 5%
  - Chlamydomphilae pneumoniae 3%
  - Legionella pneumophila 3%
  - Moraxella catarrhalis
  - Unknown 37%

➢ **Common pathogens in HAP and VAP**
  - Gram negative rods
    - Pseudomonas, Stenotrophomonas, Acinetobacter
  - Staph (MSSA, MRSA)
  - More likely to be multidrug resistant

➢ **Pathogens for pneumonia previous called HCAP (CAP-DRP)**
  - Same as for CAP
  - Drug Resistant pathogens
    - * Calculate DRP risk ---------- one calculating tool is the Shindo Score
    - * Also take into consideration the Mortality Risk

<table>
<thead>
<tr>
<th>Shindo Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Hospitalization within 90 days</td>
</tr>
<tr>
<td>● Antibiotic use within 90 days</td>
</tr>
<tr>
<td>● PPI use</td>
</tr>
<tr>
<td>● Tube feeding</td>
</tr>
<tr>
<td>● Poor functional status</td>
</tr>
</tbody>
</table>

3 or more risk factors = increased risk for DRPs
2 + PLUS HD, HF, or Hx of MRSA = increased risk for MRSA

* Shindo et al., 2013

*Adapted from Pneumonia Guidelines and Evidence-based Best Practice presented by Joanna M. Bonsall MD PhD SFHM during HM18 Annual Meeting in Orlando 4/2018*
**Steroids for CAP**

- Meta-analysis, 13 randomized, placebo-controlled trials (>2000 hospitalized CAP patients)
  - Systemic steroids (prednisone 20–60 mg daily)
  - Lower in-hospital mortality (5.3% vs. 7.9%; NNT: 38)
  - Lower ARDS (0.4% vs. 3.0%; NNT: 38)
  - Lower mechanical ventilation (3.1% vs. 5.7%; NNT: 38)
  - Shorter length of stay by 1.0 day
  - Pts with severe pneumonia had mortality benefit (7.4% vs. 22.0%; NNT: 7)
  - Hyperglycemia more common in the corticosteroid group.

**Calculate pneumonia severity**

- **PSI (Pneumonia Severity Index / PORT Score)** complex, 20 variables.
  - Online calculator
  - Pts assigned to Risk class depending of core
    - Risk Class I-III – Low Risk
    - Risk Class IV – moderate Risk
    - Risk Class V – High Risk

- **CURB65**
  - Easier to use
  - Both PSI & CURB65 have been validated, PSI better at Identifying low risk patients

**CURB65**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confusion</td>
<td>1</td>
</tr>
<tr>
<td>BUN</td>
<td>1</td>
</tr>
<tr>
<td>Tachypnea &gt; 30/min</td>
<td>1</td>
</tr>
<tr>
<td>SBP &lt; 90 or DBP &lt; 60</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt; 65</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk of Death</th>
<th>Clinical Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.6%</td>
<td>Consider home care</td>
</tr>
<tr>
<td>1</td>
<td>2.7%</td>
<td>Consider Home care</td>
</tr>
<tr>
<td>2</td>
<td>6.8%</td>
<td>Hospitalization or Home care w/ close follow up</td>
</tr>
<tr>
<td>3</td>
<td>14.0%</td>
<td>Hospitalization</td>
</tr>
<tr>
<td>4-5</td>
<td>27.8%</td>
<td>Hospitalize, consider ICU</td>
</tr>
</tbody>
</table>

*Other Factors to Consider for inpatient vs outpatient treatment*

- Home care not available
- Compliance
- Mental impairment or disability
- PO2 less than 90%
- Co-existing illness (COPD, CHF, etc)
- Aspiration pneumonia likely
- Alcoholism
- Immunosuppression
❖ **Obtain noninvasive respiratory samples for gram stain and cultures**

❖ **Antibiotics**
- Antibiotic therapy should be **started w/in 4-8 hrs** after presentation to ED

  for **Antibiotic selection click here**

- **Duration** of antibiotic therapy
  - CAP - 5 days
  - HAP – 7 days
- Switch to PO once improving and tolerating PO well

➢ **If severe pneumonia or not responding to treatment order**
  - Mycoplasma IgG, IgM
  - Urine Legionella
  - Urine Strep Pneumo
  - Influenza nasal swab
  - In Winter Park Hospital you can order a respiratory PCR panel (includes common respiratory viruses)
  - **Consider CT of chest**
  - **Adjust antibiotic therapy add MRSA/DRP coverage**

➢ Consider use of ultrasound therapy in patients with equivocal X-rays

❖ **Criteria for hospital discharge**
- Improved or improving symptoms (cough, sputum, dyspnea, pain)
- Resolution of fever ( < 100.4 °F for at least 16 hrs.)
- Improving leukocytosis
- Negative blood cultures
- Intact gastrointestinal absorption
- Oxygen saturation greater than or equal to 90%
- Stable comorbid conditions
- Adequate care of social needs

*Adapted from Lecture given by Carlos F Dumois MD at Centre for Family Medicine April 2011-updated 2018*
ANTIBIOTICS for PNEUMONIA

❖ CAP – nonICU

- Ceftriaxone 2 grams q day IV plus Azithromycin 500 mg q day IV
- Levofloxacin 750mg q day IV
  and
- Oseltamivir 75mg BID in the appropriate season
- *Doxycycline100 mg every 12 hrs PO
  *Study by Mokabberi showed that Doxycycline was as effective as Levofloxacin but it was a small study (65 pts) and IDSA/ATS guidelines recommend doxycycline only for outpatients


❖ HAP / VAP, or CAP in ICU

- Cover Pseudomonas and MSSA
  - piperacillin-tazobactam, cefepime, levofloxacin, imipenem, or meropenem
- MRSA coverage in appropriate patients
  - Vancomycin Linezolid
- Pseudomonas double coverage in appropriate patients
  - Optimal combinations include meropenem or doripenem plus either levofloxacin or aztreonam

* MRSA & Pseudomonas in HAP/VAP

- MRSA coverage if:
  - IV abx in 90 days
  - >20% S aureus is MRSA (or resistance ?)
  - High risk mortality (resp failure, septic shock)
- If not at risk for MRSA cover for MSSA
- Double cover Pseudomonas if:
  - High mortality (>25%) (resp failure, septic shock)
  - Prior IV abx in 90 days
  - Structural lung disease
Pneumococcal vaccination in adults
2014 Guidelines

Pneumococcal vaccine naïve persons aged ≥ 65 years

PCV 13 at age, ≥ 65 years → PPSV 23
6-12 months

Persons who previously received PPSV 23 at age ≥ 65 years

PPSV 23 received at age ≥ 65 years → PCV 13
≥ 1 years

Persons who previously received PPSV 23 before age ≤ 65 years
who are now aged ≥ 65 years

PPSV 23 received at age ≤ 65 years → PCV 13 at age ≥ 65 years → PPSV 23
>1 years
6-12 months
>5 Years

2014 Advisory Committee on Immunization Practices

Provided by Dr Pedersen Dec 2014
Fleischner Society Recommendations For Follow-Up of Small Lung Nodules Detected Incidentally on CT (Patients ≥ 35 Years Of Age)

<table>
<thead>
<tr>
<th>Nodule Size</th>
<th>Low-Risk Patient</th>
<th>High-Risk Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4 mm</td>
<td>• No follow-up needed</td>
<td>• CT at 12 months • If stable, no further follow-up</td>
</tr>
<tr>
<td>&gt; 4 &lt; 6 mm</td>
<td>• CT at 12 months • If stable, no further follow-up</td>
<td>• Initial CT at 6-12 months • If stable, repeat CT at 18-24 months</td>
</tr>
<tr>
<td>&gt; 6 &lt; 8 mm</td>
<td>• Initial CT at 6-12 months • If stable, repeat CT at 18-24 months</td>
<td>• Initial CT at 3-6 months • If stable, repeat CT at 9-12 months and 24 months</td>
</tr>
<tr>
<td>&gt; 8 mm</td>
<td>• CT at 3, 9, and 24 months • Consider PET or biopsy</td>
<td>• CT at 3, 9, and 24 months • Consider PET or biopsy</td>
</tr>
</tbody>
</table>

**Low Risk** = minimal or absent history of smoking or other known risk factors.  
**High Risk** = history of smoking or other known risk factors.  
Known risk factors: history of lung cancer in first-degree relative; exposure to asbestos, radon, or uranium.

❖ Nonsolid, partially solid, or ground-glass nodules may require longer follow-up to exclude indolent adenocarcinoma

❖ Guidelines do **NOT** apply to the following groups:  
• Known or suspected cancer outside of the lungs  
• Patients younger than 35 years of age  
• Patients with unexplained fever


*Provided by Jaime Gober, MD senior on FMI rotation Oct 2013*
Increased dyspnea, often accompanied by increased cough, sputum production, sputum purulence, wheezing, chest tightness, or other symptoms (and signs) of acutely worsened respiratory status, in the absence of an alternative explanation.

Respiratory infections (viral and bacterial) and air pollution trigger most exacerbations.

**Quick Guide**

| Steroids       | Prednisone 40 mg PO x 5-14 days PO  
|                | Methylprednisolone 60 mg IV, 1-4 x daily switch to PO when pt able to tolerate  
|                | Severe pt may use  
|                | Methylprednisolone 125 mg IV q 6 hrs x 3 d  
|                | Prednisone 60 mg daily x 4 days  
|                | Prednisone 40 mg daily x 4 days  
|                | Prednisone 20 mg daily x 4 days  
|                | Prednisone 60 mg daily x 4 days  
| SABA SAMA      | Albuterol 2.5mg/3ml q 1-4 hrs, PRN  
|                | Ipratropium 500 mcg q 4 hrs, PRN  
| Antibiotics    | Augmentin 875 mg BID  
|                | Doxycycline 100 mg BID  
|                | Azithromycin 250 mg daily  
|                | Avelox 400 mg daily  
| Oxygen         | Target O2 sat 88-92%  
|                | By Venturi-mask, NC, or non-rebreather  
|                | Monitor for CO2 retention  
| Noninvasive ventilation | Titrate PaO2 to .60mm Hg or SaO2 >90% w care not to hyperventilate and reduce pCO2 significantly below patients baseline  
|                | BIPAP  
| Endotracheal intubation |  

GOLD 2013  
By Nebulizer
Differential diagnosis

- Pneumothorax
- Pneumonia
- Pleural effusion
- Congestive heart failure
- Cardiac ischemia
- Pulmonary embolism

Assessment

- ABG’s: $\text{PaO}_2 < 60 \text{ mmHg (8.0 kPa)}$ with or without $\text{PaCO}_2 > 50 \text{ mmHg (6.7 kPa)}$ on room air indicates respiratory failure.
- Chest x-ray: useful to exclude other diagnoses.
- ECG: may aid in the diagnosis of coexisting cardiac problems.
- CBC: identify polycythemia, anemia or bleeding.
- CMP: electrolyte abnormalities, diabetes, poor nutrition.
- Spirometry: not recommended during an exacerbation

Indications for Hospital Assessment or Admission:

- Marked increase in symptom intensity (new onset dyspnea at rest)
- Severe underlying COPD
- Onset of new signs (cyanosis, peripheral edema)
- Lack of response to initial medical management
- Presence of comorbidities (heart failure or newly occurring arrhythmias)
- Frequent exacerbations
- Older age
- Inadequate home support

Indications for ICU Admission

- Severe dyspnea unresponsive to initial treatment
- Changes in mental status (confusion, lethargy, coma)
- Persistent or worsening respiratory status with any of the following
  - Hypoxemia $[\text{pao2}] < 40 \text{ mm hg (5.3 kPa)}$
  - Hypercapnia $[\text{paco2 }] > 60 \text{ mm hg (8 kPa)}$
  - Respiratory acidosis $\text{ph} < 7.25$

Despite supplemental oxygen and noninvasive ventilation

- Need for invasive mechanical ventilation
- Hemodynamic instability—need for vasopressors
Treatment

Pharmacologic Treatment

The ABCs of COPD exacerbations. **A** = Antibiotics, **B** = Bronchodilators, **C** = Corticosteroids

• Antibiotics
  - Controversial but there is evidence supporting use of antibiotics if patients have signs of bacterial infection (increase sputum purulence)
  - Systematic review of placebo-controlled studies has shown that antibiotics
    - Reduce the risk of short-term mortality by 77%
    - Reduce treatment failure by 53%
    - Reduce sputum purulence by 44%
  - Antibiotics should be given to patients with exacerbations of COPD who have
    - Three cardinal symptoms – increase in dyspnea, sputum volume, and sputum purulence (Evidence B)
    - Have two cardinal symptoms, if increased purulence of sputum is one of the two symptoms (Evidence C)
    - Require mechanical ventilation (invasive or noninvasive) (Evidence B)
  - Length of treatment: usually 5-10 days (Evidence D)
  - Empiric treatment: **Augmentin**, **macrolide** or **tetracycline**
  - Patients with frequent exacerbations, severe airflow limitation and/or exacerbations requiring mechanical ventilation, cultures from sputum or other materials from the lung should be performed. Consider a **Quinalone** as gram-negative bacteria (**Pseudomonas** species) or resistant pathogens may be present
  - Oral route preferred but depends on the ability of the patient

• Bronchodilators
  - Short-acting Beta₂-agonists (SABA) w/wo short-acting anticholinergics (SAMA) are the preferred bronchodilators (Evidence C)
  - No differences in FEV₁ between metered-dose inhalers (w/wo spacer) and nebulizers.
    - For sicker patients nebulizer may be more convenient
  - Intravenous methylxanthines (theophylline or aminophylline) are second-line therapy, used in cases when there is insufficient response to short-acting bronchodilators (Evidence B)

• Corticosteroids
  - Shorten recovery time
  - Improve lung function (Fev₁)
  - Improve arterial hypoxemia (pao₂)
  - Reduce the risk of early relapse
  - Reduce treatment failure
  - Reduce length of hospital stay
  - (Evidence A)
- Oral route preferred but depends on the ability of the patient
  - Nebulized budesonide may be an alternative (although more expensive)
- Dose of 30-40 mg prednisone per day for 10-14 days is recommended (Evidence D).
  - Study compared 5 days vs 14 of 40 mg prednisone and showed no difference

- Supplemental oxygen
  - Target oxygen saturation of 88% to 92%
  - NC limit up to 6 l, Venturi mask can adjust FiO2
- Noninvasive ventilation

<table>
<thead>
<tr>
<th>Indications</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate-to-severe dyspnea with evidence of increased work of breathing</td>
<td>Respiratory arrest</td>
</tr>
<tr>
<td>Acute respiratory acidosis with pH ≤7.35 and/or PaCO$_2$ &gt;45 mm Hg (6.0 kPa)</td>
<td>Hemodynamic instability</td>
</tr>
<tr>
<td>Respiratory rate &gt;25</td>
<td>Altered mental status, inability to cooperate</td>
</tr>
<tr>
<td>Acute respiratory acidosis with pH &lt;7.25 and/or PaCO$_2$ &gt;60 mm Hg (8.0 kPa)</td>
<td>High risk of aspiration</td>
</tr>
<tr>
<td>PaO$_2$ &lt;40 mm Hg (5.3 kPa)</td>
<td>Viscous or copious secretions</td>
</tr>
<tr>
<td>Respiratory rate &gt;35</td>
<td>Recent facial or gastroesophageal surgery</td>
</tr>
<tr>
<td>Coexisting conditions such as cardiovascular disease, metabolic abnormalities, sepsis, pneumonia, pulmonary embolism, pneumothorax, large pleural effusion</td>
<td>Craniofacial trauma</td>
</tr>
<tr>
<td>Fixed nasopharyngeal abnormalities</td>
<td>Burns</td>
</tr>
<tr>
<td>Extreme obesity</td>
<td></td>
</tr>
</tbody>
</table>

- Endotracheal intubation
  - Failure to improve with or not a candidate for noninvasive ventilation (see
  - Severe dyspnea with evidence of increased work of breathing
  - Acute respiratory acidosis with pH <7.25 and/or PaCO$_2$ >60 mm Hg (8.0 kPa)
  - PaO$_2$ <40 mm Hg (5.3 kPa)
  - Respiratory rate >35
  - Coexisting conditions such as cardiovascular disease, metabolic abnormalities, sepsis, pneumonia, pulmonary embolism, pneumothorax, large pleural effusion

- Discharge Criteria
  - Need for inhaled bronchodilators less frequently than every 4 hours
  - Clinical and ABG stability for at least 12 to 24 hours
  - Ability to eat, sleep, and ambulate fairly comfortably
  - Adequate patient understanding of home therapy; and adequate home arrangements.
  - Prior to discharge from the hospital, chronic therapy issues should be readdressed
Toxicology / Pain Management / Joint

Topics

*Click on topics below to go directly to that page

- Acetaminophen Overdose
- Alcohol withdraw
- CIWA Protocol
- Gout
- Nicotine addiction
- NSAIDs
- Pain Management
- Prescribing Opiates on DC
- Pain Management in Cirrhosis
- PCA Pump
- PCA Dosing
- Richmond Agitation Sedation Scale (RASS)
- Urine Drug Screen

For a poison emergency in the U.S. call 1-800-222-1222

Poison Control Center

All ways check E FORCSE prior to prescribing any controlled substance. Also check E FORCSE on patients coming in with positive UDS and/or on chronic pain medications

https://florida.pmpaware.net/login

Link to Tools or smoking cessation http://toolsforsmokingcessation.webs.com/
Max dose of Acetaminophen: 3,000 mg daily
Acetaminophen Level should be drawn 4 hrs after ingestion. If extended release Acetaminophen taken redraw at 8 hrs post ingestion
Also check LFTs
Acetaminophen Toxicity Nomogram
➢ **N-Acetylcysteine (NAC) dosing**

- **PO**
  - Loading dose is 140mg/kg PO, then 17 more doses every 4 hours of 70mg/kg PO. If patient vomits within 1 hour of dose, it must be repeated.

- **IV**
  - **Patients >40 kg:**
    - Loading Dose: 150 mg/kg in 200 mL of diluent administered over 60 min
    - Dose 2: 50 mg/kg in 500 mL of diluent administered over 4 hr
    - Dose 3: 100 mg/kg in 1000 mL of diluent administered over 16 hr

  - **Patients >20 - <40kg**
    - Loading Dose: 150 mg/kg in 100 mL of diluent administered over 60 min
    - Dose 2: 50 mg/kg in 250 mL of diluent administered over 4 hr
    - Dose 3: 100 mg/kg in 500 mL of diluent administered over 16 hr

  - **Patients <20kg**
    - Loading Dose: 150 mg/kg in 3 mL/kg of body weight of diluent administered over 60 min
    - Dose 2: 50 mg/kg in 7 mL/kg of body weight of diluent administered over 4 hr
    - Dose 3: 100 mg/kg in 14 mL/kg of body weight of diluent administered over 16 hr

---

**ALCOHOL WITHDRAW**

➢ **Within 6 to 36 hrs:** Tremor Nausea/vomiting Diaphoresis Anxiety, Elevated BP, HR, Abdominal cramps and Headaches, Perceptual disturbance

➢ **Within 6 to 48 hrs** Generalized tonic-clonic seizures usually single

➢ **Within 12-48 hrs** *Alcoholic hallucinosis* Tactile > visual > auditory hallucination

➢ **48hrs – 7 days** Delirium tremens: autonomic hyperarousal, disorientation, hallucinations, tremors

➢ **Wernicke-Korsakoff Syndrome** caused by thiamine deficiency
  
The classic triad of **Wernicke’s encephalopathy:**
  
  - **Encephalopathy** (disorientation, indifference, inattentiveness)
  - **Oculomotor dysfunction** (nystagmus, lateral rectus gaze palsy & conjugate gaze palsy)
  - **Gait ataxia** (wide based gait and slow-short spaced steps)
Plan:

- **IVF:** If dehydration NS, add D5 if patient is NPO but give thiamine first
  - If euvolemic, D5 ½ NS at maintenance rate until adequate POs.
- **Meds:** Thiamine 100 mg IV x 3d then po qd
  - Folate 1 mg po qd, Multivitamin 1 tab po qd.

**CIWA Clinical Institute Withdrawal Assessment**

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agitation</td>
<td>0 – 7</td>
<td>Nausea/Vomiting</td>
<td>0 – 7</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0 – 7</td>
<td>Paroxysmal Sweats</td>
<td>0 – 7</td>
</tr>
<tr>
<td>Auditory Disturbances</td>
<td>0 – 7</td>
<td>Tactile Disturbances</td>
<td>0 – 7</td>
</tr>
<tr>
<td>Clouding of Sensorium</td>
<td>0 – 4</td>
<td>Tremor</td>
<td>0 – 7</td>
</tr>
<tr>
<td>Headache</td>
<td>0 – 7</td>
<td>Visual Disturbances</td>
<td>0 – 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Minimal to Mild Withdrawal</th>
<th>Moderate Withdrawal</th>
<th>Severe Withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8 – 10</td>
<td>No medication is required</td>
<td>• Lorazepam 2 mg PO/IM</td>
<td>• Lorazepam 2 mg PO/IM q 1 hr until pt has a CIWA of &lt; 15 or DBP &lt; 110 mmHg</td>
</tr>
<tr>
<td>10 to 15</td>
<td>• Vital signs q 2 hours</td>
<td>• CIWA q 4 hours</td>
<td>• When CIWA is b/n 8-15, give Lorazepam 2 mg PO/IM and resume vital signs q 2 hrs and the CIWA q 4 hrs</td>
</tr>
<tr>
<td>&gt; 15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If CIWA is < 8 for 3 consecutive increments, d/c CIWA protocol

### NICOTINE REPLACEMENT

#### Absolute Contraindications
- MI, 4 weeks or less post MI
- Serious arrhythmias (SVT, atrial fibrillation with RVR)
- Unstable angina
- Pregnancy

#### Relative Contraindications
- Vasospastic disease
- Severe renal dysfunction
- Uncontrolled hypertension
- Pheochromocytoma
- Hyperthyroidism
- Peptic ulcer disease
- Coronary Artery Disease
- Psoriasis, atopic dermatitis, eczema (patch only)

#### Nicotine Replacement Therapy (NRT):

<table>
<thead>
<tr>
<th>Patch Dosing</th>
<th>Cigarette Smoking 1 pack = 20 cigarettes</th>
<th>Smokeless Tobacco cases per week</th>
<th>Pipe/Cigar</th>
</tr>
</thead>
<tbody>
<tr>
<td>14mg</td>
<td>&lt; ½ ppd</td>
<td>&lt; 2 cpw</td>
<td></td>
</tr>
<tr>
<td>21mg</td>
<td>1 ppd</td>
<td>2-3 cpw</td>
<td>Daily Use</td>
</tr>
<tr>
<td>35mg (14mg + 21mg)</td>
<td>1-2 ppd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42mg (21mg + 21mg)</td>
<td>&gt; 2 ppd</td>
<td>&gt;3 cpw</td>
<td></td>
</tr>
</tbody>
</table>

#### For acute symptoms of nicotine craving/withdrawal

- Patients with at least FOUR of the following symptoms within 24 hours:
  - Dysphoric or depressed mood
  - Insomnia
  - Irritability, frustration, or anger
  - Anxiety
  - Difficulty concentrating
  - Restlessness
  - Decreased heart rate
  - Increased appetite or weight gain

#### Use
- Nicotine gum 2 mg if patient smokes 1 pack per day or less – every hour as needed.
- Nicotine gum 4 mg if patient smokes greater than 1 pack per day – every hour as needed
- Lorazepam (Ativan) 0.5 – 1mg po IV every 4 hours as needed if unable to chew nicotine gum or symptoms are uncontrolled by nicotine gum. Max 3 mg per day for patients 65 years of age or older
# RICHMOND AGITATION SEDATION SCALE (RASS)

<table>
<thead>
<tr>
<th>Target RASS</th>
<th>RASS Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 4</td>
<td>Combative, violent, danger to staff</td>
</tr>
<tr>
<td>+ 3</td>
<td>Pulls or removes tube(s) or catheters; aggressive</td>
</tr>
<tr>
<td>+ 2</td>
<td>Frequent nonpurposeful movement, fights ventilator</td>
</tr>
<tr>
<td>+ 1</td>
<td>Anxious, apprehensive, but not aggressive</td>
</tr>
<tr>
<td>0</td>
<td>Alert and calm</td>
</tr>
<tr>
<td>- 1</td>
<td>Awakens to voice (eye opening/contact) &gt;10 sec</td>
</tr>
<tr>
<td>- 2</td>
<td>Light sedation, briefly awakens to voice (eye opening/contact) &lt;10 sec</td>
</tr>
<tr>
<td>- 3</td>
<td>Moderate sedation, movement or eye opening. No eye contact</td>
</tr>
<tr>
<td>- 4</td>
<td>Deep sedation, no response to voice, but movement or eye opening to physical stimulation</td>
</tr>
<tr>
<td>- 5</td>
<td>Unarousable, no response to voice or physical stimulation</td>
</tr>
</tbody>
</table>


PAIN MANAGEMENT IN PATIENTS WITH CIRRHOSIS

- Acetaminophen at a dose of 2 to 3 grams a day
- Avoid NSAIDs
- Caution with opiates
- Suggested algorithm from Mayo Clinic Proceedings

![Diagram showing pain management strategies for visceral or musculoskeletal pain and neuropathic pain.]

Visceral or musculoskeletal:
- Acetaminophen 2-3 grams
- Tramadol 25mg q 8 hrs (no seizure hx)

For intractable pain, consider:
- Hydromorphone, 1 mg PO every 4 h
- Fentanyl, 12.5 μg topically every 72 h

Do not combine these agents with tramadol

Neuropathic:
- Nortriptyline, 10 mg orally at night
  or
- Desipramine, 10 mg orally at night or/and
- Gapapentin, 300 mg orally daily
  or
- Pregabalin, 150 mg orally twice daily
  and
- Acetaminophen, ≤2-3 g/d

## URINE DRUG SCREEN

### Duration of drugs in urine/hair/blood screening

<table>
<thead>
<tr>
<th>Substance</th>
<th>Urine</th>
<th>Hair</th>
<th>Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>10–12 hrs</td>
<td>up to yrs</td>
<td>12 hrs</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>1 to 2 days</td>
<td>up to 90 d</td>
<td>12 hrs</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>2 to 4 days</td>
<td>up to 90 d</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Barbiturates (except phenobarbital)</td>
<td>2 to 3 days</td>
<td>up to 90 d</td>
<td>1 to 2 d</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>7 to 14 days</td>
<td>up to 90 d</td>
<td>4 to 7 d</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Therapeutic use: 3 days. Chronic use (over one year): 4 to 6 weeks</td>
<td>up to 90 d</td>
<td>6 to 48 hrs</td>
</tr>
<tr>
<td>Cannabis</td>
<td>Single Use: 14 days Chronic Use: Up to 30 days</td>
<td>up to 90 d</td>
<td>2 d</td>
</tr>
<tr>
<td>Cocaine</td>
<td>2 to 4 days</td>
<td>up to 90 d</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Codeine</td>
<td>2 days</td>
<td>up to 90 d</td>
<td>12 hrs</td>
</tr>
<tr>
<td>Morphine</td>
<td>2 days</td>
<td>up to 90 d</td>
<td>6 hrs</td>
</tr>
<tr>
<td>Heroin</td>
<td>2 days</td>
<td>up to 90 d</td>
<td>6 hrs</td>
</tr>
<tr>
<td>LSD</td>
<td>2 to 24 hours</td>
<td>Up to 3 d</td>
<td>0 to 3 hrs</td>
</tr>
<tr>
<td>Methadone</td>
<td>3 days</td>
<td>Up to 30 d</td>
<td>24 hrs</td>
</tr>
<tr>
<td>PCP</td>
<td>14 days; up to 30 days in chronic users</td>
<td>up to 90 d</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Cotinine (nicotine)</td>
<td>2 to 4 days</td>
<td>up to 90 d</td>
<td>2 to 4 d</td>
</tr>
</tbody>
</table>

### False Positives

#### Drugs which Potentially Cause False Positive Readings on Screening Tests

<table>
<thead>
<tr>
<th>Drug or Class</th>
<th>Drugs which Potentially Cause False Positive Readings on Screening Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamines</td>
<td>Amantadine, chlorpromazine, desipramine, ephedrine, fluoxetine, labetolol, phentermine, phenylephrine, ranitidine, trazodone</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>Ibuprofen, naproxen</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Sertraline</td>
</tr>
<tr>
<td>Cannabinoids</td>
<td>Dronabinol, NSAIDs (ibuprofen, ketoprofen, naproxen, piroxicam, sulindac, tolmetin), promethazine, PPIs</td>
</tr>
<tr>
<td>Cocaine</td>
<td>Amoxicillin, coca leaf teas, tonic water</td>
</tr>
<tr>
<td>Methadone</td>
<td>Chlorpromazine, diphenhydramine, ibuprofen, verapamil</td>
</tr>
<tr>
<td>Opiates</td>
<td>Dextromethorphan, diphenhydramine, poppy seeds, rifampin, quinine</td>
</tr>
<tr>
<td>Phencyclidine</td>
<td>Dextroamphetamine, dextromethorphan, diphenhydramine, ibuprofen, imipramine, tramadol, venlafaxine</td>
</tr>
</tbody>
</table>
GOUT

❖ If you suspect gout, you may use the following validated scoring system.
❖ Always consider other causes e.g. Septic arthritis, pseudogout, etc.
❖ Joint aspirate is the gold standard for definitive diagnosis
❖ Validated Scoring System for gout

<table>
<thead>
<tr>
<th>Points</th>
<th>Male Sex</th>
<th>Previous patient-reported attack of joint pain or arthritis</th>
<th>Acute onset with maximum symptoms within 1 day</th>
<th>Joint redness/erythema</th>
<th>1st MTP joint involvement</th>
<th>Hypertension or &gt;1 Cardiovascular diseases*</th>
<th>Serum uric acid &gt;5.88 mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>0.5</td>
<td>1</td>
<td>2.5</td>
<td>1.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Hypertension or >1 Cardiovascular diseases*:
- Angina / MI
- CVA / TIA
- Heart Failure
- PVD

Score Interpretation

<table>
<thead>
<tr>
<th>Score</th>
<th>Prevalence of gout</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤4 points</td>
<td>2.2%</td>
<td>diagnosis other than gout</td>
</tr>
<tr>
<td>5 and 7 points</td>
<td>31.2%</td>
<td>joint aspiration or refer to a rheumatologist</td>
</tr>
<tr>
<td>≥8 points</td>
<td>80.4%</td>
<td>clinical diagnosis of gout</td>
</tr>
</tbody>
</table>

http://jamanetwork.com/journals/jamainternalmedicine/fullarticle/225738

❖ Treatment of Gout
❖ Acute flare (High-quality evidence showed that corticosteroids, NSAIDs, and colchicine are all effective treatments to reduce pain in patients with acute gout)
- Prednisone 30 to 40 mg once daily or in two divided doses until flare resolution begins, and then taper over 7 to 10 days
  - Corticosteroids should be considered as first-line therapy in patients without contraindications
- NSAIDs younger patients (less than 60 years old) with neither renal or cardiovascular comorbidities or active gastrointestinal disease
  - Naproxen 500 mg twice daily
  - Indomethacin 50 mg three times daily
  - Ibuprofen 800 mg three times daily
  - Diclofenac 50 mg twice daily
  - Meloxicam 15 mg daily
  - Celecoxib (200 mg twice daily)
Colchicine reserved for those with contraindications to Steroids or NSAIDs or those who have previously responded to colchicine treatment

- Initial dose of 1.2 mg, followed one hour later by another 0.6 mg, for a total dose on the first day of therapy of 1.8 mg, then 0.6 mg once or twice daily as tolerated until resolution of symptoms
- Alternative low-dose regimen: 0.6 mg three times on the first day then 0.6 mg once or twice daily as tolerated until resolution of symptoms
- Patients already receiving colchicine prophylaxis (0.6 mg once to twice daily) at the time of their flare. 1.8 mg is taken in place of the usual prophylactic dose on the first day of therapy then from day 2 until 48 hours after flare resolution, 0.6 mg twice daily (total 1.2 mg per day), then resume the prophylaxis dose.

PEARLs

- Start treatment as soon as possible, the earlier the treatment quicker resolution.
- Length of treatment: continue treatment for 2-3 days after complete resolution of the flare, for steroids a slow taper is recommended to lower the risk of a rebound flare.
- Urate lowering therapy (ULT)
  - No benefit to starting therapy during a flare
  - Patients on ULT at time of flare should be continued on ULT
  - Prophylaxis for Gout flare up when starting ULT: low doses of colchicine or NSAIDs. For at least 3-6 months.
    - colchicine 0.6 mg once to twice daily
    - Naproxen 250 mg twice daily
    - indomethacin 25 mg twice daily
  - Urate crystalizes at levels above 7. Some studies have shown less flare ups with levels under 6. But there is no defined target level
  - Duration of ULT: insufficient evidence regarding duration. Moderate- to high-quality evidence suggests that urate-lowering therapy reduces the risk for acute gout attacks after 1 year, but not within the first 6 months of treatment.
  - Urate lowering medications (most common used meds, not a complete list)
    - Xanthine oxidase inhibitors
      - Allopurinol 100 mg daily
      - Febuxostat starting dose 40 mg once daily
    - Uricosuric agents
      - Probenecid

*Management of Acute and Recurrent Gout: A Clinical Practice Guideline From the American College of Physicians. January 3 2017*
Nephrology / Urology

Topics

*Click on topics below to go directly to that page

- Abnormal Urine Color
- Acute Renal Failure
- Anion gap
- Chronic Renal disease
- Contrast Induced Nephropathy
- FENa
- Glomerular Filtration Rate (GFR)
- Hypercalcemia
- Hyperkalemia
- Hyponatremia
- IV Fluids
- Nephrolithiasis

- Oliguria is urine output < 500 mL in 24 h in an adult or < 0.5 mL/kg/h in an adult
IVF Intravenous Fluid Management

IVF management is more of an art than science.
Here is my quick and simple guide to IVF

➢ Ask yourself 3 questions before prescribing IV fluids:
  1. Does patient need IV fluid? Remember to evaluate patient daily for the ability to take PO
  2. Why does the patient need IVF? 4 R’s and a P
  3. What type of fluid and how much (rate)?

➢ Does patient need IV fluid? Assess the patient’s likely fluid and electrolyte needs from their history, physical examination and labs
  ■ History
    • Decreased or limited intake
    • Abnormal losses (vomiting, diarrhea, blood loss etc.)
    • Comorbidities (HF, CRF, etc.)
    • Pt NPO
  ■ Physical examination
    • Systolic BP <100mmhg;
    • Heart rate >90bpm;
    • Respiratory rate >20 breaths per min
    • Capillary refill >2s or
    • Presence of postural hypotension
    • Peripheries cold to touch
    • Pulmonary or peripheral edema
    • Urinary output minimal 30 – 50 ml/hr

❖ REMEMBER TO EVALUATE PATIENT DAILY FOR THE ABILITY TO TAKE PO, and ALLOW PATIENTS TO DRINK AS SOON AS POSSIBLE

❖ Daily Monitoring
  • Can pt drink and take PO
  • Daily Input/output balance, weight
  • BUN, Cr, electrolytes
  • Signs of hypervolemia (SOB, edema, JVP)
Why does the patient need IVF? 4 R’s and a P

- **Resuscitation** - The patient is hypovolemic as a result of dehydration, blood loss or sepsis and requires urgent correction of intravascular depletion to correct the deficit
- **Replacement** for Hypovolemic with or without electrolyte abnormalities
  - "Pre-shock" (downtrends in blood pressure or urine output, increasing tachycardia)
  - Maintenance plus ongoing fluid loss
- **Maintenance (Regular) fluid only** – patient is NPO or poor PO intake and does not have excess losses above insensible loss. Normal adult daily Input/output is 1600 ml/day. On avg Pt’s need approximately 2400 ml/day
- **Rehydration** – Special conditions with hypovolemic with or without electrolyte abnormalities
  - Diabetic ketoacidosis
  - Rhabdomyolysis
  - Pancreatitis
- **Prevention** – The patient is scheduled to receive IV contrast and is at risk of Contrast induced ARF

What type of fluid and how much (rate)

<table>
<thead>
<tr>
<th>Type of Fluid</th>
<th>How Much</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resuscitation</strong></td>
<td></td>
</tr>
<tr>
<td>Normal Saline</td>
<td>1. Give a fluid bolus of <strong>500 ml/15 min</strong> of crystalloid</td>
</tr>
<tr>
<td>Lactated Ringers (for Pancreatitis, Trauma)</td>
<td>2. Re-asses if IVF still needed rebolus</td>
</tr>
<tr>
<td></td>
<td>3. 1-2 liter rapid (20ml/kg /15-20 min)</td>
</tr>
<tr>
<td><strong>Replacement</strong></td>
<td>Estimate deficits and add to daily maintenance requirements</td>
</tr>
<tr>
<td>NS w KCl for upper GI or bile loss.</td>
<td>urine output 50ml/h</td>
</tr>
<tr>
<td>½ NS (if no Hyponatremia)</td>
<td>insensible losses = 30ml/h</td>
</tr>
<tr>
<td>D5 ½NS +/- KCL/L (if not diabetic or hyponatremic)</td>
<td>additional loss such as GI, high fever (additional 100ml/day for each degree of temp &gt;37C, etc)</td>
</tr>
<tr>
<td></td>
<td>❖ Quick tip 50 – 100 ml/hr over maintenance rate depending on clinical picture</td>
</tr>
<tr>
<td>Maintenance (Regular)</td>
<td>D5 ½NS w 20mEq KCL/L (Most Common) D5 added to limit starvation ketosis</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rehydration DKA (usually have a 3-5 L deficit)</td>
<td>NS</td>
</tr>
<tr>
<td>HHS (severely dehydrated, deficits of 10 liters or more)</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>Rhabdomyolysis</td>
<td>0.9 NS</td>
</tr>
<tr>
<td>Prevention Contrast induced Nephropathy</td>
<td>0.9 NS</td>
</tr>
</tbody>
</table>

*How to select optimal maintenance intravenous fluid therapy*
M.A.S. SHAFIEE1, D. BOHN2, E.J. HOORN2 and M.L HALPERIN1

*Intravenous fluid therapy in adults in hospital. NICE guideline Draft for consultation, May 2013*
Debate between crystalloids vs colloids for resuscitation

In conclusion, there is no evidence that colloidal fluids are any better than saline in resuscitation and in some situations, there is some evidence that human albumin may be harmful. For other colloidal fluids like succinylated gelatin (Gelofusine) or polygeline (Haemaccel), they contain foreign proteins and there is a small risk of anaphylaxis (while there is essentially none from saline). Saline obviously costs less than colloids as well.


GLOMERULAR FILTRATION RATE (GFR)

Cockcroft and Gault equation

Online calculator

\[
\text{CrCl} = \frac{[(140 - \text{age}) \times \text{IDW}]}{(\text{SCr} \times 72)} \times 0.85 \text{ if female}
\]

Estimate ideal body weight in (kg)
Males: IBW = 50 kg + 2.3 kg for each inch over 5 feet.
Females: IBW = 45.5 kg + 2.3 kg for each inch over 5 ft

(MDRD) Modification of Diet in Renal Disease equation

- Should be used only for patients with stable creatinine concentrations.
- Do not use in pts w/ acute renal failure

Online calculator

\[
\text{GFR} = 175 \times (\text{Scr})^{-1.154} \times (\text{Age})^{-0.203} \times (0.742 \text{ if female}) \times (1.212 \text{ if AA})
\]

*The equation does not require weight because the results are reported normalized to 1.73 m² body surface area, which is an accepted average adult surface area.
ACUTE RENAL FAILURE

- Increase in serum creatinine level of 0.5 mg/dL
- 50% increase in creatinine level above baseline value
- 50% decrease in baseline glomerular filtration rate (GFR)

Definitions

- **Anuria**: Less than 50 mL of urine output in 24 hours. Acute obstruction, cortical necrosis, and vascular catastrophes such as aortic dissection should be considered in the differential diagnosis.

- **Oliguria**: Less than 400 mL of urine output in 24 hours. Physiologically, it is the lowest amount of urine a person on a normal diet can make if he or she is severely dehydrated and does not retain uremic waste products. Oliguria is a poor prognostic sign in acute renal failure (ARF). Patients with oliguric renal failure have higher mortality rates and less renal recovery than do patients who are nonoliguric.

- **Uremia**: Nonspecific symptoms of fatigue, weakness, nausea and early morning vomiting, itchiness, confusion, pericarditis, and coma attributed to the retention of waste products in renal failure but do not always correlate with the BUN level. A highly malnourished patient with renal failure may have a modestly elevated BUN and be uremic. Another patient may have a highly elevated BUN and be asymptomatic.

- **Azotemia**: Elevated BUN without symptoms.

Work up

- **Not on diuretic** Work up: Renal US, Microscopic Ua, Serum and Urine Cr and Na (calculate FENa)

- **On Diuretic** Work up: Renal US, Microscopic Ua, Serum and Urine Cr and urea (calculate FEUrea)

- **FENa**: less than 1% in oliguric patients may indicate prerenal azotemia. Values greater than 3% may be consistent with acute tubular necrosis (ATN)

\[
\text{FENa}\% = \frac{\text{UNa} \times \text{PCr}}{\text{PNa} \times \text{UCr}} \times 100
\]

FENa online calculator
**FEUrea**: The FEUrea will be less than 35% in prerenal azotemia and greater than 50% in ATN. **FEUrea not helpful in Sepsis**

\[
\text{Urea} \times \text{PCr}
\]

\[
\text{FEUrea}\% = \frac{\text{Urea}}{\text{UCr}} \times 100
\]

<table>
<thead>
<tr>
<th>Pre-renal</th>
<th>Intra-renal</th>
<th>Post-renal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• BUN to Cr ratio &gt;20:1</td>
<td>• BUN to Cr ratio 10:1 to 20:1</td>
<td>• Renal US shows hydronephrosis</td>
</tr>
<tr>
<td>• FENa &lt; 1%</td>
<td>• FENa: &gt; 1%</td>
<td>• Serum and Urine tests have similar results to intra-renal causes</td>
</tr>
<tr>
<td>• FEUrea &lt; 35%</td>
<td>• UA specific gravity 1.010 to 1.020</td>
<td></td>
</tr>
<tr>
<td>• UA specific gravity &gt; 1.020</td>
<td>• Tubular or granular casts in UA</td>
<td></td>
</tr>
<tr>
<td>• Hyaline cast in Ua sediment</td>
<td>• Renal US shows medical kidney Ds or normal</td>
<td></td>
</tr>
<tr>
<td>• No obstruction</td>
<td>• No obstruction</td>
<td></td>
</tr>
<tr>
<td>• No intrarenal causes of ARF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PLAN**

- Hydrate
- Eliminate toxins
- Treat causes

**PLAN**

- CBC, Sed Rate
- Nephrology consult
- Eliminate Toxins
- Treat causes

**Table 1: Urine studies to order and interpret in four common clinical scenarios**

<table>
<thead>
<tr>
<th>Clinical Scenario</th>
<th>Order:</th>
<th>Calculate:</th>
<th>Interpretation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Kidney Injury</td>
<td>Urine Sodium OR Urine Urea Urine Creatinine Serum Sodium OR Serum Urea Serum Creatinine</td>
<td>FENa: ( \frac{\text{Na}<em>{\text{urine}} \times \text{Cr}</em>{\text{serum}}}{\text{Na}<em>{\text{serum}} \times \text{Cr}</em>{\text{urine}}} ) OR FEUrea: ( \frac{\text{Urea}<em>{\text{urine}} \times \text{Cr}</em>{\text{serum}}}{\text{Urea}<em>{\text{serum}} \times \text{Cr}</em>{\text{urine}}} )</td>
<td>If FENa &lt;1%, consider pre-renal and other causes If FEUrea &lt;35%, consider pre-renal and other causes</td>
</tr>
<tr>
<td>Hyponatremia</td>
<td>Urine Sodium Urine Osmolality Serum Osmolality</td>
<td>Assess RAAS and ADH action</td>
<td>If ( \text{Na}<em>{\text{urine}} ) is low, RAAS is likely activated If ( \text{Osm}</em>{\text{urine}} ) is high, ADH is activated</td>
</tr>
<tr>
<td>Hypokalemia</td>
<td>Urine Potassium Urine Osmolality Serum Potassium Serum Osmolality</td>
<td>TTKG: ( \frac{\text{K}<em>{\text{urine}} \times \text{Osm}</em>{\text{serum}}}{\text{K}<em>{\text{serum}} \times \text{Osm}</em>{\text{urine}}} )</td>
<td>If TTKG is high, consider renal potassium losses</td>
</tr>
<tr>
<td>Normal anion gap metabolic acidosis</td>
<td>Urine Sodium Urine Potassium Urine Chloride</td>
<td>UAG: ( \text{Na}<em>{\text{urine}} + \text{K}</em>{\text{urine}} - \text{Cl}_{\text{urine}} )</td>
<td>If UAG is positive, consider renal causes of acidosis If UAG is negative, consider GI causes of acidosis</td>
</tr>
</tbody>
</table>
**CHRONIC KIDNEY DISEASE**

❖ **Diagnoses of CKD** requires examination of **two serum samples at least 90 days apart**. Historical values can be used.

➢ **Stages of Chronic Kidney Disease:**

• **By GFR**

<table>
<thead>
<tr>
<th>Stage</th>
<th>GFR Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>90+</td>
<td>Normal kidney function but urine findings or structural abnormalities or genetic trait point to kidney disease</td>
</tr>
<tr>
<td>G2</td>
<td>60-89</td>
<td>Mildly reduced kidney function, and other findings (as for stage 1) point to kidney disease</td>
</tr>
<tr>
<td>G3A</td>
<td>45-59</td>
<td>Moderately reduced kidney function</td>
</tr>
<tr>
<td>G3B</td>
<td>30-44</td>
<td>Moderately reduced kidney function</td>
</tr>
<tr>
<td>G4</td>
<td>15-29</td>
<td>Severely reduced kidney function</td>
</tr>
<tr>
<td>G5</td>
<td>&lt; 15 or on dialysis</td>
<td>Very severe, or endstage kidney failure (sometimes call established renal failure)</td>
</tr>
</tbody>
</table>


• **By Albumin**

<table>
<thead>
<tr>
<th>STAGE</th>
<th>Albumin to creatine ratio (mg/g)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>&lt; 30</td>
<td>Normal</td>
</tr>
<tr>
<td>A2</td>
<td>30 - 299</td>
<td>Moderately increased (microalbuminuria)</td>
</tr>
<tr>
<td>A3</td>
<td>≥ 300</td>
<td>Severely increased (macroalbuminuria)</td>
</tr>
<tr>
<td>A3</td>
<td>≥ 3000</td>
<td>Nephrotic Syndrome</td>
</tr>
</tbody>
</table>

Basic work-up for CKD
- Obtained detailed history (NSAID use/current medications, history dehydration, symptoms of urinary retention, systemic illness)
- Evaluate the chronicity of kidney disease (review old creatine results). Helps with DDx
- Calculate the patient’s eGFR
- Check Electrolytes and lipid panel
- Urinalysis with microscopy is the single most important non-invasive test for evaluating kidney disease
- Bilateral renal ultrasound
- Further work-up based on clinical situation

Lecture by David Koo, MD, given to Family Medicine Residents on May 2012

Nephrolithiasis

Probability of Passing a Stone

<table>
<thead>
<tr>
<th>Ureter Location</th>
<th>Size (mm)</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal Ureter</td>
<td>&gt;5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>&lt; 5</td>
<td>53</td>
</tr>
<tr>
<td>Middle Section Of Ureter</td>
<td>&gt;5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>&lt; 5</td>
<td>38</td>
</tr>
<tr>
<td>Distal Ureter</td>
<td>&gt;5</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>&lt; 5</td>
<td>74</td>
</tr>
</tbody>
</table>

Adapted from Am Fam Physician. 2001 Apr 1;63(7):1329-1339
Criteria for admission

- Fever and stone
- Bilateral stones or solitary kidney
- Emesis
- Requirement for IV narcotics
- Age extremes

Ureteral stones <5mm can be managed conservatively

- PO fluids to keep daily urine output above 2 liters a day
- PO pain medications
- Alpha-1-Blocker (Flomax)
- Weekly KUB
- Urology consult if fails to pass 2-4 weeks

Metabolic Stone Evaluation

- For recurrent stones, first event if requested by patient
- 24 hr urine for total volume, pH, calcium, oxalate, sodium, uric acid, citrate, phosphate, magnesium, sulfate, creatinine, quantitative cystine (optional)
- Serum calcium, phosphorus, uric acid, HCO3, BUN, creatinine, albumin, alkaline phosphate, intact PTH (optional), 1,25-di-OH-vitamin D2 (optional)
- Stone composition analysis

American Urological Association (AUA) guidelines for the medical management of kidney stones

Presented by Cliff Thomas MD during Lunch and Learn session 7-2015
ANION GAP = [Na⁺] - [Cl⁻] - [HCO₃⁻]

Reference range is 8 to 16 mmol/l  
On line Calculator

Increased anion gap acidosis (Mnemonic)

MUDPIES:
M: Methanol
U: Uremia
D: Diabetes
P: Paraldehyde
I: Idiopathic (Lactic Acidosis)
E: Ethylene Glycol
S: Salicylates

Provided by Dr. Needham

CONTRAST INDUCED NEPHROPATHY

- Increase in Cr of >25% above baseline or increase in Cr of >0.5mg/dl
- Onset: 24 to 48 hrs after exposure
- Duration: 5 to 7 days

Prevention

What Is patient at risk of developing CIN?

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ GFR &lt; 60 or ➢ 2 or more of below:</td>
<td>➢ No Risk factors ➢ GFR &gt;60</td>
</tr>
<tr>
<td>• Age &gt; 75</td>
<td></td>
</tr>
<tr>
<td>• DM</td>
<td></td>
</tr>
<tr>
<td>• Myeloma</td>
<td></td>
</tr>
<tr>
<td>• CHF (NYHA III/IV</td>
<td></td>
</tr>
<tr>
<td>• Dehydration</td>
<td></td>
</tr>
<tr>
<td>• Other Nephro-toxic drugs</td>
<td></td>
</tr>
</tbody>
</table>

PLAN for high risk:

• Discontinue nephro-toxic drugs
• Use low-osmolar contrast in the lowest dose possible
• IVF 0.9 NS; 1ml/kg per hr for 6-12 hrs before procedure and 6–12 hrs post procedure
• N-acetylcysteine 600 mg twice daily, 2 doses before procedure and 2 doses after procedure

PLAN for low risk:

• No Intervention is indicated

Provided by Dr. Needham
HYponatREMIA

Workup:

➢ **3 mandatory lab tests**
  - Serum Osmolality (nml = 275 to 290 mosmol/kg)
  - Urine Osmolality (> 100 mosmol/kg)
  - Urine Sodium Concentration

➢ **Identify Patients Volume Status**
  - **Hypovolemic**: decrease urine output, dry mucous membranes, sunken eyes
  - **Euvolemic**
  - **Hypervolemic**: Edema, past medical history, Jaundice (cirrhosis), SOB

<table>
<thead>
<tr>
<th>Factitious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary Osmolality (&gt;100 mosmol/kg)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypervolemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary Na &lt;20</td>
</tr>
<tr>
<td>Increased interstitial salt</td>
</tr>
<tr>
<td>Liver failure</td>
</tr>
<tr>
<td>Cirrhosis</td>
</tr>
<tr>
<td>Hepato-renal syndrome</td>
</tr>
<tr>
<td>CCF</td>
</tr>
<tr>
<td>Nephrotic syndrome</td>
</tr>
<tr>
<td>HF</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Urinary Na &gt;20</td>
</tr>
<tr>
<td>Renal failure</td>
</tr>
<tr>
<td>Cerebral salt wasting</td>
</tr>
<tr>
<td>Drugs</td>
</tr>
<tr>
<td>Steroids</td>
</tr>
<tr>
<td>Diuretics (early)</td>
</tr>
<tr>
<td>Hypertonic saline</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Euvolemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osmolality</td>
</tr>
<tr>
<td>Urine &lt; Serum</td>
</tr>
<tr>
<td>Water intoxication Intake related</td>
</tr>
<tr>
<td>Tea and toast diet</td>
</tr>
<tr>
<td>Beer diet</td>
</tr>
<tr>
<td>Psychogenic polydipsia</td>
</tr>
<tr>
<td>Water overload</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Osmolality</td>
</tr>
<tr>
<td>Urine &gt; Serum</td>
</tr>
<tr>
<td>SIADH</td>
</tr>
<tr>
<td>Cause</td>
</tr>
<tr>
<td>Drugs</td>
</tr>
<tr>
<td>CNS</td>
</tr>
<tr>
<td>Chest</td>
</tr>
<tr>
<td>Malignancy</td>
</tr>
<tr>
<td>Urine Na&gt;20, in the absence of hypovolemia ➔ hypothyroidism</td>
</tr>
</tbody>
</table>
### Hypovolemia

<table>
<thead>
<tr>
<th>Urinary Na &lt;20</th>
<th>Urinary Na &gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-renal</strong></td>
<td><strong>Renal:</strong> Na and water lost through kidneys</td>
</tr>
<tr>
<td>Na loss in excess of water</td>
<td>Kidney failure</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Addison’s</td>
</tr>
<tr>
<td>Sweat</td>
<td>Diuresis</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Renal failure</td>
</tr>
<tr>
<td>Burns</td>
<td>Osmotic diuresis</td>
</tr>
<tr>
<td>SBO</td>
<td>Diuretics (thiazides)</td>
</tr>
<tr>
<td>Cirrhosis</td>
<td></td>
</tr>
<tr>
<td>Heat exposure</td>
<td></td>
</tr>
</tbody>
</table>

### Reset Osmostat

Occurs in elderly and pregnancy, regulated sodium set point is lowered

### SIADH

**Causes:**
- CNS disease: tumor, infection, CVA, SAH, DTs
- Pulmonary disease: TB, pneumonia, positive pressure ventilation
- Cancer: Lung, pancreas, thymoma, ovary, lymphoma
- Drugs: NSAIDs, SSRIs, diuretics, TCAs
- Surgery: Postoperative

**Idiopathic:** most common

**Diagnostic Criteria:**
- Clinical Euvolemia
- Hypotonic Hyponatremia
- Normal hepatic, renal and cardiac function
- Normal thyroid and adrenal function
- Urine osmolality > 100 mOsm/kg (generally > 400-500 mOsm/kg in setting of low serum osmolality)
- Urine Na level > 20 mEq/L

---

#### Approach to Treatment

Treatment depends on:
- Is pt asymptomatic vs symptomatic
- Is Hyponatremia Acute (within 48 hrs) vs Chronic (>48 hrs)
Treatment (Steps)

1. Calculate Sodium deficit
   - Sodium deficit = Total body water x (desired Na – actual Na)
   - Total Body water (TBW)- Easy and quick way to calculate
     - Women (TBW) = 0.5 x body weight
     - Men = 0.6 x body weight

2. If symptomatic and acute
   - Bolus of 100 ml of 3% Hypertonic Saline generally raises serum sodium level by 2-3 mEq/L
   - Goals for correction:
     - Increase by no more than 10 - 12mEq/L in first 24 hrs
     - Increase by no more than 18 mEq/L in first 48 hrs

3. If symptomatic and chronic or of unknown duration, the serum sodium should be raised slowly (0.5 meq/L/hr)
   - Increase by no more than 10 - 12 mEq/L in first 24 hrs

4. If chronic and asymptomatic
   - Oral fluid restriction is the first step 500 - 1500 mL per day
   - NOTE: This only pertains to oral fluid, isotonic IV fluids do not count towards fluid intake
     - If dehydration start 0.9 NS

5. Estimate change in serum Na, based on the Na concentration in the IVF
   - Change in SNa = [(Na + K) in IVF – SNa] / (TBW + 1)

6. IV Fluids

<table>
<thead>
<tr>
<th></th>
<th>Lactated Ringers</th>
<th>0.9 NS</th>
<th>3% Hypertonic Na</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>130</td>
<td>154</td>
<td>514</td>
</tr>
<tr>
<td>Cl</td>
<td>109</td>
<td>154</td>
<td>514</td>
</tr>
<tr>
<td>K</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Example

77 yr old male acute mental status change, Na 114, Wt 100 kg

- Na deficit: 6 (to Na 120), 26 (to Na 140, TBW = .6 X 100  TBW= 60
- Rate: 2meg/L per hr x first 4 hrs
- Solution hypertonic sodium
- change in serum Na = 514 – 114 / 61 = 400 / 61 = 6.5

So 1 liter of hypertonic Na will increase SNa by 6.5 to 120.5
Starting 3% Normal saline

- **Indications**
  - Acute treatment of hyponatremia, Na < 115 if asymptomatic
  - Acute treatment of hyponatremia Na < 125 w/symptoms

- **Contraindications:**
  - Hypervolemic vascular status
  - Renal insufficiency with oliguria or dialysis dependant
  - Uncorrected hypokalemia
  - Metabolic acidosis

- **Orders** (at Florida Hospital use power order)
  1. Consult Nephrology for unknown etiology of hyponatremia. **I suggest that if you are starting 3% NS consult Nephrology**
  2. Order for Sodium Chloride 3% to replace ______ mEq of Sodium.
     - mEq of Na to Replace = [Desired Na − Actual Na] x [0.6* x TBW (kg)]
     - (*use 0.6 for males and 0.5 for females)
     - Generally desired Na for acute replacement is 125 mEq/L
     - non-acute is 140 mEq/L
  3. Rate
     - Sodium Chloride ______ mL/hr for ____ hours then at _____ mL/hr for ____ hr or until Serum Na ____ mEq/L or greater
     - Rate mL/hr over 24 hr = [mEq Na to replace / 512mEq] x 1000 / 24
     - Patients **without** neurologic compromise, correct serum Na level by half the amount needed to normal levels in 24 hours
     - For patients **with** neurological compromise the rate of change in Na levels should not exceed an increase faster than 1 mEq/L/hr* until neurological symptoms are controlled (usually 4 hours) then 0.5 mEq/L/hr OR 12 mEq/L of serum sodium in 24 hours.
       - * Some experts recommend 2-4 mEq/L per hour when seizures are present.
     - If rate 50mL/hr or greater admit to ICU for monitoring.
  4. **Minimum** serum sodium levels every 4 hr and neurological assessment every 4 hr. I would even recommend checking every 2 hrs
  5. Serum Osmolarity every ____ hr. Discontinue 3% Sodium Chloride if serum osmolarity greater than 310 mOsm/L.

Nursing orders

6. Administer IV solution via an automated infusion controlled device.
7. Flush with 0.9% NaCl before and after infusion
8. Administration via central line is preferred.
9. IF peripheral line is required follow these procedures:
   - Do not infuse below wrist or into small veins.
   - Use a large bore needle (18-20G) with adequate, verified blood return.
   - Observe for signs of pain, erythema, swelling or burning at site.
HYPERCALCEMIA

Calcium:

Normal: Total: 8-10 mg/dl  Ionized Calcium: 4-5.6 mg/dl
Hypercalcemia:
- Mild: Total: 10-12 mg/dl  Ionized Ca: 5.6-8 mg/dl
- Moderate: Total: 12-14 mg/dl  Ionized Ca: 8-10 mg/dl
- Hypercalcemic crises: 14-16 mg/dl  Ionized Ca: 10-12 mg/dl

Work Up

➢ Corrected Ca = (0.8 * (Normal Albumin - Pt's Albumin)) + Serum Ca

Online calculator

❖ Labs: Ionized Calcium

Intact PTH

➢ If PTH elevated
  • Measure Urine Ca / Cr Ratio
    ❖ High >0.03 Primary Hyperparathyroidism
    ❖ Low <0.01 Familial Hypercalcinuric Hypercalcemia

➢ If PTH low
  • Measure PTH-RP (related peptide) and Vit D levels
    ❖ Elevated PTH-RP: Consider Malignancy
      ✫ if neg measure TSH, Cortisol (other endocrinologies)
    ❖ Elevated 1, 25 dihydroxyvitamin D: CXR w/ consideration for lymphoma or sarcoidosis
    ❖ Elevated 25 dihydroxyvitamin D: Review medications
    ❖ Normal PTH-RP, and Vit D levels: Other causes
      ✫ TSH, SPEP, UPEP, Vit A
      ✫ Immobilization

Pharmacologic Options for the Treatment of Hypercalcemia

<table>
<thead>
<tr>
<th>Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal saline 2 to 4 L IV daily for 1 to 3 days</td>
</tr>
<tr>
<td>Furosemide (Lasix) 10 to 20 mg IV as necessary</td>
</tr>
<tr>
<td>Bisphosphonates:</td>
</tr>
<tr>
<td>Pamidronate (Aredia), 60 to 90 mg IV over 4 hours</td>
</tr>
<tr>
<td>Zoledronic acid (Zometa), 4 mg IV over 15 minutes</td>
</tr>
<tr>
<td>Calcitonin (Calcimar or Miacalcin) 4 to 8 IU per kg IM or SQ q 6 hrs for 24 hrs</td>
</tr>
<tr>
<td>Hydrocortisone, 200 mg IV daily for 3 days</td>
</tr>
</tbody>
</table>
## HYPERKALEMIA

### Potassium:
- Normal: 3.5 – 5.0 mEq/L
- Hyperkalemia:
  - Mild: 5.5-6.0 mEq/L
  - Moderate: 6.1-7.0 mEq/L
  - Severe: ≥ 7.0 mEq/L

### Management:

<table>
<thead>
<tr>
<th>K &lt; 6 mEq/L</th>
<th>&gt; 6.0 mEq/L No ECG Changes</th>
<th>&gt; 6.0 mEq/L ECG Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowering of total body potassium</td>
<td>Emergency K Reduction</td>
<td>Myocardium Stabilization</td>
</tr>
<tr>
<td><strong>Kayexalate</strong>&lt;br&gt;Dose: 50 grams&lt;br&gt;PO: Adm in 30 ml of sorbitol&lt;br&gt;Rectal: Enema activity faster than PO&lt;br&gt;Onset: Up to 4-6 hours</td>
<td><strong>Glucose and Insulin Infusion</strong>&lt;br&gt;Insulin R 10 units IV&lt;br&gt;Glucose 50% (D50W) 50 ml (25 grams)&lt;br&gt;Onset: 15-30 minutes,&lt;br&gt;Duration: 2-6 hours</td>
<td><strong>Calcium Gluconate 10%</strong>&lt;br&gt;Initial dose: 10 ml over 2-5 min&lt;br&gt;Second dose after 5 min if no response&lt;br&gt;❖ Further calcium ineffective unless Hypocalcemia&lt;br&gt;Works in minutes and lasts 30-60 min&lt;br&gt;EKG improvement within 3 minutes</td>
</tr>
<tr>
<td><strong>Furosemide</strong>&lt;br&gt;Dose: 20-40 mg IV&lt;br&gt;Normal saline if dehydrated&lt;br&gt;Onset: 15-60</td>
<td><strong>Nebulized Albuterol</strong>&lt;br&gt;5 mg/ml (typical neb is 2.5 mg/ml)&lt;br&gt;Onset: 15-30 minutes,&lt;br&gt;Duration: 2-3 hours</td>
<td>Plus</td>
</tr>
<tr>
<td><strong>Dialysis (last resort)</strong></td>
<td>Plus</td>
<td>Emergency K Reduction</td>
</tr>
<tr>
<td>Plus</td>
<td>Plus</td>
<td>Lowering of total body potassium</td>
</tr>
<tr>
<td>Plus</td>
<td></td>
<td>Lowering of total body potassium</td>
</tr>
</tbody>
</table>
ABNORMAL URINE COLOR

- Normal urine color ranges from pale yellow to deep amber.
- Caused by a pigment called urochrome and correlates with how diluted or concentrated the urine is.
- Abnormal urine color may indicate a range of normal or pathologic conditions.
- Variables that affect urine color include concentration, pH, ingested substances, and various metabolic abnormalities.
- Most causes can be determined by a careful history focusing on medications, foods, occupation, and family history. A few simple laboratory tests can confirm the diagnosis or narrow the list of possible causes.
- Differential diagnosis of abnormal urine color:

<table>
<thead>
<tr>
<th>Red urine</th>
<th>Medications</th>
<th>Rifampicin, Warfarin, Phenazopyridine (pyridium), Ibuprofen, Deferoxamine, Hydroxocobalamine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foods</td>
<td>beets, carrots, blackberries</td>
<td></td>
</tr>
<tr>
<td>Medical conditions</td>
<td>hematuria, Intravascular hemolysis: G6PD deficiency, Sickle cell anemia, Thalassemia, Transfusion reaction, Porphyria, Nut cracker syndrome, Nephrolithiasis, BPH, Urinary bladder malignancy</td>
<td></td>
</tr>
<tr>
<td>Other conditions</td>
<td>contamination (menstruation), factitious disorder</td>
<td></td>
</tr>
<tr>
<td>Orange urine</td>
<td>Medications</td>
<td>Rifampicin, Warfarin, Phenazopyridine (pyridium), Ibuprofen, Deferoxamine, Hydroxocobalamine, Isoniazid, Riboflavin.</td>
</tr>
<tr>
<td>Brown urine</td>
<td>Medications</td>
<td>Acetaminophen overdose, Metronidazole, Nitrofurantoin, Niridazole</td>
</tr>
<tr>
<td>Foods</td>
<td>Fava beans, Rhubarb</td>
<td></td>
</tr>
<tr>
<td>Medical conditions</td>
<td>Metastatic melanoma, Hemolytic anemia, Porphyria, Liver disease</td>
<td></td>
</tr>
<tr>
<td>Black urine</td>
<td>Medications</td>
<td>Metronidazole, Nitrofurantoin, Sorbitol, Cresol, Intramuscular iron, Cascara, Senna, L-dopa</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Medical conditions</td>
<td>Alkaptonuria, Metastatic melanoma, Porphyria, Liver disease</td>
</tr>
<tr>
<td>White urine</td>
<td>Medication</td>
<td>Propofol</td>
</tr>
<tr>
<td></td>
<td>Medical conditions</td>
<td>Chyluria (filariasis, lymphatic fistula), Pyuria, Urinary tuberculosis, Proteinuria</td>
</tr>
<tr>
<td></td>
<td>Mineral sediments</td>
<td>hyperoxaluria, hypercalcuria, phosphaturia.</td>
</tr>
<tr>
<td>Blue and Green urine</td>
<td>Medications</td>
<td>Methylene blue, Promethazine, Cimetidine, Propofol, Metoclopramide, Ami tryptyline, Indomethacin, Tetrahydronapthalene</td>
</tr>
<tr>
<td></td>
<td>Medical Condition</td>
<td>Herbicide ingestion, pseudomonas UTI, bile pigments in urine, Hartnup disease, Blue diaper syndrome</td>
</tr>
</tbody>
</table>

 Presented by Morgan Nichols MD 2019


South Med J 2012. Lippincott Williams & Wilkins
**Surgery**

**Topics**

- Abdominal Pain
- ACS NSQIP Risk Calculator PRE-OP Evaluation
- VTE prophylaxis following orthopedic surgery
- Meds for VTE prophylaxis post orthopedic surgery
- Management of New Anticoagulants in the Perioperative Setting
- Pre-op Evaluation
  - Airway Assessment
  - Cardiac Clearance
  - Medication Management
  - Nutritional Assessment
- Pre-op Workup by Disease State
- Pulmonary Clearance
- Peri-op Warfarin Mgmt
- Peri-op Anticoagulation Mgmt
- Perioperative Myocardial Infarctions
- Pre-op Note
- Post-op Fever
- Paracentesis
- Ruptured Aortic Abdominal Aneurysm
- SBO
- Sleep Apnea Assessment
- Thoracentesis
The ACS NSQIP risk calculator uses 21 pt predictors and the planned procedure to provide accurate, pt-specific risk for 9 different possible outcomes w/in 30 days post-op. The calculator was developed using data from over 1.4 million pts from 393 hospitals from 2009-2012.

The 9 outcomes include:

- Death
- Any complication (superficial incisional SSI, deep incisional SSI, organ space SSI, wound disruption, pneumonia, unplanned intubation, PE, ventilator > 48 hours, progressive renal insufficiency, acute renal failure, UTI, stroke, cardiac arrest, myocardial infarction, DVT, systemic sepsis)
- Serious complication (death, cardiac arrest, myocardial infarction, pneumonia, progressive renal insufficiency, acute renal failure, PE, DVT, return to the operating room, deep incisional SSI, organ space SSI, systemic sepsis, unplanned intubation, UTI, wound disruption)
- Pneumonia
- Cardiac event
- Surgical site infection
- Urinary tract infection
- Venous thromboembolism
- Renal failure (progressive renal insufficiency or acute renal failure)

ACS NSQIP risk calculator

Patient seen at request of Dr ___ for pre-operative clearance for ____ (type of surgery).

Past medical history:
Past surgical history:
Family history:
Social history:
Medications:
Allergies:
ROS:
PE:
A/P:

Type of Surgery (include timing of surgery and risk)

Definition of Timing of Surgery:
Emergent: Life or limb is threatened if not in operating room within 6 hours
Urgent: Life or limb is threatened if not in operating room within 24 hours
Time-Sensitive: Delay of 1-6 weeks for further evaluation would negatively affect outcome
Elective: Delay for up to 1 year

Risk:
High Risk (>5%): Emergency, cardiac surgery, vascular surgery, spinal surgery, anticipated prolonged surgery (>2hr) Whipple, major etc
Moderate Risk (<5%): Ortho, head and neck, Abdominal, pelvic, etc
Low Risk (<1%): Cataract surgery, breast biopsy, etc

Airway Assessment
Mallampati Score:
Mouth opening:
Neck ROM: (normal or decreased)
Thyromental distance:

Patient has the following predictors of difficult ventilation:

Document if patient has any of the following (predictors of difficult vent)
Beard
Obesity (BMI >26)
Age >55
Edentulous
Snoring
Cardiac risk Assessment

Documents patients Revised Cardiac Risk Index and risk of cardiac death
If appropriate document functional capacity
Document if additional cardiac testing is needed

Sleep Apnea Assessment / Pulmonary Risk Assessment
Document STOP-Bang and ARISCAT Index
CPAP recommendations, pulmonary consultation, smoking cessation, risk reduction

Identify Comorbidities which increase risk and preoperative Testing

Document pts comorbidities and the following tests are recommended:

Document nutritional status and recommendation regarding supplement (as needed)

Deep vein thrombosis (prophylaxis)
The following is recommended:

Patients medications were reviewed and the following recommendations were made:

Therapy to reduce perioperative risk
The following is recommended:

Appropriate Consultations
Please consult the following for further evaluation
❖ Pulmonary if CO2 > 45
❖ Cardiology if high cardiac risk, high risk surgery or poor functional capacity
   ❖ consider consult if moderate risk
❖ Social services if elderly, new cancer diagnosis or other

Adapted from Dr Keehbauch’s lecture on Pre-op clearance
AIRWAY ASSESSMENT

Predictors of difficult intubation:
Mallampati Score: III or IV

Mouth opening: <3 cm
Neck ROM: Decreased neck range of motion
Thyromental distance: <6 cm

CARDIAC PREOPERATIVE EVALUATION ACC/AHA

❖ Based on algorithm from The Journal of Family Practice Oct 2016

Step 1 Determine if Patient needs to be evaluated by a specialist

<table>
<thead>
<tr>
<th>Conditions requiring specialist evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate or greater valvular stenosis/- regurgitation</td>
</tr>
<tr>
<td>Cardiac implantable electronic device</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
</tr>
<tr>
<td>Congenital heart disease</td>
</tr>
<tr>
<td>Severe systemic disease</td>
</tr>
</tbody>
</table>

❖ If present Consult Cardiology or specialist for evaluation
Step 2 If these conditions are not present, perform cardiac assessment using RCRI or ACS NSQIP cardiac risk calculator.

❖ RCRI= Revised Cardiac Risk Index

♥ (I recommend RCRI quicker/easier to use)

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrovascular disease</td>
<td>1</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>1</td>
</tr>
<tr>
<td>Creatinine level &gt; 2.0 mg per dL (176.80 μmol per L)</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes mellitus requiring insulin</td>
<td>1</td>
</tr>
<tr>
<td>Ischemic cardiac disease</td>
<td>1</td>
</tr>
<tr>
<td>Suprainguinal vascular surgery, intrathoracic surgery, or intra-abdominal surgery</td>
<td>1</td>
</tr>
</tbody>
</table>

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%

❖ ACS NSQIP

uses 21 pt predictors and the planned procedure to provide accurate, pt-specific risk for 9 different possible outcomes w/in 30 days post-op

If High cardiac risk (RCRI >1 or ACS NSQIP >1%) go to step 3,
• if not high risk cardiac assessment complete (document cardiac death risk)

RCRI
0 predictors = 0.4%, 1 predictor = 0.9%,

Step 3 Assess Functional Capacity

Subjective Functional Capacity Activity > 4 METs

- Climbing one flight of stairs
- Gardening
- Tennis
- Riding a bike
- Jogging
- Mowing the lawn
- Golfing without a cart
- Swimming
- Square dancing

Duke Activity Status Index (DASI)

Conclusions: Subjective METS misclassifies too many pts DASI and NT pro-BNP are better predictors of risk
Clinical implications: Subjectively assessed functional capacity should not be used for preoperative risk evaluation. Clinicians could instead consider a measure such as DASI for cardiac risk assessment

if functional capacity > 4 mets, cardiac assessment complete document cardiac death risk per RCRI and that patient has good functional capacity > 4 mets and proceed to sleep apnea and pulmonary assessment. (see below for additional considerations)

If unable to perform > 4 mets functional capacity consider cardiology referral (see below for additional consideration)

Clinical Predictors (RCRI)

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceed with Surgery</td>
</tr>
<tr>
<td>Non-invasive testing</td>
</tr>
<tr>
<td>Postpone surgery, consult cardiology</td>
</tr>
</tbody>
</table>

Emergency Surgery Requires Surgery Regardless of Risk

Asymptomatic patients who have had coronary revascularization within 5 years or normal results of noninvasive evaluations within 2 years usually do not need to undergo risk stratification if stable and no signs or symptoms.

Adapted from Dr Keehbauch's FMI handout on Pre-op clearance

STOP-BANG Screening for Obstructive Sleep Apnea

<table>
<thead>
<tr>
<th>S</th>
<th>Snoring: Do you snore loudly (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Tired: Do you often feel tired, fatigued or sleepy during the daytime</td>
</tr>
<tr>
<td>O</td>
<td>Observed: Has anyone observed you stop breathing or choking/gasping during your sleep?</td>
</tr>
<tr>
<td>P</td>
<td>Pressure: Do you have or are being treated for high blood pressure?</td>
</tr>
<tr>
<td>B</td>
<td>BMI &gt; 35 kg/m²?</td>
</tr>
<tr>
<td>A</td>
<td>Age older than 50 y?</td>
</tr>
<tr>
<td>N</td>
<td>Neck size large? For male, shirt collar ≥17 in/43 cm; for female, shirt collar ≥16 in/41 cm?</td>
</tr>
<tr>
<td>G</td>
<td>Gender = male</td>
</tr>
</tbody>
</table>

1 point for each yes answer
A score of 5 or higher (of eight possible points) increases the likelihood of moderate to severe OSA, as well as rates of perioperative complications.

Adapted from Principles and Practice of Hospital Medicine, 2e 2017

If STOP-BANG ≥ 3 check serum bicarb level

Further evaluation indicated before surgery if:
- STOP-BANG ≥ 5 + uncontrolled condition (pulmonary hypertension) or hypoxemia
- STOP-BANG ≥ 3 + hypercarbia

ARISCAT Index for Predicting Postoperative Pulmonary Complications

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>51-80</td>
</tr>
<tr>
<td>Preoperative SpO2 (%)</td>
<td>91-95</td>
</tr>
<tr>
<td>Respiratory infection in past month</td>
<td>&lt;91</td>
</tr>
<tr>
<td>Location of surgery</td>
<td>Upper abdominal</td>
</tr>
<tr>
<td></td>
<td>Thoracic</td>
</tr>
<tr>
<td>Duration of surgery (h)</td>
<td>&gt;2-3</td>
</tr>
<tr>
<td>Emergency surgery</td>
<td>&gt;3</td>
</tr>
<tr>
<td>Preoperative hemoglobin ≤10 g/dL</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Risk Score</th>
<th>Postoperative Pulmonary Complications (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>&lt;26</td>
<td>1.6-3.4</td>
</tr>
<tr>
<td>Intermediate</td>
<td>26-44</td>
<td>13-13.3</td>
</tr>
<tr>
<td>High</td>
<td>&gt;44</td>
<td>38-42.1</td>
</tr>
</tbody>
</table>
Risk reduction

Smoking Cessation

- Patients who stop smoking more than 4 weeks prior to surgery have a significant decrease in postoperative pulmonary complications.
- The greatest benefit occurs at least 8 weeks before surgery.

Incentive spirometry or deep breathing exercises recommended for patients at risk for pulmonary complications started 1 to 2 weeks prior to surgery.

Obstructive Sleep Apnea Management

- For patients likely to have severe OSA, empiric use of positive airway pressure ventilation is recommended if severe hypoxia or airway obstruction are evident.
- Surgery should be delayed, if possible, for preoperative evaluation and management of OSA for pts likely to have severe sleep apnea and undergoing major surgery.
- Postoperative management of Pts with known or suspected Sleep Apnea
  - Elevate head of bed (unless contraindicated by surgical requirements)
  - Continuous pulse oximetry (with centralized monitoring)
  - Use adjunctive analgesics (eg, NSAIDs) to reduce systemic opioid needs
  - Minimize use of nonopioid sedatives
- PAP therapy
  - Previously on PAP: have pt use home PAP device whenever sleeping
  - No previous PAP: initiate PAP for frequent or severe airway obstruction or hypoxemia

NUTRITIONAL EVALUATION

- Proteins are essential for healing and regenerating tissue
- Malnourished patients have
  - Higher wound complications (dehiscence) and greater anastomotic leak rate
  - More postoperative muscle weakness (diaphragm)
  - Longer time in rehabilitation
- Indicators for Perioperative Supplementation
  - Severely malnourished patients
  - Patients who have been NPO for 3-5 days pre-operatively
  - Critically ill patients who have been NPO greater than 5 days
  - Well-nourished patients who have been NPO for 5-10 days post-operatively
- Preoperative Carbohydrate loading
  - Carb containing oral nutritional supplement 3 or 6 hours prior to surgery
  - Reduction in LOS 0.30 days (95% CI -0.56 to -0.04 days)

Cochrane Database Syst Rev. 2014 Aug 14;(8):CD009161
## PRE-OP WORKUP and RECOMMENDATIONS by DISEASE STATE

<table>
<thead>
<tr>
<th>Disease</th>
<th>Labs</th>
<th>Medical Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac Disease**</td>
<td>CBC, BMP, Digoxin level if indicated,</td>
<td>♦ EKGs on POD 1&amp;2&lt;br&gt;♦ Beta-blockade goal HR 60 - 65 peri-op&lt;br&gt;LOE=2b&lt;br&gt;♦ STATIN</td>
</tr>
<tr>
<td></td>
<td>EKG*, CXR</td>
<td></td>
</tr>
<tr>
<td>HTN</td>
<td>Bun, Cr, EKG*</td>
<td>♦ PO meds with sips&lt;br&gt;♦ Decrease Ace to 25% if changing to IV</td>
</tr>
<tr>
<td>COPD</td>
<td>CBC, EKG*, CXR</td>
<td>♦ Stop smoking &gt;8wks preop.&lt;br&gt;♦ Delay elective surgery for exacerbation&lt;br&gt;❖ CO2 &gt;45 is strongest predictor of complications</td>
</tr>
<tr>
<td></td>
<td>Spirometry for Thoracic surgery</td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>Peak Flow</td>
<td>Should be free of wheeze and PF &gt;80%. Short course of periop- steroids does not increase risk</td>
</tr>
<tr>
<td>Diabetes</td>
<td>CBC, BMP, EKG*, CXR</td>
<td>Hold metformin for contrast and restart 48 hrs post-op&lt;br&gt;Give 1/2 of total insulin as NPH&lt;br&gt;Full dose Lantus&lt;br&gt;Hold pre-prandial insulin&lt;br&gt;Low dose SS check BG q 4 hrs.&lt;br&gt;Beta-blockade peri-operatively LOE=2b</td>
</tr>
<tr>
<td>Liver disease</td>
<td>LFT's, PT/PTT, H&amp;H, NH3</td>
<td>At risk for bleeding, delirium</td>
</tr>
<tr>
<td>Renal impairment</td>
<td>CBC, BMP, EKG*, CXR</td>
<td>Beta-blockade peri-operatively LOE=2b&lt;br&gt;Renal dose medication</td>
</tr>
<tr>
<td>Malignancy</td>
<td>PT/PTT, CBC, Pre-albumin</td>
<td></td>
</tr>
<tr>
<td>Bleeding Disorder</td>
<td>H&amp;H, PT/PTT, PLT, INR</td>
<td>ASA stop 1 wk pre-op&lt;br&gt;Plavix stop 2 wks pre-op&lt;br&gt;Coumadin stop 3 days pre-op&lt;br&gt;NSAIDs stop 2 days preop</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>CBC, prealbumin</td>
<td>nutritional supplementation, consider SW consult</td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td>H&amp;H, LFT's</td>
<td>CIWA protocol</td>
</tr>
<tr>
<td>Hypothyroid</td>
<td>TSH, H&amp;H</td>
<td>Decrease IV Synthroid by 50%</td>
</tr>
<tr>
<td>Disease</td>
<td>Labs</td>
<td>Medical Management</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Steroid dependent >5 mg prednisone | K+, Glu | • Steroid dosing dependent upon surgery  
  Minor: 25 mg/d; 1 day post op  
  Moderate: 50 – 75 mg/d; 1-2 days post op  
  Major: 100 – 150 mg/d; 2-3 days post op |
| Reproductive age             | HCG     | 2nd trimester for elective surgery                                                  |
| Women on estrogen            |         | Discontinue 4-6 weeks prior to surgery  
  Strict DVT prophylaxis at increased risk of thromboembolism.                        |
| AGE >50                      | EKG*, Glu |                                                                                  |
| AGE >70                      | EKG*, Glu, CXR?, Cr ?, H&H | Social service consult for post-op planning                                           |

* EKG if not done in last 6 months  
**Cardiac Risk Factors (Smoking, Obesity, Hyperlipidemia) are indicators for an EKG  
# Consider transfusion for HGB<8.0

Adapted from Dr Keehbauch’s FMI handout on Pre-op clearance  
AAFP FP Essentials 351, Perioperative Care 2008

PERIOPERATIVE MEDICATION MANAGEMENT

❖ Hypertension medications
  • Beta-blockers: continue on the day of surgery and restart after surgery  
  • Calcium channel blockers: continue on the day of surgery and restart after surgery  
  • Renin-angiotensin system antagonists: can increase risk of hypotension following anesthesia  
    • ACE / ARBs: stop at least 10 hours prior to surgery  
    • Diuretics. can be given on the day of surgery  
      → Although they increase the risk of hypovolemia and electrolyte disturbances

❖ Diabetes medications
  ❖ Insulin
    • Type I diabetes, recommend basal insulin of 0.2 to 0.3 units/kg/day of long-acting insulin  
    • Patients using an insulin pump, basal rate should be continued.  
    • Type 2 diabetes, use one-half the normal long-acting insulin dose on the morning of surgery
  ❖ Metformin: Discontinue metformin 24 hours prior to surgery  
  ❖ Sulfonylureas: should be held on the day of surgery due to the risk of hypoglycemia and a possible increased risk of ischemia
Thiazolidinediones, dipeptidyl peptidase-4 inhibitors, and glucagon-like peptide-1 agonists: All should be held on the day of surgery.

Corticosteroids.
- Recent evidence suggests that stress-dose steroids are not needed to prevent adrenal insufficiency in patients taking corticosteroids chronically. These patients should continue maintenance therapy at regular dosing.
- Stress dosing of corticosteroids is only required when a patient has signs of adrenal insufficiency.

Statins: should be continued on the day of surgery.

Nonsteroidal anti-inflammatory drugs: NSAIDs should be stopped 5 days prior to surgery.

Anticoagulant medications
- Vitamin K antagonists (warfarin)
- Factor Xa inhibitor
- Direct thrombin inhibitor
- Aspirin, clopidogrel, ticlopidine, prasugrel
## MANAGING ANTICOAGULATION IN THE PERIOPERATIVE PERIOD

### Perioperative Timing of Bridging Anticoagulation

**To Bridge or not to Bridge**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Procedure</th>
<th>Bleeding risk</th>
<th>Pre-operative Day</th>
<th>Day of Surgery</th>
<th>Post-operative Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5</td>
<td>-4</td>
<td>-3</td>
</tr>
<tr>
<td>Warfarin</td>
<td>High</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Low or Minimal</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>LMWH</td>
<td>High</td>
<td>Start cont</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Low or Minimal</td>
<td>Start cont</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
</tbody>
</table>

### Perioperative Timing of Dabigatran

<table>
<thead>
<tr>
<th>Med</th>
<th>CrCl</th>
<th>Bleeding risk</th>
<th>Pre-operative Day</th>
<th>Day of Surgery</th>
<th>Post-operative Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5</td>
<td>-4</td>
<td>-3</td>
</tr>
<tr>
<td>Dabigatran</td>
<td>&gt;50</td>
<td>High</td>
<td>Continue</td>
<td>Last Dose</td>
<td>Hold</td>
</tr>
<tr>
<td>Low or Minimal</td>
<td>Continue</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>30-50</td>
<td>High</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Low or Minimal</td>
<td>Continue</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
</tbody>
</table>

### Perioperative Timing of Factor Xa Inhibitors

<table>
<thead>
<tr>
<th>Medication</th>
<th>Procedure</th>
<th>Bleeding risk</th>
<th>Pre-operative Day</th>
<th>Day of Surgery</th>
<th>Post-operative Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5</td>
<td>-4</td>
<td>-3</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>High</td>
<td>Continue</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Apixaban</td>
<td>Low or Minimal</td>
<td>Continue</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Edoxaban</td>
<td>High</td>
<td>cont Last Dose</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Fondaparinux</td>
<td>Low or Minimal</td>
<td>Continue</td>
<td>Last Dose</td>
<td>Hold</td>
<td>Hold</td>
</tr>
</tbody>
</table>

---

**Table of Content**

**Hematology**

**Surgery**
Procedure Related Bleeding Risk

Table 2. Procedure-Related Bleeding Risk

<table>
<thead>
<tr>
<th>Minimal Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental procedures</td>
<td>Central and peripheral nervous system</td>
</tr>
<tr>
<td>• Tooth extraction</td>
<td>• Intracranial surgery</td>
</tr>
<tr>
<td>• Root canal</td>
<td>• Spine surgery</td>
</tr>
<tr>
<td>Cardiology procedures</td>
<td>• Neuropathic anesthesia</td>
</tr>
<tr>
<td>• Pacemaker implantation</td>
<td>• Peripheral nerve block at a non-compressible site</td>
</tr>
<tr>
<td>• Defibrillator implantation</td>
<td>Urologic surgeries</td>
</tr>
<tr>
<td>Cutaneous procedures</td>
<td>• Transurethral prostate resection</td>
</tr>
<tr>
<td>• Skin biopsy</td>
<td>• Bladder resection</td>
</tr>
<tr>
<td>• Excision of skin cancers other than melanoma</td>
<td>Gastrointestinal surgeries</td>
</tr>
<tr>
<td>Cataract surgery</td>
<td>• Bowel resection</td>
</tr>
<tr>
<td></td>
<td>• Large polyp resection</td>
</tr>
<tr>
<td></td>
<td>Vaginal or cesarean delivery</td>
</tr>
<tr>
<td></td>
<td>Surgery on or biopsy of highly vascular organs</td>
</tr>
<tr>
<td></td>
<td>• Kidney</td>
</tr>
<tr>
<td></td>
<td>• Liver</td>
</tr>
<tr>
<td></td>
<td>• Spleen</td>
</tr>
<tr>
<td></td>
<td>Surgery with extensive tissue injury</td>
</tr>
<tr>
<td></td>
<td>• Cancer surgery</td>
</tr>
<tr>
<td></td>
<td>• Joint arthroplasty</td>
</tr>
<tr>
<td></td>
<td>• Reconstructive plastic surgery</td>
</tr>
<tr>
<td></td>
<td>Cardiac surgery</td>
</tr>
</tbody>
</table>


PERIOPERATIVE MANAGEMENT ANTIPLATLET THERAPY

❖ Primary Prevention. Hold before surgery (seven to 10 days if possible), unless risk of major adverse cardiac event is greater than risk of bleeding

❖ Secondary prevention
  ➢ Intracranial, major spinal, or other high risk bleeding surgery → hold for 7-10 days
  ➢ Minimal bleeding risk → ASA should be continued through the perioperative period unless the risk of bleeding outweighs the risk of discontinuing aspirin

❖ special population
  ➢ After bare-metal stent, defer surgery for at least 6 weeks (Grade 1C: strong recommendation based on consensus / weak evidence)
  ➢ After a drug-eluting stent, defer surgery for at least 6 months (Grade 1C)
  ➢ If someone needs surgery before these safety-timeframes have elapsed, ACCP suggests continuing both aspirin and clopidogrel/Plavix or prasugrel/Effient around the time of surgery (Grade 2C; suggestion based on consensus/weak evidence)

Bridge or not to bridge

<table>
<thead>
<tr>
<th>Condition</th>
<th>Bridging Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrial Fibrillation</strong></td>
<td>CHA2DS2-VASc &lt; 7</td>
</tr>
<tr>
<td></td>
<td>Recent stroke or TIA (within 3 months)</td>
</tr>
<tr>
<td></td>
<td>CHA2DS2 - VASc = 5 or 6 if both of the following</td>
</tr>
<tr>
<td></td>
<td>• History of ATE</td>
</tr>
<tr>
<td></td>
<td>• No bleeding risk factors</td>
</tr>
<tr>
<td>CHA2DS2-VASc Calculator</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Heart Valves</strong></td>
<td>Any mitral valve</td>
</tr>
<tr>
<td></td>
<td>Older aortic valve (caged ball or tilting disc)</td>
</tr>
<tr>
<td></td>
<td>Recent stroke or TIA (within 6 months)</td>
</tr>
<tr>
<td></td>
<td>Bi-leaflet aortic valve with risk factor</td>
</tr>
<tr>
<td></td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td></td>
<td>Previous arterial thromboembolic event</td>
</tr>
<tr>
<td></td>
<td>Thrombophilia</td>
</tr>
<tr>
<td></td>
<td>Left ventricular systolic dysfunction</td>
</tr>
<tr>
<td><strong>Venous Thromboembolism</strong></td>
<td>Recent VTE (within 3 months)</td>
</tr>
<tr>
<td></td>
<td>Severe thrombophilia</td>
</tr>
<tr>
<td></td>
<td>Protein C deficiency</td>
</tr>
<tr>
<td></td>
<td>Protein S deficiency</td>
</tr>
<tr>
<td></td>
<td>Antithrombin III deficiency</td>
</tr>
<tr>
<td></td>
<td>Antiphospholipid antibodies</td>
</tr>
<tr>
<td></td>
<td>More than one non-severe thrombophilia mutation</td>
</tr>
</tbody>
</table>

DVT PROPHYLAXIS FOLLOWING ORTHOPEDIC SURGERY

❖ **Always discuss with your consulting orthopedic**
❖ Patients should be assessed for thrombosis and bleeding risk
  • I recommend using a risk score like *Caprini risk assessment* for VTE risk, but no one risk score is recommended in the guidelines.
  • Most widely validated VTE risk assessment model in surgical patients
  • Has been validated in many surgical subsets but not on-orthopedic surgery
  • Always use your clinical judgment
### Caprini Risk Assessment

<table>
<thead>
<tr>
<th>1 point assigned to each of the following:</th>
<th>2 point assigned to each of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 41-60 years</td>
<td>Each of the following risk factors is assigned 2 points:</td>
</tr>
<tr>
<td>Minor surgery</td>
<td>Age older than 60 years</td>
</tr>
<tr>
<td>History of major surgery within 1 month</td>
<td>Malignancy or current chemotherapy or radiation therapy</td>
</tr>
<tr>
<td>Pregnancy or postpartum within 1 month</td>
<td>Major surgery (&gt;45 min)</td>
</tr>
<tr>
<td>Varicose veins</td>
<td>Laparoscopic surgery (&gt;45 min)</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>Confined to bed longer than 72 hours</td>
</tr>
<tr>
<td>Swelling of legs</td>
<td>Immobilizing cast shorter than 1 month</td>
</tr>
<tr>
<td>Obesity (body mass index [BMI] &gt;25 kg/m²)</td>
<td>Central venous access for less than 1 month</td>
</tr>
<tr>
<td>Oral contraceptives, patch, or hormone replacement therapy</td>
<td>Tourniquet time longer than 45 minutes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 points assigned to each of the following:</th>
<th>5 points are assigned to each of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age older than 75 years</td>
<td>Major, elective lower extremity arthroplasty, TKR, THR</td>
</tr>
<tr>
<td>History of DVT or PE</td>
<td>Hip, pelvis, or leg fracture within 1 month</td>
</tr>
<tr>
<td>Family history of thrombosis</td>
<td>Stroke within 1 month</td>
</tr>
<tr>
<td>Factor V Leiden/activated protein C resistance</td>
<td>Multiple trauma within 1 month</td>
</tr>
<tr>
<td>Medical patient with risk factors of myocardial infarction, congestive heart failure, or chronic obstructive pulmonary disease</td>
<td>Acute spinal cord injury with paralysis within 1 month</td>
</tr>
<tr>
<td>Congenital or acquired thrombophilia</td>
<td></td>
</tr>
</tbody>
</table>

### Scoring

<table>
<thead>
<tr>
<th>Risk Factor Score</th>
<th>0-1</th>
<th>2</th>
<th>3-4</th>
<th>5+</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVT Incidence</td>
<td>2%</td>
<td>10-20%</td>
<td>20-40%</td>
<td>40-80%</td>
</tr>
<tr>
<td>Risk level</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Very high</td>
</tr>
</tbody>
</table>
❖ Contra-indication to VTE prophylaxis

Contra-indications to EAS

- Gross oedema
- Leg deformity/condition
- Peripheral vascular disease
- If peripheral arterial disease present, seek expert opinion before fitting
- Peripheral neuropathy

Contra-indications to pharmacological VTE prophylaxis

I. On oral anticoagulant with INR > 2.0
II. Thrombocytopenia (platelets < 50 x 10⁹/L)
III. Known bleeding disorder
IV. Evidence of active bleeding
V. Uncontrolled hypertension (BP > 230/120 mm Hg)
VI. Lumbar puncture/epidural/spinal analgesia expected within next 12 hours or performed within last 4 hours (24 hours if traumatic)
VII. New stroke (ischaemic or haemorrhagic)

❖ Medication for VTE prophylaxis following orthopedic surgery

<table>
<thead>
<tr>
<th></th>
<th>Medication/dosage</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Hip fracture   | LMWH
 BMI <40: 30 mg BID x 7-10 days
 Alt: 40 mg daily 7-10 days
 Cont 40 mg daily x 3 weeks
 Low dose UFH
 VKA INR goal 2-3, target 2.5
 Fondaparinux 2.5 mg x 24 days
 Aspirin
 IPCD          | LMWH preferred by ACCP guidelines         |                               |
<table>
<thead>
<tr>
<th>Medication/dosage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elective Total Knee replacement</strong>&lt;br&gt;LMWH&lt;br&gt;BMI (&lt;40): 30 SQ BID x 7-10 days&lt;br&gt;Alt: 40 SQ daily 7-10 days&lt;br&gt;Low dose UFH&lt;br&gt;VKA INR goal 2-3&lt;br&gt;Fondaparinux 2.5 mg x 5-9 days&lt;br&gt;Apixaban 2.5 mg BID x 12 days&lt;br&gt;Rivaroxaban 10 mg daily x 12 days&lt;br&gt;Aspirin</td>
<td>LMWH preferred by ACCP guidelines&lt;br&gt;Dual prophylaxis with an IPCD device for at least 18 hours daily along with an antithrombotic agent is recommended&lt;br&gt;NICE guidelines ASA 81-150 mg x 14 days</td>
</tr>
<tr>
<td><strong>Elective Total Hip replacement</strong>&lt;br&gt;LMWH&lt;br&gt;BMI (&lt;40): 30 mg BID x 7-10 days&lt;br&gt;Alt: 40 mg daily 7-10 days&lt;br&gt;Cont 40 mg daily x 3 weeks&lt;br&gt;Low dose UFH&lt;br&gt;VKA INR goal 2-3, target 2.5&lt;br&gt;Fondaparinux 2.5 mg x 5-9 days&lt;br&gt;Apixaban 2.5 mg BID x 35 days&lt;br&gt;Rivaroxaban 10 mg daily x 35 days&lt;br&gt;Aspirin</td>
<td>LMWH preferred by ACCP guidelines&lt;br&gt;NICE guidelines LMWH x 10 days then ASA x 28 days&lt;br&gt;Dual prophylaxis with an IPCD device for at least 18 hours daily along with an antithrombotic agent is recommended</td>
</tr>
</tbody>
</table>

**COMMON POSTOPERATIVE COMPLICATIONS**

- Infection - 14.3%
- Respiratory - 9.5%
- Cardiac - 4.5%
PERIOPERATIVE MYOCARDIAL INFARCTIONS (PMI)

❖ 65% of perioperative myocardial infarctions are asymptomatic (Devereaux et al., 2011)
❖ occur within 24-48 hours of surgery
❖ mortality rate of 15-25% (Landesberg et al., 2009; Wu et al., 2007).
❖ 93% of troponin elevation begins within < 24 hours.
❖ Even minor troponin elevations predict early and late morbidity and mortality.
❖ Some perioperative myocardial infarctions may only be detected by cardiac enzyme testing

❖ Be highly suspicious for PMI in patient with:
  - CAD
  - CHF
  - Cerebrovascular disease
  - Insulin-requiring diabetes mellitus
  - Creatinine > 2.0
  - High-risk surgery
  - Advanced age
  - Anemia

❖ Reduce the risk for PMI by Carefully monitor for ischemia
  - EKG in the recovery room
  - EKG and cardiac enzymes POD1
  - EKG and cardiac enzymes POD2

❖ Quickly identify and treat underlying factors (maintain a low threshold for treating and preventing)
  - Tachycardia
  - Hypotension
  - Hypertension
  - Decreased cardiac output
  - Cardiac decompensation
POST-OPERATIVE FEVER

➢ EPF (early post-op fever) Fever of >100.4 is common in the first 24 hrs post-surgery (most likely 2nd to the inflammatory stimulus of surgery mediated primarily by interleukin 6, (IL-6) other probable sources include early atelectasis (lack of evidence), wound infected by B-haemolytic strep or cloistridium.

➢ Fevers of < 102°F, should raise concern for infectious cause

➢ Mnemonic for fever occurring 24 hrs + post-surgery
  • 5 W’s of pre-op fever

<table>
<thead>
<tr>
<th>Post-op Day</th>
<th>Wind</th>
<th>Water</th>
<th>Wound</th>
<th>Walk</th>
<th>Wonder drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atelectasis, pneumonia first 24-48 hrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>UTI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Check your wound, dressings, drainage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>DVT, PE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anytime</td>
<td>Check meds, lines,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

➢ Workup for post-op fever
  • Labs:
    ◆ CBC w diff
    ◆ Urine Cx
    ◆ Blood Cx x2
    ◆ Consider C. diff toxin assay, CRP, sed rate
  • Imaging:
    ◆ CXR (r/o pneumonia)
    ◆ Consider Lower extremity venous duplex (r/o DVT)
    ◆ Consider CT scan (r/o abscess, anastomosis leak, pancreatitis, PE)

Provided by Mayra Abreu Fuentes MD on FMI rounds July 2013
# Algorithm for Evaluation, Initial Treatment, and Admission Triage of Patients with Suspected Small Bowel Obstruction (SBO)

## Evaluation

<table>
<thead>
<tr>
<th>All Patients</th>
<th>Indication-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete physical examination</td>
<td>DRE, Gynecologic examination</td>
</tr>
<tr>
<td>Radiology: Acute abdominal series</td>
<td>CT abdomen if H&amp;P and initial imaging support SBO diagnosis and patient does not require emergent surgery</td>
</tr>
<tr>
<td>Labs: CBC, chemistry, lactate, urinalysis</td>
<td></td>
</tr>
</tbody>
</table>

## Initial Treatment

<table>
<thead>
<tr>
<th>Complete SBO or High-Grade Partial SBO</th>
<th>Partial SBO</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGT, continuous suction</td>
<td>NGT, continuous suction if ongoing vomiting</td>
</tr>
<tr>
<td>IVF and NPO</td>
<td>IVF and NPO</td>
</tr>
<tr>
<td>Monitor UOP</td>
<td>Monitor UOP</td>
</tr>
<tr>
<td>Serial abdominal examinations</td>
<td>Serial abdominal examinations</td>
</tr>
<tr>
<td>Early general surgery consult</td>
<td>General surgery consult if no improvement within 48 hours OR with change or worsening of the patient's condition or abdominal examination</td>
</tr>
</tbody>
</table>

## Admission Triage

<table>
<thead>
<tr>
<th>Surgical Service</th>
<th>Medical Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergent operative candidate</td>
<td>Known dilated bowel due to dysmotility problems or other medical conditions</td>
</tr>
<tr>
<td>Transition point identified on CT</td>
<td>Intra-abdominal metastases</td>
</tr>
<tr>
<td>Recent abdominal surgery (last 30 days)</td>
<td>Active inflammatory bowel disease (with planned trial of systemic therapy)</td>
</tr>
<tr>
<td></td>
<td>Acute severe medical conditions requiring stabilization (e.g., acute MI, severe COPD exacerbation)</td>
</tr>
</tbody>
</table>

*Adapted from Surgery 2012; 152:626 (Figure).*
ACUTE ABDOMINAL PAIN

❖ Up to 10% of patients in the emergency department have a serious condition or require surgery. (Kamin and colleagues in the February 2003 issue of Emergency Medicine Clinics of North America.)
❖ A thorough and logical approach to the diagnosis of abdominal pain is recommended
❖ Evaluation of acute abdominal pain should be guided by the location of pain:
  • Right Upper Quadrant
  • Left Upper Quadrant
  • Right Lower Quadrant
  • Left Lower Quadrant
  • Epigastric
  • Periumbilical
  • Suprapubic
❖ Initial evaluation requires elimination of serious conditions.
  ➢ Symptoms that might indicate surgical or emergency conditions
    • Fever
    • Persistent Emesis
    • Syncope Or Presyncope
    • GI Bleed
  ➢ Key components of history
    • Location
    • Radiation
    • Onset
    • Duration
    • Severity
    • Quality
    • Exacerbating and Remitting Factors
❖ Most useful findings
  • Right lower quadrant pain in appendicitis (likelihood ratio [LR], 8.4)
  • Constipation in bowel obstruction (LR, 8.8)
  • Murphy's sign in cholecystitis (LR, 5.0)
  ➢ Physical examination
    • Lack of movement with peritonitis vs inability to stay still with renal colic
    • Fever is consistent with infection but lack of fever does not exclude infection
    • Tachycardia and orthostatic hypotension
    • Pneumonia or cardiac ischemia can cause upper abdominal pain
    • Carnett's sign predicts abdominal wall pain (Carnett's sign abdominal pain remains unchanged or increases when the muscles of the abdominal wall are tensed)
    • Murphy's sign is present in 65% of adults with cholecystitis
    • Psoas sign predicts appendicitis (LR, 3.2)
    • Rectal examination can detect fecal impaction, mass, occult blood in stool, and retrocecal appendix
    • Pelvic examination can detect vaginal discharge, cervical motion tenderness, and peritoneal signs
Laboratory tests:
- CBC for possible infection or blood loss; WBC more than 10,000/mm³ is 77% sensitive and 63% specific for appendicitis (LR, 2.1)
  A normal white blood cell count does not rule out appendicitis.
- Amylase and lipase for epigastric pain
  Simultaneous amylase and lipase measurements are recommended in patients with epigastric pain.
- Liver chemistries for right upper quadrant pain
- Urinalysis if hematuria, dysuria, or flank pain
- Urine pregnancy test in female patients of childbearing age
- Chlamydia and gonorrhea testing for female patients at risk for STI

Imaging studies are based on location:
- **Right upper quadrant**: ultrasonography it might not detect acute cholecystitis as well as radionuclide imaging, but is less expensive, faster, and can evaluate beyond the biliary tract
  Ultrasonography is the imaging study of choice for evaluating patients with acute right upper quadrant abdominal pain.
- **Right lower quadrant**: CT with intravenous contrast, abdominal or transvaginal ultrasonography for pregnant patients
- **Left lower quadrant**: CT with oral and intravenous contrast and abdominal or transvaginal ultrasonography for female patients of childbearing age
  Computed tomography is the imaging study of choice for evaluating patients with acute right lower quadrant or left lower quadrant abdominal pain.
- **Left upper quadrant** CT but imaging is variable and includes endoscopy or upper gastrointestinal tract series to assess esophageal or gastric conditions
- **Suprapubic**: ultrasonography
  - Transvaginal ultrasonography has 95% sensitivity for detecting ectopic pregnancy if human chorionic gonadotropin level is more than 25 mIU/mL.
  - Plain radiographs can detect the following:
    - Free air under the diaphragm indicating gastrointestinal tract perforation
    - Calcifications: 10% of gallstones, 90% of kidney stones, and appendicolith in 5% of appendicitis cases
    - Dilated bowel loops and air-fluid levels indicating ileus or obstruction

Special Populations
- In women the differential diagnosis
  - Ovarian cysts
  - Uterine Fibroids
  - Tubo-Ovarian Abscesses
  - Endometriosis
  - Pregnancy
  - Loss Of Pregnancy
  - Ectopic Pregnancy
  - Plus other possible etiology by location
Algorithm for women of childbearing age

Differential diagnosis in Elderly patients
- Frequently do not present with the "classic presentation" for diseases, do not rely on the presence of fever or leukocytosis as a sign of infection.
- Malignancy
- Ogilvie syndrome is the acute dilation of the colon in the absence of any mechanical obstruction in severely ill patients. Colonic pseudo-obstruction is characterized by massive dilatation of the cecum (diameter > 10 cm) and right colon on abdominal X-ray
- Volvulus
- Large-Bowel Obstruction
- Small-Bowel Obstruction
- Appendicitis
- Cholecystitis and Biliary Colic
- Diverticulitis
- Spontaneous Bacterial Peritonitis
- Pancreatitis
- Peptic Ulcer Disease
- Constipation
- Gastroenteritis
- Inflammatory Bowel Disease
- Mesenteric Ischemia
- Hernias
- Herpes Zoster
- Bacterial Pneumonia
- Myocardial Infarction
- Diabetic Ketoacidosis
- Urinary Tract Infection
- Nephrolithiasis
- Urinary Obstruction
Algorithm for abdominal pain in the elderly.

Laboratory studies for elderly patients with abdominal pain

- Complete blood count
  - Do not make treatment decisions based on a normal WBC count in the elderly
- Serum chemistries with liver function tests
  - Can be useful in assessing renal function, diabetes, acidosis, biliary tract disease, and liver dysfunction.
  - An anion gap may be an indication of a serious intra-abdominal process; look for a gap and other signs of acidosis particularly with concern for ischemic bowel.
- Serum lipase or amylase- Little evidence supports obtaining both, and lipase is the superior test.
- Urinalysis
  - Hematuria can have many causes in elderly patients, including ruptured AAA.
  - Blood cultures are recommended for abdominal pain associated with either fever or hypothermia or when sepsis is suspected.
- Prothrombin time (PT) and activated partial thromboplastin time (aPTT)
  - Obtain these in patients in whom liver disease, sepsis, or GI bleeding is suspected and in those expected to require operative intervention.
- Arterial blood gases
  - indicated for patients in whom bowel ischemia, diabetic ketoacidosis, or sepsis is suspected.
- Serum lactate - helpful in sepsis or unexplained high anion gap acidosis.
- Type and crossmatch- patients with GI bleeding, ruptured AAA, or unstable
RUPTURED AORTIC ABDOMINAL ANEURYSM

❖ Syncope or near syncope with sudden flank pain in older adults is a ruptured or leaking abdominal aortic aneurysm (AAA) until proven otherwise!
❖ Pt’s with Unexplained altered mental status and hypotension – consider AAA rupture.
❖ Immediate bedside ultrasound to confirm and expedite the diagnosis with Immediate vascular surgery consultation is warranted if AAA is suspected.
❖ One-half of patients with a ruptured aneurysm who reach the operating room die.
❖ CT Imaging modalities should be restricted to patients who are considered unlikely to have a ruptured AAA, surgical evaluation should not be delayed.
❖ The patient suspected of having an AAA Standard resuscitative maneuvers (two large-bore intravenous catheters, a cardiac monitor, and supplemental oxygen) are required.
❖ Aortic Aneurysm may present with low back pain, renal colic, or any type of abdominal pain.
❖ risk factors. Older Age (60), hypertension, and a previous history of aneurysm
   Unfortunately, 30–60% of patients with a ruptured AAA may be initially misdiagnosed.
❖ "classic triad" of abdominal or back pain, hypotension, and a palpable abdominal mass is not usually present.
❖ Although AAA is more common in men than in women, the incidence of rupture is greater in women because the growth rate of AAA is significantly greater in women than in men.
❖ While not widely available in all ambulatory care facilities, A screening bedside ultrasound examination should be obtained on patients over 50 years of age who present with pain in the abdomen, back, flank, or groin, and on those who present with dizziness, syncope, unexplained hypotension, or cardiac arrest.
❖ The abdominal aorta aneurysm = distal aorta is dilated to 3 cm or larger.
❖ An AAA typically enlarges at a rate of 2-8 mm/year.
❖ AAAs larger than 5.0-5.5 cm should be electively repaired.
❖ 7-cm AAA has a 19-32% rate of rupture per year.
❖ USPSTF recommend one time screening for AAA in men aged 65-75 who have ever smoked.
Endocrinology

Topics

- A1C
- A1C Target Goal
- Adrenal Incidentalomas
- Calculating Avg Daily Blood Glucose from A1C
- DKA
- Fructosamine
- Hospital Management of Diabetes
- Out-patient Management of Diabetes
- Adjusting Daily Insulin Doses
- Converting from 70/30 or other Premixed Insulins to basal bolus
- Glucocorticoid Induced Hyperglycemia
- Nonketotic Hyperglycemia (NKH)
- Renal Impairment in Patients with known Insulin Needs
- Insulin Discharge Strategies
- Hypercalcemia
- Thyroid Function Test
- Thyroid Nodule Work up
Quick Guide

- Patients with elevated blood glucose on no medication or on oral diabetic medication with A1C above 7.0
  - Initiate the Glycemic Management PowerPlan 3210
  - Calculate total insulin dose (see table below for calculated dose. The prandial dose listed is for each prandial dose.)
    - FH PowerPlan dose: 0.4 Units/kg: Use on all patients admitted to FH
    - Low dose: 0.3 Units/kg: Underweight, older age, hemodialysis
    - Medium (normal): 0.5 Units/kg: Normal weight to overweight
  - Then give 50% (half) of total dose as Basal Insulin (Lantus or Levemir)
  - The other half should be divided into 3 Prandial doses
  - Add a correctional dose (sliding scale) as needed to each Prandial dose
  - Use Humalog (Insulin lispro)

Weight based basal / Prandial Insulin Dosing scale

<table>
<thead>
<tr>
<th>Weight (kilograms)</th>
<th>Low (0.3 u/kg)</th>
<th>0.4 u/kg FH Power plan</th>
<th>Medium (0.5 u/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basal</td>
<td>Prandial</td>
<td>Basal</td>
</tr>
<tr>
<td>45-54</td>
<td>7</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>55-64</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>65-74</td>
<td>10</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>75-84</td>
<td>12</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>85-94</td>
<td>13</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>95-104</td>
<td>15</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>105-114</td>
<td>16</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>115-124</td>
<td>18</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>125-134</td>
<td>20</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>135-144</td>
<td>21</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>145-154</td>
<td>23</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>155-164</td>
<td>24</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>165-174</td>
<td>26</td>
<td>9</td>
<td>34</td>
</tr>
<tr>
<td>175-182</td>
<td>26</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>Greater than 182</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Consider insulin drip.
Individualize basal/Bolus dose based on pt. requirements
Sample correction scale

<table>
<thead>
<tr>
<th>Blood Glucose</th>
<th>Low dose</th>
<th>Medium dose</th>
<th>Custom dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule</td>
<td>A/C</td>
<td>Bedtime</td>
<td>A/C</td>
</tr>
<tr>
<td>150-199</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>200-249</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>250-299</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>300-350</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>&gt;351</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
</tbody>
</table>

✦ For patients on pre-mix insulin
  - Convert Pre-mix to Lantus and Humalog.
    - Calculate Total Daily Dose
    - Use following calculations to convert

<table>
<thead>
<tr>
<th></th>
<th>Pre-Mix 70:30</th>
<th>Pre-Mix 75:25</th>
<th>Pre-Mix 50:50</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Lantus dose</td>
<td>Multiply by 0.56</td>
<td>Multiply by 0.60</td>
<td>Multiply by 0.40</td>
</tr>
<tr>
<td>For Humalog dose</td>
<td>Multiply by 0.30</td>
<td>Multiply by 0.25</td>
<td>Multiply by 0.50</td>
</tr>
</tbody>
</table>

✦ For patients on NPH or Detemir
  - Convert Detemir or NPH to Lantus
    - Calculate Total Daily Dose
    - Multiply total daily dose by 0.8 = Lantus dose

✦ Pick a diet (included in the new power plan)
  - Provides a consistent amount of carbohydrate for all three meals
    - Moderate (45 gm carbs) --- appropriate for small/thin patients
    - Average (60-75 gm carbs) --- preferred for most patients
    - Liberal (90-150 gm carbs) --- reserved for large/obese patients

✦ Adjusting daily Insulin blood sugars

❖ At Winter Park Hospital check the Glycemic management tab to monitor patients blood glucose, amount and type of insulin given, and percentage of meal eaten by patient. If patient is on D5 or D10 IVF it is also listed
❖ Simple and quick adjustment
  - If FBG above 180 adjust basal insulin
  - If preprandial BG above 180 adjust preprandial dose

Table of Content
Endocrinology
Detailed and personalized way to adjust glucose management

Adjusting daily Insulin blood sugars

Adjust prandial and basal dose according to table

<table>
<thead>
<tr>
<th></th>
<th>Breakfast prandial dose</th>
<th>Lunch prandial dose</th>
<th>Dinner prandial dose</th>
<th>Basal dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast prandial</td>
<td>Compare: Brkfst BG to lunch</td>
<td>Compare: Lunch BG to Dinner</td>
<td>Compare: Dinner BG to qhs BG</td>
<td>Compare: Dinner BG to brkfst BG</td>
</tr>
<tr>
<td>dose</td>
<td>BG</td>
<td>BG</td>
<td>BG</td>
<td>BG</td>
</tr>
<tr>
<td>If elevated by &gt;15%</td>
<td>Increase dose by 20%</td>
<td>Increase dose by 20%</td>
<td>Increase dose by 20%</td>
<td>Increase dose by 20%</td>
</tr>
<tr>
<td>Stable</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
</tr>
<tr>
<td>If decreased &gt;15%</td>
<td>Decrease dose by 20%</td>
<td>Decrease dose by 20%</td>
<td>Decrease dose by 20%</td>
<td>Decrease dose by 20%</td>
</tr>
</tbody>
</table>

From Dr Vandervoort PharmD, talk to FMI team Feb 2014 on hyperglycemic management
GENERAL INFORMATION
❖ Subcutaneous Insulin Therapy in the Hospital
➢ Goals
  • Fasting and pre-prandial BS of less than $140$
  • Post-Prandial BS less than $180$
➢ Monitoring Frequency
  • Before meals and at bedtime for patients who are eating
  • Patients who are not eating testing every four-six hours
  • Because of the risk of nocturnal hypoglycemia early morning (e.g., 0300) blood glucose monitoring may be considered
➢ Inpatient subcutaneous insulin regimens comprise of three components
  • A basal insulin component
  • A prandial insulin component
  • A correction (supplemental) insulin component to treat hyperglycemia before or between meals.
❖ Basal insulin
  • Glargine, Detemir
  • Give 40%-50% of the estimated total daily dose as the basal insulin
  • Appropriate for any patient being managed with subcutaneous insulin, whether eating meals, NPO or receiving nutrition as continuous enteral feeding or TPN.
❖ Prandial insulin
  • 3 main approaches have been suggested
    o Divide 50% of the estimated daily requirement into three equal insulin doses given before the three meals.
    o Estimate the prandial insulin dose before each meal as 10%-20% of the estimated daily insulin requirement.
    o Count the carbohydrate content of the meal (one carbohydrate unit = 15 gm of meal carbohydrate). Then give 1-2 units of insulin per carbohydrate unit.
  • Rapid-Acting Insulin Analog is given within 0-15 minutes of the meal.
    o Rapid-Acting Insulin: Lispro, Aspart, Glulisine. Peak 1 hr, duration 3-4 hrs.
  • Patients who are not eating meals will not require a prandial insulin component
❖ Correction (supplemental) insulin
  • Given in addition to the scheduled basal and prandial insulin in order to correct hyperglycemia.
  • For patients eating, it is given with meals by simply increasing the rapid acting insulin dose by an additional amount based a correction schedule.
For patients not eating meals (e.g., NPO, on continuous enteral feeding or TPN) it is reasonable to give periodic short acting insulin, either as regular insulin or a rapid-acting analog, based on a correction schedule.
- If rapid acting insulin is used, an every 4 hr schedule may be optimal
- For regular insulin, a 4 to 6 hr schedule is reasonable

One unit of insulin will lower the BS by about 50 on an average adult

SPECIAL CONSIDERATIONS

➢ Patient with Known Dosages of Insulin at home:
  - Determine the patient's Total Daily Dose (TDD)
  - Determine patient compliance with ordered doses.
    - Does the patient modify doses frequently or omit doses?
    - How often does this occur?
  - Calculate a weight-based dose on this patient.
    - How close is the home dose to the weight-based calculation?
    - If it's too high, a smaller dose can be used initially, with adjustments based upon patient response

➢ Situations Warranting Modification of Home Total Daily Dose of Insulin
  - Uncontrolled Type 1 (A1C >8 or fasting glucose > 200) ➲ home TDD by 10%
  - Uncontrolled Type 2 (A1C > 8 or fasting glucose > 200) ➲ home TDD by 20%
  - Patient is about to begin corticosteroids (newly prescribed for the inpatient stay) ➲ home TDD by 20%
  - Patient reports hypoglycemia unawareness. ➲ home TDD by 20%
  - Hypoglycemia within the past 24h: Glucose 50-70 ➲ home TDD by 30%
  - Hypoglycemia within the past 24h: Glucose < 50 ➲ home TDD by 40%

➢ Glucocorticoid Induced Hyperglycemia
  - Is caused by a loss of insulin sensitivity and is related to the dosage and duration of GC administration.
    - Prednisone has a peak effect of 4-8 hrs and duration of 12-16 hrs.
    - Dexamethasone effects are longer about 20 hrs
  - Insulin is the preferred therapy of GC related hyperglycemia
    - NPH is preferred (because of the approximate 12-16 hour duration of effect)
Suggested Dosages of NPH Insulin

<table>
<thead>
<tr>
<th>LOW DOSE GLUCOCORTICOID DOSE</th>
<th>HIGH DOSE GLUCOCORTICOID DOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-39 mg Prednisone/Prednisolone or 40-159 mg Hydrocortisone or 8-31 mg Methylprednisolone or 1.5-5.9 mg Dexamethasone/24 hours</td>
<td>&gt; 40 mg Prednisone/Prednisolone or &gt; 160 mg Hydrocortisone or &gt; 32 mg Methylprednisolone or &gt; 6 mg Dexamethasone/24 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No Diabetes</th>
<th>Type 2 Diabetes</th>
<th>No Diabetes</th>
<th>Type 2 Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 units NPH per glucocorticoid dose</td>
<td>10 units NPH per glucocorticoid dose</td>
<td>10 units NPH per glucocorticoid dose</td>
<td>20 units NPH per glucocorticoid dose</td>
</tr>
</tbody>
</table>

Full dose NPH given at the same time of glucocorticoid administration
If patient is NPO, start dose at 50%

Steroid Induced Hyperglycemia Insulin Titration

<table>
<thead>
<tr>
<th>Insulin Regimen</th>
<th>Hyperglycemia ( &gt; 2 BGs &gt;180 mg/dL)</th>
<th>Hypoglycemia ( BGs &gt; 70 mg/dL)</th>
<th>Glucocorticoid Taper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-modal (Basal, Prandial, Correctional Scale) Insulin without NPH</td>
<td>If only Correctional Scale ordered, start basal bolus at 0.2 units/kg If on Scheduled insulin, increase TDD by 10%</td>
<td>Decrease TDD by 10%</td>
<td>Decrease basal bolus incrementally back to regimen prior to glucocorticoid treatment</td>
</tr>
<tr>
<td>Multi-modal (Basal, Prandial, Correctional Scale) Insulin with NPH</td>
<td>Increase NPH dose by 25% If 1-2 BGs &gt;30 mg/dL, increase NPH by 50%</td>
<td>If 1 BG is 50-69 mg/dL, decrease NPH dose by 25% If 1 BG is &lt;50 mg/dL decrease NPH dose by 50%</td>
<td>Taper NPH insulin doses with glucocorticoid taper; decrease NPH same percentage as glucocorticoid decreases Stop NPH when glucocorticoid is less than physiologic dose (&lt;10 mg prednisone or equivalent)</td>
</tr>
</tbody>
</table>

Insulin Need in Patients with Renal Impairment

<table>
<thead>
<tr>
<th>Situation</th>
<th>Dose adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient on insulin at home, no history of hypoglycemia, and stable CKD stage I and II (GFR &gt;40 mL/min)</td>
<td>None: May use home TDD</td>
</tr>
<tr>
<td>CKD stage III (GFR 30-39 mL/min)</td>
<td>▼ home TDD by 30%</td>
</tr>
<tr>
<td>CKD stage IV (GFR 15 – 29 mL/min)</td>
<td>▼ home TDD by 50%</td>
</tr>
<tr>
<td>CKD stage V (GFR 15 mL/min) ESRD</td>
<td>▼ home TDD by 60%</td>
</tr>
<tr>
<td>Acute renal injury</td>
<td></td>
</tr>
</tbody>
</table>

*Adapted from algorithm developed by the Duke University Medical Center Glycemic Safety Committee; published by L.F. Lein et al., Glycemic Control in the Hospitalized Patient, DOI 10.1007/978-1-60761-006-9_2, Springer Science + Business Media, LLC 2011*

DISCHARGE STRATEGIES

### Previously Diagnosed Diabetes

<table>
<thead>
<tr>
<th>Diabetic control</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb AIC &lt; 7%</td>
<td>Resume previous home regimen.</td>
</tr>
<tr>
<td>Hb AIC 7-8%</td>
<td>Increase dose of home oral agents, add a third agent, or add Basal Insulin at bedtime</td>
</tr>
<tr>
<td>Hb AIC &gt; 8%</td>
<td>If already on 2 oral agents, add once daily Basal Insulin at bedtime. Intensify insulin if previously receiving it.</td>
</tr>
<tr>
<td>Hb AIC &gt; 9-10%</td>
<td>Discharge home on basal/bolus insulin regime. Intensify insulin txtmnt</td>
</tr>
</tbody>
</table>

### New Diabetics

<table>
<thead>
<tr>
<th>Hb AIC</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5.2%</td>
<td>Do not have Diabetes</td>
</tr>
<tr>
<td>5.2-6%</td>
<td>May have Diabetes. Repeat screening in near future</td>
</tr>
<tr>
<td>6-7%</td>
<td>Has or will have Diabetes in the future. D/C on diet, exercise</td>
</tr>
<tr>
<td>7-8%</td>
<td>Discharge options include diet, exercise or low dose oral agent</td>
</tr>
<tr>
<td>&gt; 9-10%</td>
<td>Discharge patients on Basal/Bolus Insulin Regime</td>
</tr>
</tbody>
</table>

### Converting from Hospital Regimen to home Regimen

<table>
<thead>
<tr>
<th>Convert Basal/Prandial to pre-mix</th>
<th>Pre-Mix 70:30</th>
<th>Lantus + (Humalog x3) = TDD</th>
<th>Multiply by 1.20</th>
<th>Divide 2/3 for AM and 1/3 for PM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Mix 75:25</td>
<td>Lantus + (Humalog x3) = TDD</td>
<td>Multiply by 1.20</td>
<td></td>
</tr>
</tbody>
</table>
CALCULATING AVG DAILY BLOOD GLUCOSE from A1C

➢ Estimate avg daily BG from HgbA1C
   A1C of 6.0 = about 120, then for each 1.0 increase in A1C add 30
   Example: A1C of 7.0 = 150

➢ Use calculator from the American Diabetes Association
  Click here
  • The calculator also allows you to convert from daily blood glucose to A1C

### A1C TARGET GOALS

<table>
<thead>
<tr>
<th>In pregnancy</th>
<th>A1C&lt; 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Children under age of 19</td>
<td>A1C&lt; 7.5 (As of 2014)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>In adults</td>
<td></td>
</tr>
<tr>
<td>• Most adults</td>
<td>A1C &lt;7.0</td>
</tr>
<tr>
<td>• More stringent target (&lt;6.5%)</td>
<td>Short diabetes diagnosis duration</td>
</tr>
<tr>
<td></td>
<td>Long life expectancy</td>
</tr>
<tr>
<td></td>
<td>No significant CVD/vascular complications</td>
</tr>
<tr>
<td>• Less stringent target (&lt;8%)</td>
<td>Severe hypoglycemia history</td>
</tr>
<tr>
<td>• New ADA guidelines no specific A1C goal 2018</td>
<td>Limited life expectancy</td>
</tr>
<tr>
<td></td>
<td>Advanced microvascular/macrovacular complications, extensive comorbid conditions and in those with long-standing diabetes in whom the general goal is difficult to attain despite appropriate glucose monitoring, and effective doses of multiple glucose-lowering agents including insulin.</td>
</tr>
</tbody>
</table>
COMPARISON OF BLOOD GLUCOSE, A1C, and SERUM FRUCTOSAMINE

❖ Fructosamine also known as Glycated Serum Protein; GSP measures short term control of blood sugar for the past 1-3 weeks.
❖ The American Diabetes Association states that fructosamine may be considered as a substitute in situations where A1c cannot be reliably measured.
❖ Instances where fructosamine may be a better monitoring choice than A1c include:
   • Rapid changes in diabetes treatment
   • Diabetic pregnancy- serum fructosamine measurements may be ordered along with glucose levels to help monitor and accommodate shifting glucose, insulin, or other medication requirements.
   • Shortened RBC life span – An A1c test will not be accurate when a person has a condition that affects the average lifespan of red blood cells (RBCs), such as hemolytic anemia or blood loss.
   • Abnormal forms of hemoglobin
❖ Comparison of serum glucose, Fructosamine and A1C

<table>
<thead>
<tr>
<th>Glucose (mg/dl)</th>
<th>Fructosamine (µmol)</th>
<th>HbA$_{1c}$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>212.5</td>
<td>5.0</td>
</tr>
<tr>
<td>120</td>
<td>250</td>
<td>6.0</td>
</tr>
<tr>
<td>150</td>
<td>287.5</td>
<td>7.0</td>
</tr>
<tr>
<td>180</td>
<td>325</td>
<td>8.0</td>
</tr>
<tr>
<td>210</td>
<td>362.5</td>
<td>9.0</td>
</tr>
<tr>
<td>240</td>
<td>400</td>
<td>10.0</td>
</tr>
<tr>
<td>270</td>
<td>437.5</td>
<td>11.0</td>
</tr>
<tr>
<td>300</td>
<td>475</td>
<td>12.0</td>
</tr>
<tr>
<td>330</td>
<td>512.5</td>
<td>13.0</td>
</tr>
<tr>
<td>360</td>
<td>550</td>
<td>14.0</td>
</tr>
<tr>
<td>390</td>
<td>587.5</td>
<td>15.0</td>
</tr>
</tbody>
</table>
DKA. DIABETIC KETOACIDOSIS

❖ A metabolic acidosis characterized by the triad of **hyperglycemia** (glucose >250 mg/dL), **metabolic acidosis** (arterial pH ≤ 7.3, serum bicarbonate ≤ 18 meq/L) and moderate ketonuria or ketonemia

❖ Most, but not all, patients have type 1 diabetes

❖ Patients with type 2 diabetes also susceptible during acute illness (especially of African American or Hispanic descent) referred to as "**ketosis-prone type 2 diabetes,**" likely due to greater relative insulinopenia

<table>
<thead>
<tr>
<th>Diagnostic Criteria for DKA and HHS</th>
<th>DKA</th>
<th>HHS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild</td>
<td>Moderate</td>
</tr>
<tr>
<td>Plasma Glucose</td>
<td>&gt;250</td>
<td>&gt;250</td>
</tr>
<tr>
<td>Arterial pH</td>
<td>7.25 - 7.30</td>
<td>7.00 - 7.24</td>
</tr>
<tr>
<td>Serum Bicarbonate</td>
<td>15 - 18</td>
<td>10 - 15</td>
</tr>
<tr>
<td>Urine Ketone</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Serum Ketone</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Serum Osmolality</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>Anion gap</td>
<td>&gt;10</td>
<td>&gt;12</td>
</tr>
<tr>
<td>Alteration in sensorium</td>
<td>A</td>
<td>A/D</td>
</tr>
</tbody>
</table>

*A=Alert    D=Drowsy    S=Stupor    C=Coma

Adapted from Kitabchi et al (2006)

❖ Factors that can precipitate Diabetic Ketoacidosis

- Infection (40%)
- Pneumonia and UTI most commonly
- Inadequate use of insulin
- Alcohol misuse
- Medical, surgical or emotional stress
- Cardiovascular event, pregnancy
- Drugs: Corticosteroids, thiazide diuretics
- Pancreatitis

❖ DKA Treatment focused on four areas:

- Fluid replacement( will lower glucose itself)
- Insulin replacement
- Electrolyte replacement
- Treatment of precipitating illness or problem.

❖ If not done in ED order a Blood Gas
**DKA treatment: Fluids**
- Average fluid deficit is 3-6 liters
- Give 1-2 liters NS in first hour.
  - Caution with the elderly and those with evidence of CHF or renal failure
- Then 150 – 500ml/hr thereafter.
- Monitor HR, BP, urine output, to judge volume needs.
- When glucose is <250 add D5 to IV (order this stat)

**DKA treatment: Insulin**
- In ED, give Bolus with 0.1 - 0.15 units/kg Regular insulin IV or IM)
- Then: IV drip at 0.1 Units/kg/hr
- Goal to drop 50-80 mg/dl per hour...if not dropping this fast then double the drip rate
- **Monitor glucose values every hour**
- If moderate – severe DKA: Admit to ICU and Start Glucomander (Use DKA power plan)

**DKA treatment: Electrolyte replacement**
- **Potassium should not be added to initial first liter of saline (0.9%)**
- Patients are initially hyperkalemic
- Addition of K+ without insulin can cause a dangerous increase in extracellular potassium leading to Cardiac arrhythmias
- **Monitor level every 4 hours until stable in normal range then at least daily.**

<table>
<thead>
<tr>
<th>Initial serum K</th>
<th>Suggested KCL replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;5.3</td>
<td>No KCL</td>
</tr>
<tr>
<td>5-5.3</td>
<td>10mEq/liter</td>
</tr>
<tr>
<td>4.5-5</td>
<td>20mEq/L</td>
</tr>
<tr>
<td>4-4.5</td>
<td>30mEq/L</td>
</tr>
<tr>
<td>3.5-4</td>
<td>40mEq/L</td>
</tr>
<tr>
<td>&lt;3.5</td>
<td>&gt; 40mEq/L; consult pharmacist</td>
</tr>
</tbody>
</table>
**Magnesium Replacement**
- Only needed in presence of Mg <1.8
- Can give MgSO4 2 grams IV over one hour.
- As alternative you can use the “magnesium replacement protocol at FH”.

**Bicarbonate Therapy**
- Rarely ever needed even with severe DKA.
- Most literature shows no benefit to using bicarbonate
  - Only use if pH<7.0 or if patient has severe hyperkalemia.
- Can mix 1 or 2 ampules of NaHCO3 in D5/W (or 0.45NS) and use as your IV solution.
- STOP when pH > 7 and or hyperkalemia resolved. Then remove the bicarbonate.

**Phosphorus Replacement**
- Controversial! Harm may be > benefit
- In patients with cardiac dysfunction, anemia, respiratory compromise or serum phosphate < 1.0 mg/dl
- 20-30 mEq potassium phosphate in replacement fluids may be considered (maximum tolerated rate 4.5 mmol/hr or 1.5 ml/h)
- Confirm corrected serum calcium level is normal
- IV phosphorus replacement can cause hypocalcemia.

**Glucomander transition**
- Stop the Insulin drip when
  - Anion gap is “closed”
  - Glucose <200
  - pH ≥ 7.3
  - HCO3 ≥ 18
- Glucomander can suggest dose OR MD can calculate dose
- Give Lantus 3 hours prior to discontinuing insulin (ET) drip (New)
- Basal/Prandial Calculation Example:
  - 68 Kg male stable on ET for 6 hours at 1.3 units/hr for last 3 hours
    - Calculate transition dose and Compare to Home Regimen and level of control (A1C)
      - 1.3 units X 24 hours = 31 units x 90% = 27 units
        - Give 50% as basal (13 units) and 50% Prandial / 3 meals (4 units)
    - Verify dose
      - 68 kg X 0.4 = 27 units TDD
        - Give 50% as bolus (13 units) and 50% Prandial / 3 meals (4 units)

*Lecture provided by Dr Keebauch to FMI rounding team updated 3/2017*
NONKETOTIC HYPERGLYCEMIA (NKH)

- Also known as Hyperglycemic Hyperosmolar nonketotic Syndrome (HHNKS) or Hyperosmolar Hyperglycemic state (HHS)
- Usually in Type 2 DM
- Higher mortality (15%) vs DKA (5%)
- More common in the elderly
- Similar precipitating causes as DKA

<table>
<thead>
<tr>
<th>HHS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma Glucose</td>
<td>&gt;600</td>
</tr>
<tr>
<td>Arterial pH</td>
<td>&gt;7.30</td>
</tr>
<tr>
<td>Serum Bicarbonate</td>
<td>&gt;15</td>
</tr>
<tr>
<td>Urine Ketone</td>
<td>Small</td>
</tr>
<tr>
<td>Serum Ketone</td>
<td>Small</td>
</tr>
<tr>
<td>Serum Osmolality</td>
<td>&gt;320</td>
</tr>
<tr>
<td>Anion gap</td>
<td>&gt;12</td>
</tr>
<tr>
<td>Alteration in sensorium</td>
<td>S/C</td>
</tr>
</tbody>
</table>

Adapted from Kitabchi et al (2006)

❖ Treatment of Hyperosmolar Hyperglycemic State involves a five-pronged approach:
  - Vigorous intravenous rehydration
  - Electrolyte replacement
  - Administration of intravenous insulin
  - Diagnosis and management of precipitating and coexisting problems
  - Prevention.

❖ The most important step in the treatment is aggressive fluid replacement, which should begin with an estimate of the fluid deficit (usually 100 to 200 mL per kg, average of 9 L)
  - 1 L of normal saline should be given per hour to start
  - Once there is only mild hypotension, calculate the corrected serum sodium
  - If the corrected serum sodium level is normal or high (>135), then 0.45% NS may be administered at a rate of 4 to 14 mL per kg per hour depending on hydration status.
  - If the corrected serum sodium level is low (<135), 0.9% NS is infused
  - When the serum glucose level is less than 300, IVF changed to D5,.45%NS
  - One half of the calculated deficit should be given in the first 18 to 24 hours and the remainder over the next 24 hours
Hyperosmolar Hyperglycemic State, Gregg D. Stoner, M.D, Am Fam Physician. 2005 May 1;71(9):1723-1730
OUTPATIENT MANAGEMENT of DIABETES

ACE 2016 Guidelines

LIFESTYLE THERAPY
(Including Medically Assisted Weight Loss)

Entry A1C < 7.5%

MONOTHERAPY*
- Metformin
- GLP-1 RA
- GLP-2i
- DPP-4i
- TZD
- AGi
- SU/GLN

If not at goal in 3 months proceed to Dual Therapy

Entry A1C ≥ 7.5%

DUAL THERAPY*
- GLP-1 RA
- SGLT-2i
- DPP-4i
- TZD
- Basal Insulin
- Colesevelam
- Bromocriptine QR
- AGi
- SU/GLN

If not at goal in 5 months proceed to Triple Therapy

Entry A1C > 9.0%

TRIPLE THERAPY*
- GLP-1 RA
- SGLT-2i
- TZD
- Basal Insulin
- DPP-4i
- Colesevelam
- Bromocriptine QR
- AGi
- SU/GLN

If not at goal in 3 months proceed to or intensify insulin therapy

SYMPTOMS
- NO
- YES

DUAL Therapy
- OTHER AGENTS
- TRIPLE Therapy

ADD OR INTENSIFY INSULIN
- Refer to Insulin Algorithm

LEGEND
- Few adverse events or possible benefits
- Use with caution
- Likelihood of adverse effects
- Uncertain effect

Anti-Diabetic medications

Table of Content
Endocrinology
ADRENAL INCIDENTALOMAS

➢ Found In 8.7% of Population
➢ 80% Are Nonfunctioning Adenoma
➢ 5% Subclinical Cushing Syndrome (SCS)
➢ 5% Pheochromocytoma
➢ 1% Aldosteronoma
➢ < 5% Adrenocortical Carcinoma (ACC)
➢ 2.5% Metastatic lesion

➢ Signs and symptoms of Cortisol Excess, Cushing Syndrome

<table>
<thead>
<tr>
<th>History</th>
<th>Physical Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>Blood pressure and pulse</td>
</tr>
<tr>
<td>Depression</td>
<td>Central obesity</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>Supraclavicular fat accumulation</td>
</tr>
<tr>
<td>Weight gain</td>
<td>Dorsocervical fat pad</td>
</tr>
<tr>
<td>Menstrual irregularities</td>
<td>Facial plethora</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Thinned skin</td>
</tr>
<tr>
<td>Glucose intolerance</td>
<td>Purple and wide (&gt;1 cm) striae</td>
</tr>
<tr>
<td>Easy bruising</td>
<td>Acne</td>
</tr>
<tr>
<td>Fracture with minimal trauma</td>
<td>Ecchymoses</td>
</tr>
<tr>
<td></td>
<td>Hirsutism</td>
</tr>
<tr>
<td></td>
<td>Proximal muscle weakness or wasting</td>
</tr>
</tbody>
</table>

➢ Work up for Adrenal Incidentaloma should address 3 questions:

♦ Is the tumor hormonally active?
♦ Does it have radiologic characteristics suggestive of a malignant lesion?
♦ Does the patient have a history of a previous malignant lesion?

♦ Work up
  • Is the tumor hormonally active?

<table>
<thead>
<tr>
<th>Lab Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
</tr>
<tr>
<td>24-hr urinary fractionated metanephrines and catecholamines</td>
</tr>
<tr>
<td>* Plasma fractionated metanephrines</td>
</tr>
</tbody>
</table>
1 mg overnight dexamethasone suppression test. The 8 AM serum cortisol concentration cutoff is >5mcg/dL (>138 nmol/L)

* If abnormal
24-hour urinary free cortisol, serum ACTH concentration, DHEA-S, and a high-dose dexamethasone suppression test

* If patient is hypertensive
a plasma aldosterone-to-plasma renin activity ratio and plasma potassium concentration

- To detect clinically significant glucocorticoid secretory autonomy
- Subclinical Cushing's syndrome

Primary Aldosteronism

- Does it have radiologic characteristics suggestive of a malignant lesion?

<table>
<thead>
<tr>
<th>Benign cortical adenoma</th>
<th>Adrenal carcinoma or metastases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter &lt;4 cm in diameter</td>
<td>Diameter &gt;4 cm</td>
</tr>
<tr>
<td>Homogeneous adrenal mass</td>
<td>Inhomogeneous density, tumor calcification</td>
</tr>
<tr>
<td>Smooth border</td>
<td>Irregular shape</td>
</tr>
<tr>
<td>Attenuation value &lt;10 hu on unenhanced ct</td>
<td>High unenhanced ct attenuation values (&gt;20 hu</td>
</tr>
<tr>
<td>Rapid contrast medium washout (eg, &gt;50 percent at 10 minutes)</td>
<td>Delayed contrast medium washout (eg, &lt;50 percent at 10 minutes)</td>
</tr>
</tbody>
</table>

- Does the patient have a history of a previous malignant lesion?
  And an adrenal mass that has an imaging phenotype consistent with metastasis

1st r/o pheochromocytoma with biochemical testing
CT-guided FNA biopsy

➢ Surgery is recommend for
  - Pheochromocytoma
  - Subclinical Cushing's in pts young with onset of HTN, DM, obesity, and low bone mass
  - Adrenal masses greater than 4 cm in diameter
  - Any tumor that enlarges by more than 1 cm during follow-up period

➢ Follow up for pys that do not fulfill the criteria for surgical resection

Hormonal Evaluation | Annually for 5 years
Radiographic Evaluation | At 3 to 6 months and then annually for 1 to 2 year

INTERPRETATION OF THYROID LABORATORY TESTS

➢ Interpretation of Thyroid Laboratory Tests

<table>
<thead>
<tr>
<th>Free T4</th>
<th>Normal TSH</th>
<th>INCREASED TSH</th>
<th>DECREASED TSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Normal, euthyroid sick syndrome</td>
<td>Subclinical hypothyroidism</td>
<td>Subclinical hyperthyroidism</td>
</tr>
<tr>
<td>Increased</td>
<td>Early thyroiditis</td>
<td>Hyperthyroidism (TSH-producing pituitary adenoma)</td>
<td>Hyperthyroidism (factitious/iatrogenic, Graves’ disease, toxic nodule)</td>
</tr>
<tr>
<td>Decreased</td>
<td>Late thyroiditis</td>
<td>Hypothyroidism (primary thyroid failure)</td>
<td>Hypothyroidism (primary pituitary failure)</td>
</tr>
</tbody>
</table>

➢ levels of **Reverse T3** (rT3) increases in conditions such as euthyroid sick syndrome

♦ **Reverse T3** — Reverse T3 (rT3) is the product of 5-monodeiodination of T4 (type III T4-5-deiodinase) (figure 2). The clearance of reverse T3 to diiodothyronine (T2) is reduced in nonthyroidal illness because of inhibition of the 5'-monodeiodinase activity [16]. As a result, serum rT3 concentrations are high in patients with nonthyroidal illnesses except in those with renal and some with AIDS

THYROID NODULE WORKUP

<table>
<thead>
<tr>
<th>Sonographic pattern</th>
<th>US features</th>
<th>risk of malignancy</th>
<th>Consider biopsy (FNA size cutoff, largest dimension)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High suspicion</strong></td>
<td>Solid hypoechoic nodule or solid hypoechoic component of a partially cystic nodule WITH one or more of the following features: irregular margins (infiltrative, microlobulated), microcalcifications, taller than wide shape, rim calcifications with small extrusive soft tissue component, evidence of extrathyroidal extension</td>
<td>&gt;70 to 90%*</td>
<td>Recommend FNA at &gt;1 cm</td>
</tr>
<tr>
<td><strong>Intermediate suspicion</strong></td>
<td>Hypoechoic solid nodule with smooth margins <strong>WITHOUT</strong> microcalcifications, extrathyroidal extension, or taller than wide shape</td>
<td>10 to 20%</td>
<td>Recommend FNA at &gt;1 cm</td>
</tr>
<tr>
<td><strong>Low suspicion</strong></td>
<td>Isoechoic or hyperechoic solid nodule, or partially cystic nodule with eccentric solid areas, <strong>WITHOUT</strong> microcalcification, irregular margin or extrathyroidal extension, or taller than wide shape</td>
<td>5 to 10%</td>
<td>Recommend FNA at &gt;1.5 cm</td>
</tr>
<tr>
<td><strong>Very low suspicion</strong></td>
<td>Spongiform or partially cystic nodules <strong>WITHOUT</strong> any of the sonographic features described in low, intermediate, or high suspicion patterns</td>
<td>&lt;3%</td>
<td>Consider FNA at &gt;2 cm. Observation without FNA is also a reasonable option</td>
</tr>
<tr>
<td><strong>Benign</strong></td>
<td>Purely cystic nodules (no solid component)</td>
<td>&lt;1%</td>
<td>No biopsy</td>
</tr>
</tbody>
</table>
All Patients with acute mental status change should have [Glasgow Coma Scale](#).
❖ IHS Criteria for Frequent episodic tension-type headache
At least 10 episodes occurring 1-15 days per month for at least 3 months and fulfilling the following criteria
♦ Headache lasting from 30 minutes to 7 days
♦ Headache has at least two of the following characteristics:
  • Bilateral location
  • Pressing/tightening (non-pulsating) quality
  • Mild or moderate intensity
  • Not aggravated by routine physical activity such as walking or climbing stairs
♦ Both of the following:
  • no nausea or vomiting (anorexia may occur)
  • no more than one of photophobia or phonophobia
♦ Not attributed to another disorder

❖ IHS Criteria for Migraines without Aura
At least 5 attacks fulfilling the following criteria
♦ Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)\(^2;3;4\)
♦ Headache has at least two of the following characteristics:
  • Unilateral location
  • Pulsating quality
  • Moderate or severe pain intensity
  • Aggravation by activity
♦ During headache at least one of the following:
  • Nausea and/or vomiting
  • Photophobia and phonophobia
♦ Not attributed to another disorder

❖ IHS Criteria for Migraines with Aura
At least 2 attacks, have three of the four characteristics
♦ One or more fully reversible aura symptoms
♦ At least one aura symptom develops gradually over more than four minutes or two or more symptoms occur in succession
♦ No aura symptom lasting more than 1 hour
♦ Headache follows aura with a free interval <1hr
Menstrual migraine

Two subtypes

- Attacks of menstrual related migraine without aura must have an onset during the peri-menstrual time period (2 days before to 3 days after the onset of menstruation) and this pattern must be confirmed in 2/3 of menstrual cycles, but other attacks may occur at other times of the menstrual cycle. Prevalence 35%-51%
- Attacks of pure menstrual migraine without aura are similar to the above criteria except that migraine headaches are strictly limited to the peri-menstrual time period and do not occur at other times of the month. Prevalence 7-19%.

Short-term Prophylactic Therapies for menstrual migraines

- Naproxen sodium 550 mgs BID. 6 d before to 7 d after menses
- Three triptans when administered for 4-5 days during the peri-menstrual time period are also effective preventative agents
  - Frovatriptan 2.5 QD or BID
  - Naratriptan 1 mg BID
  - Zolmitriptan 2.5 mgs BID and 2.5 mgs TID
- Estrogen 1.5 mg estradiol in gel qd, 7 days peri-menstrually

ID Migraine Screener

- A set of three “yes/no” screening questions developed by Lipton and colleagues
- The questionnaire asks patients whether, in the previous 3 months
  - Their headaches were accompanied by nausea
  - Their headaches were accompanied by Sensitivity to light
  - Their headaches were accompanied by Difficulty working, studying, or performing daily tasks for at least 1 day
- “Yes” answers to at least 2 of these questions has a sensitivity of 81%, specificity of 75%

Tool for assessment of migraine-related disability

- Migraine Disability Assessment Scale (MIDAS)
  - 0 to 5, MIDAS Grade I, Little or no disability
  - 6 to 10, MIDAS Grade II, Mild disability
  - 11 to 20, MIDAS Grade III, Moderate disability
  - 21+, MIDAS Grade IV, Severe disability
Hospital care for Migraine

Rarely should a patient require inpatient hospitalization for the treatment of headache without a serious underlying organic medical condition. Sometimes if the headache persists and is associated with intractable nausea and vomiting, hospital admission may be required.

Criteria for inpatient treatment include:
- Severe, Intractable Headache
- Accompanied by
- Dehydration (Requiring IV therapy for pain interruption)
- Significant comorbid neurologic, medical, or psychiatric illnesses
- Dependence on analgesic or Ergotamine medication, requiring detoxification

Goals of Inpatient of treatment:
- Terminate intractable headache
- Discontinue offending analgesics if rebound is present
- Implement preventive pharmacotherapy
- Interrupt daily headache pattern with parenteral protocols
- Identify effective abortive therapy
- Treat behavioral and neuropsychiatric comorbidities
- Education, discharge and outpatient planning

Red Flags for Headaches “SNOOP”
- Systematic symptoms or disease
- Neurologic signs or symptoms
- Onset sudden
- Onset before age 5 or after age 50
- Pattern changes from prior headaches, worse headache

Work up for Headaches:
- Symptom based
  - CBC, CMP
  - Sed Rate, CRP ➔ rule out Temporal Giant Cell Arteritis
- Neuro-imaging
  - Patients w/ Red flags
  - MRI/MRA best to diagnose aneurysms or AVM
- Indications for Lumbar Tap
  - First or worst headache of a patient's life
  - Severe, rapid-onset, recurrent headache
  - Progressive headache
  - Unresponsive, chronic, intractable headache

Courtesy of David E.J. Bazzo, M.D., FAAFP
Clinical Professor of Family Medicine University of California, San Diego
❖ Treatment of Migraine inpatient
- IVF 1-2 liters, NS
- Magnesium sulfate 1 gram q 12 hrs
  ▪ Contraindicated with renal insufficiency
    ▪ Monitor Mg levels and reflexes if repeated dosing
      If no side effects, may reach 1.5 times upper range of magnesium plasma level
    ▪ Side effects: brief flushing, diarrhea, mild hypotension

◆ Treatment Options
- Dumois Headache Cocktail: Diphenhydramine (Benadryl) 25 mg IV + Prochlorperazine (Compazine) 10 mg IV + Ketorolac (Toradol) 30 mg IV + Decadron 8 mg
  ▪ May repeat q 6 hrs without decadron
  ▪ If patient over 65 yrs old or weights less than 50 kg, use ketorolac 15 mg
  ▪ Contraindicated with renal insufficiency
- Sumatriptan 6 mg sub-q x 1 (may repeat in 1 hr)
- Valproate Sodium (500 IV) q 8 hrs
- Opioids - use rarely

◆ Patients with refractory migraine
  ▪ Modified Raskin Protocol
  Click here for Raskin

◆ Patients requiring detoxification
  Click here for detox

❖ Indications for Prophylactic Medications
◆ 2-3 disabling migraines per month
◆ Uncontrolled with abortive meds
◆ Prolonged aura
◆ Requiring symptomatic meds more than 2-3 times a week
◆ Predictable pattern, ie, premenstrual
Prophylaxis Medications; AHS/AAN Migraine Prevention Guidelines

**Level A:** Established as effective, should be offered to patients requiring migraine prophylaxis

<table>
<thead>
<tr>
<th>Medication / Dose</th>
<th>AHS/AAN</th>
<th>EFNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divalproex/sodium valproate</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Metoprolol 47.5-200 mg/day</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Petasites (butterbur) 50-75 mg bid</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Propranolol 120-240 mg/day</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Timolol 10-15 mg bid</td>
<td>A</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Topiramate 25-200 mg/day</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

**Level B:** Probably effective, should be considered for patients requiring migraine prophylaxis

<table>
<thead>
<tr>
<th>Medication / Dose</th>
<th>AHS/AAN</th>
<th>EFNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amitriptyline 25-150 mg/day</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Fenoprofen 200-600 mg tid</td>
<td>B</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Feverfew 50-300 mg bid; 2.08-18.75 mg tid for MIG-99 prep</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Histamine 1-10 ng subcutaneously twice a week</td>
<td>B</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Ibuprofen 200 mg bid</td>
<td>B</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Ketoprofen 50 mg tid</td>
<td>B</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Magnesium 600 mg trigmagnesium dicitrate qd</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Naproxen 500-1100 mg/day</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Naproxen Sodium 550 mg bid</td>
<td>B</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Riboflavin 400 mg/day</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Venlafaxine 150 mg extended release/day</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Atenolol 100 mg/day</td>
<td>B</td>
<td>NOT RATED</td>
</tr>
</tbody>
</table>

**Level C:** Possibly effective, May be considered for patients requiring migraine prophylaxis

<table>
<thead>
<tr>
<th>Medication / Dose</th>
<th>AHS/AAN</th>
<th>EFNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candesartan 16 mg/day</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Carbamazepine 600 mg/day</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Clonidine 0.75-0.15 mg/day; patch formulations also studied</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Guanfacine 0.5-1 mg/day</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Lisinopril 10-20 mg/day</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Nebivolol 5 mg/day</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Pindolol 10 mg/day</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Flurbiprofen 200 mg/day</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Mefenamic acid 500 mg tid</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
<tr>
<td>Coenzyme Q10 100 mg tid</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Cyproheptadine 4 mg/day</td>
<td>C</td>
<td>NOT RATED</td>
</tr>
</tbody>
</table>

New FDA approved medication to prevent migraine

- Aimovig (Erenumab, a human monoclonal antibody)
  - Patients self-administer the injections once a month
  - Works by inhibiting calcitonin gene-related peptide that's involved in migraine-specific pain pathways.
  - Injection site reactions and constipation were the most common side effects
  - In three trials of about 2000 patients, those treated with erenumab consistently had one to two fewer migraine days a month than those given placebo.

**Acute Therapies for Migraine**

**Group 1: Proven pronounced statistical and clinical benefit**
- Acetaminophen, aspirin, plus caffeine PO
- Aspirin PO
- Butorphanol
- Dihydroergotamine
- Ibuprofen PO
- Naproxen sodium PO
- Naratriptan PO
- Prochlorperazine IV
- Rizatriptan PO
- Sumatriptan
- Zolmatriptan

**Group 2: Moderate statistical and clinical benefit**
- Acetaminophen plus codeine PO
- Butalbital, aspirin, caffeine, plus codeine PO
- Butorphanol IM
- Chlorpromazine IM, IV
- Diclofenac K, PO
- Ergotamine plus caffeine plus pentobarbital, plus Bellafoline PO
- Ketorolac IM
- Lidocaine IN
- Meperidine IM, IV
- Methadone IM
- Metoclopramide IV
- Naproxen PO
- Prochlorperazine IM, PR

**Group 3: Conflicting or inconsistent evidence**
- Butalbital, aspirin, plus caffeine PO
- Ergotamine PO
- Ergotamine plus caffeine PO
- Metoclopramide IM, PR

**Group 4: proven to be statistically or clinically ineffective**
- Acetaminophen PO
- Chlorpromazine IM
- Granisetron IV
- Lidocaine IV

**Group 5: clinical and statistical benefits unknown**
- Dexamethasone IV
- Hydrocortisone


Lecture by Jennifer Keebauch, MD. Given to Family Medicine Residents

American Academy of Neurology guidelines for migraine headache 2000

THE DUMOIS HEADACHE COCKTAIL

❖ Diphenhydramine (Benadryl) 25 mg IV + Prochlorperazine (Compazine) 10 mg IV + Ketorolac (Toradol) 30 mg IV + Decadron 8 mg
  ▪ May repeat q 6 hrs without decadron
  ▪ If patient over 65 yrs old or weights less than 50 kg, use ketorolac 15 mg
  ❗ Contraindicated with renal insufficiency

❖ Not necessarily evidence based, but individual components in the cocktail have demonstrated effectiveness for acute migraine treatment but there are no studies with the drugs used in combination

❖ Based on experience and in consultation with numerous ED Physicians
ISCHEMIC STROKE

❖ History
   ◆ Exact time of symptom onset  “Last known well”
   ◆ Identification of risk factors for a thrombotic, embolic, hemorrhagic etiology

❖ Physical Exam
   ◆ Neurological exam (Merck Manual professional series)
   ◆ Neck: bruits
   ◆ Heart: arrhythmias, murmurs

❖ NIH stroke scale
   ▪ Uses 11 components to document the severity of the stroke
     * 0 = no stroke symptoms
     * 1-4 = minor stroke
     * 5-15 = moderate stroke
     * 16-20 = moderate to severe stroke
     * 21-42 = severe stroke
   ▪ Helps direct therapy
   ▪ Allows assessment of the patient's neurologic exam over time

❖ Workup
   ◆ Brain Imaging: non-contrast CT of head- goal completed and read 45 min of coming to ED
     (to rule out hemorrhagic stroke)
   ◆ MRI of Brain
   ◆ ECG
   ◆ Chest X-ray
   ◆ Laboratory Tests
   ◆ Complete blood count and platelet count,
   ◆ prothrombin time or INR, PTT
   ◆ Serum electrolytes, blood glucose
   ◆ CRP or sedimentation rate
   ◆ Hepatic and renal chemical analysis
   ◆ Lipid profile
   ◆ Duplex / Doppler ultrasound (Class III, Level B)
   ◆ In selected patients
     ▪ MRA or CTA
     ▪ Echocardiography,
     ▪ Pulse oximetry and arterial blood gas analysis
     ▪ Lumbar puncture
     ▪ EEG
     ▪ Toxicology screen
Treatment

♦ In Stroke Time is Brain
  - 3-hours between symptom onset and delivery of thrombolytics.
  - Symptom onset to ER doors: less than 3 hours
  - Door to lab work completed: 45 minutes (CBC, BMP, PT/PTT, UA, EKG, CXR)
  - Door to non-contrast CT-head ordered: 25 minutes
  - Door to CT being read: 45 minutes
  - Door to decision to give t-PA: 45 minutes
  - Door to drug administration: 60 minutes (and less than 3 hours from onset)

♦ At WPMH Code GRAY is initiated in the ED
♦ At WPMH use the Stroke Power Plan
♦ Intravenous t-PA if within therapeutic window and no contraindications

♦ Mechanical Thrombectomy for patients with large vessel occlusion who could be treated out to 16-24 hours.

  DAWN and DEFUSE 3 Trials

♦ Admit to a stroke unit or PCU / ICU
♦ Anticoagulation
  - If Minor Stroke (NIHSS: 3 or less), start DAPT within 24 hrs
  - Aspirin 162 mg x 5 days, then 81 mg daily, plus clopidogrel 300 mg loading dose, followed by 75 mg daily for 21 days then return to monotherapy (aspirin 81 mg daily or clopidogrel 75 mg daily)

BMJ 2019;364:l895

  - Initiation of aspirin 162 mg to 325 mg within 24-48h of acute ischemic stroke
  - Aspirin, heparin, and warfarin should be held for the first 24 hours post t-PA
  - **Heparin, low–molecular-weight heparin (LMWH), or warfarin anticoagulation are NOT recommended for acute ischemic stroke.**

♦ Emergent blood pressure management
  - Treat BP only if systolic > 220 mm Hg or diastolic blood pressure > 120 mm Hg for first 24 hrs
  - BP lowering should proceed cautiously, with 15% after the first 24 hours being a reasonable goal.
  - For t-PA, blood pressure goal ≤ 185/110 mm
  - Labetalol, nitropaste or nicardipine infusion
  - Maintain blood pressure < 180/105 mm Hg for at least 24 hours after t-PA
♦ Statins: High Intensity
Glycemic management
  - Insulin for patients with serum glucose levels > 185 mg/dl
Hypovolemia should be corrected with normal saline
Supplemental oxygen (oxygen saturation < 92%)
Swallowing evaluation
  - Tube feeding should be started for patients who cannot take PO
Venous thromboembolism prophylaxis recommended for patients with limited mobility
  - Subcutaneous anticoagulants recommended
  - Intermittent external compression devices recommended if anticoagulants contraindicated
Consult PT / OT for early mobilization
Smoking Cessation
Blood pressure goals in CVA

<table>
<thead>
<tr>
<th></th>
<th>BP Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic stroke</td>
<td>&lt;220/120 (first 24-48 hrs) Then gradual reduction</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic stroke given thrombolytics</td>
<td>Before tPA given: 185/110 Maintain: 180/105 first 24 hrs Then gradual reduction</td>
</tr>
<tr>
<td>Intracranial Hemorrhage</td>
<td>&lt;160/100</td>
</tr>
<tr>
<td>Subarachnoid Hemorrhage</td>
<td>&lt;140/90</td>
</tr>
</tbody>
</table>

GAIT ABNORMALITIES

❖ Hemiplegic Gait
The patient stands with unilateral weakness on the affected side, arm flexed, adducted and internally rotated. Leg on same side is in extension with plantar flexion of the foot and toes. When walking, the patient will hold his or her arm to one side and drags his or her affected leg in a semicircle (circumduction) due to weakness of distal muscles (foot drop) and extensor hypertonia in lower limb. This is most commonly seen in stroke. With mild hemiparesis, loss of normal arm swing and slight circumduction

❖ Diplegic Gait
Patients have involvement on both sides with spasticity in lower extremities worse than upper extremities. The patient walks with an abnormally narrow base, dragging both legs and scraping the toes. This gait is seen in bilateral periventricular lesions, such as those seen in cerebral palsy. There is also characteristic extreme tightness of hip adductors which can cause legs to cross the midline referred to as a scissors gait. In countries with adequate medical care, patients with cerebral palsy may have hip adductor release surgery to minimize scissoring.

❖ Neuropathic Gait (Steppage Gait, Equine Gait)
Seen in patients with foot drop (weakness of foot dorsiflexion), the cause of this gait is due to an attempt to lift the leg high enough during walking so that the foot does not drag on the floor. If unilateral, causes include peroneal nerve palsy and L5 radiculopathy. If bilateral, causes include amyotrophic lateral sclerosis, Charcot-Marie-Tooth disease and other peripheral neuropathies including those associated with uncontrolled diabetes.

❖ Myopathic Gait (Waddling Gait)
Hip girdle muscles are responsible for keeping the pelvis level when walking. If you have weakness on one side, this will lead to a drop in the pelvis on the contralateral side of the pelvis while walking (Trendelenburg sign). With bilateral weakness, you will have dropping of the pelvis on both sides during walking leading to waddling. This gait is seen in patient with myopathies, such as muscular dystrophy.

❖ Parkinsonian Gait
the patient will have rigidity and bradykinesia. He or she will be stooped with the head and neck forward, with flexion at the knees. The whole upper extremity is also in flexion with the fingers usually extended. The patient walks with slow little steps known at marche a petits pas (walk of little steps). Patient may also have difficulty initiating steps. The patient may show an involuntary inclination to take accelerating steps, known as festination.
❖ **Choreiform Gait (Hyperkinetic Gait)**
This gait is seen with certain basal ganglia disorders including Sydenham's chorea, Huntington's Disease and other forms of chorea, athetosis or dystonia. The patient will display irregular, jerky, involuntary movements in all extremities. Walking may accentuate their baseline movement disorder.

❖ **Atactic Gait (Cerebellar)**
Most commonly seen in cerebellar disease, this gait is described as clumsy, staggering movements with a wide-based gait. While standing still, the patient's body may swagger back and forth and from side to side, known as titubation. Patients will not be able to walk from heel to toe or in a straight line. The gait of acute alcohol intoxication will resemble the gait of cerebellar disease. Patients with more truncal instability are more likely to have midline cerebellar disease at the vermis.

❖ **Sensory Gait**
As our feet touch the ground, we receive proprioceptive information to tell us their location. The sensory atactic gait occurs when there is loss of this proprioceptive input. In an effort to know when the feet land and their location, the patient will slam the foot hard onto the ground in order to sense it. A key to this gait involves its exacerbation when patients cannot see their feet (i.e. in the dark). This gait is also sometimes referred to as a stomping gait since patients may lift their legs very high to hit the ground hard. This gait can be seen in disorders of the dorsal columns (B12 deficiency or tabes dorsalis) or in diseases affecting the peripheral nerves (uncontrolled diabetes). In its severe form, this gait can cause an ataxia that resembles the cerebellar atactic gait.

*Stanford ed 25*

Click to see video of abnormal gaits. (Stanford Medical)
Bell's Palsy

❖ History: Patients with Bell's palsy typically present with the sudden onset (usually over hours) of unilateral facial paralysis. Common findings include the eyebrow sagging, inability to close the eye, disappearance of the nasolabial fold, and drooping at the affected corner of the mouth, which is drawn to the unaffected side.

❖ Diagnosis of Bell's palsy is based upon the following criteria:

- There is a diffuse facial nerve involvement manifested by paralysis of the facial muscles, with or without loss of taste on the anterior two-thirds of the tongue or altered secretion of the lacrimal and salivary glands.
- Onset is acute, over a day or two; the course is progressive, reaching maximal clinical weakness/paralysis within three weeks or less from the first day of visible weakness; and recovery or some degree of function is present within six months.
- An associated prodrome, ear pain, or dysacusis is variable.
- A diagnosis of Bell's palsy is doubtful if some facial function, however small, has not returned within four months. Additional evaluation to determine the etiology is warranted in this instance.

❖ Examination — Facial movement is assessed by observing the response to command for closing the eyes, elevating the brow, frowning, showing the teeth, puckering the lips, and tensing the soft tissues of the neck to observe for platysma activation.

- Particular attention is directed at the external ear to look for vesicles or scabbing (which indicates zoster) and for mass lesions within the parotid gland.

❖ Imaging studies — Imaging is warranted if the physical signs are atypical, there is slow progression beyond three weeks, or if there is no improvement at four months. History of a facial twitch or spasm that precedes facial weakness suggests nerve irritation from tumor and should also prompt imaging. For patients with acute onset of facial paralysis and negative imaging studies at four months who have continued complete flaccid paralysis at seven months, repeat imaging is warranted, and biopsy is suggested if repeat imaging is negative.
Serologic testing for Lyme disease is recommended for adults with acute-onset facial palsy with exposure to Lyme-endemic areas during the spring through autumn seasons, particularly for those with bilateral facial palsy or other clinical manifestations of Lyme disease.

- Serologic testing should follow the two-tier strategy, which uses a sensitive enzyme-linked immunosorbent assay (ELISA) or an immunofluorescent assay (IFA)
- followed by a Western blot if the ELISA or IFA is positive or equivocal.

Parotid gland biopsy is suggested for patients with acute onset facial paralysis when there is no recovery and imaging studies are negative at seven months.

**Treatment**

- Mainstay of treatment prednisone (60 to 80 mg/day) for one week.
  - Treatment should preferably begin within three days of symptom onset.
- Patients with severe facial palsy at presentation, defined as House-Brackmann grade IV or higher
  - Combined therapy with prednisone (60 to 80 mg per day) plus valacyclovir (1000 mg three times daily) for one week

  *meta-analysis of six trials and 1145 patients, there was no significant benefit of combined antiviral and glucocorticoid treatment for achieving at least partial facial muscle recover (odds ratio 1.5, 95% CI 0.83-2.69

- Eye care for those with severe Bells Palsy who can not close eye lids
  - Liquid or gel formulations of artificial tears should be applied every hour while the patient is awake,
  - ointment formulations (eg, Soothe), which contain mineral oil and white petrolatum, should be used at night.
  - Protective glasses or goggles should be prescribed. Patches can be used at night.
- Physical therapy — Physical therapy for Bell’s palsy, inludes but not limited to exercises, mime therapy, massage, electrical stimulation, acupuncture, heat therapy, biofeedback, and combinations. lack of high-quality evidence to support

**Prognosis** — related to the severity of the lesion. *The House-Brackmann grading system*

devised both as a clinical indicator of severity and also an objective record of progress. On this scale, grades I and II have good outcomes, grades III and IV characterize moderate dysfunction, and grades V and VI associated with a poor outcome.

- Recurrence rate was 7%, and the mean time to recurrence was approximately 10 years.
- A third or fourth attack was unusual, occurring in 3 and 1.5 percent of cases, respectively
The House-Brackmann grading system

<table>
<thead>
<tr>
<th>Grade</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Normal</td>
<td>Normal function in all areas</td>
</tr>
<tr>
<td>II. Mild dysfunction</td>
<td>Gross</td>
</tr>
<tr>
<td></td>
<td>Slight weakness noticeable on close inspection</td>
</tr>
<tr>
<td></td>
<td>May have slight synkinesis</td>
</tr>
<tr>
<td></td>
<td>Normal symmetry and tone at rest</td>
</tr>
<tr>
<td>Motion</td>
<td>Forehead: Moderate to good function</td>
</tr>
<tr>
<td></td>
<td>Eye: Complete closure with minimal effort</td>
</tr>
<tr>
<td></td>
<td>Mouth: Slight asymmetry</td>
</tr>
<tr>
<td>III. Moderate dysfunction</td>
<td>Gross</td>
</tr>
<tr>
<td></td>
<td>Obvious but not disfiguring difference between the two sides</td>
</tr>
<tr>
<td></td>
<td>Noticeable but not severe synkinesis, contracture, or hemifacial spasm</td>
</tr>
<tr>
<td></td>
<td>Normal symmetry and tone at rest</td>
</tr>
<tr>
<td>Motion</td>
<td>Forehead: Slight to moderate movement</td>
</tr>
<tr>
<td></td>
<td>Eye: Complete closure with effort</td>
</tr>
<tr>
<td></td>
<td>Mouth: Slightly weak with maximum effort</td>
</tr>
<tr>
<td>IV. Moderately severe dysfunction</td>
<td>Gross</td>
</tr>
<tr>
<td></td>
<td>Obvious weakness and/or disfiguring asymmetry</td>
</tr>
<tr>
<td></td>
<td>Normal symmetry and tone at rest</td>
</tr>
<tr>
<td>Motion</td>
<td>Forehead: None</td>
</tr>
<tr>
<td></td>
<td>Eye: Incomplete closure</td>
</tr>
<tr>
<td></td>
<td>Mouth: Asymmetric with maximum effort</td>
</tr>
<tr>
<td>V. Severe dysfunction</td>
<td>Gross</td>
</tr>
<tr>
<td></td>
<td>Only barely perceptible motion</td>
</tr>
<tr>
<td></td>
<td>Asymmetry at rest</td>
</tr>
<tr>
<td>Motion</td>
<td>Forehead: None</td>
</tr>
<tr>
<td></td>
<td>Eye: Incomplete closure</td>
</tr>
<tr>
<td></td>
<td>Mouth: Slight movement</td>
</tr>
<tr>
<td>VI. Total paralysis</td>
<td>No movement</td>
</tr>
</tbody>
</table>

grades I and II have good outcomes, grades III and IV characterize moderate dysfunction, and grades V and VI associated with a poor outcome.
**STATUS EPILEPTICUS**

- **Status epilepticus (SE)** is a single epileptic seizure lasting more than five minutes or two or more seizures within a five-minute period without the person returning to normal between them.
- Most seizures self-resolve in < 2 minutes
- **Treatment**
  - First-line treatment: IV lorazepam 2mg every two minutes for a total of 6 or 8 mg.
  - IM Midazolam 0.2 mg/kg up to 10 mg
  - **If patients are still seizing give**
    - fosphenytoin 20 mg per kilogram. Up to 1500 mg or
    - Alternative levetiracetam 60 mg/kg up to 4500 mg
- **Algorithm**
Work up

- **New seizures** – through work up recommended
- Careful history: what happened leading to seizure, alcohol history, Hx of head trauma
- Medications
- Neurologic exam (3 min neuro exam, explanation starts at 2 min)
- Patient with any focal signs (weakness or numbness on one side, or if there is any focality to the seizure such as it started on one side and then spread—then this is a focal seizure (caused by a focal lesion)
- Labs: Urine Tox screen CBC, CMP and Mg/Phosphate, troponins
- Imaging: CT Scan
- Consider EEG, MRI and neurologic consult (can be done as an out-pt)

Treatment:
- **Anti-convulsive rarely prescribed for single unprovoked first-time seizure**
- Patients with seizures should be discharged with status rescue medications, typically a benzodiazepine, and their family members need to be educated on know how to administer them

Known epilepsy
Work up is trigger dependant, most are due to subtherapeutic drug levels of infections so send anticonvulsive drug levels. Are seizures different than their usual seizures. Did they start new medication, is there an acute issue occurring (infection, MI)
Procedures / Images / Labs

Topics  *Click” on topics below to go directly to that page

- ABG vs VBG
- ABI. Ankle Brachial Index
- Blood Patch (for post-LP HA)
- Dix-Hallpike
- Epley’s Maneuver
- ESR vs CRP
- FiO2
- New Orleans/Canadian CT Clinical Decision Rules for ordering CT after head trauma
- Lumbar Puncture
- MRI
- Ottawa ankle Rules
- Ottawa Knee Rules
- Paracentesis
- Thoracentesis
- Valsalva square wave

Guide to ordering CT vs MRI
Developed by Cliff Thomas MD

MRI With or without contrast

Shared by Dr Daniels during FMI rounds Oct 2015,
Initially provided by Dr Thomas
Using a blood pressure cuff and a doppler take the blood pressure of both arms and legs as illustrated below.

Calculating the ABI

- Right ABI: 
  \[ \frac{\text{Highest of right posterior tibial or dorsalis pedis SBP}}{\text{Highest brachial SBP}} \]

- Left ABI: 
  \[ \frac{\text{Highest of left posterior tibial or dorsalis pedis SBP}}{\text{Highest brachial SBP}} \]
Interpreting the Ankle-Brachial Index

<table>
<thead>
<tr>
<th>ABI</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00 - 1.29</td>
<td>Normal</td>
</tr>
<tr>
<td>0.91 - 0.99</td>
<td>Borderline</td>
</tr>
<tr>
<td>0.41 - 0.90</td>
<td>Mild-to-moderate disease</td>
</tr>
<tr>
<td>≤ 0.40</td>
<td>Severe disease</td>
</tr>
<tr>
<td>≥ 1.30</td>
<td>Non-compressible</td>
</tr>
</tbody>
</table>

From Lecture on PAD by Carlos Dumois MD
With or without contrast. Guide to help you choose the right MRI test for your patients

Gadolinium-Associated Nephrogenic Systemic Fibrosis
Gadolinium is a common used contrast agent in MRI
Risk Triad for developing nephrogenic sclerosis
- renal impairment
- proinflammatory state
- gadolinium exposure
FDA recommends against using gadolinium-based contrast for patients with
- a GFR less than 30 mL per minute per 1.73 m²
- acute renal failure of any severity associated with hepatorenal syndrome
- in the perioperative liver transplantation period
ESUR European Society of Urogenital Radiology guideline
- Screening all patients for renal dysfunction with a history and/or ordering laboratory testing for GFR calculation
- In patients with stage 4 or 5 chronic kidney disease and those patients with reduced renal function who are awaiting liver transplantation
  - ESUR recommends against using gadodiamide, gadopentetate dimeglumine (Magnevist), and gadoversetamide (Optimark)
- In patients with stage 3 chronic kidney disease (GFR less than 60 mL per minute), pregnant women, and children younger than one year.
  - ESUR recommends caution when using contrast

Gadolinium-Associated Nephrogenic System
JEFFREY D. SCHLAUDECKER, MD, and CHRISTOPHER R. BERNHEISEL, MD
PARACENTESIS

Ascitic Fluid
➢ Ascitic fluid absolute neutrophil count > 250 mm$^3$ = likely SBP (spontaneous bacterial peritonitis)
➢ Treat empirically with cefotaxime; alternatively, may use Unasyn or Zosyn
➢ Confirm SBP with SAAG (serum-ascites albumin gradient)

“SAAG” = Serum albumin – Ascites albumin

- SAAG > 1.1 = Portal HTN as cause for ascites
  - Test for specific etiology
  - Alcoholic hepatitis, cirrhosis, primary or metastatic liver CA, hepatic or portal vein occlusion
- SAAG < 1.1 = Consider different cause for ascites
  - Possible origin: pancreatitis, nephrotic syndrome, peritoneal TB or carcinoma, ischemic bowel

➢ If > 5 L of ascetic fluid is removed during Paracentesis
IV Albumin 6–8 g IV albumin/L of ascites removed during LVP of >5 L should be given to patients with tense ascites to prevent morbidity

 Provided by John Gulliett UCF MS4

For an observational video on how to perform a Paracentesis click on the eyeglasses icon
**PLEURAL EFFUSION**

<table>
<thead>
<tr>
<th>LDH effusion</th>
<th>LDH effusion/serum ratio</th>
<th>Protein effusion / serum ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transudative</td>
<td>&lt; 200 IU/ml</td>
<td>&lt; 0.6</td>
</tr>
<tr>
<td>Exudative</td>
<td>&gt; 200 IU/ml</td>
<td>&gt; 0.6</td>
</tr>
</tbody>
</table>

*Light Criteria for an exudative pleural effusion only one criterion above must be met for an exudative effusion to be present/considered*

**Transudative**
- Factors are systemic
- Increased hydrostatic pressure (CHF)
- Decreased oncotic pressure (cirrhosis, nephrotic syndrome)
- Typically bilateral

**Exudative**
- Factors are local
- Tb
- Pneumonia
- Pancreatitis
- Cancer
- Typically unilateral

*Pulmonary Embolism can present as either transudative or exudative*

Provided by John Gulliett UCF MS4  

For a video on how to perform a thoracentesis click on the eyeglasses icon
LUMBAR PUNCTURE

<table>
<thead>
<tr>
<th>Interpretation of CSF</th>
<th>Appearance</th>
<th>Opening pressure</th>
<th>WBC count</th>
<th>Glucose</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Clear</td>
<td>10-20 cm H₂O</td>
<td>0-5 cells/µL (&lt; 2 PMN)</td>
<td>&gt;60% of serum glucose</td>
<td>&lt; 45 mg/dL</td>
</tr>
<tr>
<td>Bacterial meningitis</td>
<td>Clear, cloudy, or purulent</td>
<td>Elevated (&gt;25 cm)</td>
<td>&gt;100 cells/µL (&gt;90% PMN); Low (&lt; 40% of serum glucose)</td>
<td>Elevated (&gt;50 mg/dL)</td>
<td></td>
</tr>
<tr>
<td>Aseptic (viral) meningitis</td>
<td>Clear</td>
<td>Normal or elevated</td>
<td>10-1000 cells /µL (lymph but PMN early)</td>
<td>&gt;60% serum glucose may be low in HSV infection</td>
<td>Elevated (&gt;50 mg/dL)</td>
</tr>
<tr>
<td>Fungal meningitis</td>
<td>Clear or cloudy</td>
<td>Elevated</td>
<td>10-500 cells/µL</td>
<td>Low</td>
<td>Elevated</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Clear or opaque</td>
<td>Elevated</td>
<td>50-500 cells/µL (early PMN then lymph)</td>
<td>Low</td>
<td>Elevated</td>
</tr>
<tr>
<td>Subarachnoid hemorrhage</td>
<td>Xanthochromia, bloody, or clear</td>
<td>Elevated</td>
<td>1 additional WBC per 1000 RBCs is considered normal correction</td>
<td>Normal</td>
<td>Elevated</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>Clear</td>
<td>Normal</td>
<td>0-20 cells/µL (lymph)</td>
<td>Normal</td>
<td>Mildly elevated 45-75</td>
</tr>
<tr>
<td>Guillain Barré syndrome</td>
<td>Clear or xanthochromia</td>
<td>Normal or elevated</td>
<td>Normal or elevated</td>
<td>Normal</td>
<td>Elevated</td>
</tr>
<tr>
<td>Pseudotumor Cerebri</td>
<td>Clear</td>
<td>Obese Pt &gt; 25 cm Non-obese Pt &gt; 20 cm</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
</tbody>
</table>

For a video on how to perform a Lumbar Puncture click on the eyeglasses icon

POST LUMBAR PUNCTURE HEADACHE

❖ Is common (32%)
❖ Is defined as “bilateral headaches that develop within 7 days after an lumbar puncture and disappears within 14 days. The headache worsens within 15 min of resuming the upright position, disappears or improves within 30 min of resuming the recumbent position”
❖ Increase incidence of post LP headaches
  • Young adults (18–30-year age)
  • Young women
  • Lower body mass index
  • Those who are pregnant
❖ Characteristics
- Onset within 24–48 h after LP, but it could be delayed by up to 12 days
- Headache rarely present immediately after LP, its occurrence should raise concern for alternate cause such as rise in intracranial pressure.
- Postural nature of the headache
- Headache are usually dull or throbbing in nature, and can start in the frontal or occipital region, which can later become generalized. It is possible for the pain to radiate to the neck and shoulder area and could be associated with neck stiffness.
- Other associated symptoms include lower back pain, nausea, vomiting, vertigo and tinnitus and, rarely, diplopia due to cranial nerve palsy and even cortical blindness.
- Symptoms are usually self limited
- Sometimes it may be severe enough to immobilize the patient

❖ Differential diagnosis of post-LP headache
- meningitis viral, chemical or bacterial
- Intracranial hemorrhage
- Cerebral venous thrombosis
- Intracranial tumor
- Non-specific headache
- Pituitary apoplexy
- Headache usually resolves within a few days

❖ Estimated rate of spontaneous recovery from post-LP headache

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Percentage recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>24%</td>
</tr>
<tr>
<td>3-4</td>
<td>29%</td>
</tr>
<tr>
<td>5-7</td>
<td>19%</td>
</tr>
<tr>
<td>8-14</td>
<td>8%</td>
</tr>
<tr>
<td>3-6 weeks</td>
<td>5%</td>
</tr>
<tr>
<td>3-6 months</td>
<td>2%</td>
</tr>
<tr>
<td>7-12 months</td>
<td>4%</td>
</tr>
</tbody>
</table>

❖ Factors contributing to headache after lumbar puncture
- Needle size: Size Matters. The size of the dural tear is directly proportionate to the amount of CSF leakage.

<table>
<thead>
<tr>
<th>Needle size</th>
<th>Incidence of headache</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 and 19G</td>
<td>70%</td>
</tr>
<tr>
<td>20 and 22G</td>
<td>40%</td>
</tr>
<tr>
<td>24 and 27G</td>
<td>12%</td>
</tr>
</tbody>
</table>

22G needle is the smallest size that should be used for diagnostic lumbar puncture
• **Direction of bevel:** The collagen fibres in the dura matter run in a longitudinal direction, parallel to the long or vertical axis of the spine, the incidence of headache after lumbar puncture is less if the needle is inserted with the bevel parallel to the dural fibres, rather than perpendicular. This “separates” the fibres rather than cutting them.

• **Needle design:** Post-LP headache reduced using non-cutting (atraumatic) needles (diamond shaped tip and the orifice is situated up to 0.5 mm from the needle tip). They temporary separate rather than cut the elastic fibres

• **Replacement of the stylet:** replace the stylet before withdrawing the needle

• **Number of lumbar puncture attempts**

❖ **The following factors do not influence the incidence of headache after LP:**

• The volume of the spinal fluid removed is not a risk factor for headache after LP.
• No evidence that bed rest after lumbar puncture has a role in preventing headache.
• Improving hydration by increased fluids (either oral or intravenous) has not been shown to prevent headache after lumbar puncture.
• No particular position during LP reduce the incidence of post LP headache
• The incidence of headache after lumbar puncture does not depend on the CSF opening pressure, CSF analysis or the volume of CSF removed

❖ **Management**

• Patient should lie in a comfortable position (mostly in the supine position owing to the postural nature of the symptoms)
• Supporting treatment such as rehydration, simple analgesics, opioids and anti-emetics may control the symptoms in milder cases.
• Typically 85% of headaches will resolve without any specific treatment.

⚠️ If conservative measures fail to resolve headaches after 72 h, then specific treatment is indicated

• The aim of specific management of post-LP headache is to replace the lost CSF, seal the puncture site and control the cerebral vasodilatation.

• **Several therapeutic measures have been suggested to treat post-LP headache**

❖ **Blood patch:** success rate of about 70–98%.

• Blood is introduced into the epidural space and forms a clot and seals the perforation, thus preventing further leak of CSF.
• Fever, local infection in the back and bleeding disorders are contraindications to the procedure
• The procedure can be repeated if it fails to resolve the symptoms at the first attempt. arachnoiditis is rare and may complicate the epidural blood patch.
• success rate is lower if it is performed within the first 24 h of lumbar puncture. This could be because a large amount of CSF leaks out during the first 24 h, which could interfere with blood clotting.

Table of Content

Procedures

Neurology
**Blood Patch:**
How is the procedure performed: The patient is asked to lie down in a curled-up lateral position and using a proper aseptic technique, an epidural needle is introduced into the epidural space of the lumbar region. About 20–30 ml of blood is then taken from a large vein, usually from the patient’s arm, and injected immediately but slowly into the epidural space through the epidural needle. As blood will distribute into the epidural space through few spinal segments superiorly and inferiorly, it is not essential to introduce it into the exact place at which the dural puncture was performed. After the procedure, the patient is asked to lie still for 1–2 h in a supine position and is then mobilized.

- **Epidural saline:** variable results.
- **Epidural dextran:** It has not been extensively studied and is not in current use.
  - In 56 patients with headache, who failed to respond to treatment including epidural blood patch, relief of headache was accomplished in all patients within 24 h after injection of 20 ml of dextran epidural.
- **Caffeine:** A few studies and some case reports have recommended oral and intravenous caffeine as a therapeutic option, although the recurrence of headache after caffeine treatment is frequent.
  - The recommended dose for the treatment of post-dural puncture headache is 300±500 mg of oral or i.v. caffeine once or twice daily.
  - Further studies needed before caffeine can be recommended as a routine treatment.
- **Sumatriptan:** Few case studies showed benefit but, a recent controlled trial found no evidence of benefit.
- **Hydration:** Initially, increased hydration was recommended as a way of replacing fluids to produce more CSF. However, several studies have shown that increased fluid intake has no effect on CSF production and this hypothesis has been discarded.
- **Surgical closure** of the dural gap: is the last resort treatment when other treatments have failed.

*Presented by Stephanie Grail MD during inpatient rounds July 2018*


As headache after lumbar puncture is relatively common and is a significant cause of morbidity, it should always be explicitly discussed when a patient consents for lumbar puncture, especially those who are in a high-risk category, such as young women with a low body mass index, and during pregnancy. As the onset of headache is usually after 24 h and may be delayed for a few days, the patients should be warned about it before discharge, particularly if they are discharged soon after the procedure.

**OTTAWA ANKLE RULES**


**OTTAWA KNEE RULES**

- X-rays indicated if One Criteria Is Met
  - Patient age >55 y (rules have been validated for children 2–16 y of age)
  - Tenderness at the head of the fibula
  - Isolated tenderness of the patella
  - Inability to flex knee to 90 degrees
  - Inability to transfer weight for four steps both immediately after the injury and in the ED

New Orleans and Canadian CT Clinical Decision Rules for ordering CT after head trauma

*Presence of any one finding indicates need for CT scan.

<table>
<thead>
<tr>
<th>New Orleans Criteria—GCS 15*</th>
<th>Canadian CT Head Rule—GCS 13–15*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>GCS &lt;15 at 2 h</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Suspected open or depressed skull fracture</td>
</tr>
<tr>
<td>Age &gt;60 y</td>
<td>Any sign of basal skull fracture</td>
</tr>
<tr>
<td>Intoxication</td>
<td>More than one episode of vomiting</td>
</tr>
<tr>
<td>Persistent antegrade amnesia</td>
<td>Retrograde amnesia &gt;30 min</td>
</tr>
<tr>
<td>Evidence of trauma above the clavicles</td>
<td>Dangerous mechanism (fall &gt;3 ft or struck as pedestrian</td>
</tr>
<tr>
<td>Seizure</td>
<td>Age ≥65 y</td>
</tr>
</tbody>
</table>

Identification of patients who have an intracranial lesion on CT

| 100% sensitive, 5% specific | 83% sensitive, 38% specific |

Identification of patients who will need neurosurgical intervention

| 100% sensitive, 5% specific | 100% sensitive, 37% specific |

*Abbreviation: GCS = [Glasgow Coma Scale](https://en.wikipedia.org/wiki/Glasgow_Coma_Scale).*
VALSALVA SQUARE WAVE

❖ Simple to perform and carries one of the best combinations of specificity (91 percent) and sensitivity (69 percent) for the detection of left ventricular systolic and diastolic dysfunction in patients with heart failure
❖ Can be used to determine if a pt with HF has been adequately diuresed: in properly diuresed pt the venous filling pressures will be restored and the SBP will drop with sustained Valsalva during phase II (well-compensated HF response pattern)
❖ Valsalva's maneuver is performed with the blood pressure cuff inflated 10 mm Hg over the systolic blood pressure. While the physician auscultates over the brachial artery, the patient is asked to perform a forced expiratory effort against a closed airway (the Valsalva's maneuver) for 10 sec and release

<table>
<thead>
<tr>
<th>Phase I (initial Valsalva)</th>
<th>Normal Response</th>
<th>Well-Compensated CHF Response</th>
<th>Decompensated CHF Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in intra-abdominal pressure → increase in SBP</td>
<td>(hear Korotkoff sounds)</td>
<td>(hear Korotkoff sounds)</td>
<td></td>
</tr>
</tbody>
</table>

| Phase II (sustained Valsalva) | Decrease in venous return → decreased preload → decrease in SBP | (absent Korotkoff sounds) |
| Patient is volume-overloaded → Valsalva is not significant enough to overcome elevated venous filling pressures → SBP remains elevated, |
| hear Korotkoff sounds |

| Phase III (release of Valsalva) | Decrease in SBP due to loss of intra-abdominal pressure | (absent Korotkoff sounds) |
| Patient is already vasoconstricted due to chronic compensation for low cardiac output → no SBP overshoot, |
| hear Korotkoff sounds |

| Phase IV (recovery from Valsalva) | Arterial constriction and increased venous return → SBP overshoot | Patient is already vasoconstricted due to chronic compensation for low cardiac output → no SBP overshoot, |
| hear Korotkoff sounds again |

DIX–HALLPIKE MANEUVER

❖ Performed to confirm diagnosis of benign paroxysmal positional vertigo (BPPV)
❖ Sensitivity about 79% (95% CI 65–94) with a specificity of 75% (95% CI 33–100)

❖ How to perform The Dix-Hallpike Maneuver (left side/ear exam)
  • Stand on left side of patient or behind patient
  • Rotate patient's head 45 degrees to left
  • Gently but quickly move patient from the seated position to supine position with neck extended back 30 degrees.
  • Observe patients eyes for up to 1 minute while supine, and then again after returning to upright Repeat on the other side
  • **Positive test = vertical, horizontal and rotatory nystagmus**
  • The affected ear is the ear that is facing down when nystagmus occurs

❖ Some patients, may not tolerate this maneuver and a modification may be needed
❖ The side-lying position
  • The modification involves the patient moving from a seated position to side-lying without their head extending off the examination table, such as with Dix-Hallpike.
  • The head is rotated 45 degrees away from the side being tested, and the eyes are examined for nystagmus.
Epley’s maneuver for treatment of BPPV

- Most recent review (11 RCTs, N = 745):
  - Results were statistically significant for the Epley maneuver versus control at 24 hours and 4 weeks.
  - Resolution of symptoms (5 RCTs, n = 273): 56% versus 21% with control (NNT = 3).
  - Positive to negative Dix-Hallpike test result (8 RCTs, n = 507): 80% versus 37% with control (NNT = 3).

How effective is Epleys in the treatment of BPPV

- How to perform Epley’s maneuver
  - The patient starts sitting upright with their head turned 45 degrees to the affected side.
  - They are laid backwards with their head hanging 30 degrees over the edge of the couch and the affected ear to the ground for 1 minute.
  - Next, their head is rotated by 90 degrees to face the opposite side for 1 minute.
  - The head is held here as the patient rolls their body onto its side.
  - The head is rotated so they are facing downward with their nose 45 degrees below horizontal for 1 minute.
  - The patient sits up sideways keeping the head in position.
SED RATE (ESR) vs C-REACTIVE PROTEIN (CRP)

➢ Common causes of an elevated ESR (>100 mm/hr)
  • Giant cell arteritis
  • Multiple myeloma
  • Tuberculosis
  • Deep abscess
  • Bacterial endocarditis
  • Acute osteomyelitis

➢ C-reactive protein (CRP) differ from ESR
  • ESR rate changes relatively slowly as patient’s condition worsens/improves, whereas CRP changes rapidly, and may better reflect acute disease
  • CRP elevations: more strongly associated with infection, especially bacterial (>10 mg/dL)
  • CRP is more sensitive to low-grade inflammation and in general less specific (may reflect smoking, diabetes, depression, chronic fatigue, hormone replacement therapy)
**ARTERIAL BLOOD GAS (ABG) vs VENOUS BLOOD GAS (VBG)**

- Venous blood gases (VBG) are widely used in the emergency setting in preference to arterial blood gases (ABG), data suggests that venous pH has sufficient agreement with arterial pH for it to be an acceptable alternative in clinical practice for most patients exceptions being in shock states or mixed acid-base disturbances.

- ABG remains the gold standard test for determining the arterial metabolic milieu (pH, PaCO2, HCO3) plus can determine PaO2
  - But ABGs can be painful, increased risk of bleeding and hematoma, infection nerve injury, risk of pseudo aneurysm and AV fistula, digital ischemia, cause delays in care.
  - Plus many times serial exams may be needed, and venous sampling may better represent the tissue milieu.

- Correlation between VBG and ABG
  - **pH**
    - Good correlation
    - Pooled mean difference: +0.035 pH units
  - **pCO2**
    - Good correlation in normocapnia
    - Non-correlative in severe shock
    - 100% sensitive in detecting arterial hypercarbia in COPD exacerbations using cutoff of PaCO2 45 mmHg, i.e. if VBG PCO2 is normal then hypercapnia ruled out
  - **HCO3**
    - Good correlation
    - Mean difference −1.41 mmol/L (−5.8 to +5.3 mmol/L 95%CI)
  - **Lactate**
    - Good correlation
    - Mean difference 0.08 (-0.27 – 0.42 95%CI)
  - **Base excess**
    - Good correlation
    - Mean difference 0.089 mmol/L (−0.974 to +0.552 95%CI)
  - **PO2**
    - PO2 values compare poorly
    - Arterial PO2 is typically 36.9 mm Hg greater than the venous with significant variability (95% confidence interval from 27.2 to 46.6 mm Hg) (Byrne et al, 2014)
  - **DIABETIC KETOACIDOSIS**
    - VBG can be used to guide management in preference to ABG (Ma et al, 2003)
    - VBG correlated with ABG well
    - Mean difference in pH -0.015 ± 0.006 units [95% CI]
❖ Conclusion when is an ABG needed?
  • to accurately determine PaCO2 in severe shock
  • to accurately determine PaCO2 if hypercapnic (i.e. PaCO2 >45 mmHg)
  • to accurately determine arterial lactate >2mM (rarely necessary)

Data taken from journal Reviews performed by LIFE IN THE FAST LANE and ACADEMIC LIFE IN EMERGENCY MEDICINE

Journal articles

CALCULATING FiO2 (Fraction of inspired oxygen)

FiO2 is the fraction or percentage of oxygen in the space being measured. Natural air includes 20.9% oxygen, which is equivalent to FiO2 of 0.209. Oxygen-enriched air has a higher FiO2 than 0.21; up to 1.00 which means 100% oxygen. FiO2 is typically maintained below 0.5 even with mechanical ventilation, to avoid oxygen toxicity.

If a patient is wearing a nasal cannula or a simple face mask, each additional liter/min of oxygen adds about 4 percentage points for the first 3 liters and only 3 Percentage point for every liter thereafter to their FiO2.

Example, a patient with a nasal cannula with 4L/min of oxygen flow would have an FiO2 of 21% + (3 x 4%)+(1 x 3%) =36%.

the Carrico index (the ratio of partial pressure arterial oxygen and FiO2) is a comparison between the oxygen level in the blood and the oxygen concentration that is breathed. A PaO2/FiO2 ratio less than or equal to 200 is necessary for the diagnosis of acute respiratory distress syndrome by the AECC criteria.

The more recent Berlin criteria defines mild ARDS at a ratio of <300.
Women’s Health

Topics
*Click on topics below to go directly to that page

❖ AUB. Abnormal Uterine Bleeding
  ❖ Work up
  ❖ Treatment

Table of Content
ABNORMAL UTERINE BLEEDING

❖ AUB includes menstrual bleeding that is abnormally heavy or abnormal in timing
❖ Acute AUB is defined as an episode of heavy bleeding requiring immediate intervention.
❖ Heavy menstrual bleeding should replace menorrhagia to describe excess menstrual bleeding
❖ Intermenstrual bleeding that occurs between clearly defined cyclic and predictable menses should replace the term metrorrhagia

❖ The etiologies of acute AUB should be classified based on the **PALM–COEIN** system
  ➢ **PALM** - refer to discrete structural entities that can be measured visually with imaging techniques
    • **P** = polyp
    • **A** = adenomyosis
    • **L** = leiomyoma
    • **M** = malignancy / hyperplasia
  ➢ **COEIN** - includes nonstructural entities that are not defined on imaging or histopathology testing
    • **C** = coagulopathy
    • **O** = ovulatory dysfunction
    • **E** = endometrial
    • **I** = iatrogenic (AUB associated with the use of exogenous gonadal steroids, intrauterine systems or devices)
    • **N** = not yet classified

❖ The leiomyoma secondary classification system categorizes lesions as "submucosal" vs "others"
  ➢ Submucosal types
  ➢ Other types
    • Intramural
    • Subserosal
    • Cervical
    • Parasitic
    • Hybrid (relate to both the endometrium and serosa).
      • The leiomyoma tertiary classification system for hybrid lesions describes the endometrial relationship first and serosal relationship second.
Laboratory Testing and Imaging

- **Initial laboratory testing**
  - Complete blood count
  - Blood type and cross match
  - Pregnancy test

- **Other laboratory tests to consider**
  - Thyroid-stimulating hormone
  - Serum iron, total iron binding capacity, and ferritin
  - Liver function tests
  - Chlamydia trachomatis

- **Initial laboratory evaluation for disorders of hemostasis**
  - Partial thromboplastin time
  - Prothrombin time
  - Activated partial thromboplastin time
  - Fibrinogen

All adolescents and women with either abnormalities in initial laboratory testing or positive screening results for disorders of hemostasis should be considered for specific tests for von Willebrand disease and other coagulopathies

- **Initial testing for von Willebrand disease**
  - von Willebrand factor antigen
  - Ristocetin cofactor assay
  - Factor VIII

Clinical Screening for Underlying Disorder of Hemostasis in Patient With Excessive Menstrual Bleeding

Heavy menstrual bleeding since menarche
One of the following conditions:
- Postpartum hemorrhage
- Surgery-related bleeding
- Bleeding associated with dental work
Two or more of the following conditions:
- Bruising, one to two times per month
- Epistaxis, one to two times per month
- Frequent gum bleeding
- Family history of bleeding symptoms


Up to 13% of women with heavy menstrual bleeding have some variant of von Willebrand disease. Up to 20% of women may have an underlying coagulation disorder

- **Endometrial tissue sampling** in patients with AUB older than 45 years
- **Endometrial sampling** in patients younger than 45 years with a history of unopposed estrogen exposure (obesity or PCOS), failed medical management, and persistent AUB
- **Pelvic ultrasound** if patient stable
Management of acute heavy uterine bleeding

Orthostatic hypotension or hemoglobin < 7 or profuse active bleeding

**No**

- **Out Patient management**
  - Contraindication to estrogen
    - MPA 20 mg 3 X daily for 10 days then once daily
    - COC (35/1) 3 X daily For 7 days then once daily

**Yes**

- **Admit to Hospital**
  - Hgb < 7
    - Offer Blood transfusion
    - Contraindication to estrogen
      - Premarin 25 mg IV q 4 hrs for 24 hrs, with promethazine for nausea
  - Hgb > 7
    - Evaluate for contraindication to estrogen
      - No Contraindication to estrogen

If no response or unstable consider D & C

MPA = Medroxyprogesterone acetate.
COC = Combined oral contraceptives

ACOG practice bulletin No.14 March 9, 2000
### Management of Acute Heavy Bleeding

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjugated estrogen premarin</td>
<td>25 mg IV Every 4–6 hours for 24 hours</td>
<td>75% will stop bleeding within 5 hours</td>
</tr>
<tr>
<td>Combined oral contraceptives</td>
<td>1 tab 3 X day for 7 days Then 1 tab daily for 21 days 21 day regimen is repeated after a 7 day interval</td>
<td>Most patients will stop bleeding within 3 days</td>
</tr>
<tr>
<td>Medroxyprogesterone acetate provera</td>
<td>20 mg 3 X daily for 10 days then once daily for 21 days 21 day regimen is repeated after a 7 day interval</td>
<td>Most patients will stop bleeding within 3 days</td>
</tr>
<tr>
<td>Tranexamic acid Lysteda</td>
<td>1.3 g orally or 10 mg/kg IV (maximum 600 mg/dose) Three times per day for 5 days (every 8 hours )</td>
<td>Antifibrinolytic drugs, such as tranexamic acid, work by preventing fibrin degradation and are effective treatments for patients with chronic AUB. They have been shown to reduce bleeding in these patients by 30–55</td>
</tr>
</tbody>
</table>

### Management of Stable Heavy Bleeding

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined oral contraceptives</td>
<td>Daily for monthly or extended cycles</td>
<td>Reduces bleeding by 50% with long term use</td>
</tr>
<tr>
<td>Progestins Medroxyprogesterone</td>
<td>10 mg daily X 14-21 days monthly</td>
<td>Reduces bleeding by 86% with long term use</td>
</tr>
<tr>
<td>Norethindrone</td>
<td>5 mg daily X 14-21 days monthly</td>
<td></td>
</tr>
<tr>
<td>Prometrium</td>
<td>200 mg daily X 14-21 days monthly</td>
<td></td>
</tr>
<tr>
<td>NSAIDs Naproxen</td>
<td>250-500 mg, 2-3 x a day during menses</td>
<td>Reduces bleeding by 29%</td>
</tr>
<tr>
<td>Levonorgestrel-IUD Mirena</td>
<td>20 mcg/24 hrs X 5 yrs</td>
<td>Reduces bleeding by 90%</td>
</tr>
<tr>
<td>Tranexamic acid Lysteda</td>
<td>650 mg, 2 tabs TID, first 3-5 days of mensis</td>
<td>Reduces bleeding by 34-54%</td>
</tr>
</tbody>
</table>

Provided By Dr Kehbauch, ACOG Committee Opinion Number 557, April 2013 (Reaffirmed 2015)
Infectious Disease

Topics *Click on topics below to go directly to that page

- Antibiotics
- Cellulitis
- Clostridium difficile infection = CDI
- Diabetic Foot Ulcer
- Diverticulitis
- Fever Unknown Origin (FUO)
- Neutropenic Fever
- PID
- Pneumonia
- Pyelonephritis
- Sepsis
- UTI
  - Complicated
  - Uncomplicated
Provided by Craig Jenkins MD during FMI Rounds Sept 2018
• Approach to empiric intravenous treatment of cellulitis in adults
  • Non-Purulent + no hx of MRSA, no risk of MRSA and no recurrent infection
    • Initiate empiric treatment for beta-hemolytic streptococci and MSSA
      • Cefazolin 1 to 2 g every 8 hours IV
      • Clindamycin 900 mg every 8 hours IV
      • Nafcillin 2 g every 4 hours IV
      • Oxacillin 2 g every 4 hours IV
    • Inadequate clinical response in 72 hrs switch to empiric coverage
  • PO antibiotics for beta-hemolytic streptococci and MSSA
    • Dicloxacillin 500 mg orally every six hours
    • Cephalexin 500 mg orally every six hours
    • Cefadroxil 1 g orally every 24 hours
    • Clindamycin 300 to 450 mg orally every six to eight hours
  • Purulent or non-purulent with hx of MRSA, or risk of MRSA or recurrent infection
    • Send drainage material for Culture
    • Initiate empiric treatment for MRSA
      • Vancomycin 15 to 20 mg/kg/dose every 8 to 12 hours, not to exceed 2 g per dose
      • Daptomycin 4 to 6 mg/kg IV every 24 hours
      • Ceftaroline 600 mg every 12 hours
      • Clindamycin 900 mg every 8 hours
      • Linezolid 600 mg every 12 hours
      • Tedizolid 200 mg every 24 hours
      • Dalbavancin 1000 mg (single dose) followed by 500 mg (single dose) one week later
      • Telavancin 10 mg/kg every 24 hours
      • Inadequate clinical response in 72 hrs add gram negative coverage
  • Healthcare associated infection, or immunocompromised pseudomonas coverage
    • Cefepime 2 g every 12 hours
    • Ceftazidime 1 g every 8 hours
    • Piperacillin-tazobactam 3.375 g every 6 hours
    • Imipenem 500 mg every 6 hours
    • Meropenem 1 g every 8 hours
• No risks for pseudomonas
  ➢ Ampicillin-sulbactam 3 g every 6 hours
  ➢ Ertapenem 1 g every 24 hours
  • PO antibiotics for MRSA only
  ❖ Clindamycin (300 to 450 mg orally every 6 to 8 hours)
  ❖ Doxycycline (100 mg orally every 12 hours)
  ❖ Linezolid (600 mg orally twice daily)
  ❖ Trimethoprim-sulfamethoxazole (1 to 2 DS tablets every 12 hours)
  • PO antibiotics for both MRSA and beta-hemolytic streptococci
• PO antibiotics for both MRSA and beta-hemolytic streptococci
• Amoxicillin 300 to 450 mg orally three times daily
• Amoxicillin 500 mg orally three times daily PLUS
  Trimethoprim-sulfamethoxazole1 double-strength tablet orally twice daily
• Amoxicillin 500 mg orally three times daily PLUS
  Doxycycline 100 mg orally twice daily
• Amoxicillin 500 mg orally three times daily PLUS
  Minocycline 200 mg once, then 100 mg orally twice daily
• Linezolid 600 mg orally twice daily

Presented by Dr Christopher Ackner during Lunch Learn Sept and 2016

• General Information
• Most common pathogens
  • beta-hemolytic streptococci (groups A, B, C, G, and F)
  • S. aureus, including methicillin-resistant strains
• Cellulitis pathogens implicated in special circumstances
  • H. influenzae - buccal cellulitis
  • clostridia and non-spore-forming anaerobes - crepitant cellulitis
  • Pasteurella multocida and Capnocytophaga canimorsus - dog and cat bites
  • Aeromonas hydrophila and Vibrio vulnificus - infections following water exposure
  • S. aureus and S. pneumoniae - Orbital cellulitis
  • Pseudomonas aeruginosa - diabetic infections and hot tub exposure
  • Group B Streptococcus - neonates and young infants
• Differential Diagnosis
  • Skin abscess
  • Deep venous thrombosis
  • Erythema migrans—an early manifestation of Lyme disease; it consists of a region of erythema at the site of a tick bite, often with central clearing and a necrotic center
  • Herpes
  • Septic arthritis—diagnosis based on synovial fluid examination
  • Septic bursitis
  • Osteomyelitis
  • Contact dermatitis
  • Acute gout
  • Drug reaction
  • Insect bite—An insect bite triggers an inflammatory reaction at the site of the punctured skin, which appears within minutes and consists of pruritic local erythema and edema. In some cases, a local reaction is followed by a delayed skin reaction consisting of local swelling, itching, and erythema
  • Panniculitis—refers to inflammation of subcutaneous fat. Diagnosis is confirmed via biopsy

**DIABETIC FOOT ULCER**

• The first step in managing diabetic foot ulcers is classifying the ulcer.
• University of Texas system (UT System) (4 grades based on clinical evaluation, plus 4 stages)
  • Grades
    • Grade 0: Pre- or post ulcerative (superficial Ulceration)
    • Grade 1: Full-thickness ulcer not involving tendon, capsule, or bone
    • Grade 2: Tendon or capsular involvement without bone palpable
    • Grade 3: Probes to bone
  • Stage:
    • Stage A: Non-infected
    • Stage B: Infected
    • Stage C: Ischemic
    • Stage D: Infected and ischemic
Treatment

- Glucose control - no randomized trials to support
- Adequate nutrition
- Local ulcer care includes sharp debridement and proper wound coverage.
- Ulcers that are subjected to sustained or frequent pressure - will benefit from pressure reduction (contact casts, cast walkers, wedge shoes, and bedrest)
- Tissue samples for culture and sensitivity should be obtained by wound curettage, rather than wound swab or irrigation
  - most common organisms aerobic gram-positive cocci.
  - Other frequent pathogens are aerobic gram-negative bacilli and anaerobes

Empiric antibiotic therapy

Mild infection — Mild diabetic foot infections can be treated with outpatient oral antimicrobial therapy.
- Coverage for streptococci and S. aureus (MSSA).
- Patients who fail to should receive extended antimicrobial coverage to include activity against MRSA, aerobic gram-negative bacilli, and anaerobes

Moderate infection — Empiric therapy of deep ulcers with extension to fascia
  - Antibiotic activity against streptococci, S. Aureus (and MRSA if risk factors are present), aerobic gram-negative bacilli and anaerobes
  - Can be administered orally in many cases.
  - Patients presenting with more extensive infections should receive empiric parenteral therapy with activity against the above pathogens
  - Empiric coverage for P. aeruginosa not always necessary

Severe infection — Limb-threatening diabetic foot infections and those that are associated with systemic toxicity should be treated with broad-spectrum parenteral antibiotic therapy.
  - In most cases, surgical debridement is necessary.
  - Antibiotic should include activity against streptococci, MRSA, aerobic gram-negative bacilli, and anaerobes.

Targeted therapy — antimicrobial therapy should be tailored to culture and susceptibility results when available.
- switch to an oral antibiotic is reasonable following clinical improvement.
- Duration of therapy
  - for mild infection 1 to 2 weeks
  - Patients with infection requiring surgical debridement 2 to 4 weeks
  - Patients requiring amputation, If entire area is resected 1 week post surgery
- Osteomyelitis — duration depends on the extent of residual affected tissue.
- If all resected (amputation) a brief course 1 week is adequate
- Four to six weeks is an appropriate course if there is residual infected bone following debridement of necrotic bone
- If necrotic bone remains, clinical cure may require several months of antibiotic therapy.

- Antibiotic Regimens
  - **SINGLE-drug regimens with activity against streptococci and staphylococci (MSSA)**
    - Cephalexin 500 mg every 6 hours or
    - Dicloxacillin 500 mg every 6 hours or
    - Amoxicillin-clavulanate 875/125 mg every 12 hours or
    - Clindamycin 300 to 450 mg every 6 to 8 hours
  
  - **TWO-drug regimens with activity against streptococci and MRSA**
    - Any above PLUS
    - Trimethoprim-sulfamethoxazole (co-trimoxazole) 2 ds tablets every 12 hrs
    - Doxycycline 100 mg orally every 12 hrs
    - Linezolid 600 mg every 12 hrs
  
  - **TWO-drug regimens with activity against streptococci, MRSA, aerobic gram-negative bacilli and anaerobes**
    - Trimethoprim-sulfamethoxazole (co-trimoxazole) 2 ds tablets every 12 hrs PLUS
    - Amoxicillin-clavulanate 875/125 mg every 12 hours OR
    - Clindamycin 300 to 450 mg every 6 to 8 hours PLUS
    - Ciprofloxacin 750 mg every 12 hours OR
    - Levofloxacin 750 mg every 24 hours OR
    - Moxifloxacin 400 mg every 24 hours

- **Parental empiric treatment of moderate to severe diabetic foot infections**
  - Beta-lactam/beta-lactamase inhibitors
    - Ampicillin-sulbactam 3 g every 6 hours No *P. aeruginosa*
    - Piperacillin-tazobactam 4.5 g every 6 to 8 hours
  - Carbapenems
    - Imipenem-cilastatin 500 mg every 6 hours
    - Meropenem 1 g every 8 hours
    - Ertapenem 1 g every 24 hours No *P. aeruginosa*
• Fluoroquinolones
  - Moxifloxacin 400 mg IV every 24 hours
• Other regimens
  - Metronidazole 500 mg IV every 8 hours
  - PLUS one of the following:
    - Ceftriaxone 1 to 2 g every 24 hours  No *P. aeruginosa*
    - Ceftazidime 2 g every 8 to 12 hours
    - Cefepime 2 g every 12 hours
    - Ciprofloxacin 400 mg IV every 8 to 12 hours
    - Levofloxacin 750 mg IV every 24 hours
    - Aztreonam 2 g every 6 to 8 hours
  - PLUS one of the following if MRSA coverage is warranted
    - Vancomycin 15 to 20 mg/kg every 8 to 12 hours
    - Linezolid 600 mg IV every 12 hours
    - Daptomycin 4 to 6 mg/kg every 24 hours

**URINARY TRACT INFECTIONS**

➢ Most common pathogen *E. coli* (75-95%)
➢ Accuracy of self-diagnosis 86-94% among women with history of recurrent UTI
➢ Dipstick U/A showing leukocyte esterase or nitrite (75% sensitive, 82% specific)
➢ **Symptomatic sexually active women with dysuria without pyuria:** screen for STIs including *chlamydia, gonorrhea, trichomoniasis, HSV, and HIV.*

★ **Uncomplicated UTI** - infection in a healthy patient with anatomically and functionally normal urinary tract.
★ **Complicated UTIs** are those that occur when certain predisposing factors are present. These factors include: Obstructed urinary flow due to congenital causes, prostatic obstruction or urinary stones; incomplete bladder emptying due to anatomic (prostatic or urethral) or neurogenic (congenital or acquired spinal cord abnormalities) reasons; vesicoureteral reflux, foreign bodies in the urinary tract (instruments, catheters, drainage tubes); systemic illness such as diabetes, male sex
➢ Treatment for uncomplicated UTI

🌟 **Fluoroquinolones are no longer considered first-line** treatment and should be reserved for patients with allergies, intolerance to other agents, severe infections.

- **Preferred:**
  - Nitrofurantoin (Macrobid) 100 mg PO twice daily for 5 days
    - Do not use if pyelonephritis suspected (poor upper urinary tract penetration)
  - Trimethoprim/sulfamethoxazole (Bactrim/Septa DS) 1 tab PO twice daily x 3d
    - Do not use if local resistance to TMP-SMX ≤ 20% and if used to Rx UTI in past 3 months.
  - Fosfomycin trometamol 3 g PO x single dose.
    - Avoid if early pyelonephritis is suspected due to low serum levels.
  - Pivmecillinam 400 mg PO twice daily for 5 days.
    - This drug is not FDA-approved or available in North America.
    - Avoid if early pyelonephritis is suspected.

- **Alternatives:** fluoroquinolone and beta-lactam regimens (see below).

  - **Fluoroquinolones**
    - use only if severe symptoms and allergy to first-line agents OR Abx treatment in prior 3 months, Infection acquired in locality with TMP/SMX *E. coli* resistance ≥20%
    - Ciprofloxacin 250 mg PO twice daily x 3d  
      - free at Publix
    - Ofloxacin 200 mg PO twice daily x 3d
    - Levofloxacin 250mg once daily x 3d
    - Norfloxacin 400 mg PO twice daily x 3d

  - **Beta-lactams:**
    - Amoxicillin/clavulanate (Augmentin)500/125 mg PO twice daily x 3-7 d
      - Close follow-up with test of cure indicated.
    - Avoid use of ampicillin or amoxicillin alone empirically >40% resistant to this agent, and trials have shown lower durable eradication rates even if susceptible
    - Cephalosporins: also inferior; test of cure advised
      - Cefpodoxime 200 mg twice daily x 3-7d
      - Cefixime 400 mg daily x 3-7d

---

These antibiotic options and suggested treatment durations for acute uncomplicated cystitis are **the same for any adult woman with acute uncomplicated cystitis, regardless of age.** A systematic review of studies evaluating treatment of cystitis in community-dwelling adults ≥65 years of age concluded that the optimal regimens are the same as those recommended for younger adults and that shorter antibiotic courses (3 to 6 days) resulted in similar outcomes as longer ones (7 to 14 days).

*UptoDate Sept 2016*
Treatment for complicated UTI and pyelonephritis

- The recommended treatment duration for complicated cystitis is **7 to 10 days**
- The recommended treatment duration for complicated pyelonephritis is **10 to 14 days**.
- Patients who are candidates for outpatient therapy may utilize:
  - Oral ciprofloxacin 500 mg BID x 7 days
  - Once daily oral fluoroquinolone (ciprofloxacin 1000 mg ER x 7 days or levofloxacin 750 mg x 5 days)
  - Oral TMP-SMX DS BID x 14 days (not for Enterococcus or Pseudomonas)
- **Parenteral regimens for empiric treatment of complicated pyelonephritis**
  - **Mild to moderate pyelonephritis**
    - Ceftriaxone 1 g every 24 hours
    - Ciprofloxacin 400 mg every 12 hours
    - Levofloxacin 750 mg every 24 hours
    - Aztreonam® 1 g every 8 to 12 hours
  - **Severe pyelonephritis**
    - Cefepime 2 g every 12 hours
    - Piperacillin-tazobactam 3.375 g every 6 hours
    - Ceftolozane-tazobactam 1.5 g every 8 hours
    - Ceftazidime-avibactam 2.5 g every 8 hours
    - Meropenem 500 mg every 8 hours
    - Imipenem 500 mg every 6 hours
    - Doripenem 500 mg every 8 hours

* Previous antimicrobial use and results of any recent urine cultures should help guide the choice of an empiric regimen.

Presented by Dr Heather Griffith during Cool Case 2016 supplemented by information from John Hopkins antibiotic guide and Uptodate 2016
PID

- Indications For Hospitalization and parenteral antibiotics
  - Pregnancy
  - Lack of response or tolerance to oral medications
  - Nonadherence to therapy
  - Inability to take oral medications due to nausea and vomiting
  - Severe clinical illness (high fever, nausea, vomiting, severe abdominal pain)
  - Complicated PID with pelvic abscess (including tuboovarian abscess)
  - Possible need for surgical intervention or diagnostic exploration for alternative etiology (e.g., appendicitis)

- Inpatient therapy

First-line therapies — >90 percent cure rates of PID cases
- Cefoxitin (2 g IV every 6 hrs) plus doxycycline (100 mg orally every 12 hrs) OR
- Cefotetan (2 g IV every 12 hrs) plus doxycycline (100 mg orally every 12 hrs). OR
- Clindamycin (900 mg IV every 8 hrs) plus gentamicin loading dose (2 mg/kg of body weight) followed by a maintenance dose (1.5 mg/kg) every 8 hours.
- Transitioning from IV to oral therapy can usually be started after 24 hours of sustained clinical improvement (resolution of fever, nausea, vomiting, and severe abdominal pain)
- Patients should complete a 14-day course of treatment with doxycycline (100 mg twice daily).
- Patients with a pelvic abscess should also receive oral clindamycin 450 mg every 6 hours or metronidazole 500 mg every 8 hours for a total of 14 days in addition to doxycycline.
- **Alternative regimens**
  - Ampicillin-sulbactam (3 g IV every 6 hrs) plus doxycycline (100 mg twice daily)
  - Azithromycin (500 mg IV daily for 1 to 2 days followed by 250 mg orally daily to complete a seven day course) with or without 12 days of metronidazole

**Outpatient therapy** for Patients with mild or moderate PID

- **First-line regimens**
  - Ceftriaxone (250 mg IM in a single dose) plus doxycycline (100 mg orally twice a day for 14 days) with or without metronidazole (500 mg twice a day for 14 days)
  - Cefoxitin (2 g IM in a single dose) with probenecid (1 g orally in a single dose) plus doxycycline (100 mg orally twice a day for 14 days) with or without metronidazole (500 mg twice a day for 14 days)
  - Metronidazole should be added for patients with Trichomonas vaginalis or in those women with a recent history of uterine instrumentation.
FEVER of UNKNOWN ORIGIN (FUO)

- Fever 101°F or 38.3°C on more than one occasion
- Duration 3 weeks or more
- No diagnosis despite 1 wk of intensive evaluation

❖ Workup

- History: thorough history attention to fever curve, infectious contacts, travel, pets, occupation, medications, TB history/risk
- Physical exam: attention to skin/mucous membranes, heart murmurs, Hepato-Splenomegaly, lymph nodes, joints
- Labs:
  - CBC with diff
  - ANA
  - SPEP
  - CMP
  - RF
  - Blood Cultures x 3
  - TSH
  - Cryoglobulin
  - U/A, Urine culture
  - ESR
  - LDH
  - PPD or Quantiferon
  - CRP
  - CK
  - HIV
  - CMP
  - Heterophile antibodies
  - EBV
  - CMV
- Imaging studies: CXR, CT w/wo contrast of chest & abdomen.
- If initial scans negative, tagged WBC or gallium scan, FDG PET,
- if suspected from history/PE echo, lower extremity Doppler U/S
- Duke’s criteria for endocarditis has good sensitivity & specificity in Pts with FUO
- Consider temporal artery biopsy if elevated ESR and age above 60, especially if other symptoms are present
- Bone marrow biopsy (if signs of marrow infiltration)
- Liver biopsy (if suspicion of CA)
  - More likely to make a dx if: continuous fever, duration more than 180 d, elevated ESR/CRP/LDH, leukopenia, thrombocytosis, abnormal chest CT

❖ Treatment

- 5–15% of FUO resolve on their own (weeks to months) w/o dx
- Empiric antibiotics are not indicated (unless Pt neutropenic)
- Empiric glucocorticoids not indicated (unless strong suspicion for rheumatologic dx)
- Discontinue unnecessary meds (only 20% of pts with med-induced FUO have elevated eosinophils or a rash)
Etiology

- Up to 30% of cases undiagnosed
- Those for whom an etiology is found

- Infection 30%
  - **Tuberculosis**: disseminated or extrapulmonary disease can have normal CXR, PPD, sputum AFB; biopsy (lung, liver, bone marrow)
  - for granulomas has 80–90% yield in miliary disease
  - **Intra-abdominal abscess**: hepatic, splenic, subphrenic, pancreatic, perinephric, pelvic, prostatic abscess or prostatitis, appendicitis
  - **Endocarditis**: consider HACEK orgs, *Bartonella, Legionella, Coxiella*
  - **Osteomyelitis**, dental abscess, sinusitis, paraspinal abscess
  - CMV, EBV, Lyme, malaria, *Babesia*, ameba, fungus, typhoid

- Connective tissue disease _30%
  - **Giant cell arteritis**: headache, scalp pain, jaw claudication, visual disturbances, myalgias, arthralgias, inc ESR
  - **Adult-onset Still’s disease** (juvenile RA): fevers w/ evanescent truncal rash, pharyngitis, LAN, very high ferritin
  - **Polyarteritis nodosa, other vasculitides**
  - RA, SLE, PMR, psoriatic arthritis, reactive arthritis

- Neoplasm _20%
  - **Lymphoma**: LAN, HSM, dec Hct or plt, inc LDH; leukemia, myelodysplasia
  - **Renal cell carcinoma**: microscopic hematuria, inc Hct
  - **Hepatocellular, pancreatic, and colon cancers, sarcomas**
  - Atrial myxomas: obstruction, embolism, constitutional symptoms

- Miscellaneous _20%
  - Drugs, factitious
  - DVT, PE, hematoma
  - Thyroiditis or thyroid storm, adrenal insufficiency, pheochromocytoma
  - Granulomatous hepatitis (many causes), sarcoidosis
  - Familial Mediterranean fever (mutation in pyrin in myeloid cells; episodic fever, peritonitis, pleuritis; inc WBC & ESR during attacks);
  - other defects in innate immunity

*Presented by Dr Taras Babiak during Cool Case presentation March 2018*
MODIFIED DUKE CRITERIA FOR INFECTIVE ENDOCARDITIS (IE)

❖ Diagnosis for infective endocarditis requires:
  • Two major criteria
  • One major and three minor criteria
  • Five minor criteria

❖ Possible infective endocarditis
  • 1 major criteria and 1 minor criteria
  • 3 minor criteria

➢ Major Diagnostic Criteria
  • Positive blood culture for typical infective endocarditis organisms (S. viridans or S. bovis, HACEK organisms, or S. aureus without other primary site, Enterococcus), from 2 separate blood cultures or 2 positive cultures from samples drawn >12 hours apart, or 3 or a majority of 4 separate cultures of blood (first and last sample drawn 1 hour apart)
  • Echocardiogram with oscillating intracardiac mass on valve or supporting structures, in the path of regurgitant jets, or on implanted material in the absence of an alternative anatomic explanation, or abscess, or new partial dehiscence of prosthetic valve or new valvular regurgitation
  • Single positive blood culture for Coxiella burnetii or anti-phase 1 IgG antibody titer >1:800

➢ Minor Diagnostic Criteria
  • Predisposing heart condition or intravenous drug use
  • Temp >38 degrees C (100.4 degrees F)
  • Vascular phenomena: arterial emboli, pulmonary infarcts, mycotic aneurysms, intracranial bleed, conjunctival hemorrhages, Janeway lesions
  • Immunologic phenomena: glomerulonephritis, Osler nodes, Roth spots, rheumatoid factor

NEUTROPENIC FEVER

❖ All cancer patients should start empiric therapy in immediately after blood cultures have been obtained.
  ❖ Fever: single oral temp 38.3 C (101F) or 38C, (100.4F) for 1 h
  ❖ Neutropenia is defined as absolute neutrophil count (ANC) <1500, Severe <500
  ❖ Profound neutropenia ANC <100

ANC = White blood cell (WBC) count X (polys or segs + bands/100)
Diagnostic evaluation

- **Detailed Hx and Physical**
  - Exam: skin, ENT, lung, perirectal area, surgical & catheter sites; **avoid DRE**
- **Labs**: CBC with differential, electrolytes, BUN/Cr, LFTs, U/A
- **Micro**: everyone blood (peripheral & through each indwelling catheter port), urine, & sputum cx.
  - Symptom guided: stool (C. difficile, cx), peritoneal fluid, CSF (rare source), fungal markers
- **Imaging**: everyone: CXR
  - Symptom guided or high risk: CT chest, or abdomen/pelvis, CNS, sinus

- **Risk Assessment** will direct approach to treatment
  - This initial Risk Assessment directs
    - Type of empiric therapy (oral vs IV)
    - Duration of antibiotic therapy
    - Inpatient versus outpatient management
  - High-risk patients are recognized by clinical factors or **formal risk classification can be performed using the Multinational Association for Supportive Care in Cancer (MASCC) scoring system**

- **High-risk patients** are those patients with any one of the following:
  - New neurological changes
  - New pulmonary findings (pulmonary infiltrates, hypoxemia, respiratory failure) and underlying COPD
  - Hemodynamic instability including uncontrolled bleeding with severe thrombocytopenia
  - GI symptoms (abdominal pain, nausea/vomiting, diarrhea, oral and GI mucositis interfering with swallowing or causing severe diarrhea
  - hepatic insufficiency; transaminitis of more than 5X upper limit of normal
  - Renal insufficiency (Cr Cl <30 mL/min)
  - Poor functional status - inadequate outpatient fluid intake or pain control
  - Profound neutropenia (ANC ≤ 100 cells/microL) that is anticipated to last for more than 7 days
  - Neutropenia as part of the conditioning regimen for allogeneic hematopoietic cell transplant
  - Neutropenia as a result of induction therapy for AML
Low-risk patients are those with the following:

- Anticipated brief (<7-d duration) period of neutropenia
- ANC greater than 500/µL and absolute monocyte count greater than 100/µL
- Normal findings on chest radiograph
- Outpatient status at the time of fever onset
- No associated acute comorbid illness
- No hepatic or renal insufficiency
- Early evidence of bone marrow recovery

Multinational Association for Supportive Care in Cancer (MASCC) scoring system

<table>
<thead>
<tr>
<th></th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 60 years old</td>
<td>2</td>
</tr>
<tr>
<td>Outpatient status</td>
<td>3</td>
</tr>
<tr>
<td>No hypotension (SBP &lt;90 mmHg)</td>
<td>5</td>
</tr>
<tr>
<td>No COPD</td>
<td>4</td>
</tr>
<tr>
<td>No dehydration requiring parenteral fluids</td>
<td>3</td>
</tr>
<tr>
<td>Solid tumor or hematological malignancy with no previous fungal infection</td>
<td>4</td>
</tr>
<tr>
<td>Burden of illness (febrile neutropenia)</td>
<td></td>
</tr>
<tr>
<td>* No or mild symptoms (5)</td>
<td>5</td>
</tr>
<tr>
<td>* Moderate symptoms (3)</td>
<td>3</td>
</tr>
<tr>
<td>* Severe symptoms (0)</td>
<td>0</td>
</tr>
</tbody>
</table>

Patients with MASCC score of less than 21 are considered High-risk.

Low-risk patients may be treated outpatient with empiric antibiotic but require very close outpatient monitoring and assessment. They should be seen daily for at least 72 hours.

- Assess risk daily, get daily labs
- If fever persist for more than 3 days on out-pt therapy will need in-pt therapy

Low-risk patients regimens include the following:

- Amoxicillin-clavulanate 500 mg/125 mg q8h plus ciprofloxacin 500 mg q12h
- Moxifloxacin 400 mg daily
- If penicillin allergic, substitute clindamycin 300 mg q6h for amoxicillin-clavulanate

High-risk patients should be admitted to the hospital for empiric therapy and close observation.

High-risk patients regimens

First-line monotherapy: must include an agent with antipseudomonal activity.

- Quinolones and aminoglycosides are not acceptable as monotherapy.
- No single agent has shown superiority in empiric treatment of febrile neutropenia.
The following antibiotics are appropriate as monotherapy:
- Piperacillin-tazobactam 4.5 g IV q6h
- Cefepime 2 g IV q8h
- Meropenem 1 g IV q8h
- Imipenem-cilastatin 500 mg IV q6h

**Second-line dual therapy:** indicated for complicated cases (hypotension or pneumonia) or suspected or proven antimicrobial resistance.

Appropriate antibiotic regimens include the following:
- Piperacillin-tazobactam 4.5 g IV q6h plus an aminoglycoside (see below)
- Cefepime 2 g IV q8h plus an aminoglycoside (see below)
- Meropenem 1 g IV q8h plus an aminoglycoside (see below)
- Imipenem-cilastatin 500 mg IV q6h plus an aminoglycoside (see below)

**Aminoglycoside options:**
- Gentamicin 2 mg/kg IV q8h or 5 mg/kg q24h
- Amikacin 15 mg/kg/day
- Tobramycin 2 mg/kg q8h

**Indications for the empiric addition of vancomycin (15 mg/kg IV q12h):**
- Suspected catheter-related infections (e.g., bacteremia, cellulitis)
- Known colonization with methicillin-resistant *Staphylococcus aureus* (MRSA)
- Blood culture positive for gram-positive bacteria
- Hypotension
- Severe mucositis, if prior fluoroquinolone prophylaxis provided

**Other additions to initial empirical therapy:** for those at risk for infection with antibiotic-resistant organisms:
- **MRSA** – Vancomycin, linezolid, or daptomycin
- **VRE** – Linezolid or daptomycin
- **ESBL producing gram-negative bacteria** – imipenem, meropenem
- **Carbapenemase-producing organisms** – polymyxin-colistin or tigecycline

**Recommendations if fever resolves in 3-5 days**

<table>
<thead>
<tr>
<th>Organism identified</th>
<th>No organism identified and ANC greater than 500 for 2 days</th>
<th>No organism identified and ANC less than 500/µL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic based on cultures / sensitivities</td>
<td>Change to PO Augmentin 500 mg/125 mg 8h plus ciprofloxacin 500-750 mg q12h</td>
<td>Continue current antibiotic regimen until day 7</td>
</tr>
<tr>
<td>Continue therapy for at <strong>least 7 days</strong> until cultures are negative and clinical recovery is noted</td>
<td>May stop antibiotics after 5-7 days once patient is afebrile for 2 consecutive days</td>
<td>If patient is initially <strong>low risk</strong> and clinically stable by day 7, then antibiotics can be discontinued</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If patient is initially <strong>high risk</strong> cannot antibiotics for 2 weeks or until resolution of neutropenia</td>
</tr>
</tbody>
</table>

**Table of Content**

- Infectious Disease
- Hematology
If fever persists after 3-5 days:

<table>
<thead>
<tr>
<th>ANC greater than 500/µL</th>
<th>ANC less than 500/µL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue current empiric antibiotic regimen</td>
<td>If patient is not on vancomycin, add vancomycin</td>
</tr>
<tr>
<td>Stop regimen 4-5 days after ANC has reached &gt;500/µL</td>
<td>If patient is already on vancomycin, consider discontinuation if cultures are negative for MRSA</td>
</tr>
<tr>
<td>Reassess for undiagnosed fungal infection</td>
<td>Consider adding empiric antifungal therapy</td>
</tr>
</tbody>
</table>

Empiric antifungal therapy:

- Amphotericin B liposomal complex 3 mg/kg q24h or
- Voriconazole 6 mg/kg q12h X 2 doses, then 4 mg/kg q12 h or
- Posaconazole 200 mg PO q6h for 7d, then 400 mg PO q12h or
- Itraconazole 200 mg IV q12h for 2d, then 200 mg IV or PO q24h for 7d, then 400 mg PO q24h thereafter or
- Caspofungin 70 mg IV for 1 dose, then 50 mg IV q24h or
- Micafungin 100-150 mg IV q24h or
- Anidulafungin 200 mg IV for 1 dose, then 100 mg IV q24h
- In low-risk patients, the risk of fungal infection is low; so, empiric antifungal should not be used routinely.
- Patients already on antifungal prophylaxis should be switched to a different class if fever persists.
- Continue therapy for 2 wks if patient is stable and no infectious etiology is identified.

Provided by Dr David Ross during inpatient rounds June 2018

Clinical Practice Guideline for the Use of Antimicrobial Agents in Neutropenic Patients with Cancer:
2010 Update by the Infectious Diseases Society of America
Dermatology for The Hospitalist

Topics

*Click on topics below to go directly to that page

- Description of skin lesions
- Drug Eruptions
- Skin Care Codes
- The Red Leg
- Wound Care
DISCRPTION OF SKIN LESIONS

❖ Primary lesions are the basic elements of skin morphology; they can undergo a variety of changes to become secondary lesions

➢ Primary Lesions

| Flat, not palpable | | Raised, palpable |
|-------------------|-----------------|
| Macule            | Localized change in color of the skin |
| Papule            | < 5mm in diameter |
| Nodule            | > 5mm |
| Plaque            | Large slightly raised lesion, always > 5mm |
| Vesicle           | < 5mm, filled with clear fluid |
| Bulla             | > 5mm, filled with clear fluid |
| Pustule           | Lesion filled with pus |
| Hive (urtica)     | Transient papule or plaque caused by dermal edema |

➢ Secondary Lesions

| Pustules          | can be both primary, or develop secondarily from vesicles |
| Scales            | are visible aggregates of corneocytes, varying in size and color |
| Crust             | Dried serum or exudate, often admixed with scale |
| Erosion           | Superficial defect involving only epidermis |
| Excoriation       | Defect extending into dermis, caused by scratching |
| Ulcer             | Chronic defect extending into dermis or subcutaneous defect, which develops as a result of tissue necrosis and heals poorly |
| Scar              | May be raised, flat (rarely) or atrophic; result of healing of skin defect |
| Cyst              | Space lined by epithelium and usually filled with products of lining cells (keratin, sebum, mucin) |
| Necrosis          | Dead tissue |

➢ Additional Descriptive Terms

| Color               | | Nature               |
|---------------------|-----------------|
|                    | uniform, irregular, patchy |
| Configuration       | Circinate: arched or rounded border |
|                     | Annular: circular or ring-shaped. |
|                     | Discoid, nummular: disk or coin-shaped. |
|                     | Serpiginous: winding, twisting (snake-like). |
|                     | Iris or cockade (target-like). |
|                     | Other: Oval, Finger-shaped, Leaf-like, Swirled, Starry |
| Border              | Sharp (well-circumscribed) or vague (blurred). |
| Surface             | Smooth, rough, warty, vegetating, glistening, dull |
| Consistency         | Soft, doughy, hard, fluctuant, lobed, knotty, moveable, fixed, attached to |
Patterns of Distribution

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
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<tbody>
<tr>
<td>Linear</td>
<td>Following a line</td>
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<tr>
<td>Lines of Blaschko</td>
<td>Following embryologic skin lines</td>
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<tr>
<td>Reticular</td>
<td>Net-like</td>
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<tr>
<td>Herpetiform</td>
<td>Arranged in clusters, grape-like</td>
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<tr>
<td>Zosteriform</td>
<td>Following a dermatome</td>
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<tr>
<td>Discrete</td>
<td>Solitary</td>
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<tr>
<td>Confluent</td>
<td>Blending together</td>
</tr>
<tr>
<td>Chessboard pattern</td>
<td>Arranged in rectangular patterns</td>
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<tr>
<td>Disseminated</td>
<td>Randomly distributed</td>
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Distribution Over the Skin Surface

<table>
<thead>
<tr>
<th>Degree of spread</th>
<th>Localized, regional, generalized (widespread), universal. Limited to certain areas (such as palms and soles or scalp).</th>
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</thead>
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<tr>
<td>Specific patterns</td>
<td>Symmetrical, asymmetrical, light-exposed skin, light-protected skin, intertriginous areas, seborrheic areas, pressure points, sites of predilection</td>
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</tbody>
</table>

Description of Complex Findings

Note: The following terms are frequently used in dermatologic descriptions but are not traditionally considered primary or secondary lesions.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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<tr>
<td>Atrophy</td>
<td>Loss of substance of the skin</td>
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<tr>
<td>Ecchymosis</td>
<td>Large area of extravasation of erythrocytes</td>
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<tr>
<td>Erythema</td>
<td>Redness of the skin</td>
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<tr>
<td>Erythroderma</td>
<td>Diffuse redness of the entire skin, usually associated with scaling</td>
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<tr>
<td>Exanthem</td>
<td>Abrupt appearance of diffuse or generalized similar skin lesions (usually represents viral infection or drug reaction).</td>
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<tr>
<td>Lichenification</td>
<td>Response of skin to chronic rubbing, leading to thickening with accentuated markings.</td>
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<tr>
<td>Livedo</td>
<td>Blue-red discoloration of skin due to passive congestion of vessels, often with net-like pattern</td>
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<tr>
<td>Petechiae</td>
<td>Tiny areas of extravasation of erythrocytes, usually pinhead-size</td>
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<tr>
<td>Poikiloderma</td>
<td>Combination of telangiectases, atrophy and pigmentary changes</td>
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<tr>
<td>Purpura</td>
<td>General term for extravasation of erythrocytes into the skin</td>
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<tr>
<td>Rhagade or fissure</td>
<td>Linear split or defect, extending into dermis and often originating from an orifice</td>
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<tr>
<td>Sclerosis</td>
<td>Hardening and thickening of skin</td>
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<tr>
<td>Sinus</td>
<td>Tract lined with epithelium, often discharging secretions</td>
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<tr>
<td>Suggillation</td>
<td>Synonym for ecchymosis, also used for bruise or contusion</td>
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<tr>
<td>Telangiectases</td>
<td>Small, irreversibly dilated blood vessels</td>
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</table>
Description of General Skin Condition, Vascular Status, and Associated Findings

<table>
<thead>
<tr>
<th>General Skin Condition</th>
<th>Xerotic (dry), Seborrheic (oily), ichthyotic (scaly), actinic damage, atrophic, thickened, abnormal texture, hyper, hypo, anhidrotic</th>
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</thead>
<tbody>
<tr>
<td>Vascular status:</td>
<td>Cyanotic, pale, cold, warm, edematous, with varicosities, necrotic</td>
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<tr>
<td>Nature of wound healing</td>
<td>Central or peripheral healing with scarring or atrophy, Pigmentary changes, erosion or ulcer, crust, or scale</td>
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<tr>
<td>Dynamics of lesion</td>
<td>All lesions in same stage or lesions in different stages</td>
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<tr>
<td>Associated findings</td>
<td>Lymphadenopathy, fever, malaise</td>
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THE RED LEG

Cellulitis is frequently over-diagnosed. In one study in UK cellulitis was over diagnosed in 28-33 percent of cases

Differential

- **Erysipelas**: infection of the superficial dermis is associated with a sharply demarcated raised border and elevation of the involved skin
- **Cellulitis**: is a deeper process involving dermis and subcutaneous fat that causes brawny (less well-demarcated) edema and a diffuse red border to the involved skin.
- **Stasis dermatitis** (also termed ‘venous eczema’) – brown skin pigmentation present from haemosiderin
- **DVT**
- **Contact dermatitis**
- **Resolved cellulitis** – signs of resolution include cessation of the advance, fading redness, diminished edema, skin peeling

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<tr>
<th>Cellulitis</th>
<th>Stasis Dermatitis</th>
<th>Contact Dermatitis</th>
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<tr>
<td>Gp A beta hemolytic strep and Staph aureus rapid onset usually with rapid expansion of redness, painful swelling, not fluctuant, streaking Patient often appears toxic Elevated WBC, lymphangitis, Rarely bilateral</td>
<td>Often bilateral, L&gt;R Itchy and/or painful Red, hot, swollen leg No fever, elevated WBC, LAD, streaking Look for: varicosities, edema, venous ulceration, hemosiderin deposition Superimposed contact dermatitis common</td>
<td>• Itch (no pain) • Patient is non-toxic • Erythema and edema can be severe • Look for sharp cutoff • Treat with topical steroids</td>
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</tbody>
</table>

Treatment of cellulitis

Table of Content

Dermatology
DRUG ERUPTIONS

掀起

+ Degrees of Severity

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<thead>
<tr>
<th>Simple</th>
<th>Complex (Skin eruption plus systemic symptoms)</th>
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<tr>
<td>Morbilliform (Simple) Drug Eruption</td>
<td>Drug hypersensitivity reaction</td>
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<tr>
<td>minimal systemic involvement</td>
<td>Stevens-Johnson syndrome (SJS)</td>
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<td></td>
<td>Toxic epidermal necrolysis (TEN)</td>
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+ Simple

<table>
<thead>
<tr>
<th>Morbilliform (Simple) Drug Eruption</th>
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<tr>
<td><strong>Characteristics</strong></td>
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<tr>
<td>Begins <strong>5-10 days</strong> after drug started</td>
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<tr>
<td>Erythematous macules, papules</td>
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<td>Pruritus</td>
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<tr>
<td>No systemic symptoms</td>
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<tr>
<td>Risk factors: EBV, HIV infection</td>
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<tr>
<td>Resolves 7-10 days after drug stopped</td>
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<tr>
<td>Gets worse before gets better</td>
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+ Complex

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<tr>
<th>Hypersensitivity Reactions</th>
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<td>• DRESS - Drug reaction w/ eosinophilia and systemic symptoms</td>
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<tr>
<td>• DIHS - Drug induced hypersensitivity syndrome</td>
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<tr>
<th><strong>Characteristics</strong></th>
<th><strong>Treatment</strong></th>
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</thead>
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<tr>
<td>Begins <strong>2-6 weeks after drug started</strong></td>
<td>Stop the medication</td>
</tr>
<tr>
<td>HHV6 may play a role</td>
<td>Avoid cross reacting medications</td>
</tr>
<tr>
<td>Mortality 10-25%</td>
<td>Aromatic anticonvulsants cross react 70%</td>
</tr>
<tr>
<td>Clinical features</td>
<td>Carbamazepine , Phenobarbital, Phenytoin.</td>
</tr>
<tr>
<td>• Rash</td>
<td>Valproic acid and Keppra generally safe</td>
</tr>
<tr>
<td>• Fever (precedes rash by day or more)</td>
<td>Systemic steroids (Prednisone 1.5-2mg/kg)</td>
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<tr>
<td>• Pharyngitis</td>
<td>tapering dose slowly over 1-3 months</td>
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<tr>
<td>• Hepatitis</td>
<td>Allopurinol hypersensitivity may require other</td>
</tr>
<tr>
<td>• Arthralgias</td>
<td>immunosuppressive therapy</td>
</tr>
<tr>
<td>• Lymphadenopathy</td>
<td>E.g. Cellcept</td>
</tr>
<tr>
<td>• Hematologic abnormalities</td>
<td>Completely recover, If the hepatitis resolves</td>
</tr>
<tr>
<td>– eosinophilia</td>
<td>– myocarditis, interstitial pneumonitis,</td>
</tr>
<tr>
<td>– atypical lymphocytosis</td>
<td>interstitial nephritis, thyroiditis</td>
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<tr>
<td>Other organs involved</td>
<td></td>
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</tbody>
</table>
Severe Bullous Reactions

❖ Stevens-Johnson Syndrome
❖ Toxic Epidermal Necrolysis (TEN)
  • Common medications that cause it
    o Sulfonamides
    o Aromatic anticonvulsants (carbamazepine, phenobarbital, phenytoin)
    o Allopurinol
    o NSAIDs
    o Nevirapine
    o Lamotrigine
    o Weaker link: Sertraline, Pantoprazole, Tramadol


<table>
<thead>
<tr>
<th>Stevens-Johnson (SJS)</th>
<th>Toxic Epidermal Necrolysis (TEN)</th>
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</thead>
<tbody>
<tr>
<td><strong>Causes</strong></td>
<td><strong>Causes</strong></td>
</tr>
<tr>
<td>Drugs: NSAIDs, sulfonamide, allopurinol anticonvulsants</td>
<td>Almost always a medication: NSAIDs, sulfonamide, anticonvulsants, allopurinol</td>
</tr>
<tr>
<td>Mycoplasma</td>
<td>Mortality up to 25-35% Sepsis, multiorgan failure</td>
</tr>
<tr>
<td>Mortality 5%</td>
<td>Prodrome: fever, sore throat, burning sensation in eyes X 1-3 days before skin lesions appear</td>
</tr>
<tr>
<td>Prodrome</td>
<td>Clinical features</td>
</tr>
<tr>
<td>fever, respiratory symptoms, headache, vomiting, diarrhea</td>
<td>Flat atypical purpuric targets</td>
</tr>
<tr>
<td>Clinical features:</td>
<td>Lesions become dusky, poorly demarcated, and confluent</td>
</tr>
<tr>
<td>Widespread typical targets or Atypical “targetoid” or bullous +/- skin pain, fragility, blisters</td>
<td>Lesions often blister</td>
</tr>
<tr>
<td>– Two or more mucous membranes involved</td>
<td>Nikolsky sign</td>
</tr>
<tr>
<td></td>
<td>Skin is PAINFUL</td>
</tr>
<tr>
<td></td>
<td>Often mucous membrane involvement</td>
</tr>
<tr>
<td></td>
<td>Systemic involvement can occur</td>
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<td></td>
<td>GI tract, Pulmonary, Liver</td>
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<td></td>
<td>Hypoxemia with nml chest X-ray due to Bronchial epithelial sloughing</td>
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<tr>
<td></td>
<td>LFTs can be abnormal</td>
</tr>
<tr>
<td></td>
<td>Leukopenia common</td>
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**Nikolsky's sign** is a clinical dermatological sign, named after Pyotr Nikolsky, a Russian physician. The sign is present when slight rubbing of the skin results in exfoliation of the outermost layer.
SCORTEN Criteria for prognosis of Toxic Epidermal Necrolysis

<table>
<thead>
<tr>
<th>Criteria (1 point for each)</th>
<th>Mortality rates</th>
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<tbody>
<tr>
<td>Age &gt; 40 yrs</td>
<td>0-1</td>
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<tr>
<td>Presence of malignancy</td>
<td>2</td>
</tr>
<tr>
<td>BUN &gt; 27 mg/dL</td>
<td>3</td>
</tr>
<tr>
<td>Pulse &gt; 120 bpm</td>
<td>4</td>
</tr>
<tr>
<td>Glucose &gt; 252 mg/d</td>
<td>≥5</td>
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<tr>
<td>Bicarbonate &lt; 20 mEq/BSA &gt; 10%</td>
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† Treatment of Stevens-Johnson (SJS) and Toxic Epidermal Necrolysis (TEN)

- Emergency Management
  - Stop all unnecessary medications
  - Ophthalmology consult
  - Check for Mycoplasma- 25% of SJS in pediatric patients
  - Treat like a burn patient
    - Monitor fluid and electrolyte status
    - Nutritional support
    - Warm environment
    - Respiratory care
      - Death (can occur up to 25% of patients with more than 30% skin loss, age dependent)

- Treatment
  - Topical
    - Protect exposed skin, prevent secondary infection
    - Aquaphor and Vaseline gauze
  - Systemic- controversial
    - No role for empiric antibiotics
  - Surveillance cultures
  - Treat secondary infection (septicemia)
  - Consider antivirals
  - SJS High dose corticosteroids 1.5-2 mg/kg
  - TEN: IVIG 0.5-1 g/kg/d x 4d

Adapted from presentation; Dermatology Pearls for the Hospitalist: How to Avoid the Pitfalls by Lindy P. Fox, MD Assistant Professor Director, Hospital Consultation Service 2010 at UCSF
<table>
<thead>
<tr>
<th>CPT</th>
<th>DESCRIPTION</th>
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<tr>
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Ophthalmology for The Hospitalist

Topics

*Click on topics below to go directly to that page

✦ Ophthalmology PEARLs
✦ Ophthalmology Cranial Nerve Palsies
✦ The Red Eye
✦ Vision Loss
**OPHTHALMOLOGY PEARLS**

- Ophthalmologic consultation is recommended for any condition that may cause severe and permanent vision loss, including
  - Corneal ulcers
  - Iritis
  - Acute angle glaucoma
  - Sudden visual loss
  - Orbital mass, including orbital abscess
  - Stevens Johnson Syndrome with mucosal involvement

- Remember the red flags! In acute red eye
  - Severe eye pain
  - Severe photophobia
  - Marked redness of one eye (Unilateral)
  - Reduced visual acuity (after correcting for refractive errors)
  - Suspected penetrating eye injury
  - Worsening redness and pain occurring within 1 to 2 weeks of an intraocular procedure (Suspected endophthalmitis)
  - Irritant conjunctivitis caused by an acid or alkali burn or other highly irritating substance
  - Purulent conjunctivitis in a newborn infant

- Causes of Vision Loss in Hospitalized Patients

<table>
<thead>
<tr>
<th>Condition</th>
<th>Time of Onset</th>
<th>Severity</th>
<th>Unilateral vs Bilateral</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>Gradual</td>
<td>Usually mild or moderate</td>
<td>Bilateral &gt;&gt; unilateral</td>
<td>Observation, refraction, surgery</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>Gradual</td>
<td>Severe when noticed by patient</td>
<td>Bilateral &gt;&gt; unilateral</td>
<td>Medication vs surgery</td>
</tr>
<tr>
<td>Macular degeneration</td>
<td>Gradual (dry)</td>
<td>Often severe</td>
<td>Bilateral &gt;&gt; unilateral</td>
<td>Intravitreal medication, laser therapy</td>
</tr>
<tr>
<td></td>
<td>Rapid (wet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetic retinopathy</td>
<td>Gradual</td>
<td>Moderate to severe</td>
<td>Unilateral &gt;&gt; bilateral</td>
<td>Laser therapy, intravitreal medication</td>
</tr>
<tr>
<td>Nonarteritic ischemic optic neuropathy</td>
<td>Sudden</td>
<td>Moderate to severe</td>
<td>Unilateral &gt;&gt; bilateral</td>
<td>Usually none</td>
</tr>
<tr>
<td>Arteritic ischemic optic neuropathy</td>
<td>Sudden</td>
<td>Severe</td>
<td>Unilateral &gt;&gt; bilateral</td>
<td>Immediate systemic corticosteroid therapy</td>
</tr>
<tr>
<td>Optic chiasm/postchiasmal disease</td>
<td>Sudden &gt; gradual</td>
<td>Moderate to severe</td>
<td>Bilateral</td>
<td>Varies by underlying cause</td>
</tr>
</tbody>
</table>
Vision loss – Step by step approach

➢ Step 1: Sudden or gradual vision loss
- Sudden: vascular occlusion or bleeding (vitreous hemorrhage, “wet” macular degeneration).
- Gradual: degenerations or depositions (cataract, macular dystrophies or “dry” macular degeneration, corneal dystrophies).

➢ Step 2: Associated with pain
- Associated pain is common in anterior ocular processes (keratitis, anterior uveitis)
- Other painful conditions: orbital disease, optic neuritis, and giant cell arteritis

➢ Step 3: Transient or persistent vision loss
- Transient: temporary/subcritical vascular insufficiency (e.g., giant cell arteritis, amaurosis fugax, vertebrobasilar artery insufficiency) or papilledema
- Persistent: structural or irreversible damage (vitreous hemorrhage, macular degeneration)

➢ Step 4: Unilateral or Bilateral vision loss
- Unilateral: a local cause or lesion anterior to optic chiasma
- Bilateral: a more widespread or systemic process or lesion posterior to optic chiasma

➢ Step 5: Blurred, dimmed or distorted vision
- Blurring or dimming: pathology anywhere in the visual pathway from cornea to cortex; common problems include refractive error, cataract, and macular disease.
- Distortion: macular pathology, high refractive error (high ametropia/astigmatism) or other ocular disease.

➢ Step 6: Where is the vision loss
- Superior or inferior hemispheric field loss: inferior or superior vascular event involving the retina (e.g., retinal vein occlusion) or optic disc (e.g., segmental AION)
- Peripheral field loss: retinal detachment (usually rapidly evolving from far periphery), optic nerve disease, chiasmal compression (typically bitemporal loss), or cortical pathology (homonymous hemianopic defects)
- Central blurring of vision: diseases of the macula (positive scotoma: a “seen” spot) or optic nerve (negative scotoma: an unseen defect).

➢ Step 7: When is the vision loss
- Glare: from headlights or bright sunlight due to posterior subcapsular lens opacities
CRANIAL NERVE PALSIES

❖ CN III: A patient with new third nerve paresis, especially if painful and/or incomplete, must be evaluated with urgent neuroimaging.

❖ CN IV: Trochlear palsy results in double vision with images appearing tilted with respect to one another; it arises from microvascular disease or neurosurgery.

❖ CN VI: The Horner syndrome (a sixth nerve paresis accompanied by ipsilateral ptosis and miosis) localizes the process to the cavernous sinus; acute onset can arise from cavernous sinus thrombosis or rapid tumor growth or hemorrhage.

❖ Ocular myasthenia gravis may mimic virtually any cranial neuropathy but the pupil is virtually never involved.
**RED EYE**

❖ **Differential Diagnosis of Red Eye**

➢ **Painless red eye:**

  - Diffuse redness:
    - Lids normal: Conjunctivitis
    - Lids abnormal: Blepharitis, Ectropion, Trichiasis, Eyelid lesion
  - Localized redness: Pterygium, Corneal foreign body, Ocular trauma, Subconjunctival hemorrhage, Episcleritis

➢ **Painful red eye:**

  - Cornea abnormal: Herpes simplex keratitis, Bacterial/Acanthamoebal ulcer, Marginal keratitis, Foreign body/Corneal abrasion
  - Lids abnormal: Chalazion, Blepharitis, Herpes zoster
  - Diffuse Conjunctival congestion: Viral conjunctivitis, Allergic conjunctivitis, Bacterial conjunctivitis, Dry eyes
  - Ciliary congestion: Angle closure glaucoma, Anterior uveitis (Iridocyclitis)
  - Scleral congestion: Scleritis

<table>
<thead>
<tr>
<th>Incidence</th>
<th>Conjunctivitis</th>
<th>Iritis</th>
<th>Acute Glaucoma</th>
<th>Corneal Infection</th>
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<tbody>
<tr>
<td>Discharge</td>
<td>Very common</td>
<td>Common</td>
<td>Uncommon</td>
<td>Common</td>
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<tr>
<td>Vision</td>
<td>Unaffected</td>
<td>Slightly blurred</td>
<td>Severely blurred</td>
<td>Usually blurred</td>
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<tr>
<td>Conjunctival injection</td>
<td>Diffuse</td>
<td>Circumcorneal</td>
<td>Circumcorneal</td>
<td>Circumcorneal</td>
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<td>Pain</td>
<td>None</td>
<td>Moderate</td>
<td>Severe</td>
<td>Moderate to severe</td>
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<tr>
<td>Cornea</td>
<td>Clear</td>
<td>Usually clear</td>
<td>Steamy</td>
<td>Variable</td>
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<tr>
<td>Pupil size</td>
<td>Normal</td>
<td>Small</td>
<td>Mid-dilated</td>
<td>Normal</td>
</tr>
<tr>
<td>Pupillary light response</td>
<td>Normal</td>
<td>Sluggish</td>
<td>Fixed</td>
<td>Normal</td>
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<tr>
<td>IOP</td>
<td>Normal</td>
<td>Normal</td>
<td>Elevated</td>
<td>Normal</td>
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</table>

❖ **Step by step approach**

➢ **Step 1:** Assess for possible causes of red eye

  - Trauma (foreign body, subconjunctival hemorrhage)
  - Recent ocular history such as surgery (postoperative endophthalmitis)
  - Previous history of Angle closure glaucoma, uveitis or systemic illness

➢ **Step 2:** Painful or painless red eye ?

➢ **Step 3:** If the pain is deep – assess for pattern of redness

  - Diffuse: Examine eyelids
    - Lids normal: Rule out scleritis
    - Lids abnormal:
      - With ptosis: Orbital cellulitis, Grave’s disease
      - Without ptosis: Grave’s disease
• Focal: Scleritis
• Ciliary: Examine pupils
  • Mid-dilated: Acute angle closure glaucoma
  • Small or normal pupils: Evaluate anterior chamber
  • Cloudy: Evaluate cornea
  • Cornea clear: Anterior uveitis
  • White infiltrate: Corneal ulcer

➤ **Step 4:** If the pain is superficial – Assess vision
• If decreased vision – Perform topical fluorescein staining
  • Foreign body
  • Chemical injury
  • Corneal abrasion
  • Corneal ulcer
• If normal vision – Evaluate pattern of redness
  • Diffuse congestion: Examine lids
    • Abnormal: Blepharitis, Chalazion, Hordeolum
    • Normal: Note the type of discharge
  • No discharge: Non-specific conjunctivitis
  • Purulent: Bacterial conjunctivitis
  • Watery: Is itching present?
    • No itching: Viral conjunctivitis
    • Itching: Allergic conjunctivitis (Medication related or unrelated)
• Focal: Is conjunctival lesion present:
  • Conjunctival lesion present: Pingueculum, Pterygium
  • Conjunctival lesion not present: Subconjunctival hemorrhage, Episcleritis

➤ **Step 5:** If there’s no pain but the vision is poor – possible causes are
• Vasculitis
• Vitreitis
• Retinitis

❖ Diagnostic aids for acute red eye:
➤ Light sensitivity: Iritis, keratitis, abrasion, ulcer
➤ Unilateral: Above + herpes simplex, acute angle closure glaucoma
➤ Significant pain: Above + scleritis
➤ White spot on cornea: Corneal ulcer
➤ Non-reactive pupil: Acute glaucoma, iritis
➤ Copious discharge: Gonococcal conjunctivitis
REFERENCES


18. Barbara Kirchheimer. Do hospitalists get a bad rap from satisfaction surveys? Physicians share strategies that can improve your scores Today's Hospitalist December 2008


23. ACCURACY (Assessment by Coronary Computed Tomographic Angiography of Individuals Undergoing Invasive Coronary Angiography) trial, J Am Coll Cardiol 52 2008 1724-1732


36. ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest 2008; 133; (suppl).

37. Reding (2009) UMN CME Internal Medicine Review, Minneapolis


46. Philip O. Katz, MD 1, Lauren B. Gerson , MD, MSc 2 and Marcelo F Vela, MD, MSCR 3 Am J Gastroenterol 2013; 108:308 – 328; doi: 10.1038/ajg.2012.444; published online 19 February 2013


48. The 2012 AHS/AAN Guidelines for Prevention of Episodic Migraine: A Summary and Comparison With Other Recent Clinical Practice Guidelines. Elizabeth Loder, MD, MPH; Rebecca Burch, MD; Paul Rizzoli, MD. 2012 American Headache Society 2185 930.945 ISSN 0017-8748

49. Management of Acute Abnormal Uterine Bleeding in Nonpregnant Reproductive-Aged Women, ACOG Committee Opinion Number 557, April 2013


53. Sylvia C. McKean, John J. Ross, Daniel D. Dressler, Danielle B. Scheurer. Principles and Practice of Hospital Medicine, 2e. McGraw-Hill Education. 2017


60.

On-Line Calculator
RESOURCES

My Little Book of Family Medicine Inpatient Rounding Tools

This resource section contains specific information used to hyperlink to the main section of the book when working off line.
### Medical Decision Making

#### Final Result for MDM
2 of 3 needed

<table>
<thead>
<tr>
<th>Number diagnoses/treatment</th>
<th>1 = Minimal</th>
<th>2 = Limited</th>
<th>3 = Multiple</th>
<th>4 = Extensive</th>
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<tr>
<td>Amnt &amp; complexity of data</td>
<td>1 = Minimal or low</td>
<td>2 = Limited</td>
<td>3 = Multiple</td>
<td>4 = Extensive</td>
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<td>Highest Risk</td>
<td>Minimal</td>
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<td>Moderate</td>
<td>High</td>
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<td>Straight Forward</td>
<td>Low Complex</td>
<td>Moderate Complex</td>
<td>High Complex</td>
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#### Number of Diagnoses or Treatment

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<th>Problem(s) Status</th>
<th>Number</th>
<th>Points</th>
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<tr>
<td>Est. problem (to examiner); stable, improved</td>
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<td>1</td>
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<tr>
<td>Est. problem (to examiner); worsening</td>
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<td>2</td>
</tr>
<tr>
<td>New problem (to examiner); no additional workup planned</td>
<td>Max = 1</td>
<td>3</td>
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<tr>
<td>New prob. (to examiner); add. workup planned</td>
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<td>4</td>
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<td><strong>TOTAL</strong></td>
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#### Amount and/or Complexity of Data Reviewed

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<th>Points</th>
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<tr>
<td>Review and/or order of clinical lab tests</td>
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<tr>
<td>Review and/or order of tests in the radiology section of CPT</td>
</tr>
<tr>
<td>Review and/or order of tests in the medicine section of CPT</td>
</tr>
<tr>
<td>Discussion of test results with performing physician</td>
</tr>
<tr>
<td>Decision to obtain old records and/or obtain history from someone other than patient</td>
</tr>
<tr>
<td>Review and summarize of old records and/or discussion of case with another health care pro</td>
</tr>
<tr>
<td>Independent visualization of image, tracing or specimen itself (not simply review of report)</td>
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</table>

| TOTAL |

[BACK]
<table>
<thead>
<tr>
<th>Level of Risk</th>
<th>Presenting Problem(s)</th>
<th>Diagnostic Procedure Ordered</th>
<th>Management Options</th>
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<tr>
<td>Minimal</td>
<td>● 1 self-limited or minor problem</td>
<td>●Laboratory tests requiring Venipuncture ●Chest x-rays, ●EKG/EEG ●Urinalysis ●Ultrasound ●Echocardiography ●KOH prep</td>
<td>●Rest ●Gargles ●Elastic bandages ●Superficial dressings</td>
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<tr>
<td>Low</td>
<td>● 2 + self-limited or minor problems. ●One stable chronic illness ●Acute illness /injury uncomplicated (cystitis, AR, sprain)</td>
<td>●Physiologic tests not under stress, eg, PFT's ●Non-CV imaging with contrast, eg, barium enema ●Superficial needle biopsies ●laboratory tests requiring arterial puncture ●Skin biopsies</td>
<td>●Over-the-counter drugs ●Minor surgery with no identified risk factors ●Physical therapy ●Occupational therapy ●IV fluids without additives</td>
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<tr>
<td>Moderate</td>
<td>● 1 + chronic illnesses with mild excerbtn ●Two or more stable chronic illnesses ●Undiagnosed new problem ●Acute illness with systemic symptoms ●Acute complicated injury</td>
<td>●Physiologic tests under stress, eg, cardiac stress test ●Dx endoscopies no risk factors ●Deep needle or incisional bx ●CV imaging studies with contrast ●Obtain fluid from body cavity</td>
<td>●Prescription drugs ●IV fluids with additives ●Closed treatment of fracture or dislocation w/out manipulation ●Minor surgery with risk factors ●Elective major surgery with no identified risk factors</td>
</tr>
<tr>
<td>High</td>
<td>● 1 + chronic illnesses w/ severe excerbtn, ●Acute or chronic illnesses or injuries that pose a threat to life or bodily function ●Psychiatric illness with potential threat to self or others, ●Acute renal failure</td>
<td>●Cardiovascular imaging studies with contrast with identified risk factors ●Cardiac electrophysiological tests ●Diagnostic Endoscopies with identified risk factors ●Discography</td>
<td>●Parenteral controlled Substances ●Drug therapy requiring intensive monitoring for toxicity ●Decision not to resuscitate or to de-escalate care because of poor prognosis ●An abrupt change in neuro status, eg, seizure, TIA, weakness, sensory loss ●Elective major surgery with risk factors ●Emergency major surgery</td>
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### Summary and strength of recommendations

#### Establishing the diagnosis of Gastroesophageal Reflux Disease (GERD)

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Strength of Recommendation</th>
<th>Level of Evidence</th>
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</thead>
<tbody>
<tr>
<td>A presumptive diagnosis of GERD can be made in the setting of typical symptoms of heartburn / regurgitation.</td>
<td>Strong recommendation</td>
<td>Moderate level of evidence</td>
</tr>
<tr>
<td>Empiric medical therapy with a proton pump inhibitor (PPI) is recommended in this setting</td>
<td></td>
<td></td>
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<tr>
<td>Patients with non-cardiac chest pain suspected due to GERD should have diagnostic evaluation before institution of therapy</td>
<td>Conditional recommendation</td>
<td>Moderate level of evidence</td>
</tr>
<tr>
<td>A cardiac cause should be excluded in patients with chest pain before the commencement of a gastrointestinal evaluation</td>
<td>Strong recommendation</td>
<td>Low level of evidence</td>
</tr>
<tr>
<td>Barium radiographs <strong>should not be performed</strong> to diagnose GERD</td>
<td>Strong recommendation</td>
<td>High level of evidence</td>
</tr>
<tr>
<td>Endoscopy is recommended in the presence of alarm symptoms and for screening of patients at high risk for complications.</td>
<td>Strong recommendation</td>
<td>Moderate level of evidence</td>
</tr>
<tr>
<td>Esophageal manometry is recommended for preoperative evaluation, but has <strong>no role in the diagnosis of GERD</strong>.</td>
<td>Strong recommendation</td>
<td>Low level of evidence</td>
</tr>
</tbody>
</table>
| Ambulatory esophageal reflux monitoring is indicated:  
  - Before consideration of endoscopic or surgical therapy in patients with non-erosive disease  
  - Evaluation of patients refractory to ppi therapy  
  - Situations when the diagnosis of GERD is in question. | Strong recommendation | Low level of evidence |
| Screening for Helicobacter pylori infection is not recommended in GERD patients.  
  - Treatment of H. pylori infection is not routinely required as part of anti-reflux therapy. | Strong recommendation | Low level of evidence |

### Management of GERD

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Strength of Recommendation</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss is recommended for GERD patients who are overweight or have had recent weight gain.</td>
<td>Conditional recommendation</td>
<td>Moderate level of evidence</td>
</tr>
</tbody>
</table>
| In patients with **nocturnal GERD**:  
  - Head of bed elevation  
  - Avoidance of meals 2 – 3 h before bedtime | Conditional recommendation | Low level of evidence |
<p>| Routine elimination of food that can trigger reflux (chocolate, caffeine, alcohol, acidic, spicy foods) <strong>is not recommended</strong> | Conditional recommendation | Low level of evidence |</p>
<table>
<thead>
<tr>
<th>Statement</th>
<th>Recommendation</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>An <strong>8-week course of PPIs</strong> is the therapy of choice for symptom relief and healing of erosive esophagitis.</td>
<td><strong>Strong</strong></td>
<td><strong>High level</strong></td>
</tr>
<tr>
<td>There are no major differences in efficacy between the different PPIs.</td>
<td><strong>Strong</strong></td>
<td><strong>High level</strong></td>
</tr>
<tr>
<td>Traditional delayed release PPIs should be administered 30 – 60 min before meal for maximal pH control.</td>
<td><strong>Strong</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
<tr>
<td>PPI therapy should be initiated at once a day dosing, before the first meal of the day.</td>
<td><strong>Strong</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
<tr>
<td>Non-responders to PPI should be referred for evaluation.</td>
<td><strong>Conditional</strong></td>
<td><strong>Low level</strong></td>
</tr>
<tr>
<td>In patients with partial response to PPI therapy, increasing the dose to twice daily therapy or switching to a different PPI may provide additional symptom relief.</td>
<td><strong>Conditional</strong></td>
<td><strong>Low level</strong></td>
</tr>
<tr>
<td>Maintenance PPI therapy should be administered for GERD patients who continue to have symptoms after PPI is discontinued, and in patients with complications including erosive esophagitis and Barrett’s esophagus.</td>
<td><strong>Strong</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
<tr>
<td>For patients who require long-term PPI therapy, it should be administered in the lowest effective dose, including on demand or intermittent therapy.</td>
<td><strong>Conditional</strong></td>
<td><strong>Low level</strong></td>
</tr>
<tr>
<td>H 2 -receptor antagonist (H 2 RA) therapy can be used as a maintenance option in patients without erosive disease if patients experience heartburn relief.</td>
<td><strong>Conditional</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
<tr>
<td>Bedtime H 2 RA therapy can be added to daytime PPI therapy in selected patients with objective evidence of night-time reflux if needed</td>
<td><strong>Conditional</strong></td>
<td><strong>Low level</strong></td>
</tr>
<tr>
<td>Therapy for GERD other than acid suppression, including prokinetic therapy and / or baclofen, should not be used in GERD patients without diagnostic evaluation.</td>
<td><strong>Conditional</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
<tr>
<td>No role for sucralfate in the non-pregnant GERD patient.</td>
<td><strong>Conditional</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
<tr>
<td>PPIs are safe in pregnant patients if clinically indicated.</td>
<td><strong>Conditional</strong></td>
<td><strong>Moderate level</strong></td>
</tr>
</tbody>
</table>

**Surgical options for GERD**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Recommendation</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical therapy is a treatment option for long-term therapy in GERD patients.</td>
<td><strong>Strong</strong></td>
<td><strong>High level</strong></td>
</tr>
<tr>
<td>Surgical therapy is generally not recommended in patients who do not respond to PPI therapy.</td>
<td><strong>Strong</strong></td>
<td><strong>High level</strong></td>
</tr>
<tr>
<td>Recommendation</td>
<td>Level of Evidence</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>Preoperative ambulatory pH monitoring is mandatory in patients without evidence of erosive esophagitis. All patients should undergo preoperative manometry to rule out achalasia or scleroderma-like esophagus.</td>
<td>Strong recommendation Moderate level of evidence</td>
<td></td>
</tr>
<tr>
<td>Surgical therapy is as effective as medical therapy for carefully selected patients with chronic GERD when performed by an experienced surgeon.</td>
<td>Strong recommendation High level of evidence</td>
<td></td>
</tr>
<tr>
<td>Obese patients contemplating surgical therapy for GERD should be considered for bariatric surgery. Gastric bypass would be the preferred operation in these patients.</td>
<td>Conditional recommendation Moderate level of evidence</td>
<td></td>
</tr>
<tr>
<td>The usage of current endoscopic therapy or transoral incisionless fundoplication cannot be recommended as an alternative to medical or traditional surgical therapy</td>
<td>Strong recommendation Moderate level of evidence</td>
<td></td>
</tr>
</tbody>
</table>

**Potential risks associated with PPIs**

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching PPIs can be considered in the setting of side-effects.</td>
<td>Conditional recommendation Low level of evidence</td>
</tr>
<tr>
<td>Patients with known osteoporosis can remain on PPI therapy. Concern for hip fractures and osteoporosis should not affect the decision to use PPI long-term except in patients with other risk factors for hip fracture.</td>
<td>Conditional recommendation Moderate level of evidence</td>
</tr>
<tr>
<td>PPI therapy can be a risk factor for Clostridium difficile infection, and should be used with care in patients at risk</td>
<td>Moderate recommendation Moderate level of evidence</td>
</tr>
<tr>
<td>Short-term PPI usage may increase the risk of community-acquired pneumonia. The risk does not appear elevated in long-term users</td>
<td>Conditional recommendation Moderate level of evidence</td>
</tr>
<tr>
<td>PPI therapy does not need to be altered in concomitant clopidogrel users as there does not appear to be an increased risk for adverse cardiovascular events.</td>
<td>Strong recommendation High level of evidence</td>
</tr>
</tbody>
</table>

Philip O. Katz, MD 1, Lauren B. Gerson, MD, MSc 2 and Marcelo F. Vela, MD, MSCR 3
Am J Gastroenterol 2013; 108:308 – 328; doi: 10.1038/ajg.2012.444; published online 19 February 2013
ROCKALL SCORE

Online calculator at themastersurgeon.com

The score is calculated using the table below:

<table>
<thead>
<tr>
<th>Age</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60</td>
<td>60-79</td>
<td>&gt;80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Shock**
- "No shock": pulse <100 + systolic BP ≥100 mm Hg
- "Tachycardia": pulse ≥100 + systolic BP ≥100 mm Hg
- "Hypotension": systolic BP ≥100 mm Hg

**Co-morbidity**
- No major
- Heart failure, ischemic heart disease, any major co-morbidity
- Renal failure, liver failure, disseminated malignancy

**Diagnosis**
- Mallory-Weiss
- All other diagnoses
- GI malignancy

**Evidence of bleeding**
- None
- Blood, adherent clot, spurting vessel

**Rockall score and corresponding risk of mortality**

<table>
<thead>
<tr>
<th>Score</th>
<th>Mortality</th>
<th>Mortality with rebleed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score 1</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Score 2</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Score 3</td>
<td>5%</td>
<td>5-10%</td>
</tr>
<tr>
<td>Score 4</td>
<td>5-10%</td>
<td>15-25%</td>
</tr>
<tr>
<td>Score 5</td>
<td>5-10%</td>
<td>15-25%</td>
</tr>
<tr>
<td>Score 6</td>
<td>5-10%</td>
<td>15-25%</td>
</tr>
<tr>
<td>Score 7+</td>
<td>10-35%</td>
<td>25-50%</td>
</tr>
</tbody>
</table>

Rockall TA, Logan RF, Devlin HB, Northfield TC. Incidence of and mortality from acute upper gastrointestinal haemorrhage in the United Kingdom. Steering Committee and members of the National Audit of Acute Upper Gastrointestinal Haemorrhage. *BMJ*. 1995 Jul 22;311(6999):222–226
GLASGOW BLATCHFORD SCORE (GBS)

Online calculator at mdcalc.com

The score is calculated using the table below:

<table>
<thead>
<tr>
<th>Score</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Score 5</th>
<th>Score 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUN</td>
<td>≥6·5 &lt;8·0</td>
<td>≥8·0 &lt;10·0</td>
<td>≥10·0 &lt;25·0</td>
<td>≥25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemoglobin (g/L) for men</td>
<td>≥12·0 &lt;13·0</td>
<td>≥10·0 &lt;12·0</td>
<td>&lt;10·0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemoglobin (g/L) for women</td>
<td>≥10·0 &lt;12·0</td>
<td>&lt;10·0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>100–109</td>
<td>90–99</td>
<td>&lt;90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse ≥100</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation with melena</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation with syncope</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatic disease</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Failure</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GBS score of 0 = "Low Risk" for GI bleed, and is highly sensitive (99.6% in a 2007 retrospective study) for predicting which patients did not require any "medical intervention": blood transfusion, endoscopy, or surgery. This was confirmed in a 2009 Lancet study where patients with a score of 0 were actually discharged and had no GI bleeding mortality at 6 months.

Score of 0 = Low risk
Score is equal to "0" if all the following are present:
- Hemoglobin level >12.9 g/dL (men) or >11.9 g/dL (women)
- Systolic blood pressure >109 mm Hg
- Pulse <100/minute
- Blood urea nitrogen level <18.2 mg/dL
- No melena or syncope
- No past or present liver disease or heart failure

A risk score to predict need for treatment for upper gastrointestinal haemorrhage. Dr Oliver Blatchford MFPHM, William R Murray FRCS, Mary Blatchford MRCGP. The Lancet - 14 October 2000 (Vol. 356, Issue 9238, Pages 1318-1321) DOI: 10.1016/S0140-6736(00)02816-6
STAGE 1

Images taken from The National Pressure Ulcer Advisory Panel web site
Images taken from The National Pressure Ulcer Advisory Panel web site
Images taken from The National Pressure Ulcer Advisory Panel web site
STAGE 4

Images taken from The National Pressure Ulcer Advisory Panel web site

BACK
Low-Dose Thrombolysis Improves Outcomes in Submassive PE

- A small prospective, randomized study finds “safe-dose” TPA to be safe and effective for treating moderate-sized pulmonary embolism.
- “Safe dose” TPA was defined as 50 mg administered as a 10-mg bolus followed by a 40-mg infusion within 2 hours (or 0.5 mg/kg total dose for patients weighing <50 kg).
- Moderate PE was defined as >70% involvement of thrombus in at least two lobes or left or right main pulmonary arteries shown on angiography, or a high probability ventilation/perfusion scan showing mismatch in at least two lobes.
- Pulmonary hypertension was present in 16% of the thrombolysis group and 57% of the control group, and the composite endpoint of pulmonary hypertension and recurrent PE occurred in 16% and 63% of patients, respectively.
- Mean hospital length of stay was shorter in the thrombolysis group (2.2 vs. 4.9 days).
- There were no significant differences in mortality or bleeding complications between groups.

Summary of The Surviving Sepsis Campaign International Guidelines for Management of Severe Sepsis and Septic Shock 2008 w/2012 updates

<table>
<thead>
<tr>
<th>Initial resuscitation (first 6hrs)</th>
<th>*2012 update in red</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin resuscitation immediately in patients with suspected Sepsis and hypotension or elevated serum lactate &gt;4mmol/L; do not delay pending ICU admission. (1C)</td>
<td></td>
</tr>
<tr>
<td>• Resuscitation goals: (1C)</td>
<td></td>
</tr>
<tr>
<td>• Central venous pressure (CVP) 8–12 mm Hg*</td>
<td></td>
</tr>
<tr>
<td>• Mean arterial pressure ≥ 65 mm Hg</td>
<td></td>
</tr>
<tr>
<td>• Urine output ≥ 0.5 mL.kg⁻¹.hr⁻¹</td>
<td></td>
</tr>
<tr>
<td>• Central venous (superior vena cava) oxygen sat  ≥ 70%, or mixed venous ≥ 65%</td>
<td></td>
</tr>
<tr>
<td>• If venous O₂ saturation target not achieved: (2C)</td>
<td></td>
</tr>
<tr>
<td>• consider further fluid</td>
<td></td>
</tr>
<tr>
<td>• transfuse pRBC if required, to hematocrit of ≥ 30% and/or</td>
<td></td>
</tr>
<tr>
<td>• Dobutamine infusion max 20 μg.kg⁻¹.min⁻¹</td>
<td></td>
</tr>
<tr>
<td>* A higher target CVP of 12-15 mmHg is recommended in the presence of mechanical ventilation or pre-existing decreased ventricular compliance.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fluid Therapy</th>
<th>*2012 update in red</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fluid-resuscitate using crystalloids (1B)</td>
<td></td>
</tr>
<tr>
<td>• Target a CVP of ≥ 8mmHg (≥12mmHg if mechanically ventilated). (1C)</td>
<td></td>
</tr>
<tr>
<td>• Use a fluid challenge technique using incremental fluid boluses be continued for as long as patients improve hemodynamically based on dynamic (eg, delta pulse pressure) or static (eg, arterial pressure) variables (strong recommendation; Grade 1C)</td>
<td></td>
</tr>
<tr>
<td>• Give fluid challenges of 1000 mL of crystalloids or more to achieve a minimum of 30 mL/kg of crystalloids in the first four to six hours</td>
<td></td>
</tr>
<tr>
<td>• Rate of fluid administration should be reduced if cardiac filling pressures increase without concurrent hemodynamic improvement. (1D)</td>
<td></td>
</tr>
<tr>
<td>• The researchers also suggest adding albumin to the initial fluid resuscitation for severe sepsis and septic shock (weak recommendation; Grade 2B).</td>
<td></td>
</tr>
</tbody>
</table>
## Diagnosis

- Obtain appropriate cultures before starting antibiotics provided this does not significantly delay antimicrobial administration. (1C)
  - Obtain two or more blood cultures
  - One or more BCs should be percutaneous
  - One BC from each vascular access device in place > 48 h
  - Culture other sites as clinically indicated
- Perform imaging studies promptly in order to confirm and sample any source of infection; if safe to do so. (1C)
- Obtain one of the numerous assays that are available for early diagnosis of invasive candidiasis for patients at risk for fungal severe sepsis
  - [1,3 beta-D-glucan assay (Grade 2B),
    - mannan, and anti-mannan antibody assays (Grade 2C)]
- Procalcitonin. 2012 update does not recommend or suggest the use of procalcitonin as a diagnostic tool for severe sepsis.
  - In antibiotic therapy, however, they suggest that clinicians use low procalcitonin levels as a marker to discontinue empiric antibiotics when no infection is found (weak recommendation; Grade 2C)

## Source Identification And Control

- A specific anatomic site of infection should be established as rapidly as possible (1C) and within the first 6 hours of presentation. (1D)
- Formally evaluate patient for a focus of infection amenable to source control measures (eg: abscess drainage, tissue debridement). (1C)
- Implement source control measures as soon as possible following successful initial resuscitation. (1C)
- Exception: infected pancreatic necrosis, surgical intervention best delayed. (2B)
- Choose source control measure with maximum efficacy and minimal physiologic upset. (1D)
- Remove intravascular access devices if potentially infected.
| **Vasopressors** | *2012 update in red*
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Maintain MAP ≥ 65mmHg. (1C)</td>
<td></td>
</tr>
<tr>
<td>• Norepinephrine or dopamine centrally administered are the initial vasopressors of choice. (1C)</td>
<td></td>
</tr>
<tr>
<td>• Epinephrine, phenylephrine, or vasopressin should <strong>not be</strong> administered as the initial vasopressor in septic shock. (2C)</td>
<td></td>
</tr>
<tr>
<td>• Vasopressin 0.03 units/min may be subsequently added to norepinephrine with anticipation of an effect equivalent to norepinephrine alone.</td>
<td></td>
</tr>
<tr>
<td>• Use epinephrine as the first alternative agent in septic shock when blood pressure is poorly responsive to norepinephrine or dopamine. (2B)</td>
<td></td>
</tr>
<tr>
<td>• Do not use low-dose dopamine for renal protection. (1A)</td>
<td></td>
</tr>
<tr>
<td>• In patients requiring vasopressors, insert an arterial catheter as soon as practical. (1D)</td>
<td></td>
</tr>
</tbody>
</table>

| **Inotropic therapy** | *2012 update in red*
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use dobutamine in patients with myocardial dysfunction as supported by elevated cardiac filling pressures and low cardiac output. (1C)</td>
<td></td>
</tr>
<tr>
<td>• Do not increase cardiac index to predetermined supranormal levels.</td>
<td></td>
</tr>
</tbody>
</table>

| **Steroids** | *2012 update in red*
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consider intravenous hydrocortisone for adult septic shock when hypotension responds poorly to adequate fluid resuscitation and vasopressors. (2C)</td>
<td></td>
</tr>
<tr>
<td>• ACTH stimulation test is not recommended to identify the subset of adults with septic shock who should receive hydrocortisone. (2B)</td>
<td></td>
</tr>
<tr>
<td>• Hydrocortisone is preferred to dexamethasone. (2B)</td>
<td></td>
</tr>
<tr>
<td>• Fludrocortisone (50 μg orally once a day) may be included if an alternative to hydrocortisone is being used which lacks significant mineralocorticoid activity. Fludrocortisone is optional if hydrocortisone is used. (2C)</td>
<td></td>
</tr>
<tr>
<td>• Steroid therapy may be weaned once vasopressors are no longer required. (2D)</td>
<td></td>
</tr>
<tr>
<td>• Hydrocortisone dose should be ≤300mg/day. (1A)</td>
<td></td>
</tr>
<tr>
<td>• Do not use corticosteroids to treat sepsis in the absence of shock unless the patient’s endocrine or corticosteroid history warrants it. (1D)</td>
<td></td>
</tr>
</tbody>
</table>
**Recombinant human activated protein C (rhAPC)**  
*2012 update in red*

- Consider rhAPC in adult patients with sepsis-induced organ dysfunction with clinical assessment of high risk of death (typically APACHE II ≥ 25 or multiple organ failure) if there are no contraindications. (2B; 2C for postoperative patients)
- Adult patients with severe sepsis and low risk of death (eg: APACHE II >20 or one organ failure) should not receive rhAPC. (1A)

**Glucose Control**  
*2012 update in red*

- Use IV insulin to control hyperglycemia in patients with severe sepsis following stabilization in the ICU. (1B)
- Aim to keep blood glucose <8.3 mmol/L (150 mg/dL) using a validated protocol for insulin dose adjustment. (2C)
- Provide a glucose calorie source and monitor blood glucose values every 1-2 hours (4 hours when stable) in patients receiving intravenous insulin. (1C)
- Interpret with caution low glucose levels obtained with point of care testing, as these techniques may overestimate arterial blood or plasma glucose values. (1B)

**Sedation, analgesia, and neuromuscular blockade in sepsis**  
*2012 update in red*

- Use sedation protocols with a sedation goal for critically ill mechanically ventilated patients. (1B)
- Use either intermittent bolus sedation or continuous infusion sedation to predetermined end points (sedation scales), with daily interruption/lightening to produce awakening. Re-titrate if necessary. (1B)
- Avoid neuromuscular blockers where possible. Monitor depth of block with train-of-four when using continuous infusions. (1B)

In critically ill patients, intensive glucose control leads to moderate and severe hypoglycemia, both of which are associated with an increased risk of death.

**Hypoglycemia and Risk of Death in Critically Ill Patients; The NICE-SUGAR Study Investigators**  
Mechanical ventilation of sepsis-induced acute lung injury (ALI)/ARDS

• Target a tidal volume of 6mL/kg (predicted) body weight in patients with ALI/ARDS.(1B)
• Target an initial upper limit plateau pressure ≤30cmH2O.
• Consider chest wall compliance when assessing plateau pressure.(1C)
• Allow PaCO2 to increase above normal, if needed, to minimize plateau pressures and tidal volumes.(1C)
• Positive end expiratory pressure (PEEP) should be set to avoid extensive lung collapse at end expiration.(1C)
• Consider using the prone position for ARDS patients requiring potentially injurious levels of FiO2 or plateau pressure, provided they are not put at risk from positional changes.(2C)
• Maintain mechanically ventilated patients in a semi-recumbent position unless contraindicated.(1B)
• Suggested target elevation 30 - 45 degrees.(2C)
• Noninvasive ventilation may be considered in the minority of ALI/ARDS patients with mild-moderate hypoxemic respiratory failure. The patients need to be hemodynamically stable, comfortable, easily arousable, able to protect/clear their airway, and expected to recover rapidly.(2B)
• Use a weaning protocol and a spontaneous breathing trial (SBT) regularly to evaluate the potential for discontinuing mechanical ventilation.(1A)
• SBT options include a low level of pressure support with continuous positive airway pressure 5 cm H2O or a T-piece.
• Before the SBT, patients should:
  • Be Arousable
  • Be Hemodynamically Stable Without Vasopressors
  • Have No New Potentially Serious Conditions
  • Have Low Ventilatory And End-Expiratory Pressure Requirement
  • Require FiO2 levels that can be safely delivered with a face mask or nasal cannula
• Do not use a pulmonary artery catheter for the routine monitoring of patients with ALI/ARDS.(1A)
• Use a conservative fluid strategy for patients with established ALI who do not have evidence of tissue hypoperfusion.(1C)
### Bicarbonate therapy

| • Do not use bicarbonate therapy for the purpose of improving hemo dynamics or reducing vasopressor requirements when treating hypo perfusion-induced lactic acidemia with pH ≥ 7.15. (1B) |

### Renal replacement

| • Intermittent hemodialysis and continuous veno-venous hemofiltration (CVVH) are considered equivalent. (2B) |
| • CVVH offers easier management in hemodynamically unstable patients. (2D) |

### Deep vein thrombosis (DVT) prophylaxis

| • Use either low-dose unfractionated heparin (UFH) or low-molecular weight heparin (LMWH), unless contraindicated. (1A) |
| • Use a mechanical prophylactic device, such as compression stockings or an intermittent compression device, when heparin is contraindicated. (1A) |
| • Use a combination of pharmacologic and mechanical therapy for patients who are at very high risk for DVT. (2C) |
| • In patients at very high risk LMWH should be used rather than UFH. (2C) |

### Stress ulcer prophylaxis

| • Provide stress ulcer prophylaxis using H2 blocker (1A) or PPI |
| • Benefits of prevention of upper GI bleed must be weighed against the potential for development of ventilator-acquired pneumonia |

### Consideration for limitation off support

<p>| • Discuss advance care planning with patients and families. |
| • Describe likely outcomes and set realistic expectations. (1D) |</p>
<table>
<thead>
<tr>
<th>Blood Product Administration</th>
<th>*2012 update in red</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Give red blood cells when hemoglobin decreases to &lt;7.0 g/dL ( (&lt;70 \text{ g/L}) ) to target a hemoglobin of 7.0 – 9.0 g/dL in adults. (1B)</td>
<td></td>
</tr>
<tr>
<td>• A higher hemoglobin level may be required in special circumstances (eg: myocardial ischemia, severe hypoxemia, acute hemorrhage, cyanotic heart disease, or lactic acidosis)</td>
<td></td>
</tr>
<tr>
<td>• Do not use erythropoietin to treat sepsis-related anemia.</td>
<td></td>
</tr>
<tr>
<td>• Erythropoietin may be used for other accepted reasons.(1B)</td>
<td></td>
</tr>
<tr>
<td>• Do not use fresh frozen plasma to correct laboratory clotting abnormalities unless there is bleeding or planned invasive procedures.(2D)</td>
<td></td>
</tr>
<tr>
<td>• Do not use antithrombin therapy.(1B)</td>
<td></td>
</tr>
<tr>
<td>• Administer platelets when:(2D)</td>
<td></td>
</tr>
<tr>
<td>• Counts are &lt;5000/mm(^3) ( (5 \times 10^9/\text{l}) ) regardless of bleeding.</td>
<td></td>
</tr>
<tr>
<td>• Counts are 5000 to 30,000/mm(^3) ( (5–30 \times 10^9/\text{l}) ) and there is significant bleeding risk.</td>
<td></td>
</tr>
<tr>
<td>• Higher platelet counts ≥ 50,000/mm(^3) ( (50 \times 10^9/\text{l}) ) are typically required for surgery or invasive procedures.</td>
<td></td>
</tr>
</tbody>
</table>
MODIFIED RASKIN PROTOCOL

Review side effects and contra-indications prior to using

Metoclopramide
(10 mg in 50 ml DSW. IV over 30 min)

DHE
(0.5 mg IV over 1 min-lest dose)

BP stable and no chest pain or severe nausea → NO → DHE stopped

YES

Headache persistent; no severe nausea

DHE 0.5mg 1 H after 1\textsuperscript{st} dose then 1 mg q8h

Headache improved

DHE 0.5 mg q8h

either increase metoclopramide to 20 mg, or decrease next dose of DHE to 0.25mg

Headache improved; severe nausea

DHE

q 8h until headache is eliminated, then q 12h for 2 or 3 doses and metoclopramide prn

Repetitive intravenous dihydroergotamine dosing in status migrainosus. Silberstein et al
Reproduced from Dr Jennifer Keehbauch Hand out
DETOXIFICATION GUIDELINES

- Fluid replacement for 24 to 48 hours
- Ergotamine tartrate can be discontinued abruptly if dihydroergotamine is administered
  - Otherwise, it should be tapered over 2 to 3 days
- Analgesics not containing opiates or barbiturates can be stopped abruptly
- Combined analgesics containing barbiturate should be discontinued gradually
  - Rapid discontinuation can be achieved by giving phenobarbital
- Opioid withdrawal must be carried out slowly or through replacement with methadone and subsequent rapid taper
  - Side effects can be reduced by giving clonidine hydrochloride, phenobarbital, or a benzodiazepine derivative

(Gold et al 1980; Bakris et al 1982; Silberstein et al 2001)

DIHYDROERGOTAMINE (DHE)

- **Contraindications**
  - Coronary artery disease
  - Prinzmetal angina
  - Peripheral vascular disease
  - Prolonged aura
  - Basilar migraine
  - Pregnancy
  - Poorly controlled hypertension

- **Main side effects**
  - Noncardiac chest pain
  - Neck or trunk pressure
  - Head or body warmth
  - Nausea
  - Leg pain
  - Diarrhea

- **Special Points**
  - Dihydroergotamine must be given slowly IV push over 2 to 3 min, to reduce nausea, flushing, and chest symptoms
  - Mixing with an equal volume of saline reduces side effects
**Contraindications**
- Coronary artery disease
- Prinzmetal angina,
- Peripheral vascular disease
- Prolonged aura
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- Pregnancy
- Poorly controlled hypertension

**Main side effects**
- Noncardiac chest pain
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- Leg pain
- Diarrhea

**Special Points**
- Dihydroergotamine must be given slowly IV push over 2 to 3 min, to reduce nausea, flushing, and chest symptoms
- Mixing with an equal volume of saline reduces side effects
# Inclusion/Exclusion Criteria for 0 to 3 Hr Intravenous tPA for Acute Stroke

## tPA Eligibility

- Age ≥
- Clinical diagnosis of ischemic stroke causing measurable neurologic deficit and noncontrast head CT showing no hemorrhage.
- Onset of stroke symptoms well established to be less than 180 min (3 hr) before treatment would begin.

## Contraindications

- Symptoms minor or rapidly improving.
- Other stroke or serious head trauma within past 3 mo.
- Major surgery within last 14 d.
- Known history of intracranial hemorrhage.
- Sustained systolic blood pressure >185 mm Hg.
- Sustained diastolic blood pressure >110 mm Hg.
- Aggressive treatment necessary to lower blood pressure.
- Symptoms suggestive of subarachnoid hemorrhage.
- Received heparin within 48 hr and has elevated PTT**
- Patient has received treatment (not prophylactic) doses of injectable anticoagulants (e.g., enoxaparin) in the past 48 hr.**
- Patient has taken dabigatran in the last 48 hr (regardless of PTT).**
- Patient has taken dabigatran in >48 hr AND has an elevated PTT.**
- Arterial puncture at noncompressible site within 7 d.
- GI or GU hemorrhage within 21 d.
- International normalized ratio (INR) >1.7.**
- Platelet count <100,000/mL.
- Seizure at onset of stroke (with deficits thought to be related to ictal or post-ictal state and not new stroke).
- Serum glucose <50 mg/dL. (If glucose is >400 mg/dL, consider other etiology such as unmasking of old deficits vs. new stroke.)
### Inclusion/Exclusion Criteria for 3.0 to 4.5 Hr Intravenous tPA for Acute Stroke

#### tPA Eligibility

- **Age** 18–80 yr.
- Clinical diagnosis of ischemic stroke causing measurable neurologic deficit and noncontrast head CT showing no hemorrhage.
- Onset of stroke symptoms well established to be between 3.0 and 4.5 hr before treatment would begin.

#### Contraindications

- Symptoms minor or rapidly improving.
- Seizure at onset of stroke.
- Major surgery or significant trauma in past 3 mo.
- Blood glucose <50 or >400 mg/dL.
- Prior stroke within the last 3 mo.
- Known history of or suspected ICH.
- Systolic blood pressure >185 mm Hg or diastolic blood pressure >110 mm Hg, or aggressive management (more than a single dose of IV medication) necessary to reduce BP to these limits.
- Symptoms suggestive of SAH.
- Recent (<10 d) puncture of a noncompressible blood vessel, external heart massage, or obstetrical delivery.
- Received heparin within previous 48 hr and an elevated PTT.
- Patients receiving Coumadin even with normal PT/INR.
- History of CNS damage (e.g., neoplasm, aneurysm, intracranial or spinal surgery).
- Patient has received treatment (not prophylactic) doses of injectable anticoagulants (e.g., enoxaparin) in the past 48 hr.
- Patient has taken dabigatran in the last 48 hr (regardless of PTT).
- Patient has taken dabigatran in >48 hr AND has an elevated PTT.
- Platelet count of below 100,000/mL.
- Severe stroke assessed clinically (NIHSS >25) or by imaging (>1/3 involvement MCA).
- History of prior disabling stroke (MRS 2 or more) and diabetes requiring treatment.
- Known hemorrhagic diathesis.
- Recent severe/dangerous bleeding.
- Hemorrhagic retinopathy (e.g., in diabetes, vision disturbance may indicate hemorrhagic retinopathy).
- Acute pancreatitis, documented ulcerative GI disease during last 3 mo, esophageal varices, arterial-aneurysm, or AVM.
- Other major disorders associated with a risk of bleeding such known bacterial endocarditis, pericarditis, or severe liver disease.
## Contrast vs. No Contrast Reference Sheet – Head/Neck

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Reason for Exam</th>
<th>Procedure to Pre-Cert</th>
<th>CPT Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain</td>
<td>Alzheimer’s/Confusion/Dementia Headache/Migraine Memory Loss Mental Status Changes Seizures Stroke, CVA, TIA Trauma</td>
<td>MRI Brain without Contrast</td>
<td>70551</td>
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<tr>
<td>Brain</td>
<td>Cranial Nerve Lesions F/U Lesion/Mass IAC/Hearing Loss/Tinnitus/Vertigo Infection Metastatic Disease Multiple Sclerosis Neurofibromatosis Pituitary</td>
<td>MRI Brain without and with Contrast</td>
<td>70553</td>
</tr>
<tr>
<td>Brain</td>
<td>Fiducials Gamma Knife Planning</td>
<td>MRI Brain with Contrast</td>
<td>70552</td>
</tr>
<tr>
<td>Circle of Willis (COW)</td>
<td>Stroke/CVA/TIA Aneurysm</td>
<td>MRA Head without Contrast</td>
<td>70544</td>
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<tr>
<td>Carotid</td>
<td>Stroke/CVA/TIA</td>
<td>MRA Neck without Contrast</td>
<td>70547</td>
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<tr>
<td>Carotid</td>
<td>Stenosis &gt; 60% on Doppler Ultrasound</td>
<td>MRA Neck without and with Contrast</td>
<td>70549</td>
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<tr>
<td>Intracranial Venous Sinus</td>
<td>Venous Thrombosis</td>
<td>MRV Head without and with Contrast</td>
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<tr>
<td>Orbits</td>
<td>Optic Neuritis Exophthalmos Proptosis Pseudotumor/Mass/Cancer/Mets Vascular Lesions Visual Disturbances</td>
<td>MRI Orbits/Face/Neck without and with Contrast</td>
<td>70543</td>
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<tr>
<td>Neck-Soft Tissue</td>
<td>Infection Tumor/Mass/Cancer/Mets Vocal Cord Paralysis</td>
<td>MRI Orbits/Face/Neck without and with Contrast</td>
<td>70543</td>
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# Contrast vs. No Contrast Reference Sheet – Spine

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<tbody>
<tr>
<td>Spine: Cervical</td>
<td>Degenerative Disease Disc Herniation Extremity Pain/Weakness Neck Pain Radiculopathy Trauma</td>
<td>MRI Cervical Spine without Contrast</td>
<td>72141</td>
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<tr>
<td>Spine: Cervical</td>
<td>Discitis Mass/Lesion Osteomyelitis</td>
<td>MRI Cervical Spine without and with Contrast</td>
<td>72156</td>
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<tr>
<td>Spine: Thoracic</td>
<td>Back Pain Compression Fx Disc Herniation Radiculopathy Trauma</td>
<td>MRI Thoracic Spine without Contrast</td>
<td>72146</td>
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<tr>
<td>Spine: Thoracic</td>
<td>Discitis Mass/Lesion Osteomyelitis</td>
<td>MRI Thoracic Spine without and with Contrast</td>
<td>72157</td>
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<tr>
<td>Spine: Lumbar</td>
<td>Back Pain Compression Fx Disc Herniation Radiculopathy Stenosis Trauma</td>
<td>MRI Lumbar Spine without Contrast</td>
<td>72148</td>
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<tr>
<td>Spine: Lumbar</td>
<td>Discitis Mass/Lesion Osteomyelitis Post Lumbar Surgery (&lt;10 yrs)</td>
<td>MRI Lumbar Spine without and with Contrast</td>
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# Contrast vs. No Contrast Reference Sheet – MSK

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<th>Procedure to Pre-Cert</th>
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<tbody>
<tr>
<td>Extremity, Non Joint: Forearm</td>
<td>Fracture/Stress Fracture</td>
<td>MRI Non-Joint without Contrast</td>
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<tr>
<td>Extremity, Non Joint: Hand/Finger</td>
<td>Muscle/Tendon Tear</td>
<td>Upper Extremity</td>
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<tr>
<td>Extremity, Non Joint: Humerus</td>
<td></td>
<td>Lower Extremity</td>
<td></td>
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<tr>
<td>Extremity, Non Joint: Foot/Toes</td>
<td>(Venous Injection)</td>
<td></td>
<td>73220</td>
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<tr>
<td>Extremity, Non Joint: Lower Leg Thigh</td>
<td>Abscess</td>
<td>MRI Non-Joint without and with Contrast</td>
<td>73720</td>
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<tr>
<td>Extremity, Non Joint: (Venous Injection)</td>
<td>Cellulitis</td>
<td>Upper Extremity</td>
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<tr>
<td>Extremity, Joint: Elbow</td>
<td>Morton’s Neuroma</td>
<td>Lower Extremity</td>
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<tr>
<td>Extremity, Joint: Shoulder</td>
<td>Osteomyelitis</td>
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<tr>
<td>Extremity, Joint: Wrist</td>
<td>Soft Tissue Tumor/Mass</td>
<td>MRI Joint without Contrast</td>
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<tr>
<td>Extremity, Joint: Ankle</td>
<td>Ulcer</td>
<td>Upper Extremity</td>
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<tr>
<td>Extremity, Joint: Hip</td>
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<td>Lower Extremity</td>
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<tr>
<td>Extremity, Joint: Knee</td>
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<td>Extremity, Joint: Elbow</td>
<td>Arthritis</td>
<td>MRI Joint without and with Contrast</td>
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<td>Extremity, Joint: Shoulder</td>
<td>Cartilage Tear</td>
<td>Upper Extremity</td>
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<td>Extremity, Joint: Wrist</td>
<td>Fracture/Stress Fracture</td>
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<td>Extremity, Joint: Ankle</td>
<td>Internal Derangement</td>
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<td>Extremity, Joint: Hip</td>
<td>Joint Pain</td>
<td>MRI Joint with Contrast</td>
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<td>Extremity, Joint: Knee</td>
<td>Ligament Tear</td>
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<td>Extremity, Joint: (Venous Injection)</td>
<td>Meniscal Tear</td>
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<td>Extremity, Joint: Elbow</td>
<td>Muscle/Tendon Tear</td>
<td>MRI Pelvis without Contrast</td>
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<tr>
<td>Extremity, Joint: Shoulder</td>
<td>Tumor/Mass</td>
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<td>Extremity, Joint: Wrist</td>
<td>Ulcer</td>
<td>MRI Pelvis without and with Contrast</td>
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<td>Extremity, Joint: Ankle</td>
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<td>Extremity, Joint: Hip</td>
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<td>Extremity, Joint: Knee</td>
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## Contrast vs. No Contrast Reference Sheet – Body

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<td>Adrenals</td>
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<td>MRI Chest without Contrast</td>
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<td>Chest – MRA</td>
<td>Thoracic Aorta</td>
<td>MRI Chest without and with Contrast</td>
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<td>Uterine Artery Embolus</td>
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Contraindications to The Initiation of Oral Anticoagulants & Anti-platelet Agents in Patients with Atrial Fibrillation in Primary Care

As a patient’s relative stroke & bleeding risk can change, it is essential that all AF patients are reviewed at LEAST annually for a re-assessment of their stroke versus bleeding risk & the anti-thrombotic treatment option of choice. Contraindications listed below apply to BOTH anti-platelet agents (e.g. aspirin, clopidogrel, dipyridamole) & ALL oral anticoagulants (e.g. warfarin, phenindione, dabigatran, rivaroxaban) except where indicated.

**Absolute Contraindications**

- Known large esophageal varices.
- Significant thrombocytopenia (platelet count < 50 x 109/L) - refer to haematologist.
- Within 72 hours of major surgery with risk of severe bleeding - defer & reassess risk postoperatively.
- Previously documented hypersensitivity to either the drug or excipients – consider cardiology opinion.
- Acute clinically significant bleed - defer & re-assess stroke versus bleeding risk within 3 months.
- Decompensated liver disease or deranged baseline clotting screen (INR>1.5) – refer to Gastroenterology/Hepatology. Contraindication applies to oral anticoagulants only
- Pregnancy or within 48 hours post partum - seek urgent haematological advice. Contraindication applies to oral anticoagulants only.
- Severe renal impairment (GFR < 30 mL/min/1.73 m2 or on dialysis). Contraindication applies to dabigatran only.

**Relative Contraindications**

- Previous history intracranial haemorrhage - as some AF patients especially those considered at higher stroke risk (i.e. CHADS2 score ≥3) may benefit from anti-thrombotic therapy, seek the opinion of a stroke specialist.
- Recent major extracranial bleed within the last 6 months where the cause has not been identified or treated – decision for oral anti-thrombotic therapy should be deferred.
- Recent documented peptic ulcer (PU) within last 3 months – decision for oral anti-thrombotic therapy should be deferred until treatment for PU completed. In all cases with history PU give PPI cover whilst on anti-thrombotic.
- Recent history recurrent iatrogenic falls in patient at higher bleeding risk.
  - A patient at higher bleeding risk = having 3 or more of the following risk factors:
    - age > 65 years
    - previous history bleed or predisposition to bleeding (e.g. diverticulitis)
uncontrolled hypertension
severe renal impairment (i.e. serum creatinine > 200umol/L, GFR < 30 mL/min/1.73 m2 or on dialysis)
acute hepatic impairment (e.g. bilirubin > 2xULN + LFTS > 3x ULN), chronic liver disease (e.g.cirrhosis)
low platelet count < 80 or a thrombocytopenia or anemia of undiagnosed cause
on concomitant drugs associated with an increased bleeding risk e.g. SSRIs, oral steroids, NSAIDs, methotrexate or other immune-suppressant agents.

➢ A risk of falls is not a contraindication to initiating oral anticoagulation. (e.g. a patient with an annual stroke risk of 5% (CHADS2 score 2-3) would need to fall 295 times for fall risk to outweigh stroke reduction benefit of warfarin).
◆ Dementia or marked cognitive impairment with poor medicines compliance & no access to carer support.
◆ Chronic alcohol abuse – especially if associated with binge drinking.

Poor compliance with any oral anticoagulant agent will reduce benefits and may increase risks associated with use.

Contraindications to the Initiation of Oral Anticoagulant & Anti-Platelet Therapy for Atrial Fibrillation in Primary Care - Supporting Information & Acknowledgements.

Summary
The aim of this document is to give GPs a pragmatic decision guide on the absolute and relative contraindications to oral anticoagulants and anti-platelet agents in AF management in primary care.
The information given has been drawn from “expert clinical opinion” together with established documented clinical evidence where available.
The key message is that although aspirin or aspirin/clopidogrel combinations may be chosen in preference to oral anticoagulants to reduce stroke risk in AF, the contraindications to using anti-platelet agents almost mirror those of oral anticoagulants. In addition the reduction in stroke risk in AF conferred by antiplatelets has never been shown to be as effective as oral anticoagulants.

Key Supporting References
patient. Highlights the use of the ‘HAS-BLED’ bleeding risk score as a tool to assess bleeding risk in AF patients.


- Mant J Hobbs FDR, et al, Warfarin versus aspirin for stroke prevention in an elderly community population with atrial fibrillation (AF), (BAFTA RCT study): Lancet 2007;370: 493-503. BAFTA study showed clear superiority of warfarin over aspirin with no increase in risk of major haemorrhage. Mean age of population was 81.5 years.

- Bailey RD, Hart RG, Benavante O, Pearce LA. Recurrent brain haemorrhage is more frequent than ischaemic stroke after intracranial haemorrhage. Neurology 2001;56:773-7. Recurrent stroke among survivors of primary intracranial haemorrhage (ICH) occurs at a rate of about 4% per patient year and most are recurrent ICH. Survivors of ICH likely to have a higher risk of recurrent ICH than of ischaemic stroke with CHADS2 score < 3. (Adjusted annual stroke rate risk with CHADS2 score 3 is 5.9%)


- The ACTIVE Writing Group on behalf of the ACTIVE investigators. Lancet 2006;367:1903–12 Study found incidence of bleeding was significantly greater with aspirin + clopidogrel compared with warfarin (19.3% vs. 16.5%; NNH 35; RR=1.21, 95% CI 1.08–1.35, P=0.001).


- PROGRESS Collaborative Group. RCT of a perindopril-based BP-lowering regimen among 6,105 individuals with previous stroke or transient ischaemic attack. Lancet. 2001 Sep 29;358(9287):1033-41 study showed importance of BP control in patients with cerebrovascular disease in significantly lowering risk of first ICH.

Dite PD. Labrecque D et al. World Gastroenterology Organisation Practice Guideline Oesophageal Varices 2008. Oesophageal varices develop in patients with cirrhosis at an annual rate of 5–8%, but varices large enough to pose a risk of bleeding occur in only 1–2% of cases. Approx 4–30% of pts with small varices will develop large varices each year & therefore be at risk of bleeding. Mortality resulting from bleeding depends on the severity of the underlying liver disease.

Acknowledgements
This document was written in collaboration with Dr Matthew Fay, GP & NHS Heart Improvement Clinical Lead and Dr Paul Guyler, Lead Stroke Consultant Southend University Hospital NHS Foundation Trust and Stroke Improvement Programme Associate, with contributions received from various clinical healthcare professionals in cardiology, neurology, haematology and gastroenterology.

Produced by: Maria Smith Pharmacist Prescribing Support Lead for AF & Anticoagulation on behalf of NHS Buckinghamshire July 2011
## Guide to Ordering CT vs. MRI Imaging Studies

<table>
<thead>
<tr>
<th>Body Part</th>
<th>CT</th>
<th>MRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain</td>
<td>CT Head without contrast for initial evaluation of stroke, trauma, or hemorrhage. CT Head with and without contrast only for metastatic disease in a patient with contraindication to MRI</td>
<td>MRI Brain without contrast for dementia, headache, memory loss mental status changes, seizures; secondary eval of Stroke, CVA, TIA, encephalopathy MRI Brain with and without contrast for metastatic disease, infection, MS, pituitary disease, vertigo, hearing loss, tinnitus</td>
</tr>
<tr>
<td>Neck Vessels</td>
<td>CTA Head/Neck with and without contrast if there is a contraindication to MRI</td>
<td>MRA Neck with and without contrast for visualization of all neck arteries. MRV Head with and without contrast for intracranial veins and dural venous sinuses MRA Head without contrast for intracranial circulation-circle of Willis (posterior circulation)</td>
</tr>
<tr>
<td>Neck Soft Tissue</td>
<td>CT Soft Tissue Neck with contrast for evaluation all neck pathology except for suspected salivary gland mass, tongue and nasopharyngeal pathology</td>
<td>MRI Soft Tissue Neck with and without contrast for evaluation of salivary gland mass, tongue and nasopharyngeal pathology</td>
</tr>
</tbody>
</table>
| Spine                        | CT Cervical/Thoracic/Lumbar Spine without contrast for initial spine trauma evaluation | MRI Spine with and without contrast for evaluation of infection, inflammatory process, known or suspected neoplasm, cord compression
<p>|                             | MRI without contrast for initial evaluation of neck and back pain with/without radiculopathy, disc herniation, or after initial CT for trauma. If MRI is contraindicated then a CT with and without contrast should be performed. |
| Lungs                       | CT Chest with contrast for initial screening/evaluation of lung disease, suspected PE. Unilateral suspicious effusion. Also for follow up of a known malignancy. CT Chest without contrast for follow up of pulmonary nodules | Only order MRI if directed by a radiologist |
| Heart                       | CCTA for evaluation of the coronary arteries for disease, calcification, or anomalies IF &lt;65yo | Cardiac MRI for evaluation of myocardial infarction, cardiac viability, cardiac function or morphology. |
| General Abdomen/Pelvis      | CT with PO and IV contrast is preferred for generalized abdominal pain (including appendicitis, diverticulitis, abdominal abscess) RUQ US 1st line for suspected gallbladder disease (choledocholithiasis, cholelithiasis) | MRI abdomen without contrast with MRCP only FOLLOWING RUQ US if needed for choledocholithiasis |</p>
<table>
<thead>
<tr>
<th>Role</th>
<th>Protocol Details</th>
<th>Recommended Imaging Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kidney</strong></td>
<td>CT Renal Stone Protocol for nephrolithiasis, hematuria, or flank pain</td>
<td>MRI Renal protocol for further characterization or follow up of known renal mass</td>
</tr>
<tr>
<td><strong>Uterus and Ovaries</strong></td>
<td>MRI Renal protocol for further characterization or follow up of known renal mass</td>
<td>MRI Pelvis without contrast for Adenomyosis, Endometriomas, Pelvic Pain, Uterine Anomalies</td>
</tr>
<tr>
<td></td>
<td><strong>US preferred 1st line</strong></td>
<td>MRI Pelvis without and with Contrast for Adnexal Mass, Endometrial CA, Known Fibroids, Ovarian CA, Ovarian Cysts</td>
</tr>
<tr>
<td><strong>Pancreas</strong></td>
<td>CT Pancreatic Protocol for pancreatitis or suspected pancreatic mass</td>
<td>Radiology will recommend MRI following CT if needed. Also consider endoscopic U/S</td>
</tr>
<tr>
<td><strong>Liver/Biliary System</strong></td>
<td>CT Liver Protocol for initial workup of the liver for suspected mass lesion or other abnormality</td>
<td>MRI/MRCP Liver/Pancreas if there is a known lesion of the liver or biliary system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MRI without and with contrast to characterize liver lesions</td>
</tr>
<tr>
<td><strong>Musculoskeletal</strong></td>
<td>MRI is the imaging method of choice</td>
<td>MRI Non-Joint without contrast for fracture/stress fracture, muscle/tendon tear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MRI Joint without contrast for arthritis, joint pain ligament tear, meniscal tear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MRI without and with contrast for suspected osteomyelitis, AFTER XRAY IF NEEDED</td>
</tr>
</tbody>
</table>

Developed by Cliff Thomas MD 2016
Images Of Diabetic Foot Ulcer Grades

Grade 0: Pre- or postulcerative

Grade 1: Full-thickness ulcer not involving tendon, capsule, or bone
Grade 2: Tendon or capsular involvement without bone palpable

Grade 3: Probes to bone
THE MIGRAINE DISABILITY ASSESSMENT TEST

The MIDAS (Migraine Disability Assessment) questionnaire was put together to help you measure the impact your headaches have on your life. The information on this questionnaire is also helpful for your primary care provider to determine the level of pain and disability caused by your headaches and to find the best treatment for you.

INSTRUCTIONS: Please answer the following questions about ALL of the headaches you have had over the last 3 months. Select your answer in the box next to each question. Select zero if you did not have the activity in the last 3 months.

1. On how many days in the last 3 months did you miss work or school because of your headaches?
2. How many days in the last 3 months was your productivity at work or school reduced by half or more because of your headaches? (Do not include days you counted in question 1 where you missed work or school.)
3. On how many days in the last 3 months did you not do household work (such as housework, home repairs and maintenance, shopping, caring for children and relatives) because of your headaches?
4. How many days in the last 3 months was your productivity in household work reduced by half or more because of your headaches? (Do not include days you counted in question 3 where you did not do household work.)
5. On how many days in the last 3 months did you miss family, social or leisure activities because of your headaches?

Total (Questions 1-5)

<table>
<thead>
<tr>
<th>MIDAS Grade</th>
<th>Definition</th>
<th>MIDAS Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Little or no disability</td>
<td>0-5</td>
</tr>
<tr>
<td>II</td>
<td>Mild disability</td>
<td>6-10</td>
</tr>
<tr>
<td>III</td>
<td>Moderate disability</td>
<td>11-20</td>
</tr>
<tr>
<td>IV</td>
<td>Severe disability</td>
<td>21+</td>
</tr>
</tbody>
</table>

Additional Questions

A. On how many days in the last 3 months did you have a headache? (If a headache lasted more than 1 day, count each day.)

B. On a scale of 0 - 10, on average how painful were these headaches? (where 0 = no pain at all, and 10 = pain as bad as it can be.)

This survey was developed by Richard B. Lipton, MD, Professor of Neurology, Albert Einstein College of Medicine, New York, NY, and Walter F. Stewart, MPH, PhD, Associate Professor of Epidemiology, Johns Hopkins University, Baltimore, MD.
The National Institutes of Health Stroke Scale (NIHSS)

Is a score calculated from 11 components and is used to quantify the severity of strokes. The 11 components are:

❖ 1a. Level of consciousness
The investigator must choose a response if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation.

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

❖ 1b. LOC questions
The patient is asked the month and his/her age. The answer must be correct - there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not "help" the patient with verbal or non-verbal cues.

- 0 = answers both questions correctly
- 1 = answers one question correctly
- 2 = answers neither question correctly

❖ 1c. LOC commands
The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.

- 0 = performs both tasks correctly
- 1 = performs one task correctly
- 2 = performs neither task correctly

❖ 2. Best gaze
Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.

- 0 = normal
- 1 = partial gaze palsy; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present
- 2 = forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver

❖ 3. Visual fields
Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia, is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11.

- 0 = no visual loss
- 1 = partial hemianopia
• 2 = complete hemianopia
• 3 = bilateral hemianopia (blind including cortical blindness)

❖ 4. Facial palsy
Ask – or use pantomime to encourage – the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible.

• 0 = normal symmetrical movements
• 1 = minor paralysis (flattened nasolabial fold, asymmetry on smiling)
• 2 = partial paralysis (total or near-total paralysis of lower face)
• 3 = complete paralysis of one or both sides (absence of facial movement in the upper and lower face)

❖ 5. Motor: arm (5a. left arm, 5b. right arm)
The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.

• 0 = no drift; limb holds 90 (or 45) degrees for full 10 seconds
• 1 = drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support
• 2 = some effort against gravity; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity
• 3 = no effort against gravity; limb falls
• 4 = no movement
• UN = amputation or joint fusion, explain: ____________________

❖ 6. Motor: leg (6a. left Leg, 6b. right Leg)
The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.

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

❖ 7. Limb ataxia
This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position.

• 0 = absent
• 1 = present in one limb
• 2 = present in two limbs
• UN = amputation or joint fusion, explain: ________________

❖ 8. Sensory
Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of 2, “severe or total sensory loss,” should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and
aphasic patients will, therefore, probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item.

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

❖ 9. Best language
A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences. Comprehension is judged from responses here, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands.

- 0 = no aphasia; normal
- 1 = mild-to-moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression; reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible; for example, in conversation about provided materials, examiner can identify picture or naming card content from patient’s response
- 2 = severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener; range of information that can be exchanged is limited; listener carries burden of communication; examiner cannot identify materials provided from patient response
- 3 = mute, global aphasia; no usable speech or auditory comprehension

❖ 10. Dysarthria
If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested.

- 0 = normal
- 1 = mild-to-moderate dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty
- 2 = severe dysarthria; patient’s speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasias, or is mute/anarthric. UN = Intubated or other physical barrier, explain:_____________________________

❖ 11. Extinction and inattention (formerly neglect)
Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.

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

SCORING
0 = no stroke symptoms 5-15 = moderate stroke
1-4 = 0 minor stroke 16-20 = moderate to severe stroke