The University of Wisconsin

Critical Care Anesthesiology Reading List

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Section 1: Cardiovascular

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        ii. PE Review, JAMA 2022: https://pubmed.ncbi.nlm.nih.gov/36194215
        iii. Management of Acute PE, JAMA 2020 Clinical Guidelines Synopsis: https://jamanetwork.com/journals/jama/fullarticle/2769249
        iv. Management of PE, A short ACC Review, 2020: https://www.acc.org/latest-in-cardiology/articles/2020/01/27/07/42/management-of-pe
        v. Initial Anticoagulation for PE: Br J Clin Pharmacol 2017: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5651323/
        vi. PEITHO Trial, Fibrinolysis for Intermediate Risk PE, NEJM 2014: https://pubmed.ncbi.nlm.nih.gov/24716681/
        vii. Moppett trial follow-up, half-dose alteplase, CCM 2018: https://pubmed.ncbi.nlm.nih.gov/29979222/
        viii. Catheter Directed Thrombolysis for Intermediate Risk PE: Ann ATS 2018: https://pubmed.ncbi.nlm.nih.gov/29073366/ & StatPearls: https://www.ncbi.nlm.nih.gov/books/NBK536918/
        ix. Systemic Lysis syst review, Eur H J 2015: https://pubmed.ncbi.nlm.nih.gov/24917641/
        x. Management of high risk PE, narrative review, JICM 2018: https://pubmed.ncbi.nlm.nih.gov/29511564/
        xi. Thrombolysis for PE & Risk of Mortality/Bleed/ICH: JAMA 2014: https://pubmed.ncbi.nlm.nih.gov/24938564/
        xii. Thrombolytic therapy for acute PE: Cochrane Review, 2021: https://pubmed.ncbi.nlm.nih.gov/33857326/
        xiii. Safety & efficacy of reduced dose alteplase for acute PE – a propensity matched analysis, CCM 20m24: https://pubmed.ncbi.nlm.nih.gov/38165776/ - this has a great editorial with updated data as of 2024 -- https://pubmed.ncbi.nlm.nih.gov/38619343/
        xiv. ECHOS Catheter Editorial, Circ 2014: https://pubmed.ncbi.nlm.nih.gov/24226804/
        xv. Catheter-therapies for PE, Clinic Chest Med 2018: https://pubmed.ncbi.nlm.nih.gov/30122188/
    b. **VTE**
        i. Antithrombotic Therapy for VTE Disease: Second Update of the CHEST Guideline and Expert Panel Report https://pubmed.ncbi.nlm.nih.gov/34352278/
        ii. DVTs, JAMA 2018 Review Dx and Tx: https://pubmed.ncbi.nlm.nih.gov/30326130/

2. **Pulm HTN and the RV**
    a. Diagnosis and management of pulmonary HTN and RV failure in the CVICU, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/37973349/
    b. Management of acute RV failure in the ICU, Ann ATS 2014: https://pubmed.ncbi.nlm.nih.gov/24828526/
    c. ICU Management of severe pHTN and RV failure, AJRCCM 2011: https://pubmed.ncbi.nlm.nih.gov/21700906/

d. The Challenge of Managing an RV infarct, Ero Heart JACVC 2013: https://pubmed.ncbi.nlm.nih.gov/24222834/
e. Pulm Vasodilators and Anesthesia, Anesthesiol Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28526144/
f. **Other**
    i. DAH within cardiac disease, Lung 2021: https://pubmed.ncbi.nlm.nih.gov/33709230/

3. Peripheral Vascular Disease – aortic aneurisms, dissections, and more

a. Preoperative Assessment for Vascular Surg, Anesthesiol Clin 2022: https://pubmed.ncbi.nlm.nih.gov/36328616/
b. Critical Care after Vascular Surgery, Anesthesiol Clin 2022: https://pubmed.ncbi.nlm.nih.gov/36328628/
c. Thoracic Aortic Aneurysm: A clinical review: Cardiol Clin 2021: https://pubmed.ncbi.nlm.nih.gov/34686263/ *(This focuses on preoperative assessment, timing of intervention and medical history/factors)*
d. Anesthetic Management for Open Vasc Surg (helps to learn the critical care concepts), Anesthesiol Clin 2022: https://pubmed.ncbi.nlm.nih.gov/36328624/
e. Anesthetic Management for Endovascular Vasc Surg (helps to learn the critical care concepts), Anesthesiol Clin 2022: https://pubmed.ncbi.nlm.nih.gov/36328625/
f. Society for Vascular Surgery practice guidelines on the care of patients with an AAA, J Vasc Surg 2018: https://pubmed.ncbi.nlm.nih.gov/29268916/
g. Spinal cord ischemia/injury in TAAs: JCTVA 2014: https://pubmed.ncbi.nlm.nih.gov/25107722/
h. Neuroprotection in the OR and spinal cord ischemia, endovascular, J Vasc Surg 2016: https://pubmed.ncbi.nlm.nih.gov/26968081/
i. Open repair of TAAA: Step by Step (operative approach, pictures): Operative techniques, 2018: https://www.optechtcs.com/article/S1522-2942(18)30073-4/fulltext
j. Perioperative management of patients undergoing thoracic endovascular repair, Ann CT Surg 2021: https://pubmed.ncbi.nlm.nih.gov/34926179/
k. Hybrid approach in acute and chronic aortic disease (pictures of hybrid devices and approaches included): Medicina, 2021: https://pubmed.ncbi.nlm.nih.gov/35056357/

4. Rhythm/arrhythmias and antiarrhythmic agents

a. Mechanisms of atrial fibrillation, review, BMJ Heart, 2019: https://pubmed.ncbi.nlm.nih.gov/31444267/
b. Tx Strategies for new atrial fibrillation in the ICU, Crit Care 2021: https://pubmed.ncbi.nlm.nih.gov/34289899/
c. Approach to ventricular arrhythmias in the ICU, J Intensive Care Med, 2021: https://pubmed.ncbi.nlm.nih.gov/32705919/
d. Managing arrhythmias in the ICU, Crit Care Clin, 2014: https://pubmed.ncbi.nlm.nih.gov/24996602/
e. Management of arrhythmias in the cardiovascular ICU, Crit Care Clin, 2024: https://pubmed.ncbi.nlm.nih.gov/37973359/
f. 2019 ESC Guideline Cardiac arrhythmias in the emergency settings of acute coronary syndrome and revascularization https://pubmed.ncbi.nlm.nih.gov/31353412/

5. Shock States and Vasoactives

a. Reviews:

i. Not all shock states are created equal: a review of the diagnosis and management of septic, hypovolemic, cardiogenic, obstructive and distributive shock. *Anesthesiol Clin,* 2023*:* https://pubmed.ncbi.nlm.nih.gov/36871993/ *(Fantastic initial review and educational piece)*
ii. Application of cardiovascular physiology to the critically ill patient, CCM 2024: https://pubmed.ncbi.nlm.nih.gov/38126845/
iii. Pathophys of Septic Shock, Crit Care Clin 2018: https://pubmed.ncbi.nlm.nih.gov/29149941/
iv. Circulatory Shock, NEJM 2013: https://pubmed.ncbi.nlm.nih.gov/24171518/
v. 2019 AHA Review Cardiogenic Shock https://pubmed.ncbi.nlm.nih.gov/30947630/
vi. Cardiac function & dysfunction in sepsis, Clin Chest Med 2016: https://pubmed.ncbi.nlm.nih.gov/27229645/
vii. Cardiogenic shock: pathogenesis, classification and management, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/37973356/
viii. Shock and vasoactive management after Cardiac Surgery/CPB, reviews:
    1. Crit Care Clin, 2024: https://pubmed.ncbi.nlm.nih.gov/37973358/
    2. J Card Surg, 2021: https://pubmed.ncbi.nlm.nih.gov/34251716/
    3. JCVTA, 2020: https://pubmed.ncbi.nlm.nih.gov/31917073/
    4. Crit Care, 2020: https://pubmed.ncbi.nlm.nih.gov/32019600/
    5. Anesth Analg, 2020: https://pubmed.ncbi.nlm.nih.gov/31348056/

b. Fluid Considerations:

i. Historical: Early Goal Directed Therapy, NEJM 2001: https://pubmed.ncbi.nlm.nih.gov/11794169/
ii. EGDT F/u: Review of ProCESS, ProMISe and ARISE Trials, Crit Care 2016: https://pubmed.ncbi.nlm.nih.gov/27364620/
iii. Goal-directed resuscitation, a critical analysis, Clin Chest Med, 2016: https://pubmed.ncbi.nlm.nih.gov/27229640/
iv. Fluid Restriction, NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/35709019/
v. First 24h restrictive or liberal fluid strategy, NEJM 2023: https://pubmed.ncbi.nlm.nih.gov/36688507/

c. Lactate & Capillary Refill:

i. Understanding Lactate in Sepsis: AJRCCM 2019: https://pubmed.ncbi.nlm.nih.gov/30985210/
ii. Andromeda shock- cap refill versus lactate, JAMA 2019: https://pubmed.ncbi.nlm.nih.gov/30772908/
    1. F/u Supporting the Outcome, Ann Int Care 2020: https://pubmed.ncbi.nlm.nih.gov/32845407/

d. Vasoactive Therapy

i. Vasopressor Selection & Targets, Clin Chest Med 2016: https://pubmed.ncbi.nlm.nih.gov/27229642/
ii. Decatecholaminization during Sepsis, Crit Care 2016 editorial: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5048664/
iii. Vasodilatory Shock & Angio II review of all, CoCC 2018: https://pubmed.ncbi.nlm.nih.gov/29877879/
iv. ATHOS, NEJM 2017: https://www.nejm.org/doi/full/10.1056/nejmoa1704154

v. Angio II Narrative review, from JAACC 2024, smaller journal but good concise summary of available literature to date: https://pubmed.ncbi.nlm.nih.gov/38383521/
vi. Vaso vs. NE in septic shock: VANISH trial https://jamanetwork.com/journals/jama/fullarticle/2540403
vii. A2 and Vaso, a Critical Appraisal of Catecholamine sparing strategies, JICM 2021: https://pubmed.ncbi.nlm.nih.gov/32223515/

e. **MAP Goals**
   i. MAP 63 vs. 77 after cardiac arrest (and comatose), NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36027564/
   ii. MAP 85 vs. 65 in Septic Shock, NEJM 2014: https://pubmed.ncbi.nlm.nih.gov/24635770/
   iii. MAP 60-65 versus >65 in adults >65yo, JAMA 2020: https://pubmed.ncbi.nlm.nih.gov/32049269/
   iv. Intraop Data: BP and Postop Clinical Outcomes NCS, Anesthesiology 2013: https://pubmed.ncbi.nlm.nih.gov/23835589/
   v. MAP Goal Selection in the ICU, systematic review & meta-analysis, CCM 2023: https://pubmed.ncbi.nlm.nih.gov/36661452/
   vi. Higher MAP vs Normotension to prevent AKI, a systematic review – Crit Care 2022: https://pubmed.ncbi.nlm.nih.gov/36434726/
   vii. Low versus high BP targets in critically ill and surgical patients: systematic review & meta-analysis of RCTs: CCM 2024: https://pubmed.ncbi.nlm.nih.gov/38656245/

f. Other Agents (this is not advocating for these drugs):
   i. Ionized calcium – should we bother? Chest 2016: https://pubmed.ncbi.nlm.nih.gov/26836894/
   ii. Hydroxycobalmin, Crit Care Explor 2021: https://pubmed.ncbi.nlm.nih.gov/33912838/ and Cureus 2022: https://pubmed.ncbi.nlm.nih.gov/36039127/
   iii. Methylene Blue, BMC Anesth 2022: https://pubmed.ncbi.nlm.nih.gov/35761204/ *(please note with SSRI use, methylene blue can cause serotonin syndrome)*
   iv. Cytosorb in CHF (one of many Cytosorb studies), BMJ Open 2022: https://pubmed.ncbi.nlm.nih.gov/36123067/

6. Structural Heart Disease: Pericardial, Valvular including HOCM, ASH, IHSS, oxygen supply and demand in the heart, acquired ASD and VSD, cardiomyopathies, non-infectious myocarditis, papillary muscle dysfunction, myocardial stunning, Takotsubo's

a. Valvular Heart disease in the CTICU, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/37973348/
b. Valvular Heart Disease and Anaesthesia, Indian Journal of Anaesthesia, 2017: https://pubmed.ncbi.nlm.nih.gov/28970630/ *(a fantastic review of "shock state" management of valvular cardiomyopathy)*
c. Takotsubo Review, Clin Med Insights 2022: https://pubmed.ncbi.nlm.nih.gov/35002350/

7. Pericardial effusion, pericarditis and tamponade

a. Intraop Management of Tamponade, Anesthesiol Clin 2010: https://pubmed.ncbi.nlm.nih.gov/20400042/
b. Pericardial tamponade: a comprehensive EM & echocardiography review, Am J EMerg Med, 2022: https://pubmed.ncbi.nlm.nih.gov/35696801/

c. Pericardial effusions: causes, diagnosis and management, Prog Cardiovasc Dis, 2017: https://pubmed.ncbi.nlm.nih.gov/28062268/

8. Devices:

a. **ECMO-VA** *[See VV ECMO in Resp; See ELSO Site & ELSO Redbook]*
   i. Intro to ECMO – ECMO in cardiopulmonary disease in adults, J Am Coll Cardiol 2014: https://pubmed.ncbi.nlm.nih.gov/24814488/
   ii. Introduction to ECMO, Crit Care Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28887925/ *paired to:*
   iii. Cardiac Support: Emphasis on Venoarterial ECMO, Crit Care Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28887927/
   iv. Clinical Dilemmas (cases), J Extracorp Tech 2012: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4557570/
   v. Issues in ICU on ECMO, Crit Care Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28887932/
   vi. Monitoring of the adult patient on venoarterial ECMO, ScientificWorldJournal 2014 (odd journal, great article): https://pubmed.ncbi.nlm.nih.gov/24977195/
   vii. LV Venting/unloading in cardiogenic shock, J Clin Med, 2020: https://pubmed.ncbi.nlm.nih.gov/32272721/
   viii. Bleeding & Thrombosis with ECMO, Semin Thromb Hemost 2018: https://pubmed.ncbi.nlm.nih.gov/28898902/
   ix. 2021 ELSO Adult and Pediatric Anticoagulation Guidelines: https://pubmed.ncbi.nlm.nih.gov/35080509/
   x. ECMO versus Impella LVAD, systemic review, Shock 2022: https://pubmed.ncbi.nlm.nih.gov/36445229/
   xi. Oxygenation on VA-ECMO. Don't hyperoxygenate! Pragmatic approach and review, CCM 2024: https://pubmed.ncbi.nlm.nih.gov/38059745/

b. **VADs:** LVAD or RVAD, open or percutaneous
   i. LVAD Emergencies, diagnosis and management, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/37973352/
   ii. RV Failure during LVAD Therapy, Crit Care Clinics 2018: https://pubmed.ncbi.nlm.nih.gov/29907275/
   iii. Device management and flow for LVADs, Crit Care Clinics 2018: https://pubmed.ncbi.nlm.nih.gov/29907276/
   iv. Managing patients with short-term circulatory support, JACC 2021: https://pubmed.ncbi.nlm.nih.gov/33663742/
   v. Durable LVAD Complications, Crit Care Clinics 2018: https://pubmed.ncbi.nlm.nih.gov/29907277/
   vi. ECMO + Impella, JCTVA Review 2022: https://pubmed.ncbi.nlm.nih.gov/33642170/

c. **Pacer/Defibrillators:** AICDs, External defibrillators, transthoracic, Transvenous / epicardial
   i. **Pacing in the CTICU,** Journal of CTS, 2024 (a "reference guide" for periop teams): https://pubmed.ncbi.nlm.nih.gov/38468357/
   ii. Temporary Epicardial Pacing after Cardiac Surgery – JCTVA 2022: https://pubmed.ncbi.nlm.nih.gov/36180288/

iii. Implantable Devices: Perioperative Management – Anesthesiol Clin 2016: https://pubmed.ncbi.nlm.nih.gov/26927747/
iv. Periop Management of Patients with Cardiac Implantable Electronic Devices and Utility of Magnet Application (a fantastic clinical review including how to determine device type on imaging and brand-specific response to magnets), J Clin Med 2022: https://pubmed.ncbi.nlm.nih.gov/35160149/

d. IABP

e. IVC Filters *(not in CCM outline)*

i. IVC Filters for VTE and 30d mortality, JAMA 2018: https://pubmed.ncbi.nlm.nih.gov/30646021/

9. Postop Management Topics

a. Postoperative critical care of the adult cardiac surgical patient, part I (routine postoperative care), Crit Care Med 2015: https://pubmed.ncbi.nlm.nih.gov/25962078/
b. Postoperative critical care of the adult cardiac surgical patient, part II (procedure-specific considerations, management of complications and QI, Crit Care Med 2015: https://pubmed.ncbi.nlm.nih.gov/26136101/
c. Perioperative Management of Valve Replacements, Ann Card Anesth, 2022: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9387617/
d. Fluid responsiveness post-cardiac surgery, BMC Anesth 2018: https://pubmed.ncbi.nlm.nih.gov/29788919/
e. CALS – ACLS after cardiac surgery. See "Procedure Section please," core article also here: The Society of Thoracic Surgeons expert consensus for the resuscitation of patients who arrest after cardiac surgery: Ann Thorac Surg 2017: https://pubmed.ncbi.nlm.nih.gov/28122680/
f. CALS – Management of cardiac arrest following cardiac surgery (CALS #2): BJA Educ, 2018: https://pubmed.ncbi.nlm.nih.gov/33456790/

10. Transplant – rejection and complications

a. Heart transplant: postoperative considerations, Crit Care Clin, 2024: https://pubmed.ncbi.nlm.nih.gov/37973350/
b. Controversies in the Postop Management of Heart Tx, Anesth Analg 2019: https://pubmed.ncbi.nlm.nih.gov/31162160/

11. Infection/inflammation – endo-, myo-, pericarditis

a. Myocarditis – NEJM, but older, 2009: https://pubmed.ncbi.nlm.nih.gov/19357408/
b. Myopericarditis – StatPearls: https://www.ncbi.nlm.nih.gov/books/NBK534776/
c. Acute Pericarditis, triage/management, Int J Cardiol 2007: https://pubmed.ncbi.nlm.nih.gov/17049636/

12. CAD, MI, HTN; CHF- LV (diastolic/systolic)

a. 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention https://pubmed.ncbi.nlm.nih.gov/22064601/
b. 2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction https://pubmed.ncbi.nlm.nih.gov/26489034/
c. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction https://pubmed.ncbi.nlm.nih.gov/23299937/

d. 2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes https://pubmed.ncbi.nlm.nih.gov/25249585/
e. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation https://pubmed.ncbi.nlm.nih.gov/28886621/

13. Congenital Heart Disease in adults – Eisenmenger, TOF, shunts

a. Congenital heart disease in the adult cardiac intensive care unit, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/37973353/
b. Special Considerations in critical care of the CHD patient, Can J Cardiol: https://pubmed.ncbi.nlm.nih.gov/36682483/ (a landmark review)
c. Adult patients with CHD in the ICU, Heart 2022: https://pubmed.ncbi.nlm.nih.gov/35383106/

14. Trauma – contusion, tamponade, ATLS

a.

15. DO2 (systematic) and VO2 (oxygen supply and demand)

16. Diagnostics

a. Physical Exam

i. See above in Andromeda Shock & Septic Shock section.
ii. Kinetics of capillary refill time after fluid challenge, Ann of Inten Care, 2022: https://pubmed.ncbi.nlm.nih.gov/35962860/
iii. Pulsus Alternans, Stat Pearls 2021: https://pubmed.ncbi.nlm.nih.gov/32491574/
iv. Pulsus Paradoxus, Stat Pearls 2021: https://pubmed.ncbi.nlm.nih.gov/29493917/

b. **Art line / BP, CO monitors, CVP, EKG, PPV, SVV, other.** *Please read Miller's Anesthesiology Chapter on Hemodynamic Monitoring, it is fantastic.*

i. Hemodynamic Monitoring by Dr. Pinsky, preeminent in this arena, Crit Care 2022: https://pubmed.ncbi.nlm.nih.gov/36171594/
ii. Advanced uses of pulse oximetry for monitoring mechanically ventilated patients, Anesth Analg, 2017: https://pubmed.ncbi.nlm.nih.gov/27183375/

c. Imaging: CT, MRI, interventional imaging, nuclear imaging, TTE, TEE, bedside ultrasound

i. See TTE / Echo below.

17. Management

a. Antihypertensives
b. Antidysrhythmics (see above)
c. Pericardiocentesis (see procedures)

Section 2: Respiratory

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1. **ARDS**
   - **a. Reviews:**
     - i. ATS, ESICM and SCCM CPG – mechanical ventilation in ARDS, AJRCCM (Blue), 2017: https://pubmed.ncbi.nlm.nih.gov/28459336/
     - **ii.** Lancet 2022: Causes, Pathophys & Phenotypes: https://pubmed.ncbi.nlm.nih.gov/36070787/
     - iii. Lancet 2022: Diagnosis, outcomes, long-term sequelae and management: https://pubmed.ncbi.nlm.nih.gov/36070788/
     - **iv.** ARDS Review: NEJM 2017 Thompson & Liu: https://pubmed.ncbi.nlm.nih.gov/28792873/
     - **v.** ARDS Review: JICM 2020: https://pubmed.ncbi.nlm.nih.gov/31208266/
     - **vi.** ARDS, evolving standards of Care, ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33156382/
     - **vii.** Disability 5y after ARDS: NEJM 2011 https://pubmed.ncbi.nlm.nih.gov/21470008/
     - **viii.** Gas Exchange in ARDS: AJRCCM 2017 https://pubmed.ncbi.nlm.nih.gov/28406724/
   - **b. Select Therapies for ARDS**
     - i. Adjunctive therapies in ARDS, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/38432699/
     - ii. Rescue Therapies, in order! CoCC 2017: https://pubmed.ncbi.nlm.nih.gov/27898438/
     - iii. Rescue Therapies – great charts and systematic review, CCM 2018: https://pubmed.ncbi.nlm.nih.gov/30247273/
     - iv. Pharmacologic Tx in ARDS, Crit Care Clin 2021: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8449143/
     - v. Inhaled Nitric Oxide in ARDS: Cochrane Review 2010: https://pubmed.ncbi.nlm.nih.gov/20614430/
     - vi. Inhaled nitric therapy in adults: NEJM 2005 review: https://pubmed.ncbi.nlm.nih.gov/16371634/
   - **c. Prone Positioning**
     - i. Proning in ARDS: NEJM 2013 https://pubmed.ncbi.nlm.nih.gov/23688302/
     - ii. Proning in ARDS, Chest 2017: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6026253/
     - iii. Proning in ARDS, who/how/whom, ICM 2020: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7652705/
   - **d. Paralysis**
     - i. Paralysis in ARDS, the Acurasys Trial (Papazian): NEJM 2010: https://pubmed.ncbi.nlm.nih.gov/20843245/
     - ii. Paralysis in ARDS, the Rose Trial: NEJM 2019: https://pubmed.ncbi.nlm.nih.gov/31112383/
     - iii. Myorelaxants in ARDS, ICM review 2020: https://pubmed.ncbi.nlm.nih.gov/33159530/
     - iv. Paralysis in ARDS review: Anesth 2020: https://pubmed.ncbi.nlm.nih.gov/32032097/
   - **e. Steroids**

i. Steroids in ARDS: Steinberg NEJM 2006 https://pubmed.ncbi.nlm.nih.gov/16625008/
ii. Steroids in ARDS: Meduri Chest 2007 https://pubmed.ncbi.nlm.nih.gov/17426195/
iii. Steroids in ARDS: Meduri round 2: CCM 2018: https://pubmed.ncbi.nlm.nih.gov/29432350/ with good editorial review here: https://pubmed.ncbi.nlm.nih.gov/29762401/
iv. Steroids in ARDS: Dexa-ARDS: Lancet Resp 2020 https://pubmed.ncbi.nlm.nih.gov/32043986/
v. Steroids in ARDS: Pharm Principles surrounding prolonged therapy in ARDS, ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33150472/

f. Fluids

i. Fluids in ARDS (and PAC catheters), by CVP goal (dry is better), FACTT Trail, NEJM, 2000's: https://pubmed.ncbi.nlm.nih.gov/16714767/
ii. Fluids in ARDS: Which Management: ICM review 2020: https://pubmed.ncbi.nlm.nih.gov/33169217/

g. Re-examining Permissive Hypercapnea in ARDS, Narrative Review in Chest 2018: https://pubmed.ncbi.nlm.nih.gov/29175086/
h. Analgesia and Sedation for ARDS: ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33170331/

2. <u>Ventilator: Tidal Volumes, Power, PEEP, VILI, FiO2</u>

a. VILI

i. The ARMA Trial (low or high Vt): NEJM 2000 https://pubmed.ncbi.nlm.nih.gov/10793162/
    1. Possibly not the most ethical trial, NEJM 2003: https://pubmed.ncbi.nlm.nih.gov/12672870/
ii. Tidal Volume Selection Review: AJRCCM 2017: https://pubmed.ncbi.nlm.nih.gov/28930639/
iii. Opening Pressures & Atelectotrauma in ARDS: ICM 2017 https://pubmed.ncbi.nlm.nih.gov/28283699/
iv. Driving Pressure and Survival in ARDS, NEJM 2015: *This is my favorite article in all of ventilation & ARDS!!* https://pubmed.ncbi.nlm.nih.gov/25693014/
v. Follow-up – Lower tidal volume *versus* driving pressure (or tidal volume guided by elastance): Effect of lowering Vt on mortality in ARDS varies with elastance, AJRCCM (Blue), 2021: https://pubmed.ncbi.nlm.nih.gov/33439781/
vi. Driving Pressure for ARDS: Anesthesiology 2020 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7449829/
vii. VILI Review, Crit Care Clin 2018: https://pubmed.ncbi.nlm.nih.gov/29907269/
    1. VILI and Individualizing Vent Parameters (great review), Int Care Med, 2017: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5289131/
    2. Mechanical Power and VILI: Anesthesiology 2016: https://pubmed.ncbi.nlm.nih.gov/26872367/
    3. Mechanical Power and VILI: ICM 2016: https://pubmed.ncbi.nlm.nih.gov/27620287/
        a. Note – driving pressure and respiratory rate alone likely are sufficient and more bedside-applicable, AJRCCM (Blue), 2021: https://pubmed.ncbi.nlm.nih.gov/33784486/
    4. VILI Review: NEJM 2013 https://pubmed.ncbi.nlm.nih.gov/24283226/

viii. How to use transpleural gradients / esophageal manometry: EPVent2 2014: https://pubmed.ncbi.nlm.nih.gov/25287106/
ix. Clinical Strategies for implanting lung and diaphragm protective ventilation: Insufficient and Excessive Effort, ICM 2020 narrative rview: https://pubmed.ncbi.nlm.nih.gov/33140181/

b. FiO2 / Oxygenation / Saturation Goals

i. Dangers of Hyperoxia, Crit Care 2021: https://pubmed.ncbi.nlm.nih.gov/34924022/
ii. Clinical Implications of Hyperoxia, Int Anesth Clinics 2018: https://pubmed.ncbi.nlm.nih.gov/29227312/
iii. Hyperoxia and Mortality: BJA 2020: https://pubmed.ncbi.nlm.nih.gov/32753102/
iv. O2 Goals 1: NEJM 2020 https://pubmed.ncbi.nlm.nih.gov/32160661/
v. O2 Goals 2: JAMA 2021, has a great review of other work: https://pubmed.ncbi.nlm.nih.gov/34463696/
vi. NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36278971/

c. PEEP

i. Optimal PEEP in ARDS: Lung recruitment estimate math: AJRCCM 2020 https://pubmed.ncbi.nlm.nih.gov/31577153/
ii. Optimal PEEP / Recruitment: How and Why? AJRCCM 2020, Gattinoni https://pubmed.ncbi.nlm.nih.gov/31661307/
iii. High PEEP and Alveolar Cycling, Med Klin Intensivmed Notfmed, 2018 Gattinoni: https://pubmed.ncbi.nlm.nih.gov/29134246/
iv. How I do it: Setting and titrating PEEP, Millington, Chest 2022. https://pubmed.ncbi.nlm.nih.gov/35131298/
v. Another fantastic "how to," Crit Care 2022, Ten Rules for vent management after cardiac arrest: https://pubmed.ncbi.nlm.nih.gov/36527126/
vi. Driving Pressure and PPCs in Major Abdominal Surgery, BJA Open 2022: https://pubmed.ncbi.nlm.nih.gov/36687665/
vii. Personalizing Mechanical Ventilation according to physiologic parameters to stabilize alveoli and minimize VILI [another "how to optimize PEEP" manuscript]. Intensive Care Med Exp, 2017: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5289131/

3. Ventilator Modes & Waveforms

a. Ventilator Waveforms to diagnose pulmonary pathology - stepwise, Anesthesiology 2022 Review: https://pubmed.ncbi.nlm.nih.gov/35511174/
b. How to ventilate obese patients in the ICU, ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33095284/
c. How to ventilate obstructive/asthmatic patients, ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33169215/
d. Ventilator Synchrony: ICM 2019: https://pubmed.ncbi.nlm.nih.gov/31346799/
e. Management of the Patient with Ventilatory Dyssynchrony, Anesthesiology 2021: https://pubmed.ncbi.nlm.nih.gov/33592102/
f. Synchrony & Flow Waveforms Narrative Review: Can J RT 2020: https://pubmed.ncbi.nlm.nih.gov/32844110/
g. APRV – a review and waveforms included, Resp Care 2016: https://pubmed.ncbi.nlm.nih.gov/27235312/

4. Non-invasive Modes

a. NIV: HFNC in ARDS: NEJM 2015: https://pubmed.ncbi.nlm.nih.gov/25981908/

b. HFNC as resp support, CPG, ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33201321/ with accompanying editorial: https://pubmed.ncbi.nlm.nih.gov/32901374/
c. Post-extubation HFNC vs. NIV: JAMA 2016: https://pubmed.ncbi.nlm.nih.gov/27706464/
d. HFNC for Resp Failure, ERS CPG, 2021: https://pubmed.ncbi.nlm.nih.gov/34649974/
e. NIV after extubation in Obese patients – which mode to pick? Lancet Respir Med, 2023: https://pubmed.ncbi.nlm.nih.gov/36693403/

5. **Pulmonary Edema; Pleural effusion**
   a. Parapneumonic effusion and empyema: Clin Chest Med 2021: https://pubmed.ncbi.nlm.nih.gov/34774171/
   b. Other reviews in Resp Med 2021: https://pubmed.ncbi.nlm.nih.gov/34896966/ & Cureus 2022 https://pubmed.ncbi.nlm.nih.gov/35018275/

6. **Infections: Abx, antivirals, antifungals**
   a. **Pneumonia (CAP, HAP, VAP)**
      i. IDSA & ATS Guide to CAP, 2019: https://pubmed.ncbi.nlm.nih.gov/31573350/
      ii. Aspiration Pneumonia, NEJM 2019: https://pubmed.ncbi.nlm.nih.gov/30763196/
      iii. Aspiration PNA, Stat Pearls: https://www.ncbi.nlm.nih.gov/books/NBK470459/
      iv. IDSA Guideline HAP/VAP 2016 https://www.idsociety.org/practice-guideline/hap_vap/
      v. IDSA Guideline Influenza 2018 https://www.idsociety.org/practice-guideline/influenza/
   b. Pulm Infections Complicating ARDS, ICM 2020: https://pubmed.ncbi.nlm.nih.gov/33175277/
   c. HAP & VAP – IDSA Guideline 2016: https://pubmed.ncbi.nlm.nih.gov/27418577/
   d. CAP requiring hospitalization in Adults: NEJM 2015: https://pubmed.ncbi.nlm.nih.gov/26172429/
   e. CAP – IDSA Guidelines 2019: https://www.idsociety.org/practice-guideline/community-acquired-pneumonia-cap-in-adults/
   f. CAP – Abx Strategies for adults: NEJM 2015: https://pubmed.ncbi.nlm.nih.gov/25830421/
   g. Hydrocortisone for CAP requiring ICU, NEJM 2023: https://pubmed.ncbi.nlm.nih.gov/36942789/
   h. BAL for Fungal Infections, Clin Chest Med 2009: https://pubmed.ncbi.nlm.nih.gov/19375640/
   i. Aspergillus Infections, NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/35021000/
   j. New aspects in PNA Tx, Crit Care 2016: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5045574/
   k. Procalcitonin guided Abx Tx for Resp Infections, Lancet 2018: https://pubmed.ncbi.nlm.nih.gov/29037960/
   l. VAP / HAP: Guidelines and Risk Factors Semin Resp CCM 2022: https://pubmed.ncbi.nlm.nih.gov/35042262/
   m. Eosinophilic Pneumonia, J Allergy Clin Immunol Pract, 2018: https://pubmed.ncbi.nlm.nih.gov/29735405/
   n. Empyema, abscess (see pleural effusion)
   o. Mediastinitis
   p. Tracheobronchitis
   q. Pneumovax / vaccination

7. **VV ECMO:** *See the ELSO Site and ELSO Redbook*
   a. Clinical Decisions, Cases, NEJM 2018: https://www.nejm.org/doi/full/10.1056/NEJMclde1804601

b. ARDS Rescue with ECMO & other- Crit Care Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28887928/
c. ECMO for Severe ARDS, ICM 2020: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7605473/
d. ELSO VV ECMO Guideline 2021 https://journals.lww.com/asaiojournal/Fulltext/2021/06000/Management_of_Adult_Patients_Supported_with.1.aspx
e. ECMO for ARDS, the CESAR Trial: Lancet 2009: https://pubmed.ncbi.nlm.nih.gov/19762075/
f. ECMO For ARDS, the EOLIA Trial: NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/29791822/
g. Combined CESAR, EOLIA (more), meta-analysis, ICM 2020: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7537368/
h. Ventilation While on VV-ECMO:
    i. Ventilation on ECMO – Super protect – Pro. Pro/Con Editorials in CCM, 2019 https://pubmed.ncbi.nlm.nih.gov/31149964/
    ii. Ventilation on ECMO – Super protect – Con. Pro/Con Editorials in CCM, 2019 https://pubmed.ncbi.nlm.nih.gov/31162204/
    iii. UltraProtective & BioTrauma, Pro, 2019 CCM: https://pubmed.ncbi.nlm.nih.gov/31385880/
    iv. Ultraprotective & BioTrauma, Con, 2022 Crit Care: https://pubmed.ncbi.nlm.nih.gov/36510324/
i. Medications and ECMO, Crit Care Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28887935/
j. Issues in the ICU for ECMO, Crit Care Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28887932/
k. Awake ECMO, Crit Care 2016 Review: https://pubmed.ncbi.nlm.nih.gov/27357690/
l. Bleeding & Thrombosis with ECMO, Semin Thromb Hemost 2018: https://pubmed.ncbi.nlm.nih.gov/28898902/
m. Algorithmic approach to Hypoxia on ECMO: Intensive Care Medicine 2016, a must read https://pubmed.ncbi.nlm.nih.gov/27271548/
n. Weaning from VV ECMO, JTD 2018: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5911556/
o. ECOR (ECMO for CO2 Removal), Vent-AVOID Trial, **ECOR –** AJRCCM (Blue), 2024: https://pubmed.ncbi.nlm.nih.gov/38261630/

8. Spontaneous breathing trials / Cuff Leak
    a. Clinical Practice Guideline for Ventilator Weaning, AJRCCM 2017: https://pubmed.ncbi.nlm.nih.gov/27762595/ This includes a guide and figure towards the management of the patient without a cuff leak.

9. Differential lung ventilation, prone positioning
10. Aspiration
    a. Aspiration ARDS: Yes-steroids: BMC Pulm 2016: https://pubmed.ncbi.nlm.nih.gov/26864571/
11. Embolic disorders – air, fat, thromboembolic, other
    a. See CV – PE & RV failure portions
12. Inflammatory & autoimmune diseases
    a. Eosinophilic Lung diseases, Clin Chest Med 2016: https://pubmed.ncbi.nlm.nih.gov/27514599/
    b. Diffuse Alveolar Hemorrhage, a review, AJR AM J R 2021: https://pubmed.ncbi.nlm.nih.gov/33826359/
        i. DAH in cardiac disease: https://pubmed.ncbi.nlm.nih.gov/33709230/

   c. Life-threatening Hemoptysis, Seminars in Resp Crit Care Med 2021: https://pubmed.ncbi.nlm.nih.gov/32862418/

13. **Lung transplant**
    a. Lung Tx – Atrial fibrillation and Atrial flutter guide, Heart Lung Circ 2020: https://pubmed.ncbi.nlm.nih.gov/31786113/
    b. Anesthesia for Lung Tx, Anesth Clinics 2017: https://pubmed.ncbi.nlm.nih.gov/28784221/
    c. Hyperammonemia after Lung Transplant, Chen Transplantation 2016 (see Non-hepatic hyperammonemia in ID and GI, as well): https://pubmed.ncbi.nlm.nih.gov/26335916/
14. **Airway disruption:** tracheal, PTX, volutrauma, BPF
    a. Management: Bronchopleural, bronchocutaneous fistula management
    b. BPF Management: StatPearls 2021: https://www.ncbi.nlm.nih.gov/books/NBK534765/
15. Lung and chest wall tumors
16. Chest trauma (contusion, flail)
    a. Pulmonary Contusion, JTD 2019 Review: https://pubmed.ncbi.nlm.nih.gov/30906578/
    b. REBOA versus Thoracotomy, JAMA 2023: https://pubmed.ncbi.nlm.nih.gov/36542395/ *(not part of ABA content outline)*
17. General Topics: Airway disease – obstructive, reactive, restrictive; Pulm mechanics and WOB; Resp Failure; Hypoxia (acute/chronic), hypercapnia (acute, chronic); and V/Q problems; OSA – central and obstructive sleep apnea; Drowning – fresh and saltwater; PFTs, pulm mechanics; Sleep Studies; Imaging: CXR, CT/MRI, nuclear studies, US
    a. See Miller Chapter: Respiratory Physiology
    b. TRALI / TACO – see hematology / transfusion

18. ABG, capnography, pulse ox
    a. Capnography during critical illness, Chest 2016: https://pubmed.ncbi.nlm.nih.gov/26447854/
    b. See Miller Chapter: Respiratory Physiology
19. Thoracentesis & chest tubes; bronchoscopy, laryngoscopy.
    a. https://epmonthly.com/article/pigtail-insertion/
20. Pulmonary meds
    a. Dornase Alfa etc
    b. RT Therapies (see table at bottom)

21. Other Recommended Literature:
22. Vaping: 2019 review: https://pubmed.ncbi.nlm.nih.gov/31751326/
23. The RV in ARDS, Chest 2017: https://pubmed.ncbi.nlm.nih.gov/28267435/
24. Perioperative Lung Protective Ventilation, BMJ 2018: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6889848/
25. Driving Pressure in Thoracic Surgery: Anesthesiology 2019 RCT: https://pubmed.ncbi.nlm.nih.gov/30664548/
26. Lung protective, even if no ARDS? CCM 2015: https://pubmed.ncbi.nlm.nih.gov/26181219/
27. Optimal PEEP in bariatric OR: Anesthesia 2020 (look at last tables): https://pubmed.ncbi.nlm.nih.gov/32675698/

Respiratory Therapy Treatments

Airway Clearance

Therapy	Indication	Contraindication
MetaNeb Delivers 3 therapies in one-aerosol, secretion clearance and lung expansion in line with the ventilator	Excessive or retained secretion clearance and/or Atelectasis	1. Untreated tension pneumothorax or persistent air leak 2. Tracheoesophageal surgery 3. Active hemoptysis
Cough Assist Machine (In-Exsufflator) Patient disconnected from the ventilator to receive therapy	Assist with clearing secretions by delivering a positive pressure followed by a negative pressure to the airways	1. Known pneumothorax 2. Bullous emphysema
High Frequency Chest Compression Vest Treatment (HFCC)	Mobilize respiratory trat secretions from lung lobes or segments into the central airways	1. Known pneumothorax 2. Fractured ribs
Positive Expiratory Pressure (PEP) (For non-vented patients only)	Mobilizes secretions toward the large airways to be cleared more easily by coughing	1. Untreated/Known pneumothorax 2. Recent facial, oral, skull surgery or trauma 3. Tympanic membrane rupture
Aerobika (For non-vented patients only)	Loosen mucus in the airway so the patient can expectorate more easily. Patient unable to create an expiratory flow of 10 liters per minute may not be able to generate enough force to preform adequate	1. Untreated/Known pneumothorax 2. Active hemoptysis 3. Tympanic membrane rupture

Volume Expansion

Therapy	Indication	Contraindication
Constant Positive Airway Pressure (CPAP) Continuous and intermittent	Spontaneously breathing patients that provide positive pressure to the airways for: Hypoxemia, Pulmonary edema, and Obstructive Sleep Apnea	1. Recent facial, oral or skull surgery/trauma 2. Epistaxis 3. Esophageal surgery 4. Active hemoptysis 5. Untreated pneumothorax 6. Tympanic membrane rupture
Cough and Deep Breathing/Incentive Spirometer	Removal of bronchial secretions via coughing/deep breathing	N/A

Section 3: Procedures, Airways, Codes

Return to Table of Contents

Includes Intubation, POCUS, Codes, Line Placement & Emergencies

1. **Intubations**
    a. **Overall reviews of intubation in the ICU**
        i. ICU Airway Management, 2018 Crit Care Clin: https://pubmed.ncbi.nlm.nih.gov/29907267/
        ii. A review of emergency airway management out of the OR, Anesth Analg 2021: https://pubmed.ncbi.nlm.nih.gov/34153007/
        iii. Endotracheal intubation in the ICU, Crit Care 2015: https://pubmed.ncbi.nlm.nih.gov/26082175/
        iv. Tracheal intubation in the critically ill, systematic review, Crit Care 2018: https://pubmed.ncbi.nlm.nih.gov/29351759/
        v. Intubation and Outcomes in the ICU, the INTUBE Study, JAMA 2021: https://pubmed.ncbi.nlm.nih.gov/33755076/
        vi. Risks of severe collapse after intubation in the ICU, Crit Care 2015: https://pubmed.ncbi.nlm.nih.gov/26084896/
        vii. Risk Factors for hemodynamic collapse (again), Annals ATS 2020: https://pubmed.ncbi.nlm.nih.gov/32364753/
        viii. Peri-intubation CV Collapse in ICU Intubations (round 3), AJRCCM 2022: https://pubmed.ncbi.nlm.nih.gov/35536310/
        ix. Management of the Difficult Airway, NEJM review, 2021: https://pubmed.ncbi.nlm.nih.gov/33979490/
        x. How I manage a difficult intubation – Crit Care, 2019: https://pubmed.ncbi.nlm.nih.gov/31096995/
    b. **Approach**
        i. VL vs. DL is more likely driven by trainee level and prior experience than device specific, so I am avoiding the topic here. Please consider reading: Trainee Level and Success of intubation, J Clin Anesth 2016: https://pubmed.ncbi.nlm.nih.gov/27871589/
        ii. Bougie Trial, JAMA 2021: https://pubmed.ncbi.nlm.nih.gov/34879143/
        iii. Bougie Meta-Analysis, Eur J Trauma Emerg Surg, 2022: https://pubmed.ncbi.nlm.nih.gov/34333690/
        iv. Awake FBO in the OR for anticipated difficult airways – a review and meta-analysis of RCTs, Anesth Analg 2019: https://pubmed.ncbi.nlm.nih.gov/30896601/
        v. Awake FBO – Yale Review, 1998. An oldie but reviews some good lidocaine pharmacokinetics and strategies: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2578951/pdf/yjbm00025-0089.pdf

vi. Awake VL vs. Awake FBO, Curr Opin Anaesthesiol, 2019: https://pubmed.ncbi.nlm.nih.gov/31356364/
vii. Airway Anesthesia/Topicalization for awake intubation. Note that I think they over-emphasize lido-heavy strategies that may result in over-dosage and LA toxicity. Cureus 2021: https://pubmed.ncbi.nlm.nih.gov/34405073/
viii. Awake Airway – Dexmed still causes upper airway collapse (healthy volunteers), nonblinded crossover versus propofol, Anesthesiology 2019: https://pubmed.ncbi.nlm.nih.gov/31403974/
ix. Intubation Tube Exchange, NEJM 2023: https://pubmed.ncbi.nlm.nih.gov/36920758/ I actually disagree with (part of) their technique! However, focus on the impetus to NEVER DO THIS BLIND (don't just do a bougie exchange). *My technique: put the VL down, look at old tube --> +/- add exchange catheter --> put new tube in place, ready to tube again (so in total, old-tube, VL and new-tube all in mouth) --> old tube out (by assistant) --> new tube in BESIDE the airway exchange catheter, if used.*

c. Intubation Drugs:

i. The INTUBE study (above), looking at CV collapse & Propofol, AJRCCM 2022: https://pubmed.ncbi.nlm.nih.gov/35536310/
ii. Etomidate Debate: is etomidate safe in unstable critically ill patients? Crit Care 2012: https://pubmed.ncbi.nlm.nih.gov/22809235/
iii. Etomidate IS a first-line, CCM 2018: https://pubmed.ncbi.nlm.nih.gov/29923933/
iv. Etomidate IS NOT a first-line, CCM 2018: https://pubmed.ncbi.nlm.nih.gov/29923932/
v. Etomidate vs Ketamine RCT, ICM 2022: https://pubmed.ncbi.nlm.nih.gov/34904190/
vi. Prop, Keta, Etom in the ICU, Crit Care Explor 2021: https://pubmed.ncbi.nlm.nih.gov/34046636/
vii. Avoid or use NMBs for intubation? Cochrane Review 2017: https://pubmed.ncbi.nlm.nih.gov/28513831/
viii. Roc vs. Succ – Cochrane Review 2015. Please note limitations on dosing of rocuronium used throughout the article (0.6 vs. 1.2): https://pubmed.ncbi.nlm.nih.gov/26512948/
ix. The limits of succinylcholine for critically ill patients: Anesth Analg 2012: https://pubmed.ncbi.nlm.nih.gov/22763904/
x. Succinylcholine: Should it be used anymore? Transl Perioper Pain Med 2019 – obscure journal, but reviews considerations: https://pubmed.ncbi.nlm.nih.gov/33834087/
xi. Roc & Succ (and more): IBW or TBW? Dosing of NM Blocking agents in patients with obesity, narrative review, Anaesth Intensive Care 2021: https://pubmed.ncbi.nlm.nih.gov/33906465/
xii. Sugammadex: Special considerations and complications after administration: BMC Anesthesiol 2017: https://pubmed.ncbi.nlm.nih.gov/29041919/

d. Airway Edema / Cuff Leak

i. Steroids for Edema, BMJ 2008 meta-analysis: https://pubmed.ncbi.nlm.nih.gov/18936064/
ii. Clinical Practice Guideline for Ventilator Weaning, AJRCCM 2017: https://pubmed.ncbi.nlm.nih.gov/27762595/ This includes a guide and figure towards the management of the patient without a cuff leak.

2. Tracheostomy

a. *Instead of citing all the trials, the following link is a recent systematic review and meta-analysis. If you'd like to see each trial (e.g. TracMan from JAMA), go through these citations:*
Bayesian analysis comparing early/late approaches, BJA 2022:
https://pubmed.ncbi.nlm.nih.gov/36163077/

b. I enjoy the unofficial (non-peer reviewed) guidance for Percutaneous tracheostomy placement at https://resusreview.com/2015/perc-trach-tutorial/

c. Managing Complications of Perc Trachs (and PEGs): J Thorac Dis, 2021. *A mandatory read before participating in any of these procedures.*
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8411191/

d. Prolonged mechanical ventilation, weaning and the role of tracheostomy, Crit Care Clin 2025:
https://pubmed.ncbi.nlm.nih.gov/38432703/

3. Codes & Cardiac Arrest

a. Management of patients after cardiac arrest, Crit Care Clin 2024:
https://pubmed.ncbi.nlm.nih.gov/37973357/

b. AHA/ILCOR 2020 CPR Guidelines https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines

c. E-CPR

i. Systematic Review, Resuscitation 2022: https://pubmed.ncbi.nlm.nih.gov/36521684/

ii. Another Review, Can J Cardiol, 2022: https://pubmed.ncbi.nlm.nih.gov/36526148/

1. Timing – Low-flow duration and outcomes with IN-HOSPITAL arrest: Crit Care Med 2022: https://pubmed.ncbi.nlm.nih.gov/36190237/
2. The Prague OHCA Trial: JAMA 2022:
https://pubmed.ncbi.nlm.nih.gov/35191923/
With follow-up to 180 day survival: https://pubmed.ncbi.nlm.nih.gov/36303227/

iii. ECPR with and without a mechanical CPR device - "MechCPR" helped! Resusc 2022:
https://pubmed.ncbi.nlm.nih.gov/36503025/

iv. How to perform TEE during ECPR: Euro Heart J CV Imaging 2022:
https://pubmed.ncbi.nlm.nih.gov/36227723/

v. Use of an IABP with ECPR, Resuscitation 2022:
https://pubmed.ncbi.nlm.nih.gov/36481238/

d. Head-up Position in CPR, meta-analysis: Crit Care 2021:
https://pubmed.ncbi.nlm.nih.gov/34717715/

e. CASA Echo Protocol in Codes leads to shorter pulse checks, Resusc 2018:
https://pubmed.ncbi.nlm.nih.gov/30071262/

f. Wide Complex EKG Differential Diagnosis, Circ 2018:
https://pubmed.ncbi.nlm.nih.gov/29581367/

g. Methylprednisone & Vasopressin in Codes, JAMA 2021:
https://pubmed.ncbi.nlm.nih.gov/34587236/

h. Cardiac Advanced Life Support:
    i. CALS – ACLS after cardiac surgery. The Society of Thoracic Surgeons expert consensus for the resuscitation of patients who arrest after cardiac surgery: Ann Thorac Surg 2017: https://pubmed.ncbi.nlm.nih.gov/28122680/
    ii. CALS – Management of cardiac arrest following cardiac surgery #2: BJA Educ, 2018: https://pubmed.ncbi.nlm.nih.gov/33456790/

4. Pericardiocentesis:
    a. Pericardial tamponade: a comprehensive emergency medicine & echocardiography review, Am J EMerg Med, 2022: https://pubmed.ncbi.nlm.nih.gov/35696801/

5. Post-Arrest Management
    a. Post-arrest care after ECMO-CPR: CCM 2024 https://pubmed.ncbi.nlm.nih.gov/37921532/
    b. Post-Cardiac Arrest Interventions that Save Lives, EMJ of NA 2020: https://pubmed.ncbi.nlm.nih.gov/32981616/
    c. OHCA and Non-STEMI: Cath lab now or later, NEJM 2019: NEJM 2019: https://pubmed.ncbi.nlm.nih.gov/32876654/
    d. Temp goals: See separate cooling section under Neurology
    e. Neuroprognostication: See Neurology
    f. MAP goals after arrest, 77 vs. 63: NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36027564/
        i. Other data not herein says higher may be better.
    g. O2 goals after arrest: NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36027567/
    h. CO2 goals after arrest (PaCO2 35-45 versus 50-55): NEJM 2023: https://pubmed.ncbi.nlm.nih.gov/37318140/
    i. Vent Management after arrest, review, Crit Care 2022: https://pubmed.ncbi.nlm.nih.gov/36527126/
    j. Vent Management and Respiratory Care after arrest, review, Chest 2018: https://pubmed.ncbi.nlm.nih.gov/29175085/

6. Rescue Echo: Note, minimal echo-related content is in the CCM Content Outline (for the exam). *I strongly recommend the Utah Anesthesiology Website Lecture Series and Resources. See a full guide at bottom. https://echo.anesthesia.med.utah.edu/pocus-content/*
    a. Ultrasonography in the CICU, Crit Care Clin, 2024: https://pubmed.ncbi.nlm.nih.gov/37973351/
    b. Nuts and Bolts of FoCus: Anesth Analg 2017: https://pubmed.ncbi.nlm.nih.gov/28207445/
    c. Rescue Echo Protocol in noncardiac surgery, Anesth Analg 2019: https://pubmed.ncbi.nlm.nih.gov/29916865/
    d. POCUS in Septic Shock, an excellent review, integrated multiorgan ultrasound, Semin Respir CCM 2021: https://pubmed.ncbi.nlm.nih.gov/34544181/
    e. POCUS, NEJM 2021: https://pubmed.ncbi.nlm.nih.gov/34670045/
    f. POCUS-CA (cardiac arrest): The Ultrasound Journal 2021 https://pubmed.ncbi.nlm.nih.gov/34855015/

7. Central Access and Line Placement: including catheter / bundles
    a. Risks by CVL Site (Fem vs SCL vs. IJ), NEJM 2015: https://www.nejm.org/doi/full/10.1056/nejmoa1500964

b. Supraclavicular Lines: ACEP Now, 2015: https://www.acepnow.com/article/using-the-supraclavicular-approach-to-ultrasound-guided-subclavian-vein-cannulation/
c. Subclavian Ultrasounds, NEJM 2018: https://www.nejm.org/doi/full/10.1056/nejmvcm1406114
d. Preventing Line Complications, NEJM 2003: https://www.nejm.org/doi/full/10.1056/nejmra011883
e. Prone IJ Cannulation, Crit Care Explorations 2023: Prone IJ Cannulation, CCE 2023: https://pubmed.ncbi.nlm.nih.gov/36600779/

8. **Chest Tubes**
    a. Comprehensive Chest Tube Management, JAMA Surgery 2022: https://jamanetwork.com/journals/jamasurgery/fullarticle/2788397

9. **Other**
    a. In-flight medical emergencies, JAMA 2018: https://pubmed.ncbi.nlm.nih.gov/30575886/
    b. In-Flight, including adult & pediatrics, Int J Pediatr, 2018: https://pubmed.ncbi.nlm.nih.gov/30595702/
    c. Disaster triage
    d. Biologic/chem/nuclear exposures
        i. Toxidrome Recognition in Chemical Attacks, NEJM 2018: https://www.nejm.org/doi/full/10.1056/NEJMra1705224
        ii. Snake Envenomation, NEJM 2022: https://www.nejm.org/doi/full/10.1056/NEJMra2105228
    e. ACLS, ATLS: Please see accordant guidelines and resources.
    f. Anaphylaxis
        i. Perioperative Anaphylaxis, Anesthesiology 2023: https://pubmed.ncbi.nlm.nih.gov/36413685/

Echo Self-Directed Lecture Series,
From the "Home Base" of the Utah Department of Anesthesiology

Introductory Lectures:

1. "Why Focused Cardiac Ultrasound"?
2. What is "FoCUS"?
3. Anatomy Review
    a. *Optional*: I recommend you print something out to jot notes on while you watch, or just to see things in two ways. Here is a wonderful PPT (attached as a PDF) reviewing what the basic views are with anatomy printed, and what you look for in each view.
    b. *Optional*: Another site that has the basic views with short video clips, and really good Netter style anatomy right next to the echo image – by "CriticalEcho.com"
4. Basic Concepts of Ultrasound – I don't love setting these up too early, because it always feels like it gets into the weeds. But this is short and gets into how to review basic settings and use a probe. Worth it.
5. TeachingMedicine.com – One of many resources to quiz yourself.

Intermediate Lectures

6. FoCUS "How to"
7. Function Videos:
    a. LV Function
    b. RV Function
8. Case Review: Here – Focus to the Rescue
9. Then, go back to the Teaching Medicine Course and review the Module: "TTE Shock Assessment"
10. I'd recommend a TEE-heavy lecture on Hypovolemia vs. Vasoplegia.

Advanced Echo:

11. Basic Valves
12. Wall Motion Abnormalities – is your patient having an MI?
13. Other excellent cases are here – mostly TEE; my favorites:
    a. PE https://echo.anesthesia.med.utah.edu/rescue-tee-part-ii-dynamic-obstruction-pulmonary-embolism/
    b. Failure and Tamponade https://echo.anesthesia.med.utah.edu/rescue-tee-iii-tamponade-ventricular-failure/

Chest / Lung Ultrasound

14. Introduction and Pneumothorax
    a. If you prefer learning by reading, this is a great review: https://pubmed.ncbi.nlm.nih.gov/29411300/
15. Fluid – Pulmonary Edema (crucial) and Pleural Effusions.

Section 4: Neuro & CNS

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1. **Brain Death**; end-of life and futility; Consent, living will, DPOA, surrogate
    a. Determination of Brain Death, NEJM 2022, a fantastic clinical guide with a video: https://pubmed.ncbi.nlm.nih.gov/32761206/
    b. Cerebral Recovery Index after Cardiac Arrest – predicting neuro outcome, CCM 2017: https://pubmed.ncbi.nlm.nih.gov/28430695/
    c. Neuro Outcome Prediction Models after cardiac arrest – scores/actual outcomes are reviewed, Crit Care 2022: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9741710/
    d. Neurologic prognostication after arrest, Curr Opin CC, 2015: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4955580/
    e. Prognostication after cardiac arrest, Crit Care 2018: https://ccforum.biomedcentral.com/articles/10.1186/s13054-018-2060-7
    f. Guidelines for Neuroprog after cardiac arrest, Neurocrit Care 2023: https://pubmed.ncbi.nlm.nih.gov/36949360/

2. **Stroke –**hemorrhagic & ischemic, hypertensive; hemorrhagic conversion
    a. Prevention of perioperative stroke / anesthetic management with recent stroke, Circulation 2021: https://pubmed.ncbi.nlm.nih.gov/33827230/
        i. Follow-up, maybe this AHA guidance is too restrictive, and 90-days is enough, JAMA Surgery, 2023: https://pubmed.ncbi.nlm.nih.gov/35767247/
    b. Stroke: Intensive versus Conventional MAP targets after thrombectomy after acute stroke, JAMA 2024: https://pubmed.ncbi.nlm.nih.gov/38386320/
3. **Anoxic Brain Injury**
    a. Acute Ischemic Stroke, NEJM 2020: https://www.nejm.org/doi/full/10.1056/NEJMcp1917030
    b. Neuro Clinics Review, 2017: https://www.neurologic.theclinics.com/article/S0733-8619(17)30062-2/pdf
    c. Prognostication in Anoxic Brain Injury, 2018 Palliative journal: https://pubmed.ncbi.nlm.nih.gov/29614864/
    d. Brain Injury After Cardiac Arrest, Prognostication to Rehab Review, Lancet 2020: https://pubmed.ncbi.nlm.nih.gov/32562686/
    e. Acute respiratory failure in severe acute brain injury, Crit Care Clin 2024: https://pubmed.ncbi.nlm.nih.gov/38432701/
    f. Cooling after Arrest
        i. Review: Temperature Control after Cardiac Arrest, Resuscitation 2023: https://pubmed.ncbi.nlm.nih.gov/37355091/
        ii. Review: Temperature Management after Cardiac Arrest, Crit Care 2022: https://pubmed.ncbi.nlm.nih.gov/36434649/
        iii. Review: TTM, EM Clinics 2019: https://pubmed.ncbi.nlm.nih.gov/31262410/
        iv. TTM in post-resuscitation care after incorporating results of TTM-2, JAHA, 2022: https://pubmed.ncbi.nlm.nih.gov/36285786/
        v. TTM-1 Trial, 33 vs 36, Cooling after OOH Arrest, NEJM 2013: https://pubmed.ncbi.nlm.nih.gov/24237006/
        vi. Hyperion Trial, 33 vs 37 Cooling after arrest that is NON-shockable, NEJM 2019: https://pubmed.ncbi.nlm.nih.gov/31577396/

1. Anthartic Trial, if you cool, give ABX for VAP: NEJM 2019: https://pubmed.ncbi.nlm.nih.gov/31693806/

vii. 33 vs. 37 for OHCA, TTM-2 Trial, NEJM 2021: https://pubmed.ncbi.nlm.nih.gov/34133859/

viii. Cooling in cardiogenic shock on VA ECMO, JAMA 2022: https://pubmed.ncbi.nlm.nih.gov/35103766/

ix. HACA Trial: 32-34 vs. Normothermia after IHCA, Circ 2022: https://pubmed.ncbi.nlm.nih.gov/36168956/

4. SAH, subdural, epidural hematoma

a. SAH, NEJM 2017 Review: https://www.nejm.org/doi/10.1056/NEJMcp1605827

i. BP management after brain bleed, aggressive lowering doesn't help, NEJM 2016 https://www.nejm.org/doi/10.1056/NEJMoa1603460

5. Vascular malformations (AVMs, Aneurisms)

a. Cerebral Aneurisms, NEJM 2006, old but stable and good https://www.nejm.org/doi/full/10.1056/nejmra052760

b. AVMs in the Brain, NEJM 2017 https://www.nejm.org/doi/full/10.1056/NEJMra1607407

6. **TBI –** closed and open, SAH, Subdural/Epidural Hematoma.

a. Guidelines for Management of TBI, NSX 2017 Update https://pubmed.ncbi.nlm.nih.gov/27654000/

i. TBI - Craniectomy Guidelines, Neurosurgery 2020: https://pubmed.ncbi.nlm.nih.gov/32761068/

b. TBI Having other emergency trauma surgery, J Clin Med 2022: https://pubmed.ncbi.nlm.nih.gov/35011760/

c. "Neuro-Storm," Paroxysmal sympathetic hyperactivity: the storm after acute brain injury: Lancet Neurology, 2017: https://pubmed.ncbi.nlm.nih.gov/28816118/

7. Other "Neuro" Trauma – Blunt Cerebrovascular Injury & CSF Leak

a. Blunt cerebrovascular Injuries – Outcomes (stroke risk), original work, Ann Surg 2002: https://pubmed.ncbi.nlm.nih.gov/11981216/

b. Blunt carotid injuries – grading scale guides therapy – J Trauma 1999 (old, original): https://pubmed.ncbi.nlm.nih.gov/10568710/

c. Blunt Cerebrovascular Injury – Evaluation & Management. Practice guideline from the Eastern Association for the Surgery of Trauma, J Trauma ACS 2020: https://pubmed.ncbi.nlm.nih.gov/32176167/

8. Masses and intracranial compliance

a. Cerebral Blood Flow

i. Anesthesia for Neurosurgical Emergencies, Anesth Clinics 2020 https://pubmed.ncbi.nlm.nih.gov/32008658/

ii. Traumatic Intracranial HTN, Review, NEJM 2014: https://pubmed.ncbi.nlm.nih.gov/24869722/

iii. Decompressive Crani for Traumatic ICH, NEJM 2016: https://pubmed.ncbi.nlm.nih.gov/27602507/

iv. Cooling for Traumatic ICH, NEJM 2016
https://www.nejm.org/doi/full/10.1056/NEJMoa1507581

9. **ICP therapies** Neuroprotectants, Steroids
10. Vasoactive drugs and CBF

11. **Infection:** abscess, encephalitis, meningitis/ventriculitis
    a. Meningitis, Royal College of Physicians Management Update, 2022:
    https://www.rcpjournals.org/content/clinmedicine/22/5/396
    b. CNS Infections in the Immune Compromised, Curr Op 2017:
    https://pubmed.ncbi.nlm.nih.gov/28169858/
    c. Nosocomial Bacterial Meningitis, NEJM 2010:
    https://www.nejm.org/doi/full/10.1056/nejmra0804573
    d. Community Acquired Bacterial Meningitis in Adults, NEJM 2006, not much has changed:
    https://pubmed.ncbi.nlm.nih.gov/16394301/
    e. Infectious Meningitis & Encephalitis, Neurol Clin 2022:
    https://pubmed.ncbi.nlm.nih.gov/34798976/

12. Endocrine Disease & AMS, 2014: https://pubmed.ncbi.nlm.nih.gov/24766938/

13. Seizures, Status Epilepticus including AEMs
    a. Seizure Management, 2021 Tx Options review:
    https://link.springer.com/article/10.1007/s11940-021-00692-2

14. Spinal Cord Injury
    a. Acute Spinal Cord Compression, NEJM 2017:
    https://www.nejm.org/doi/full/10.1056/NEJMra1516539

15. AMS, Encephalopathy, coma, delirium, hallucinations, hypoxic/metabolic encephalopy, CAM-ICU and RASS scoring systems; Pain/sedation, analgesia, regional, sedatives/hypnotics, Antipsychotics; daily holiday; delirium assessments with CAM/RASS *[from BUNDLES section of CCM Outline]*
    a. **Sedation**
        i. Review: Sedation & Delirium in the ICU, NEJM 2014:
        https://pubmed.ncbi.nlm.nih.gov/24476433/
        ii. Early sedation with Dexmed in the ICU, NEJM 2019:
        https://pubmed.ncbi.nlm.nih.gov/31112380/
            1. Editorial: What is safe sedation in the ICU, NEJM 2019:
            https://pubmed.ncbi.nlm.nih.gov/31242368/
        iii. Nonsedation versus light sedation in critically ill, ventilated patients, NEJM 2020:
        https://pubmed.ncbi.nlm.nih.gov/32579832/
            1. With Editorial, “Calming down about sedation,” NEJM 2020:
            https://pubmed.ncbi.nlm.nih.gov/32068367/
            2. And prior work, No sedation, Lancet 2010:
            https://pubmed.ncbi.nlm.nih.gov/20116842/
        iv. Dexmedetomidine versus Midazolam, JAMA 2009:
        https://pubmed.ncbi.nlm.nih.gov/19188334/

1. MENDS Trial, Dexmed versus Ativan, JAMA 2007: https://pubmed.ncbi.nlm.nih.gov/18073360/

b. Delirium:

i. Haldol for delirium in the ICU, NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36286254/
ii. Antipsychotics for Delirium – A systematic review and meta analysis, CCM 2024: https://pubmed.ncbi.nlm.nih.gov/38488422/

c. Scores / Assessment and Nursing Tools, Mobility and the like:

i. ABCDEF SCCM ICU Liberation Bundle, a review of the evidence: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5351776/
    1. This tackles SAT, SBT, RASS goals, PT/OT, Family engagement (etc).
ii. RASS: Validation / Reliability, JAMA 2003: https://pubmed.ncbi.nlm.nih.gov/12799407/
iii. CPOT, validation, Am J Crit Care 2006: https://pubmed.ncbi.nlm.nih.gov/16823021/
iv. CPOT versus Behav Pain Scale: J Crit Care 2015: https://pubmed.ncbi.nlm.nih.gov/25446372/
v. Early Mobility, Lancet 2009: https://pubmed.ncbi.nlm.nih.gov/19446324/
vi. Early mobility (exercise while intubated), potential for harm, NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36286256/
vii. The ABC Trial: Paired sedation and ventilator weaning trial, Lancet 2008: https://pubmed.ncbi.nlm.nih.gov/18191684/
(This followed Ely NEJM 1996 SBT, and Kress NEJM 2000 SAT trials).

16. Alcohol Withdrawal

a. Alcohol Withdrawal: Phenobarb or CIWA? 2018 Review: https://pubmed.ncbi.nlm.nih.gov/30385536/

17. Degenerative disease (alzheimer's, Parkinson's)
18. NM Disorders
19. GBS, Myasthenia gravis, myopathy
    a. Guillain Barre Syndrome, Dx and Management, Nat Rev Neuro 2019: https://pubmed.ncbi.nlm.nih.gov/31541214/
    b. Guillain-Barre Syndrome review, Lancet 2021: https://pubmed.ncbi.nlm.nih.gov/33647239/
    c. Myasthenia Gravis, NEJM 2016: https://www.nejm.org/doi/full/10.1056/NEJMra1602678

20. Demyelinating disease; polyneuropathy / myopathy in the ICU – *see endocrine for steroid-weakness*
21. Pituitary – acromegaly / sheehan's/pituitary infarct - *see endocrine section*

22. Depression, anx, PTSD
23. Diagnostics:
    a. Brain stem exam: Rule of 4, Gates 2005 (Fellow-recommended, ESSENTIAL pre-Neuro ICU Reading): https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1445-5994.2004.00732.x

    b. Angiography, Other imaging (CT, CTA, MRI, MRA); CBF / nuc med studies; Transcranial doppler
    c. EEG, Evoked potential, Nerve conduction, EMG
        i. Chapter: Lee & Menon, Neuromonitoring in Anaesthesia and Intensive Care Medicine, 2005 (it's fantastic), Chapter 6, p158+

ii. EVD Cheat Sheet (ICU One Pager) https://static1.squarespace.com/static/5e6d5df1ff954d5b7b139463/t/600f1147f6c92c18b41ae252/1611600200433/ICU_one_pager_EVD_V11.pdf
iii. EVD Monitoring review, Hirzallah 2016 https://www.e-jnc.org/upload/pdf/jnc-160093.pdf
iv. EEG Primer for Acute Care Physicians (Prior Fellow recommended) https://journals.sagepub.com/doi/pdf/10.1177/1751143720949454

d. Jugular venous saturation and Microdialysis
   i. Microdialysis in NICU Review, 2018: https://pubmed.ncbi.nlm.nih.gov/30353361/

24. Management:
   a. IR – coils, clips, vasospasm tx | surgical interventions
   b. PLEX and plasmapheresis
   c. Antidepressants: TCAs, SSRIs, Li, other, Antipsychotics
   d. NM blockers

ICU Ethics

25. Organ donation
26. Palliative care, hospice and autonomy
27. Impaired provider

Bundles / Special Topics

28. Poisons, toxic ingestions, overdoses

   a. Toxidrome Recognition in Chemical Attacks, NEJM 2018: https://www.nejm.org/doi/full/10.1056/NEJMra1705224
   b. Snake Envenomation, NEJM 2022: https://www.nejm.org/doi/full/10.1056/NEJMra2105228

29. **Thermoregulation:** heat stroke, fever, Malig Hyperthermia, NMS, Serotonin syndrome
   a. Serotonin Syndrome, an oldie but goodie, NEJM 2005: https://www.nejm.org/doi/full/10.1056/nejmra041867
   b. Neuroleptic Malignant Syndrome, StatPearls - https://www.ncbi.nlm.nih.gov/books/NBK482282/
   c. Neuroleptic Malignant Syndrome, NEJM Case Series: https://www.jwatch.org/na52186/2020/08/24/treating-neuroleptic-malignant-syndrome-case-series
   d. NMS, a more detailed review, 2015: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4812801/

Additional Worthwhile Readings:

a. CEA, BJA 2007 (around when the surgeons quit staying up to date): https://academic.oup.com/bja/article/99/1/119/269458

Post-Intensive Care Syndrome

b. **PICS – Outcomes after Critical Illness,** NEJM 2023: https://pubmed.ncbi.nlm.nih.gov/36884324/
c. Post-Intensive Care Syndrome – Recent Insights, ICM 2021: https://pubmed.ncbi.nlm.nih.gov/33731201/

d. Iwashyna TJ, Ely EW, Smith DM, Langa KM. Long-term cognitive impairment and functional disability among survivors of severe sepsis. *JAMA.* 2010;304(16):1787-1794.
e. ICU Acquired Weakness and ICU Recovery, NEJM 2014: https://pubmed.ncbi.nlm.nih.gov/24758618/
f. ICU Acq Weakness, Editorial, Anesthesia 2016: https://pubmed.ncbi.nlm.nih.gov/26448468/
g. ICU Acq Weakness in the SICU, Anesthesia 2016: https://pubmed.ncbi.nlm.nih.gov/26445385/
h. PICS: Physical impairments and function, Crit Care Clin 2025: https://pubmed.ncbi.nlm.nih.gov/39547718/
i. Long-term cognitive impairment after critical illness (Brain-ICU Study). NEJM 2013: https://pubmed.ncbi.nlm.nih.gov/24088092/
j. Brain ICU Follow-up: Depression, PTSD & Functional Disability in survivors of critical illness in the Brain-ICU Study. Lancet Respir Med, 2014: https://pubmed.ncbi.nlm.nih.gov/24815803/
k. VISIONS Trial imaging follow-up from delirium, and cognitive outcomes, CCM, 2012: https://pubmed.ncbi.nlm.nih.gov/22710202/
l. PTSD – the landmark meta-analysis addressing frequency: Crit Care Med. 2015: https://pubmed.ncbi.nlm.nih.gov/25654178/
m. Long-term cognitive function among critical illness survivors, Crit Care Clin 2025: https://pubmed.ncbi.nlm.nih.gov/39547726/

Section 5: Renal, Fluids & Electrolytes

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1. **Diagnoses**
    a. Infection, Trauma, Transplant and rejection
    b. Failure – pre/post/intrinsic
    c. Contrast nephropathy, HRS,
    d. Blood gases, lytes, osmolarity, spec grav of serum & urine
    e. Angiography, CT/MRI, AXR, Renal US, Renal Bx

2. **AKI and Renal Failure**
    a. Contrast-induced AKI (a large review): BMC Nephrology, 2024: https://pubmed.ncbi.nlm.nih.gov/38649939/
    b. Avoiding contrast to prevent AKI, NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/36351273/
    c. Renal Medicine in the ICU: A narrative Review, Anaesthesia 2023: https://pubmed.ncbi.nlm.nih.gov/36632667/
    d. See MAP goals section in "***Cardiovascular***"

3. **Fluids & Lytes**
    a. Balanced vs. NS in ICU, NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/29485925/
    b. Balanced vs. NS in non-ICU, NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/29485926/
    c. Plasmalyte vs. NS in ICU, NEJM 2022: https://pubmed.ncbi.nlm.nih.gov/35041780/
    d. SAFE Study, Albumin/Saline, NEJM 2004: https://pubmed.ncbi.nlm.nih.gov/15163774/
    e. CRISTAL Trial, crystal/colloid in ICU with hypoV shock, JAMA 2013: https://pubmed.ncbi.nlm.nih.gov/24108515/
    f. Crystalloids vs. Colloids in ICU Surgical Pt; Anesthesiology 2018: https://pubmed.ncbi.nlm.nih.gov/30212412/
    g. Crystalloids versus Colloids and Perioperative Hemodynamics, Anesthesiology 2022: https://pubmed.ncbi.nlm.nih.gov/34724045/
    h. The Glycocalyx, a review, Crit Care Clinics 2020: https://pubmed.ncbi.nlm.nih.gov/32172810/
    i. Glycocalyx degradation in the ICU – Front Med (Lausanne), 2022 – small journal but reasonable narrative update about clinical considerations as they stand: https://pubmed.ncbi.nlm.nih.gov/35872762/
    j. Albumin preserves glycocalyx integrity? Ann Int Care 2020: https://pubmed.ncbi.nlm.nih.gov/32572647/

4. **Electrolytes**
    a. Hyponatremia: European Clinical Practice Guideline for Dx & Tx: https://pubmed.ncbi.nlm.nih.gov/24569125/
    b. Disorders of Sodium, NEJM 2015: https://www.nejm.org/doi/pdf/10.1056/NEJMra1404489
    c. Hyponatremia, JAMA 2022: https://pubmed.ncbi.nlm.nih.gov/35852524/
        i. Hyponatremia, NEJM 2000 – old but fantastic for "sodium math" (and has a Hypernatremia NEJM 2000 by the same author in the same issue): https://pubmed.ncbi.nlm.nih.gov/10824078/
    d. Hypernatremia, JAMA 2022: https://pubmed.ncbi.nlm.nih.gov/35191944/

e. Calcium: iCa in the ICU – should we bother? https://pubmed.ncbi.nlm.nih.gov/26836894/

5. **Buffers, Diuretics, N-acetylcysteine**
   a. Bicarb and RRT for Metab Acidosis, Crit Care Review 2021: https://ccforum.biomedcentral.com/articles/10.1186/s13054-021-03677-4
   b. BICAR-ICU, Lancet 2018: https://www.thelancet.com/article/S0140-6736(18)31080-8/fulltext

6. **RTA, Rhabdo**
   a. RTA is highly prevalent in the ICU: Crit Care 2015: https://ccforum.biomedcentral.com/articles/10.1186/s13054-015-0890-0
   b. Rhabdomyolysis and AKI, NEJM 2009: https://www.nejm.org/doi/full/10.1056/nejmra0801327
   c. Rhabdo review Dx/Tx, Ochsner 2015: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4365849/

7. **Infections & ABx**
   a. Urosepsis, stat-pearls: https://www.ncbi.nlm.nih.gov/books/NBK482344/

8. **RRT: CVVH including ultrafiltration, IHD, PD**
   a. CVVH Who/WWWW, Chest 2019 review: https://pubmed.ncbi.nlm.nih.gov/30266628/
   b. Early vs. Late, NEJM 2010: https://www.nejm.org/doi/full/10.1056/nejmoa1000552
   c. Delayed vs. Early, Lancet 2020: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30531-6/fulltext
   d. Early Late Meta-analysis, Swiss 2017: https://pubmed.ncbi.nlm.nih.gov/29039628/
   e. Early vs Late RRT for AKI – Cochrane Review, 2022: https://pubmed.ncbi.nlm.nih.gov/36416787/
   f. Hemodialysis Emergencies, Am J Kid Dis 2021 – a fantastic educationally focused review that cites other work for each emergency extremely well: https://pubmed.ncbi.nlm.nih.gov/33771393/

9. Osmolarity and spec grav (serum, urine)

Section 6: Endocrine, GI including Liver, Nutrition

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1. **Adrenal –** insufficiency, cushing's, pheochroma, Carcinoid/other
   In Sepsis
   a. HC +/- FC, JAMA Internal Med 2023: https://pubmed.ncbi.nlm.nih.gov/36972033/
   b. HC+FC Updated Systematic Review with Bayesian Meta-analysis, CCM 2024: https://pubmed.ncbi.nlm.nih.gov/38156911/
   c. The ADRENAL Trial, Adjunctive GC in Septic Shock, NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/29347874/
   d. The APROCCHSS Trial (Annane #2): HC+FC in Septic Shock, NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/29490185/
   e. Editorial on the NEJM 2018 trials: https://www.nejm.org/doi/full/10.1056/NEJMe1801463
   f. Adjunctive Steroids in Septic Shock, a Review, Anesthesiology 2019: https://pubmed.ncbi.nlm.nih.gov/30694852/
   g. Steroids and ICU acquired weakness, systematic review, Crit Care 2018: https://pubmed.ncbi.nlm.nih.gov/30075789/
   h. Mineralcorticoid dysfunction in ICU: Anesthesiology 2020 review: https://pubmed.ncbi.nlm.nih.gov/32501957/
   i. The Hypress Trial (HC with severe sepsis), JAMA 2016: https://pubmed.ncbi.nlm.nih.gov/27695824/
   j. The Corticus Trial (HC in septic shock), NEJM 2008: https://pubmed.ncbi.nlm.nih.gov/18184957/ [Even this is dated; this followed the Annane Trial which is from 2002 which is not included here]

   Other
   k. Management of Endocrine Emergencies in the ICU, J Pharm Pract, 2019: https://pubmed.ncbi.nlm.nih.gov/30852927/
   l. Endocrine Interventions in the ICU, a great review, Handb Clin Neurol, 2021: https://pubmed.ncbi.nlm.nih.gov/34266609/
   m. Perioperative Management of Pheo, JCTVA 2017: https://pubmed.ncbi.nlm.nih.gov/28392094/
   n. Sepsis as a Pan-Endocrine Illness: J Clin Med 2021: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8152097/
   o. Etomidate – Not Safe the Sicker you are: JICM 2021: https://pubmed.ncbi.nlm.nih.gov/32912050/
   p. Etomidate Versus Ketamine, a Bayesian Analysis, Crit Care 2024: https://pubmed.ncbi.nlm.nih.gov/38368326/
   q. Endocrine Disease & AMS, 2014: https://pubmed.ncbi.nlm.nih.gov/24766938/

2. **Pituitary-** salt wasting, DI (central, nephron), SIADH, Panhypopit of various etiologies.
   a. Dx/Tx of Hypopituitarism, Endo Metab 2015: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4722397/
   b. Management of DI after NSx, 2021: https://pubmed.ncbi.nlm.nih.gov/34522399/

3. **Thyroid –** critical euthyroid, hyperT/storm, hypoT/myxedema
    a. Non-thyroidal illness syndrome (stress euthyroid), J Endo Invest 2021: https://pubmed.ncbi.nlm.nih.gov/33320308/

    b. General Glucose Guidelines:
        i. CCM Updated Guidelines on Glycemic Control in the ICU, CCM 2024: https://pubmed.ncbi.nlm.nih.gov/38240484/
        ii. Tight Control, The Original VDB Trial, NEJM 2001: https://www.nejm.org/doi/full/10.1056/nejmoa011300
        iii. Discussion of why high glucose hurts you: https://pubmed.ncbi.nlm.nih.gov/27161085/
        iv. NICE-Sugar (intermediate glucose is best), NEJM 2009: https://pubmed.ncbi.nlm.nih.gov/19318384/
        v. Individualizing Glucose control - DM vs. Non-DM & Many Glucose Metrics: JDST 2018 https://pubmed.ncbi.nlm.nih.gov/28875724/
        vi. An editorial on individualized glucose control and how challenging it is to achieve: ICM 2021: https://pubmed.ncbi.nlm.nih.gov/34533593/ and a narrative review in Crit Care 2017: https://pubmed.ncbi.nlm.nih.gov/28756769/
        vii. Hypoglycemia and the Risk of Death, NEJM 2012: https://pubmed.ncbi.nlm.nih.gov/22992074/
        viii. Perioperative glycemic control, an update, Anesthesiology 2017: https://pubmed.ncbi.nlm.nih.gov/28121636/
        ix. The Perils of Perioperative Dysglycemia, International Anesth Clinics, 2020: https://pubmed.ncbi.nlm.nih.gov/31800411/
    c. Diabetic Ketoacidosis
        i. Evaluation & Management of the Critically Ill Adult with DKA, J Emerg Med, 2020: https://pubmed.ncbi.nlm.nih.gov/32763063/
        ii. Management of DKA in the ICU- a survey (ESICM-endorsed), Crit Care, 2024: https://pubmed.ncbi.nlm.nih.gov/39695701/
        iii. Treatment challenges and controversies, Cureus 2024: https://pubmed.ncbi.nlm.nih.gov/39360087/
        iv. Balanced versus Saline for Fluids: JAMA Netw Open 2020, https://pubmed.ncbi.nlm.nih.gov/33196806/ with f/u meta-analysis, Heart Lung 2022: https://pubmed.ncbi.nlm.nih.gov/35358905/

4. Diagnostics: CT, labs (serum, urine), US
5. Management: Anti-HTN, Hormone replacement, glucose management (oral antihyperglycemics, insulin), steroids (GC and MC), Vasodilators, Vasopressin & DDAVP

Rheumatologic

1. Lupus – SLE in the ICU, narrative review. Lupus, 2020: https://pubmed.ncbi.nlm.nih.gov/32723062/

Gastrointestinal

6. Abd compartment Syndrome, intraabdominal hypertension & Management
    a. Intraabdominal HTN and abdominal compartment syndrome, an update. Current Opinion Critical Care, 2022: https://pubmed.ncbi.nlm.nih.gov/33480617/

   b. Consensus Def & Guidelines, ICM 2013: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3680657/
   c. ACS, Stat Pearls: https://www.statpearls.com/ArticleLibrary/viewarticle/19771

7. **Bowel:** Including surg intervention timing and tx options
   a. Infections
   b. Perforation and volvulus
   c. Pseudomembranous colitis
   d. Bowel ischemia
      i. Mesenteric Ischemia, Crit Care Clin 2016: https://pubmed.ncbi.nlm.nih.gov/27016159/
      ii. Acute Mesenteric Ischemia, NEJM 2016: https://pubmed.ncbi.nlm.nih.gov/26962730/

8. **Gallbladder**
   a. Interventional approaches to gallbladder dz, NEJM 2015: https://www.nejm.org/doi/full/10.1056/NEJMra1411372

9. **Stomach: UGIB, LGIB, gastritis, ulcer**
   a. Acute LGIB, NEJM 2017: https://www.nejm.org/doi/full/10.1056/NEJMcp1603455
   b. Transfuse (less) in UGIB, NEJM 2013: https://www.nejm.org/doi/full/10.1056/nejmoa1211801
      i. The Villanueva trial has a worthwhile WikiJournalClub to consider: https://www.wikijournalclub.org/wiki/Transfusion_Strategies_for_Acute_Upper_Gastrointestinal_Bleeding
   c. Endoscopy <6h vs. 6-24h no different in UGIB, NEJM 2020: https://www.nejm.org/doi/full/10.1056/NEJMoa1912484
   d. GI Prophylaxis: *see bottom of this section.*

10. **Dysmotility, GERD, diarrhea, n/v, ileus, toxic megacolon, malabsorption**
   a. CPG for Ogilvie's & Volvulus: https://pubmed.ncbi.nlm.nih.gov/27270510/

11. **Pancreas, pancreatitits, cancer**
   a. Acute Pancreatitis, NEJM 2016: https://www.nejm.org/doi/full/10.1056/Nejmra1505202
   b. Severe pancreatitis for the surgeon, JTACS 2016: https://pubmed.ncbi.nlm.nih.gov/26953759/

12. **Hepatic –** dysfunction, failure (acute/chronic), HE, HRS, HCC, HPS, Hepatitis, Liver Tx rejection and complications; Lactulose and rifaximin
   a. SCCM Guideline 2020 Liver Failure ICU https://pubmed.ncbi.nlm.nih.gov/32058375/
   b. Anesthesia with severe liver failure, Anesth Clin 2020: https://pubmed.ncbi.nlm.nih.gov/32008656/
   c. Anesthesia for Liver Transplant, Anesth Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28784222/
   d. Neuro complications after Liver Transplant, WJ Hepat 2013: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3767839/
   e. Infectious/Malignancy after Liver Transplant, Anesth Clin 2017: https://pubmed.ncbi.nlm.nih.gov/28784215/
   f. Coagulopathy of Chronic Liver Disease, NEJM 2011: https://www.nejm.org/doi/full/10.1056/nejmra1011170
   g. Coagulation Profile of ESLD and OR Management, Anesth Analg 2018: https://pubmed.ncbi.nlm.nih.gov/28795966/

h. Acute on Chronic Liver Failure, NEJM 2020: https://pubmed.ncbi.nlm.nih.gov/32459924/
i. Hepatic Encephalopathy Review, Hepat Int 2018: https://pubmed.ncbi.nlm.nih.gov/28770516/
j. Cirrhosis:
    i. Treatment of patients with cirrhosis, NEJM 2016 Review: https://pubmed.ncbi.nlm.nih.gov/27557303/
    ii. Management of Decompensated Cirrhosis & associated syndromes, Surg Clin 2022 review: https://pubmed.ncbi.nlm.nih.gov/34800381/
    iii. Hepatorenal Syndrome: PathoPhys, Diagnosis & Management, an excellent BMJ review, 2020: https://pubmed.ncbi.nlm.nih.gov/32928750/
    iv. Which vasoactive to pick for HRS? CCM 2022: https://pubmed.ncbi.nlm.nih.gov/35777925/
    v. Hepatopulmonary Syndrome:
        1. An Update: World J Hepat, 2021: https://pubmed.ncbi.nlm.nih.gov/34904039/
        2. The use of ECMO in HPS to facilitate transplant, 2022 Transpl Review: https://pubmed.ncbi.nlm.nih.gov/35413506/
k. NON-HEPATIC Hyperammonemia: Diagnosis & Management, J Crit Care 2022
    i. https://pubmed.ncbi.nlm.nih.gov/35447602/

13. GI Prophylaxis

a. GI Prophy in ICU, NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/30354950/
b. PPI Worth the Risk? NEJM Editorial 2018: https://pubmed.ncbi.nlm.nih.gov/30354949/
c. GI Bleeding Prophylaxis in the Critically Ill, BMJ 2020, a fantastic review: https://pubmed.ncbi.nlm.nih.gov/31907223/ with a rapid "Infographic" - https://www.bmj.com/content/368/bmj.l6722

14. Diagnostics
    a. Assessment of motility
    b. Immune studies, coagulation studies, nutrition assessment (pre-albumin and albumin), stool assessment (FOBT, C Diff), Serologies of HIV and Hepatitis, amylase, lipase, other.
    c. Imaging: CT, MRI, AXR, nuc med studies, US
    d. IR interventions. Liver Bx, ERCP. Paracentesis.
15. Management
    a. IgG / immunotherapy, IR embolization and coiling
    b. GI Blood flow modulators
    c. Hepatitis vaccination

Nutrition

16. **EN, PN,** formula and caloric intake
    a. SCCM & ASPEN Guidelines: ICU PN & EN: https://pubmed.ncbi.nlm.nih.gov/26773077/
    b. Practical guidance for ICU phases, Crit Care 2019: https://pubmed.ncbi.nlm.nih.gov/31752979/
    c. EN vs. PN in ICU MetaAnalysis, Crit Care 2016: https://pubmed.ncbi.nlm.nih.gov/27129307/
    d. Trophic or Full EN in ICU: CoCC 2018: https://pubmed.ncbi.nlm.nih.gov/29877878/
    e. Changing paradigms in metabolic/nutrition support: CoCC 2018: https://pubmed.ncbi.nlm.nih.gov/29901462/

17. Tx/Dx: Enteral tubes, metabolic assessment (basal, stress energy requirements), indirect calorimetry and nitrogen balance, refeeding syndrome.

Section 7: Heme/Onc & Transfusion, Infectious Disease

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1. **Coagulopathies** – acquired: DIC, factor abnormalities, Vit K dependent, congenital, hypercoagulable state. Coag studies including viscoelastics, routine blood studies
    a. Bleeding & Coagulopathies in Critical Care, NEJM 2014: https://www.nejm.org/doi/full/10.1056/nejmra1208626
    b. Anticoagulation monitoring for perioperative physicians, Anesthesiology 2021: https://pubmed.ncbi.nlm.nih.gov/34499103/
    c. Viscoelastic Testing, Int Anesth Clinics, 2017: https://journals.lww.com/anesthesiaclinics/Fulltext/2017/05530/Viscoelastic_Testing_of_Coagulation.8.aspx
    d. Viscoelastic Testing in Perioperative Decision Making, Anesthesiology 2021: https://pubs.asahq.org/anesthesiology/article/135/2/342/115739/Viscoelastic-Coagulation-Testing-Use-and-Current
    e. The Cell-Based Coagulation Model in the Management of Critical Bleeding: Anaesth Intensive Care 2017: https://pubmed.ncbi.nlm.nih.gov/28267938/
    f. PCC – 3-factor versus 4-factor: Thromb Haemo, https://pubmed.ncbi.nlm.nih.gov/36626899/

2. **Fibrinolysis**
    a. TXA with CABG, NEJM 2017: https://www.nejm.org/doi/full/10.1056/nejmoa1606424
    b. Therapeutics Targeting the Fibrinolytic System, Nature sub-journal 2020: https://www.nature.com/articles/s12276-020-0397-x
    c. Fibrinolysis and the control of blood coagulation, Blood Rev, 2015: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4314363/
    d. Antifibrinolytic therapy and perioperative considerations, Anesthesiology 2018: https://pubmed.ncbi.nlm.nih.gov/29200009/

3. **Hb abnormalities**
    a. Anemia – polycythemia, carboxyHb, Methemoglobin, other – sickle, thalassemia
        i. Sickle Cell Disease, NEJM 2017: https://www.nejm.org/doi/full/10.1056/nejmra1510865
    b. HUS due to Pneumococcus, Pathogens 2021: https://pubmed.ncbi.nlm.nih.gov/34207609/

4. **Plt abnormalities:** thrombocytosis, ITP, TTP, thrombocytopenia, HIT and Plt Dysfunction
        i. TTP: Blood 2017 Review: https://pubmed.ncbi.nlm.nih.gov/28416507/
        ii. ITP, Clinical Practice Review, NEJM 2019: https://www.nejm.org/doi/10.1056/NEJMcp1810479
        iii. HIT: Anesthesiology 2022 Review: https://pubs.asahq.org/anesthesiology/article/136/2/336/118129/Heparin-induced-Thrombocytopenia-Perioperative

5. **Leukemia, Lymphoma, Tumor lysis syndrome, white blood cell disorder, BMT, Stem cell transplant**. BM Biopsy and culture. EPO, G-CSF
    a. Tumor Lysis Syndrome, NEJM 2011: https://www.nejm.org/doi/full/10.1056/nejmra0904569

b. Endothelial dysfunction – graft versus host disease (GVHD), SOS/VOD (veno-occlusive disease), transplant-associated thrombotic microangiopathy (TA-TMA), capillary leak and idiopathic pneumonia, review 2022: https://pubmed.ncbi.nlm.nih.gov/35160072/
c. CAR T-Cell therapy, review 2016: https://pubmed.ncbi.nlm.nih.gov/27626062/

6. **Anticoagulants:**
   a. Heparin, LMWH, Unfractionated
      i. American Society of Hematology 2018 Guidelines for VTE Prophylax in medical patients: https://pubmed.ncbi.nlm.nih.gov/30482763/
      ii. Prophylaxis in Liver Failure: Ann Pharmacotherapy 2016: https://pubmed.ncbi.nlm.nih.gov/26861989/
   b. Warfarin; Antiplatelet agents; Thrombin inhibitors- argatroban; Thrombolytics; Anticoagulation, antithrombotics; Antiplatelet agents; Antifibrinolytics; Factor Xa inhibitors and DOACs
      i. Anticoag reversal in GIB review 2021: https://pubmed.ncbi.nlm.nih.gov/33403486/
      ii. Periprocedural management of DOACs: Curr Op Anesth 2020: https://pubmed.ncbi.nlm.nih.gov/32371643/
      iii. CVA and VTE prevention in atrial fibrillation, Heart 2020: https://pubmed.ncbi.nlm.nih.gov/31533990/
   c. Transfusion & factor replacement
      i. PCC Reversal of Vit K and non-Vit K, Anesthesiology 2018: https://pubmed.ncbi.nlm.nih.gov/30157037/
      ii. Anticoagulant Reversal and Anesthetic Considerations: Meltzer, Anesth Clinics 2017: https://pubmed.ncbi.nlm.nih.gov/28526142/
      iii. Prothrombin concentrates for perioperative bleeding, Anesth Analg 2016: https://pubmed.ncbi.nlm.nih.gov/26983050/
   d. IVC filters and "other mechanical devices" - *See CardioVascular*
   e. PLEX, Plasmapheresis
      i. Therapeutic PLEX in ICU: Tech & Indications, 2021: https://pubmed.ncbi.nlm.nih.gov/34389138/
      ii. Plasma exchange in the intensive care unit: a narrative review, 2022: https://pubmed.ncbi.nlm.nih.gov/35960275/
      iii. PLEX for liver failure, a meta-analysis, Clin Res Hepatol Gastroenterol 2022: https://pubmed.ncbi.nlm.nih.gov/36031099/
      iv. PLEX for EtOH Liver Failure, J Clin Apher 2022: https://pubmed.ncbi.nlm.nih.gov/36065827/

Transfusion Thresholds

7. Transfusion in ARDS / Ventilated patients, ICM 2020 narrative: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7658306/
   a. Septic Shock
      i. "A concise review" of ICU Transfusion: CCM 2019: https://pubmed.ncbi.nlm.nih.gov/31449062/

ii. TRISS study, 7 vs. 9, NEJM 2014: https://www.nejm.org/doi/full/10.1056/nejmoa1406617
iii. TRICC Study, the original NEJM 1999 (9 vs. 7): https://www.nejm.org/doi/full/10.1056/nejm199902113400601

b. Perioperative
   i. Liberal works periop, not ICU, meta-analysis of RCTs, BJA 2015: https://pubmed.ncbi.nlm.nih.gov/26385661/
   ii. TRICS III Trial: Cardiac Surgery, 7.5 vs. 9.5 ICU / 8.5 Ward, NEJM 2015: https://pubmed.ncbi.nlm.nih.gov/25760354/
   iii. Same study, 6m Follow-up, No difference between thresholds, NEJM 2018: https://pubmed.ncbi.nlm.nih.gov/30146969/
c. With Myocardial Infarctions
   i. Addressing Mortality, JAMA Int Med 2013: https://pubmed.ncbi.nlm.nih.gov/23266500/
   ii. In ACS, Liberal may be better – metanalysis & systematic review: J Am Heart Assoc 2023: https://www.ahajournals.org/doi/10.1161/JAHA.122.028497
d. Blood Management in Vascular Surgery, Anesthesiol Clin 2022: https://pubmed.ncbi.nlm.nih.gov/36328618/

8. Trauma & Transfusion

a. PCC (4-factor) for trauma at risk of massive transfusion, JAMA 2023: https://pubmed.ncbi.nlm.nih.gov/36942533/
b. Transfusion Management in Trauma, Current Opin Crit Care, 2022: https://pubmed.ncbi.nlm.nih.gov/36226706/
c. Trauma-induced Hypocalcemia, Transfusion 2022: https://pubmed.ncbi.nlm.nih.gov/35748689/
d. Approaches to hemorrhage control transfusion, Curr Opin Anaesth, 2022: https://pubmed.ncbi.nlm.nih.gov/35081057/

9. **TRALI, TACO** (from Respiratory)

a. TRALI – Perioperative review, Anesthesiology 2019: https://pubmed.ncbi.nlm.nih.gov/31408449/
b. Coagulation Management / Transfusion in Post-partum hemorrhage, Curr Opin Anaesth, 2023: https://pubmed.ncbi.nlm.nih.gov/36815533/

Immune

10. Diagnoses:

a. A/I – mixed CT disease, RA, SLE, Vasculitides
b. Serologies and immune studies
c. Immune Suppression, acquired – HIV/AIDS
d. GVHD (see onc section)
e. Pharm: Abx, prophy abx, HAART, steroids
f. Other:
   i. IDSA Guidelines - Neutropenic Fever, Clin ID 2011: https://pubmed.ncbi.nlm.nih.gov/21258094/
   ii. Neutropenic Typhlitis, Spectrum & Fungal Risk, CCM 2019: https://pubmed.ncbi.nlm.nih.gov/30741755/

iii. Fungal infections in immunocompromised critically ill patients, Journal of Intensive Medicine, 2024 (not PMID indexed, but a fantastic review): https://www.sciencedirect.com/science/article/pii/S2667100X2400015X

Infectious Catch-All

11. Diagnoses:
    a. Coverage for varied organisms. Prophylaxis.
        i. Histoplasmosis and Coccioides, NEJM 2024 review: https://pubmed.ncbi.nlm.nih.gov/38324487/
        ii. **Fungal Infections in Critically Ill Immunocompromised Folks** – Includes reasons for false positive labs (e.g. galactomannan) and tables for antifungal approaches. Focus is on aspergillosis, pneumocystis, candidemia and mucormycosis. Small journal, but good educational work, Journal of Intensive Medicine, 2024: https://www.sciencedirect.com/science/article/pii/S2667100X2400015X?via%3Dihub
    b. Genetic considerations
    c. Infection Control, Isolation techniques & Environmental exposures (Needle sticks Management / Risks)
    d. Nosocomial infections: CAUTI, CLABSI and lines, PNA-VAP, HAP
        i. *See the IDSA guidelines for varied infectious emergencies*
        ii. *See line risks in Procedures*
        iii. *See PNA / HAP in Resp*
        iv. *See CAUTI in Renal*

12. Other ID:
    a. Prolonged beta-lactam infusions, Lancet ID 2018: https://pubmed.ncbi.nlm.nih.gov/29102324/
    b. Infectious complications after solid organ transplant, Crit Care Clin 2019: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7127653/
    c. Duration of Hypotension before ABx and Mortality, CCM 2006: https://pubmed.ncbi.nlm.nih.gov/16625125/

13. NON-HEPATIC Hyperammonemia: Diagnosis & Management, J Crit Care 2022
    a. https://pubmed.ncbi.nlm.nih.gov/35447602/

Section 8: Obstetrics, Dermatology, Burn & Biostatistics

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1. **Obstetrics & Pregnancy**
    a. Physiologic changes in pregnancy
        i. Physiologic & Hemodynamic changes during pregnancy, AACN Adv Crit Care, 2018: https://pubmed.ncbi.nlm.nih.gov/30185494/
        ii. Pregnant & postpartum admissions to the ICU, Intensive Care MEd, 2010: https://pubmed.ncbi.nlm.nih.gov/20631987/
    b. Pre-eclampsia, eclampsia
        i. Diagnosis, prevention and management of Eclampsia, Obstet Gynecol, 2005: https://pubmed.ncbi.nlm.nih.gov/15684172/
        ii. Management of late preterm and early-term pregnancies complicated by mild gestational HTN / pre-eclampsia, Semin Perinatol, 2011: https://pubmed.ncbi.nlm.nih.gov/21962629/
    c. Emboli – amniotic fluid, VTE
        i. https://pubmed.ncbi.nlm.nih.gov/27372270/ (AFE criteria)
        ii. https://pubmed.ncbi.nlm.nih.gov/31376394/ (AFE management)
        iii. https://pubmed.ncbi.nlm.nih.gov/11803092/ (Thrombophilia)
    d. Liver function
        i. https://pubmed.ncbi.nlm.nih.gov/31725416/ (Acute fatty liver of pregnancy)
        ii. https://pubmed.ncbi.nlm.nih.gov/15519429/ (HELLP)
    e. Coagulopathy, bleeding disorders
        i. https://pubmed.ncbi.nlm.nih.gov/30503399/ (OB hemorrhage)
        ii. https://pubmed.ncbi.nlm.nih.gov/26658204/ (Coag disorders)
    f. Peripartum infection
        i. https://pubmed.ncbi.nlm.nih.gov/26855098/ (Chorioamnionitis)
        ii. https://pubmed.ncbi.nlm.nih.gov/22914482/ (Sepsis)
    g. Peripartum cardiomyopathy
        i. https://pubmed.ncbi.nlm.nih.gov/29793631/ (CARPREG-2)
        ii. https://pubmed.ncbi.nlm.nih.gov/30565890/ (DOPA-Ag cardiomyopathy)
    h. Airway/Resp changes, pulm physiology
        i. https://rebelem.com/respiratory-failure-and-airway-management-in-the-pregnant-patient/
        ii. https://pubmed.ncbi.nlm.nih.gov/21277444/ (Respiratory mechanics)
        iii. https://pubmed.ncbi.nlm.nih.gov/11339930/ (ARDS in pregnancy)
    i. Diagnostics: Ultrasound, cardiotocography
        i. https://pubmed.ncbi.nlm.nih.gov/34011889/ (Fetal testing)
        ii. https://pubmed.ncbi.nlm.nih.gov/30159815/ (Ultrasound placental abruption)
        iii. https://pubmed.ncbi.nlm.nih.gov/31126811/ (Ultrasound placenta accreta)
    j. Management: Anticoagulation, Anticonvulsants, Anti-HTN, Abx, Delivery
        i. https://pubmed.ncbi.nlm.nih.gov/31351999/ (Levels of maternal care)
        ii. https://pubmed.ncbi.nlm.nih.gov/30575639/ (Acute hypertension)
        iii. https://pubmed.ncbi.nlm.nih.gov/21069663/ (Magnesium-seizures)
        iv. https://pubmed.ncbi.nlm.nih.gov/31108013/ (YEARS—PE)

v. https://pubmed.ncbi.nlm.nih.gov/30940371/ (Delivery in the ER)
vi. https://pubmed.ncbi.nlm.nih.gov/26598097/ (Antibiotic safety)

Dermatology

2. **Allergic reactions**
    a. Drug Hypersensitivity Reactions, Emerg Med Clin NA 2022: https://pubmed.ncbi.nlm.nih.gov/34782090/

3. **Disruptions of skin:** infections, cellulitis, necrotizing soft tissue, ulcers / decubiti
    a. Infectious Emergencies for the Dermatologist, Current Derm Rep 2021: https://pubmed.ncbi.nlm.nih.gov/34642610/
    b. Staph Scalded Skin Syndrome in Adults & Kids, 2014: https://pubmed.ncbi.nlm.nih.gov/24841497/
    c. Mucormycoses, Pharm Options Review, Ann PharmacoTx 2016 https://pubmed.ncbi.nlm.nih.gov/27307416/
    d. Mucor, advances & considerations, 2020: https://pubmed.ncbi.nlm.nih.gov/32718789/

4. **Stevens-Johnsons and other Derm Emergencies:**
    a. A fantastic resource from the Cleveland Clinic: https://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/dermatology/dermatological-emergencies/
    b. SJS & TEN, Focus on Tx Options/Support, 2017: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5487863/
    c. SJS Images in Clinical Medicine, NEJM 2005: https://www.nejm.org/doi/pdf/10.1056/nejmicm031127
    d. Pathologist "need to know" review, Path 2019: https://pubmed.ncbi.nlm.nih.gov/30785787/
    e. Derm Emergencies Review, 2020 (low-journal): https://www.sciencedirect.com/science/article/pii/S0185106315000864
    f. Abstract / Newsletter "Description from an expert" - Page 26 HERE.

5. **Dx: ESR and CRP**
    a. Markers of mortality (https://pubmed.ncbi.nlm.nih.gov/18029335/) and Brain Health / Brain dysfunction (crit care 2011: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3219330/)
    b. CRP in infections, BMJ Open 2018: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6318522/
    c. Procalcitonin as a metric of trauma, Crit Care 2019: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6892215/
    d. Procalcitonin and Infection (an introduction) PLoS One 2018: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6235293/
    e. Procalcitonin – Threshold in renal impairment (threshold 0.5 80% sensitive for bacterial infection; at threshold 3.2 ng/mL, sensitivity increases to 75%), Open Forum ID, 2014: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4281808/

6. Tx: Steroids – systemic and topical. Antihistamines, immunotherapies and topical meds.
7. Tx: Wound care

Burns

8. Complications, electrical, inhalational
9. Management including airway, abx, fluids/resuscitation, hyperbaric tx, "other"
    a. Update on Severe Burn Management, JICM 2016: https://pubmed.ncbi.nlm.nih.gov/26112758/
    b. Burn Injuries, Nature Rev Dis 2020: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7224101/
    c. Burn Resuscitation, Crit Care Clin 2016: https://pubmed.ncbi.nlm.nih.gov/27600122/ and https://www.criticalcare.theclinics.com/article/S0749-0704(16)30068-9/fulltext; with end-points of resuscitation discussed here: https://www.criticalcare.theclinics.com/article/S0749-0704(16)30064-1/fulltext and colloids, here: https://www.criticalcare.theclinics.com/article/S0749-0704(16)30050-1/fulltext
        i. Vitamin C in burn, here: https://www.criticalcare.theclinics.com/article/S0749-0704(16)30051-3/fulltext
    d. Protocolized Resuscitation, Crit Care Clin 2016: https://www.criticalcare.theclinics.com/article/S0749-0704(16)30060-4/fulltext
        i. And Am Surg 2022: https://pubmed.ncbi.nlm.nih.gov/34761698/
    e. Topical Antimicrobial Agents in Burn, Hx and Review, 2021: https://pubmed.ncbi.nlm.nih.gov/33124942/
    f. Review of Sepsis in Burn, 2021: https://pubmed.ncbi.nlm.nih.gov/33095105/

Biostatistics: ***Please see separate Teams file: Hess Math & Statistics, by Dr. Aaron Hess.***

g. NNT, OR, and RR
h. ROC
i. Regression analysis, sample size estimates
j. Sens/Spec, PPV/NPV, Confidence intervals
k. P-values and significance
l. Tests: Non-parametric: Wilcoxon, mann whitney u-test, chi squared, Kaplan meier; parametric: t-test, ANOVA
m. Type 1 and type 2 errors.

Other Stats Issues (not on content outline):

n. ARDS Study Design: Focus on Enrichment Strategies: ICM 2020: https://link.springer.com/article/10.1007/s00134-020-06232-x
o. The Platform Trial: How to use and interpret results: JAMA 2022: https://pubmed.ncbi.nlm.nih.gov/34982138/ based on the 2015 Platform Trial Design Overview, JAMA 2015: https://jamanetwork.com/journals/jama/fullarticle/2210902
p. Assessing Ventilation: Risks/Benefits of Large databases: ICM 2020 https://pubmed.ncbi.nlm.nih.gov/32845351/
q. Bias in Before & After Studies: https://journals.lww.com/anesthesia-analgesia/Fulltext/2018/05000/Bias_in_Before_After_Studies__Narrative_Overview.49.aspx
r. Observational Studies, Cohort & Case Control: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2998589/
s. Scientists rise up against statistical significance! Nature, 2019: https://www.nature.com/articles/d41586-019-00857-9
t. Lessons learned from negative trials & how to improve research in the ICU, Anesth Crit Care Pain Med, 2020: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8166406/

Organizational Issues

u. HIPAA
v. ICU transport
w. HCAPS measures
x. QA/QI / Safety, regulatory requirements
y. Telemedicine and triage.
z. APACHE and SOFA
    i. SOFA – a recent review including evolution and challenges, Critical Care 2019: https://pubmed.ncbi.nlm.nih.gov/31775846/
    ii. Serial Delta-SOFA to predict outcomes, JAMA 2001: https://pubmed.ncbi.nlm.nih.gov/11594901/
    iii. SOFA Score: Time for an Update? Crit Care 2023: https://pubmed.ncbi.nlm.nih.gov/36639780/