

Emergency Medicine/ Acute Care Medical Literature Update
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Learning Objectives:

At the end of this activity, the attendee will be able to:

1. Discuss the pros/cons of 0/2 and 0/1 hour troponin protocols
2. Recognize the dangers associated with insulin bolus delivery in DKA
3. Understand that “back-up” strep cultures are not worthwhile
4. Determine whether topical NSAID’s or corticosteroids are worthwhile in the management of acute musculoskeletal back pain
5. Compare sensitivities of urine vs swab specimens in evaluating patients with potential STI’s.
6. Properly employ clinician gestalt, lactate levels and BC’s in patients presenting with symptoms suggestive of an underlying infection and /or sepsis
7. Understand the role of CT-Angiography of the head and neck in patients with suspicious neurologic complaints
8. Identify children with fractures that may be the victims of abuse
9. Discuss the pros/cons of providing patients with topical anesthetics at discharge for simple acute corneal abrasions
10. Recognize the potential strain on patients and the health care system will endure with increasing heat emergencies.

DAY 2....

Article #11: *Early Physician Gestalt versus Usual Screening Tools for the prediction of Sepsis in Critically Ill Emergency Patients.* Knack SKS, et al. *Ann Emerg Med* published ahead of print, March 24, 2024. doi: 10.1016/j.annemergmed.2024.02.009

Background: To identify sepsis patients, some hospitals have used published measures such as SIRS, SOFA, qSOFA and MEWS scoring systems. Others have tried AI algorithms. How do these decision aids stack up to physician gestalt?

Methods: Single center, prospective study of critically ill, undifferentiated adult medical patients brought to a “resuscitation area” of academic urban ED. Faculty physicians were asked “What is the likelihood that this patient has sepsis?” and rate the probability 0-100. Impressions were recorded at 15 (vital signs available) and 60 min after presentation. The physicians’ impressions were compared with the ICD-10 code at discharge.

Results: 2,484 patients enrolled; 275 (11%) met criteria for sepsis. At 15 minutes (when limited clinical data is available), physician gestalt significantly outperformed all tools (SIRS, SOFA, qSOFA, MEWS). Expanding to data available at 60 minutes did not meaningfully change results.

Conclusion: Get in there, do a good history and physical, and if your gut says “sepsis”, do not wait around for labs and radiology results to initiate therapy.

And do NOT hang your diagnosis on lactate levels...

Article #12: *Prevalence and clinical significance of a point of care elevated lactate at emergency admission in older patients: a prospective study.* Gosselin M, et al. *Intern Emerg Med.* 2022; 17(6): 1803–1812.

Background: With increasing emphasis on identifying patients with sepsis, lactate levels are being increasingly ordered as part of a screening laboratory panels. This study explores the prevalence and prognostic value of lactate levels in non-critically ill elderly patients presenting to a single ED in Switzerland.

Methods: Prospective study of patients 65 years of age or older presenting to a single urban academic tertiary care hospital ED. POC lactate levels collected by research RN within 2 hours of ED triage and before any treatment. Exclusion included with a life/limb threatening situation or a seizure.

Results: 602 patients included in analysis. Median age = 80.

**Using a lactate level cutoff of 2.5 mmol/L, 163 (27.1%) of patients had elevated levels.

**There was no association between lactate level and poor outcome

(none of the patients that died in the ED or within 48 hrs had elevated levels)

Discussion: This study disagrees with previous work suggesting lactate levels have prognostic value. The authors point out:

- a) Some of these previous studies were retrospective studies (ie. data “mining”)
- b) Some included trauma and critically ill patients, with over 48% of patients with elevated lactate levels
- c) Others that did document an association of poor outcome with elevated lactate levels used higher cutoffs (3.6mmol and 4.0mmoL, Seker 2020, Datta 2013)

Conclusion: Elevated lactate levels in undifferentiated elderly patients arriving in the ED is not associated with poor clinical outcome.

Article #13: Blood Culture Utilization in the Hospital Setting: A Call for Diagnostic Stewardship Fabre V, et al. J Clin Micro 2022: e01005-21

Background: Optimizing BC use is important to

- a) ensure true (actionable) bacteremia is identified (eg. sepsis, endocarditis) and
- b) reduce harms associated with false-positive results.

However, expert guidelines specifying when to draw BC are lacking.

This review discusses targets to improve BC practices and describe interventions that have successfully reduced unnecessary blood cultures and

A. Optimizing BC use:

- > 90% of BC do not grow any organisms, and 30-50% of (+) are contaminants
- All too often BC’s are ordered reflexively by clinicians for “fever”.
- However, lacking blood culture data has been shown NOT to impact common infections such as CAP, cellulitis or UTI.

The authors provide the following table to help guide BC ordering:

TABLE 1 Examples of common scenarios when initial blood cultures have high and low diagnostic utility for immunocompetent hosts^a

Diagnostic value of initial blood cultures	Exception
High diagnostic value	
Severe sepsis/septic shock	NA
Infections associated with high or intermediate risk of bacteremia	NA
Low diagnostic value	
Fever ± leukocytosis in stable patients without suspicion for endovascular infection	Patients with splenectomy
Postoperative fever within 48 h	Presence of severe sepsis/ septic shock
Infections with low risk of bacteremia (e.g., cystitis, prostatitis, cellulitis, non-severe pneumonia, prosthetic joint infection)	Endovascular infection suspected Presence of severe sepsis/ septic shock
Persistent febrile neutropenia in hemodynamically stable patients with 2 negative sets	NA

A more complicated algorithm published in 2016 (Pawlowicz) that demonstrated a 33% decrease in ED BC ordering is provided at the end of this handout.

B. Obtaining blood cultures correctly:

- a. Current guidelines recommend collection of 2 sets of BC's consisting of 10ml into each bottle.

Reasons: *if only one set obtained: 10-40% miss rate and

** bacteremia detection increases 3% for each extra ml of blood

C. When to obtain blood cultures: of course, try to obtain before antibiotics

- a. Severe sepsis/shock: 31% (+) before Abx, 19% (+) 4 hr after Abx started
b. Non-severely ill hospitalized patients: <1% had (+) BC after Abx started

D. One venipuncture or two?

- a. The authors site a prospective multicentered ED study of 2,314 adults comparing a single draw of adequate amount of blood (40ml) equally distributed in 2 aerobic and 2 anaerobic bottles vs. 2 venipunctures. Result: BC (+) rates higher in single draw without an increase in blood culture contamination (Dargere 2016). The authors do not fully endorse this approach but recommend further study.

Article #14 : Trends in non-focal neurologic chief complaints and CT angiography utilization among adults in the emergency department. Rigney GH, et al. Intern and Emerg Med published online March 21, 2024.

Background: Despite efforts to decrease unnecessary imaging in the ED, imaging utilization rates continue to rise. CT-Angiography of the head and neck appear to be a “fan favorite” of ED providers. The objective of this study is analyze ordering rates of head and neck CTA presenting to a single tertiary care ED between 2017-21.

Methods: Retrospective observational cohort study at Mass General, Boston. Reviewed all ED encounters for patients with CC: “dizziness” or “headache”.

Results: 24,892 encounters for “dizziness” or “headache” → 2,264 (9.1%) head and neck CTA

	<u>2017.</u>	<u>2018.</u>	<u>2019.</u>	<u>2020.</u>	<u>2021</u>
- # of Patients	5351.	5407.	5469.	3664.	5001
- # CTA's (%)	422 (7.89%)	425 (7.86%).	459 (8.39%).	296 (8.08%).	662 (13.24%)
- # Positive (%).	71 (16.8%).	63 (14.8%).	56 (12.2%).	28 (9.5%).	69.(10.4%)

Discussion: Take a step back... why would you do a CTA for “dizziness” or headache? What are you looking for?

- 1) Regarding undifferentiated “dizziness” – the only study evaluating CTA (n=153) revealed a sensitivity of 14.3% (95% CI 1.8-42.8) (Shah, Acad Emerg Med 2023)
- 2) As for headache, a 2018 meta-analysis (Alons, J Stroke Cerebrovas Dis) noted that with a normal neuro exam and negative noncontrast head CT, the diagnostic yield of CTA is low (approx. 1.6%)

Conclusion: A 67% increase in head and neck CTA at Mass General resulted in a decrease in positive studies.

Editor Note: (+) study included: any kind of intracerebral hemorrhage, vascular lesion (eg. AVM, dural AV fistula, any intracranial aneurysm) and anything considered moderate or greater for stenosis. But... many of these likely were not responsible for the patient's "dizziness" or "headache" presentation and were "incidental findings". Thus, the positivity rate likely greater overestimates the true "clinical" positivity rate.

Article #15a: *Brain cancer after radiation exposure from CT examinations of children and young adults: results from the EPI-CT cohort study.* Hauptmann M, et al. *Lancet Oncol* 2023; 24: 45-53.

Background: Several small epidemiological studies showed increased brain tumor risk after pediatric CT exams. This study is a large European cohort of children exposed to ionizing radiation during CT exams.

Methods: Pooled data from 9 European countries in children who received a CT exam before age 22, between 1977- 2014. Outcome: brain cancer 5 years after CT exam.

Results: 948,174 patients enrolled in EPI-CT study; 658,752 patients with follow up data. 165 (+) brain cancer. The RR of developing brain cancer from 38mGy (the average dose in 2012-14) was 1.5 (95%CI; 1.2-2.0). Absolute risk is 1 brain cancer for every 10,000 CT's. Increasing doses (ie. studies) increases risk in a linear fashion.

Conclusion: With approximately 5 million head CT's performed/yr in the US in this population, there are approx. 500 excess brain tumors/per year in children in the US due to CT scanning.

Editor Note: the median follow-up in this study is 5.6 yrs. Would the number of cancers increase if followed further?

Article # 15b: *Risk of hematological malignancies from CT radiation exposure in children, adolescents and young adults.* Gomez MBdB, et al. *Nature Medicine*, published online Nov 9, 2023.

Methods/Results: 948,174 patients enrolled in EPI-CT study;
*876,771 patients with follow-up data -1,331,896 CT scans performed (mean =1.5 scans/pt).
790 hematologic malignancies identified,
Mean follow up = 7.8yrs.

- For patients with multiple exams, risk increased 43% with each exam.

Conclusion: Like the risk for brain cancer, for every 10,000 CT's, 1-2 children are expected to develop a hematological malignancy.

Article #16: *Identifying Maltreatment in Infants and Young Children presenting with fractures: Does age matter?* Mitchell AC, et al. *Acad Emerg Med* 2021; 28:5-18.

Background: Fractures are common in children. But which ones should we suspect may be associated with abuse? The aim of this study is to provide evidence-based recommendations on "which children with which fractures" should undergo a child abuse evaluation.

Methods: Systematic review.

Results and Recommendations:

- 1) **Rib fracture:** “*In children presenting to a health care facility with a rib fracture,we strongly recommend routine child abuse evaluations for patients **younger than 3 years of age.**” . Moderate quality of evidence, based on 3 studies. 113 of 145 (78%) rib fx in children < 3 yrs were associated with abuse*
- 2) **Humeral fracture:** “*In children presenting to a health care facility with a humeral fracture... we strongly recommend routine child abuse evaluations for patients **younger than 18 months of age.**” Moderate quality of evidence, based on 4 studies, 48% of these fractures were associated with abuse*
- 3) **Femoral fracture:** “*In children presenting to a health care facility with a femoral fracture **aged < 18 months,** we strongly recommend routine evaluation to identify child abuse.*” Moderate quality of evidence, based on 6 studies. Abuse identified in 34% and 25% of children < 12 and 18 months of age, respectively.

Article #17: Treatment of post-tonsillectomy hemorrhage with nebulized tranexamic acid: A retrospective study. Shin TJ, et al. Int J Ped Otorhinolaryngology 2023; 171: 111644

Background: What do you do for the post-tonsillectomy hemorrhage? This retrospective study suggests using nebulized TXA while you wait for ENT.

Methods: Retrospective review of 1110 cases, 1/1/15 – 12/31/2022, single university setting (Indianapolis, IN).

Results: 83 cases received TXA (500mg/5ml nebulized). No TXA (n=1027) typically received cold water gargles, topical oxymetazoline spray, or nebulized racemic epinephrine.

	<u>TXA (n=83)</u>	<u>Age-matched controls (n=249)</u>
Operative intervention	30 (36%)	150 (60%)

Conclusion: Treatment with nebulized TXA in the ED for post-tonsillectomy hemorrhage appears to successfully decrease the need for re-operation.

MYTH or FACT: b-HCG levels below 1,500mIU/mL (discriminatory level) does not warrant an Ultrasound (ie. will not visual any sort of pregnancy)

Article #18: Relationship of Beta-Human Chorionic Gonadotropin to Ectopic Pregnancy Detection and Size. Eisaman DM, et al. West J Emerg Med 2024; 25: 431-5.

Background: Many hospitals utilize B-hCG levels and the discriminatory cutoff to determine the use of US ordering (ie. no US for B-hCG < 1,500). While this may be helpful to determine intrauterine pregnancy, signs of ectopic pregnancy may be visible at significantly lower levels. The study attempts to determine whether B-hCG levels correlate with the size of an ectopic pregnancy.

Methods: Retrospective review of ectopic pregnancies at an urban ED (Univ of Pittsburgh), 1/1/15-12/31/17.

Results: 519 cases of ectopic pregnancy. Rupture = 22.9% of cases,
hemodynamic instability = 14.4%

***the median B-hCG= 1,209; 50.4% of the patients had B-hCG < 1,500**
****44% of ruptured ectopic pregnancies had B-hCG < 1,500**

Additionally, there was no correlation between the size of ectopic and B-hCG levels.

Conclusion: Patients that present with pelvic pain and/or vaginal bleed AND are pregnant, a work-up including a transvaginal ultrasound is warranted regardless of the b-hCG level.

CONTROVERSY #2: Can you give a patient with a corneal abrasion a topical anesthetic at discharge?

Article #19a: Use of topical anesthetics in the management of patients with simple corneal abrasions: Consensus guidelines from the American College of Emergency Physicians. Green SM, et al. Ann Emerg Med May 2024; 83: 477-89.

Background: Corneal abrasions are extremely painful due to the cornea's densely innervated tissue. Historically, ED providers have avoided providing patients with topical anesthetics for home use due to corneal toxicity. However, ophthalmologists do it after photorefractive keratectomy.

This evidence-based guideline was developed as a joint effort by the American Academy of Ophthalmology (AAO) and the American College of Emergency Physicians (ACEP). The attempts to answer the following questions:

Q1: Among ED adults discharged home with a simple corneal abrasion, is there evidence that analgesia using short courses (up to 24 hours) of commercially available topical anesthetics, when compared to saline placebo or nonuse, is associated with more frequent adverse visual outcomes or healing?

Answer: Level B recommendations. In adult ED patients...it appears safe to prescribe or otherwise provide a commercial topical anesthetic (ie, proparacaine, tetracaine, oxybuprocaine) for use up to every 30 minutes as needed during the first 24 hours after presentation as long as no more than 1.5 to 2 mL total (an expected 24-hour supply) is dispensed and any remainder is discarded after 24 hours.

Recommendation based upon: 1) animal studies that demonstrated no toxicity for short courses, 2) 3 small RCT's (n=684 eyes) post photorefractory keratectomy procedures and 3) 4 RCT ED studies that demonstrated no adverse outcomes with short courses (1-7 days)

Article #19b: Topical anesthetics for analgesia in acute corneal abrasion: Eye Care Providers Survey. Anderson-quinines C, et al. Eye and Contac Lens, 2023; 49: 143-6.

Background Question: What do ophthalmologists and optometrists think about the ED providing patients with topical analgesia for simple corneal abrasions?

Methods and Results: Email survey asking these 3 questions. 978 surveyed, 486 (47%) responded.

Scenario 1: If the patient is examined only by the ED provider, it should be a recommended practice to prescribe tetracaine. **Response: 97.7% disagreed**

Scenario 2: I would prescribe tetracaine after examining the above patient. **Response: 96.9% disagreed**

Scenario 3: If I were the patient, I would use tetracaine. **Response 89% disagreed**

Conclusion: This is going to be an uphill struggle.

ENVIRONMENTAL ISSUE – The Heat is on!

Article #20a: Projected Change in the burden of Excess cardiovascular death associated with extreme Heat by Midcentury (2036 -2065) in the contiguous United States. Khatana SAM, et al. Circulation 2023; 148: 1559-69.

Background and Methods: Previous studies have demonstrated that extreme heat is associated with CV mortality. Based on data of CV deaths among adults and the number of extreme heat days in the US from 2008-19, the authors modeled trajectories of greenhouse gas emissions and along with future socioeconomic and demographic projections to estimate future heat-related CV mortality.

Results: Extreme heat was associated with 1651 excess CV deaths/yr from 2008-19. By mid-century, this is anticipated to increase to 4320-5491 CV deaths/yr., a 162-233% increase. Elderly adults are projected to have a 3.5x greater risk; non-Hispanic Black adults a 4.6x greater risk.

Article #20b: How blackouts during heat waves amplify mortality and morbidity risks. Stone B, et al. Environ Sci Technol 2023; 57: 8245-55.

Background: The incidence of electrical grid failure or “blackout” events has doubled (151% increase) in the US from 2015/16 → 2020/21. The majority of these occur in the summer months. With extreme weather events such as heat waves and hurricanes increasing in frequency and intensity, the authors of this study simulate blackout conditions during a heat wave in 3 metropolitan cities (Atlanta, Phoenix, Detroit) to estimate the potential heat-related morbidity and mortality.

Methods: Mathematical modeling of potential excess morbidity and mortality under “blackout” conditions for 2- and 5-day periods in Atlanta, Phoenix and Detroit.

Results: If blackout approached 5 days...

- Phoenix would have > 800,000 ED visits, > 13,000 would die
- Atlanta would have > 12,500 ED visits, 6 would die
- Detroit would have 221 would die (due to older population)

Discussion/Conclusion: We have seen some of this already:

- 61,672 people died in Europe from heat-related illness, summer 2022
- >900 deaths in the Northwest attributed to heat wave, June 2021
- 56,000 estimated died in Russia from heat-related illness, summer 2010

This study highlights:

- 1) the need for electrical grid resilience, expanding tree canopies and improving roofing materials to mitigate future climate/infrastructure failure events
- 2) ED and hospital preparedness throughout the country for these looming catastrophic events

YES.. improving our environment can improve our health outcomes!

Article # 20c: An interrupted time series analysis of the cardiovascular health benefits of a coal coking operation closure. Yu W, et al. Environ Res Health 2023: 045002

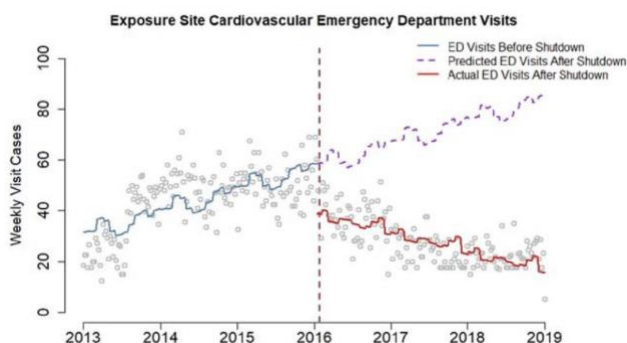
Background: Air pollution = increased adverse health outcomes. Studies demonstrating health benefits associated with a reduction in air pollution (ie. accountability studies) are uncommon. However, this study does just that by studying the health benefits associated with improved air quality after a coke plant in Pittsburgh, PA was closed in 2016.

Methods: Time-interrupted series, evaluating the air quality and CV outcomes in the 3 years before and after the closure of the Shenango Inc, coal-burning plant in January 2016. This coal-processing plant used high temperatures and pressure to remove impurities in cal and convert it into a fuel called coke. This results in the release of small particulate matter (PM₂<2.5um).

Results: In the 3 years after plant closure,

- nearby SO₂ levels decreased by 90%
- Cardiovascular ED visits decreased by 42%
- Cardiovascular hospitalizations decreased by 28 admissions/week
- Overall ED visits decreased by 14 ED visits/week

Conclusion: This study provides compelling evidence that eliminating fossil-fuel related coal-coking air pollution emissions significantly improved both the air quality and CV health of the nearby community.



Thank you for your time and attention

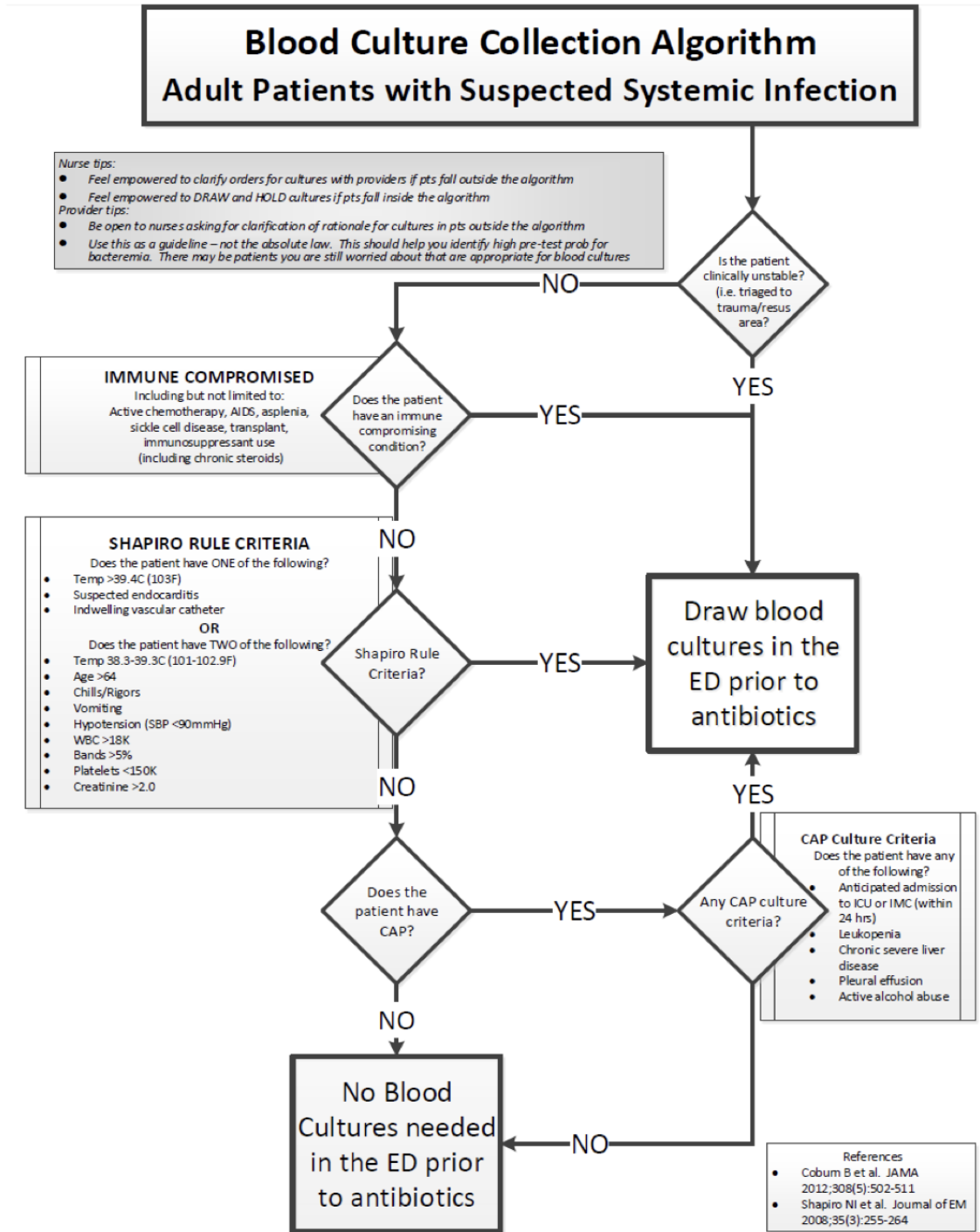


Figure 1. Flow chart detailing the blood culture ordering algorithm.