Emergency Medicine Journal Club

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Emergency Medicine Journal Club

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Abstract
In this column, we provide a brief review of important papers recently published that relate to the field of Emergency Medicine. The goal is to provide the busy clinician a bullet-like summary of the study, focusing on the research question, methods, results, limitations, and bottom line interpretation.

Keywords
journal club, emergency medicine, evidence-based medicine, review

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The authors have no personal conflicts of interest to disclose

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**Topic:** Radiology  
**Question:** Does radiocontrast dye lead to long term kidney impairment in ED patients?  
**Methods:** This was a regression discontinuity analysis of ED patients in Alberta Canada who received CTPA to evaluate for PE. Patients were divided into two cohorts based on D-dimer levels of less than or greater than 500, as patients with D-dimer > 500 were much more likely to receive a CTPA. This design was intended to ensure the two groups were otherwise very similar and reduce confounding. GFR at up to six months was the primary outcome.  
**Results:** Over 150,000 patients were included, with a mean age of 53 yrs. Groups were similar in respect to baseline characteristics. There was no association between the administration of contrast with a clinically significant change in eGFR up to 6 months later. There was no significant difference in secondary outcomes of need for renal replacement therapy, death, or acute kidney injury.  
**Limitations:** This was a relatively young and healthy population. The group of patients with baseline eGFR less than 45 was quite small and harm in these patients could not be excluded. It is possible that patients perceived to be at risk for AKI received IV fluids or other prophylactic measures prior to scanning, and this was not recorded.  
**Bottom Line:** This is another study showing no significant association between IV contrast and long-term kidney injury when given for CT scanning in ED patients. Many radiology departments have been moving to policies permitting contrasted scans without radiologist consultation in patients with eGFR down to 30, which appears generally safe.

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**Topic:** Radiology  
**Study:** Lee KH et al. Risk of Hematologic Malignant Neoplasms From Abdominopelvic Computed Tomographic Radiation in Patients Who Underwent Appendectomy. JAMA Surg. 2021 Apr 1;156(4):343-351  
**Question:** How much does abdominal CT scanning increase the risk of malignancy?
**Methods:** Population-based cohort study using an insurance claims database in South Korea. The primary outcome was the incidence rate ratio (IRR) of hematologic malignant neoplasms for both groups. The secondary outcomes were IRR of abdominopelvic organ cancers and IRR of all cancers. The cohort included over 800,000 patients with a mean age of 28 years.

**Results:** For all hematologic malignant neoplasms, the IRR for the CT-exposed vs CT-unexposed group was 1.26 (95%CI, 1.09-1.45). In terms of individual categories of hematologic malignant neoplasms, the CT-exposed group had an elevated risk only for leukemia (IRR, 1.40 [98.75%CI, 1.04-1.87]). There was no between-group difference in incidence rate of abdominopelvic organ cancers. The carcinogenic risk was most pronounced in patients aged 0 to 15 years. In this subgroup, the IRR was 2.14 (95%CI 1.35-3.40). It is somewhat unclear whether there was a dose-dependent relationship between increased malignancy risk and the number of CT scans performed.

**Limitations:** Follow-up was at 5 years, so longer term risk is not known. There could be unmeasured confounders that made these patients more likely to need appendectomy that increased their risk for cancer, but cases of appendiceal carcinoma diagnosed retrospectively were excluded.

**Bottom Line:** This is relatively strong evidence supporting a link between increased relative risk of malignancy, particularly hematologic cancers, and CT scanning, although the absolute risk remains very low.

**Topic:** Medical technology


**Question:** Are pulse oximeters less accurate in Black patients?

**Methods:** This was a comparison between pulse oximetry readings and oxygen saturation measured on arterial blood gases for adult patients at the University of Michigan hospital and ICU patients at 178 hospitals. Measurements were taken within 10 minutes of each other and the rate of occult hypoxemia was recorded.

**Results:** Occult hypoxemia (defined by an arterial oxygen saturation of <88% despite an oxygen saturation of 92-96% by pulse oximetry) was three times more common in black patients. Among the patients who had an oxygen saturation of 92-96% on pulse oximetry, an arterial oxygen saturation of less than 88% was found in 88 of 749 arterial blood gas measurements in Black patients (11.7%;
95% confidence interval [CI], 8.5 to 16.0), and in 99 of 2778 measurements in White patients (3.6%; 95% CI, 2.7 to 4.7).

**Limitations:** This appears to be retrospective data and was presented in the form of correspondence, so the exact methods used are not fully described. It’s unclear if this problem is specific to certain manufacturers’ devices, or if it is inherent to pulse oximetry generally.

**Bottom Line:** This is a concerning report which suggests we could be undertriaging and treating hypoxemic patients due to errors in pulse oximetry for patients with dark skin. Further analysis is needed to determine the extent of this problem. Clinicians should be aware of these possible discrepancies and consider obtaining an ABG if the results would change management significantly, similarly to obtaining a rectal temperature when there is concern for sepsis but the oral temperature is normal.

**Topic:** Musculoskeletal


**Question:** Do muscle relaxers add anything in terms of pain control for management of low back pain?

**Methods:** Randomized, double-blind, parallel-group, 4-arm study conducted in 2 urban emergency departments (EDs) of 320 patients who were randomized to ibuprofen + placebo, ibuprofen + baclofen, ibuprofen + tizanidine, or ibuprofen + metaxalone. Primary outcome was improvement in disability as reported on a questionnaire.

**Results:** Improvement in the placebo group was 11.1 points (95% confidence interval [CI] 9.0 to 13.3), baclofen by 10.6 points (95% CI 8.6 to 12.7), metaxalone by 10.1 points (95% CI 8.0 to 12.3), and tizanidine by 11.2 points (95% CI 9.2 to 13.2). Pain scores at 1 week were similar in all 3 groups.

**Limitations:** Doses of treatment medications were not based on previously established dosing (as authors could not find any literature supporting specific dosing) so could be less effective than when prescribed at higher dosing. They tried to overcome this by allowing patients to self-titrante medication and take a second dose if needed.
**Bottom Line:** Pretty good evidence that these muscle relaxants aren’t adding much in the treatment of low back pain

**Topic:** Musculoskeletal

**Study:** Naproxen With Cyclobenzaprine, Oxycodone/Acetaminophen, or Placebo for Treating Acute Low Back Pain: A Randomized Clinical Trial. JAMA. 2015 Oct 20;314(15):1572-80.

**Question:** Does a muscle relaxant or opiate add to pain relief in the management of low back pain?

**Methods:** Randomized, double-blind, 3-group study of 323 patients into naproxen + placebo, naproxen + cyclobenzaprine, and naproxen + oxycodone/acetaminophen. Primary outcome was improvement on a disability questionnaire between discharge and 1 week later.

**Results:** Mean Roland-Morris Disability Questionnaire (RMDQ) improvement was 9.8 in the placebo group, 10.1 in the cyclobenzaprine group, and 11.1 in the oxycodone/acetaminophen group. Between-group difference in mean RMDQ improvement for cyclobenzaprine vs placebo was 0.3 (98.3% CI, -2.6 to 3.2; P = .77), for oxycodone/acetaminophen vs placebo, 1.3 (98.3% CI, -1.5 to 4.1; P = .28), and for oxycodone/acetaminophen vs cyclobenzaprine, 0.9 (98.3% CI, -2.1 to 3.9; P = .45).

**Limitations:** Adequacy of blinding was not assessed in this study, and it was conducted in a single, low socioeconomic status area, which may mean results are not generalizable.

**Bottom Line:** Another nail in the coffin for muscle relaxants in the management of low back pain. It also appears that oxycodone has limited benefit as well.

**Topic:** Musculoskeletal


**Question:** Does a course of steroids add anything to the management of acute lumbar radicular pain?

**Methods:** 54 patients were enrolled complaining of radiculopathy that was confirmed by MRI and randomized to steroids or pregabalin/gabapentin for
treatment. Primary outcome was disability questionnaire improvement at 2, 6, and 12 weeks post treatment.

**Results:** Steroid group showed greater improvement in radiating pain after 2, 6, and 12 weeks than the gabapentin group ($p < 0.001$, $p = 0.001$, and $p < 0.001$, respectively). No differences were observed between the groups in satisfaction at the beginning and 12 weeks after taking the medication ($p = 0.062$ and $p = 0.061$, respectively) and in objective improvement of patients and physicians ($p = 0.657$ and $p = 0.748$, respectively). Steroid group was less disabled and had greater physical health scores than the gabapentin group ($p = 0.014$ and $p = 0.017$, respectively)

**Limitations:** Relatively small sample size and a small follow up period may have missed complications of steroids

**Bottom Line:** Although it is is a small treatment effect, there is some evidence that steroids can reduce radicular pain compared to gabapentin and pregabalin.

**Topic:** Cardiac arrest management


**Question:** Does targeted temperature management (TTM) with a goal temperature of $33^\circ$ celsius benefit patients when compared to normothermia and prevention of fever?

**Methods:** This was a multi-center RCT of 1,900 adults with coma following out-of-hospital cardiac arrest (OHCA) of presumed cardiac or unknown cause. Patients were randomly assigned to undergo targeted hypothermia at $33^\circ$C, followed by controlled rewarming, or targeted normothermia with early treatment of fever (body temperature, $\geq 37.8^\circ$C). The primary outcome was death from any cause at six months and the secondary outcome was moderate to severe disability on the modified Rankin scale.

**Results:** The primary outcome of death was observed in 465 (50%) of patients in the hypothermia group, as compared with 446 (48%) in the normothermia group. 55% of survivors in both groups had moderate to severe disability at six month follow-up.

**Limitations:** All patients with OHCA were included regardless of rhythm and the underlying cause of cardiac arrest was variable, so there may be subgroups of
patients who would still benefit from hypothermia. ICU staff were not blinded to group assignment, but evaluators of neurologic function were.

**Bottom Line:** This is a very well conducted, possibly practice changing study, showing no benefit to TTM in post cardiac arrest patients when cooled to 33°C when compared to normothermia. This result is consistent with data from other recent trials. We probably don’t have to rush to cool patients post-cardiac arrest in the ED, and it’s questionable whether it benefits patients after admission. We should continue to monitor body temperature in all patients to prevent hyperthermia as this is still thought to be harmful.

**Topic:** Pharmacotherapy

**Study:** Chen SW, et al. **Effects of Fluoroquinolones on Outcomes of Patients With Aortic Dissection or Aneurysm. J Am Coll Cardiol. 2021 Apr 20;77(15):1875-1887.**

**Question:** Is there an increased risk of aortic related morbidity and death associated with fluoroquinolones (FQ) as compared to amoxicillin in patients with known aortic dissection (AD) or aneurysm (AA)?

**Methods:** Retrospective cohort study conducted in Taiwan. A total of 31,570 adult patients who survived after admission for AD or AA between 2001 and 2013 were included. Patients were used as their own controls, and the authors compared morbidity during two month periods of fluoroquinolone exposure relative to periods of no antibiotic exposure and to periods of amoxicillin exposure.

**Results:** Exposure to FQs was associated with a higher risk of all-cause death (adjusted hazard ratio: 1.61; 95% confidence interval: 1.50 to 1.73), aortic death (adjusted hazard ratio: 1.80; 95% confidence interval: 1.50 to 2.15), and later aortic surgery. Amoxicillin exposure was not significantly associated with risk of any of the outcomes. A subgroup analysis revealed that the effect of FQs was not significantly different between the AD and AA groups.

**Limitations:** This study is certainly subject to possible confounding and a causal link can’t be definitively established. Perhaps fluoroquinolones were prescribed for more serious conditions which were independent risk factors for the studied outcomes when compared to conditions for which amoxicillin was prescribed.
Bottom Line: Relative to amoxicillin use, FQ exposure in patients with AD or AA was associated with a higher risk of adverse outcomes. FQs should not be used by high-risk patients unless no other treatment options are available.

Topic: Chest pain management


Question: Is there agreement between clinician and researcher interpretation of the HEART score? Are these differences clinically important and how accurate is the HEART score in predicting 30-day major adverse cardiac events (MACE)?

Methods: Prospective study of patients presenting with symptoms concerning for ACS at a tertiary care ED. Clinicians recorded the HEART score and researchers then independently interviewed patients to generate a research HEART score. Patients were followed for 30 days. Researchers generated scores using standardized research methods similar to prior validation studies. ECG interpretations were verified by blinded content experts.

Results: 336 patients were enrolled, with 77.7% being admitted. 8.9% had MACE within 30 days. HEART score agreement was 78%, with the poorest agreement in the history component, at just 72%. The most frequent disagreement (41% of the time) was in the 3 vs. 4 point threshold which often determines whether the patient is admitted. Clinicians had 100% sensitivity for MACE vs. only 86.7% sensitivity for researchers, while researchers had better specificity (34.6% for researchers vs. 27.8% for clinicians). 33% of low-risk patients were admitted despite having a HEART score of 3 or less, with no occurrences of MACE in this group.

Limitations: This was a relatively small study conducted in one ED. Study eligibility was determined by chief complaint, so atypical presentations may have been missed. There was a high rate of refusal to participate in the study, with significantly more female patients refusing to participate for an unclear reason.

Bottom Line: There was only moderate agreement between clinician and researcher calculated HEART scores. Clinicians actually detected 100% of MACE in this study, but specificity was worse for clinicians. This study suggests we should be cautious when determining whether or not to admit for further workup based on HEART score alone, and studies comparing the accuracy of the
HEART score to clinical gestalt are needed. We should probably think twice when deciding to admit patients with a HEART score of 3, however, as this may be associated with additional resource utilization and unnecessary testing.

**Topic:** Pediatrics

**Study:** The Effect of Epinephrine Dosing Intervals on Outcomes from Pediatric In-Hospital Cardiac Arrest. Am J Respir Crit Care Med. 2021 Jul 15. doi: 10.1164/rccm.202012-4437OC.

**Question:** Does a more frequent epinephrine dosing strategy improve neurologic outcomes for in-hospital pediatric cardiac arrests?

**Methods:** Single center retrospective cohort study of 125 pediatric patients who received epinephrine during cardiac arrest. Of these 33 received frequent (<2 min between doses) epinephrine administration.

**Results:** Frequent epinephrine administration was associated with increased odds of favorable neurologic outcome (aOR 2.56; CI 95% 1.07-6.04, p=0.036)

**Limitations:** Small, retrospective study and it’s possible that frequent epinephrine dosing was a marker of better resuscitation overall introducing confounding. Additionally, timing of charting for epinephrine can be unreliable in codes. Additionally this is a preprint ahead of publication and we do not know if there is a significant difference in characteristics between groups.

**Bottom Line:** There is a signal to more frequent early pediatric epinephrine being beneficial early on in cardiac arrest, but I think it’s too early to update PALS just yet. A RCT is needed.

**Topic:** Cardiology


**Question:** What are some multispecialty consensus to the approach in management to low risk recurrent chest pain in the ED

**Methods:** A panel was created of ED physicians, a cardiologist, patient representative and methodologists to grade recommendations to 8 questions. All the literature underwent a complicated scoring process to determine the strength of their recommendations.

**Results:** Eight questions were established and answered as listed below:
1. In adult patients with recurrent, low-risk chest pain, is a single troponin versus serial troponins needed for ACS outcomes within 30 days?

**Recommendation 1:** In adult patients with recurrent, low-risk chest pain, for >3 h duration we suggest a single, high-sensitivity troponin below a validated threshold to reasonably exclude ACS within 30 days. (Conditional, For) [Low level of evidence].

2. In adult patients with recurrent, low-risk chest pain, and normal or non-diagnostic stress testing within the last 12 months, does repeat stress testing versus no stress test have an effect on MACE within 30 days?

**Recommendation 2:** In adult patients with recurrent, low-risk chest pain, and a normal stress test within the previous 12 months, we do not recommend repeat routine stress testing as a means to decrease rates of MACE at 30 days. (Conditional, Against) [Low level of evidence].

3. In adult patients with recurrent, low-risk chest pain, is admission to the hospital versus stay in the ED observation unit versus outpatient follow up recommended for ACS outcomes within 30 days?

**Recommendation 3:** In adult patients with recurrent, low-risk chest pain, there is insufficient evidence to recommend hospitalization (either standard inpatient admission or observation stay) versus discharge as a strategy to mitigate major adverse cardiac events within 30 days. [No evidence].

4. In adult patients with recurrent, low-risk chest pain and a negative cardiac catheterization defined as less than 50% stenosis, what is their risk of subsequent ACS and time to ACS?

**Recommendation 4:** In adult patients with recurrent, low-risk chest pain and non-obstructive (<50% stenosis) CAD on prior angiography within 5 years, we suggest referral for expedited outpatient testing as warranted rather than admission for inpatient evaluation. (Conditional, For) [Low level of evidence].

5. In adult patients with recurrent, low-risk chest pain and a negative cardiac catheterization defined as no coronary disease (0% stenosis) what is their risk of subsequent ACS and time to ACS?
**Recommendation 5:** In adult patients with recurrent, low-risk chest pain and no occlusive CAD (0% stenosis) on prior angiography within 5 years, we recommend referral for expedited outpatient testing as warranted rather than admission for inpatient evaluation. (Conditional, For) [Low level of evidence].

6. In adult patients with recurrent, low-risk chest pain and a negative coronary CT angiogram, what is their risk of subsequent ACS and time to ACS?

**Recommendation 6:** In adult patients with recurrent, low-risk chest pain and prior CCTA within the past 2 years with no coronary stenosis, we suggest no further diagnostic testing other than a single, high-sensitivity troponin below a validated threshold to exclude ACS within that 2-year time frame. (Conditional, For) [Moderate level of evidence].

7. In adult patients with recurrent, low-risk chest pain, what is the yield of depression and anxiety screening tools in healthcare use and return ED visits?

**Recommendation 7:** In adult patients with recurrent, low-risk chest pain, we suggest the use of depression and anxiety screening tools as these might have an effect on healthcare use and return ED visits. (Conditional, Either) [Very low level of evidence].

8. In adult patients with recurrent, low-risk chest pain, what is the role of referral for anxiety/depression in healthcare use and return ED visits?

**Recommendation 8:** In adult patients with recurrent, low-risk chest pain, we suggest referral for anxiety or depression management, as this might have an impact on healthcare use and return ED visits. (Conditional/ Either) [Low level of evidence].

**Limitations:** Most of the recommendations are based on low level of evidence. Additionally, only one cardiologist represented on the panel. In order for this to be practice changing, we would need more buy in from cardiology and policy statements from ACEP.

**Bottom Line:** These recommendations are in line with what we know: we over work up chest pain in the ED. But until we get higher quality evidence or more buy in from cardiology and our specialty as a whole, it is hard to change our practice.
Topic: Pediatrics
Question: Does balanced crystalloid reduce incidence of AKI in critically ill pediatric patients?
Methods: Before and after study of all patients (2863) admitted to the PICU between August 2018 and March 2020. In June 2019, all fluids switched from saline to balance crystalloid (Plasma-Lyte or lactated ringers). Primary outcome was AKI at day 3 with secondary outcomes being mortality, LOS, ventilator days, need for RRT, and electrolyte abnormalities.
Results: After adjusting for confounders, there was no difference in AKI at day 3 (pre 13%, post 12.5% adjusted odds ratio 0.96 [95%CI 0.65-1.42]). There were also no significant differences in secondary outcomes, but the type of electrolyte abnormality varied depending on fluid used.
Limitations: Single hospital study, retrospective and not randomized, and used all comers rather than a specific disease process. It may be that balanced crystalloid benefits septic shock patients as seen in adult trials. Additionally the fluids administered prior to arrival in the PICU were not included in analysis.
Bottom Line: This suggests that balanced crystalloids do not change outcomes to all comers in the PICU, but more study is needed to determine whether it helps certain subgroups or if balanced crystalloid is initiated in the ED.

Topic: Trauma
Question: Can prehospital ETCO2 be used to predict hemorrhagic shock in trauma patients?
Methods: Retrospective observational study of 307 intubated trauma patients transported to a single level 1 trauma center for which prehospital ETCO2 data was available. Primary outcome was hemorrhagic shock as defined as SBP <90 or Shock index of >0.9 plus transfusion of at least one unit of PRBCs.
Results: 307 patients (82% men, 34% penetrating injury, 42% in hemorrhagic shock on ED arrival, 27% mortality) were included in the study. Patients in hemorrhagic shock had lower median ETCO2 values (26.5 mm Hg vs. 32.5 mm Hg; p < 0.001) than those not in hemorrhagic shock. Patients with prehospital
ETCO2 less than 25 mm Hg were 3.0 times (adjusted odds ratio = 3.0; 95% confidence interval, 1.1–7.9) more likely to be in hemorrhagic shock upon ED arrival than patients with ≥ 25 mm Hg.

**Limitations:** Single trauma center, so may not be generalizable. Only used a convenience sample which had ETCO2 levels available, which may have been a sicker cohort and affected the results. Cannot be generalized to ETCO2 detected from nasal cannula in non-intubated patients. Additionally the patients were largely adult males so may not be generalizable to the population at large.

**Bottom Line:** This study suggests ETCO2 may be able to predict hemorrhagic shock, and suggests that a larger RCT is needed to see if it has a role in trauma resuscitation.

**Topic:** Ultrasound


**Question:** How does the accuracy of ultrasound compare to CXR for the diagnosis of acute pulmonary edema in the ED?

**Methods:** Cohort study of 81 patients with either suspected CHF or suspected COPD received both POCUS and CXR. Positive test by POCUS was defined as at least 3 B-lines detected in at least two of the four lung zones on both sides. Reference standard was defined by: 1) a discharge diagnosis for admitted patients, 2) an ED diagnosis with a repeat ED visit or a follow-up visit to outpatient clinic for the same initially presumed diagnosis within a month after the first ED visit, or 3) in all other cases where a diagnosis was only made by an emergency physician after seeing a patient once and sending them home after treatment.

**Results:** Emergency physicians identified acute heart failure by lung POCUS with sensitivity of 92.5% (95% confidence interval [CI] 83.4–97.5%) and specificity of 85.7% (95% CI 57.2–98.2%). The radiology reading of chest x-ray study had sensitivity of 63.6% (95% CI 50.9–75.1%) and specificity of 92.9% (95% CI 66.1–99.8%).

**Limitations:** Not a well defined/accepted reference standard for comparison, does not include other diagnoses such as pneumonia which lung ultrasound classically has a difficult time distinguishing from pulmonary edema.
**Bottom Line:** This study adds to the idea that POCUS may be superior to CXR for the diagnosis of pulmonary edema, but a randomized trial with a good reference standard is necessary.

**Topic:** Infectious disease  
**Question:** Does therapeutic anticoagulation have a mortality benefit over standard thromboprophylaxis in hospitalized non-critically ill COVID 19 patients?  
**Methods:** Multiplatform prospective randomized controlled trial of therapeutic vs thromboprophylactic dosed heparin in 2,219 hospitalized COVID 19 patients across 9 countries. The primary outcome was organ support–free days, evaluated on an ordinal scale that combined in-hospital death and the number of days free of cardiovascular or respiratory organ support up to day 21 among patients who survived to hospital discharge.  
**Results:** The trial was stopped early when pre-specified criteria for superiority were met. The probability of therapeutic anticoagulation improving organ support free days was 98.6% (aOR 1.27; 95% CI 1.03 - 1.58). The adjusted absolute between-group difference in survival until hospital discharge without organ support favoring therapeutic-dose anticoagulation was 4.0 percentage points (95% credible interval, 0.5 to 7.2)  
**Limitations:** Open label design may possibly introduce bias, and the secondary outcomes lend themselves to ascertainment bias. The information for exclusion to the trial is not readily available, leading to potential selection bias.  
**Bottom Line:** Fairly well done study suggesting all admitted non-critically ill COVID 19 patients should be placed on therapeutic anticoagulation. Potential game changer. Note that a similar study also in the NEJM was stopped due to harm when therapeutic anticoagulation was initiated in critically ill COVID 19 patients.

**Topic:** Venous thromboembolism (VTE)  
**Question:** Can D-dimer be used to exclude VTE in pregnant patients?

**Methods:** Systematic review and meta-analysis of studies in which D-dimer was used to rule out VTE in pregnancy.

**Results:** Of 45 studies reviewed, only four met criteria for inclusion with a total of 836 patients. At three month follow up, only one patient with a negative D-dimer developed a thrombosis. Sensitivity was 99.5%. A D-dimer cut-off of <500 ng/ml was used in three studies, and <1000 ng/ml was used in one study.

**Limitations:** Relatively small study population, only four suitable studies included.

**Bottom Line:** D-dimer appears to be reliable in ruling out pulmonary embolism in low to moderate risk pregnant patients when the traditional threshold of <500 ng/ml is used. Using higher D-dimer levels with a structured clinical decision tool such as **YEARS criteria** may need further study before being ready for prime time and consideration should be given to local practice patterns and standards.

**Topic:** Resuscitation


**Question:** Does the choice of IV crystalloid fluid have an effect on 90-day survival in critically ill patients?

**Methods:** Double-blind, randomized trial at 75 ICUs in Brazil. Patients were randomized to balanced solution (Plasma-Lyte 148) or 0.9% sodium chloride at two different infusion rates (333 cc/hr vs 999 cc/hr for four study arms in total. Patients had to be adults with at least 1 risk factor for AKI (Age > 65 years, hypotension, sepsis, mechanical ventilation, oliguria, raised serum creatinine level, cirrhosis or acute liver failure).

**Results:** Over 10,000 patients were included in the study. 48.4% of patients were surgical, and 60.6% of patients had hypotension or vasopressor use. Both groups received a median of 1.5L of fluid during the first day of admission to ICU. 90 day mortality was 26.4% in the balanced solution group and 27.2% in the saline solution group. There was no significant difference in the secondary outcomes of the need for kidney replacement therapy or occurrence of acute kidney injury. There was a statistically significant interaction between presence of traumatic brain injury, fluid type, and 90-day mortality, 31.3% for the balanced solution...
group vs 21.1% for the saline solution group [HR, 1.48; 95% CI, 1.03-2.12]. This is consistent with other studies suggesting superiority of saline vs balanced solutions in brain injured patients. There was no difference in outcomes based on infusion rate.

**Limitations:** The total amount of IV fluid administered was very low, at just 1.5L, and many patients received IVF in the OR or ED prior to admission to the ICU. The trial utilized Plasma-Lyte and results may not be generalizable to other balanced solutions such as lactated ringers. It’s questionable whether the difference between infusion rates was large enough to result in any meaningful difference in outcomes as the study did not address rapid bolusing of fluids.

**Bottom Line:** There was no difference in clinically important outcomes when patients were randomized to receive balanced crystalloids vs normal saline in the first 24 hours of admission to the ICU. There is probably no need to pick one fluid over the other in the ED in most patients, at least when giving relatively small amounts of fluids. Normal saline is probably a better choice for TBI patients.

**Topic:** Pediatrics, infectious disease


**Question:** Clinical practice guidelines from the AAP regarding the evaluation and management of well-appearing febrile infants.

**Methods:** Review of literature and synthesis of expert opinion. The guideline is broken down into groups from 8-21 days, 22-28 days, and 29-60 days. Applies only to well-appearing term infants who have a documented temperature of 100.4° or greater and have no significant medical problems or history. Guidelines require clinical judgment and shared decision making with family.

**Highlights:**

- Infants under 8 days are considered high risk, and should have complete diagnostic workup performed, antibiotics, and admission.
- Infants 8-21 days are treated much as previously was done for febrile neonates, including pan-culture, and CSF should be obtained. Urine should be obtained by catheterization. Treat for HSV as well if there are risk factors.
• Infants 22-28 days can be managed more like the older infants and should have inflammatory markers performed (procalcitonin and CRP or ANC). WBC is not part of the guideline. If all IMs are normal, LP may be performed. If CSF is normal, the patient can be discharged with close follow up. If no CSF is obtained, admit to hospital for observation.

• Infants 29-60 days need blood cultures, inflammatory markers, and urine. May treat urine if IMs are normal without performing LP. Admission is optional if CSF and IMs are normal and may be reasonable with elevated IMs and negative or uninterpretable CSF.

**Bottom Line:** This is a landmark guideline with some important changes from traditional practice. The article has three essential flowsheets making it reasonably easy to walk through the separate algorithms. Most non-pediatric trained EM physicians are probably going to want to err on the conservative side of these guidelines, but they are well worth a read.