THE SKEPTICS GUIDE TO EMERGENCY MEDICINE

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INTRO

Welcome to the Skeptics' Guide to Emergency Medicine (TheSGEM). Meet 'em, greet 'em, treat 'em and street 'em. The goal of the SGEM has always been to cut the knowledge translation (KT) window down from over ten years to less than one year. It does this by using social media to provide you with high quality, clinically relevant, critically appraised, evidence based information. The SGEM wants you to have the best evidence so you can provide your patients with the best care.

Much of the SGEM content is a result of the Best Evidence in Emergency Medicine (BEEM) process. The BEEM process is a reliable and validated method of selecting relevant emergency medicine articles. BEEM is evidence based medicine worth spreading. You can get the BEEM critical appraisal tools as part of the Free Open Access to Meducation movement. FOAMed – Medical education for anyone, anywhere, anytime.

"FOAM should not be seen as a teaching philosophy or strategy, but rather as a globally accessible crowd-sourced educational adjunct providing inline (contextual) and offline (asynchronous) content to augment traditional educational principles". http://lifeinthefastlane.com/foam/

The SGEM consists of a weekly podcast and blog. It also has a Facebook page, active Twitter feed, Google+ and YouTube channel.

So stop practicing medicine from ten years ago and start practicing medicine based on the best evidence. Listen to the podcast and turn your car into a classroom. And always remember:

Be skeptical of anything you learn,
even if you learned it from the Skeptics' Guide to Emergency Medicine.

To Access the SGEM:
• Email (TheSGEM@gmail.com), Blog (www.TheSGEM.com), Twitter (@TheSGEM), Facebook, YouTube, and on iTunes

DISCLAIMER

The Skeptics' Guide to Emergency Medicine (SGEM) is produced in Canada and is intended for medical students, residents and emergency physicians. The goal of The Skeptics' Guide to Emergency Medicine (SGEM) program is to provide the students and physicians with best evidence so they can provide their patients with the best care.

The provider of this educational material may discuss commercial products and/or devices as well as the approved/investigative use of commercial products/devices.

The provider of this educational material report that they do not have significant relationship that crate, or may be perceived as creating, a conflict relating to this educational activity.

The SGEM makes a reasonable effort to supply accurate information but does not assume any liability for errors or omissions. Because of the nature of the program and its format, it is not recommended that they serve as the sole basis for patient evaluation and treatment.

Remember to be skeptical of anything you learn,
even if you learned it from The Skeptics' Guide to Emergency Medicine.

Evidence Based Medicine

Dr. David Sackett's mentee Dr. Gordon Guyatt coined the term "Evidence Based Medicine"(EBM)[1] and a new philosophy of transforming clinical care was born. As with most paradigm shifts, opponents argued that EBM was neither novel nor a panacea for the imperfections of medical science, particularly since EBM was inherently contradictory lacking any evidence of effectiveness compared with centuries of medical tradition.[2] Early pundits criticized EBM as a cult-like phenomenon in which groupthink reduced the complexities of medical research to a single step while confusing statistics with scientific method. In particular, EBM opponents criticize the EBM hierarchy of evidence, which is believed to minimize clinician's expertise and imply that every medical question requires and is ethically appropriate for randomized controlled trial answers.[3]

EBM supporters readily acknowledge that the structured approach to finding, appraising, and acting upon research evidence outlined by Dr. Guyatt's EBM Working Group is imperfect, will require Continual methodological upgrades, often hijacked by entities with ulterior motives, and merits rigorous investigation like any other "intervention". [4,5] Yet EBM mirrors the perspective of democracy, which is frequently viewed as the worst type of Government, except for every other alternative. Indeed, EBM is the worst form of (research-enhanced) medicine, except for every other approach! While nurses, physician extenders, and physicians await a better approach to find practice-ready evidence and translate that research into bedside care, EBM remains a lighthouse to guide all of us towards the best approximation of truth in a sea of chaos, noise, and competing influences.

The label "EBM" implies that evidence is the sole ingredient. On the contrary, the philosophy of EBM seeks to incorporate and weigh equally patient preferences/priorities, clinician expertise, and the least biased research evidence to deliver the highest quality medical care to patients when faced with diagnostic, prognostic, or therapeutic scenarios. EBM provides a structured approach to find, appraise, and begin to apply research.[6] The EBM approach diverges from the more passive approach relied upon by investigators, which relied upon publishing alone to disseminate innovations. One problem with complete reliance upon publication is that most published research erroneously asks the wrong questions on misrepresentative patients and thereby misguides clinicians without improving patient outcomes.[7] Another logical flaw of relying upon publications as a vehicle for widespread permeation into clinical practice is that clinicians are bombarded with over 3800 new biomedical publications on PubMed daily, yet residency training in finding and critically appraising research is haphazard.[8]

The EBM approach involves starting with a focused clinical question followed by five-steps to finding an answer that accommodates clinical expertise, patient perspectives, and the highest quality research.

Step 1: Develop an answerable and focused PICOT question

- **P** = population (including age, gender, ethnicity, disease process and severity, if appropriate)
- **I** = intervention (treatment, risk factor exposure – note this is not pertinent for most diagnostic accuracy queries)
- **C** = control (comparator population to whom the intervention group is assessed)
- **O** = outcomes (rate of occurrence, progression of disease, accuracy of test)
- **T** = timing of the intervention to affect outcome(s)

The PICOT question focuses subsequent steps to achieve the most pertinent results for the patients typically encountered.[9]

Step 2: Devise a Search Strategy

Numerous open access electronic databases exist, including PubMed (https://www.ncbi.nlm.nih.gov/pubmed/) and Google Scholar (https://scholar.google.com/). Both resources often provide access to the full manuscript as well. The Turning Research Into Practice (TRIP) database is an extremely useful EBM resource that permits users to develop search strategies using a PICOT question (https://www.tripdatabase.com/). Alternatively, some sites like the Washington University in St. Louis Journal Club (http://emed.wustl.edu/Journal-Club) provide search strategies for common emergency medicine scenarios, along with User's Guide to the Medical Literature critical appraisals.[6]

Step 3: Find and Select the Least Biased Research

EBM describes a hierarchy of evidence depicting less biased research towards the top. Expert opinion and case reports site at the bottom of the hierarchy because they are more prone to spurious observations via unconscious interpretation, small sample sizes and statistical chance then are masked controlled trials and systematic reviews of multiple trials. However, this hierarchy does not imply that the more bias prone forms of evidence are worthless or that systematic reviews are consistently free of bias or worthy of changing practice. Sufficiently large, high-quality observational research can inform healthcare delivery, while meta-analyses can be skewed by industry influence, ignorant of methodological standards, and overly duplicative.[10]

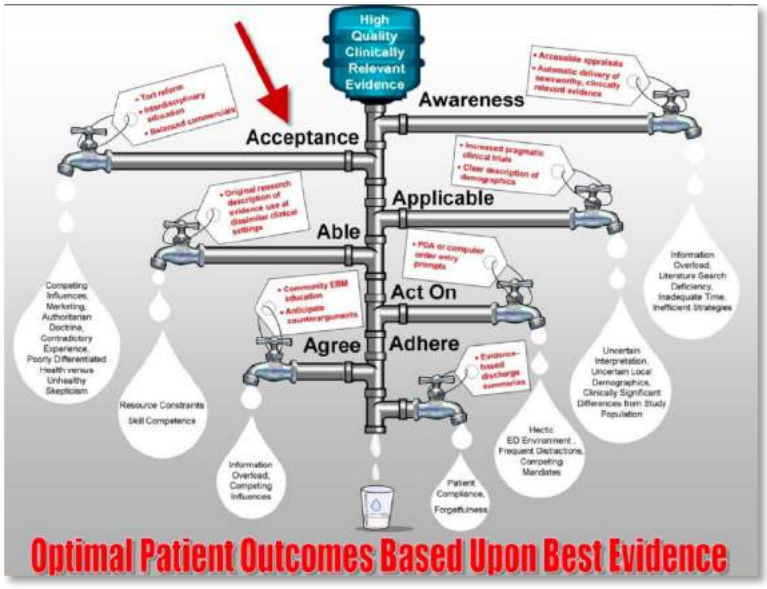
Step 4: Critically Appraise the Study

Not all research is created equal. Reviewing each relevant manuscript identified requires time and (just like inserting a central line or emergently intubating the crashing patient's airway) a bit of mentorship.8 Critically appraising a randomized controlled trial, for example, consists of a series of questions:

1. Does the study population apply to your patient?
2. Were the patients adequately randomized?
3. Was the randomization process concealed (to patients, clinicians, outcome assessors)?
4. Were the patients analyzed in the groups to which they were randomized (Intention to Treat)?
5. Were the patients recruited consecutively to minimize selection bias?
6. Were patients in both groups similar with respect to pertinent prognostic factors?
7. Were all groups managed similarly except for the intervention?
8. Was follow-up complete?
9. Were all patient-important outcomes considered?
10. Was the treatment effect large enough and precise enough to be clinically significant?

Step 5: Apply the Evidence Using Shared Decision Making

In 1999 the Institute of Medicine estimated an average delay of 17-years for 14% of research evidence to penetrate into bedside practice. The Knowledge Translation Pipeline developed at the 2007 Academic Emergency Medicine Consensus Conference illustrates the "leaks" that occur between the research "lab" and real-world bedside application.[11]



FOAMed (Free Open Access Medical Education) secondary peer review resources like Skeptics Guide to Emergency Medicine and Best Evidence in Emergency Medicine reduce many of these leaks by raising awareness of potentially practice-enhancing research in an era of information overload, while discussing potential biases and pragmatic issues associated with application of the evidence. In addition, the last two Knowledge Translation Pipeline leaks involve patients and patients' families, so discussing important diagnostic, prognostic, and therapeutic applications of research with the patients when more than one reasonable choice exists is essential.[12]

So it seems that the intent of EBM is admirable, while the realities of applying EBM are rife with challenges. SGEM Season 4 is an invaluable resource for physicians, nurses, and students aspiring to implement new knowledge and de-implement outdated dogma in an increasingly time and resource-constrained clinical context. These pages include humor, tears, personal strife, occasional disagreement, and a steady stream of empathy for our patients and clinical colleagues. Enjoy – and carpe diem.

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Best Evidence in Emergency Medicine

The Best Evidence in Emergency Medicine (BEEM) is an international, emergency medicine, knowledge translation project created by emergency physicians for emergency physicians It was started by Dr. Andrew Worster of McMaster University in 2005. It provides up to 12 hours of continuing medical education per course. BEEM does not have any financial or other affiliation with any commercial organization.

BEEM Mission: To provide emergency physicians with the best clinical evidence to optimize patient care.

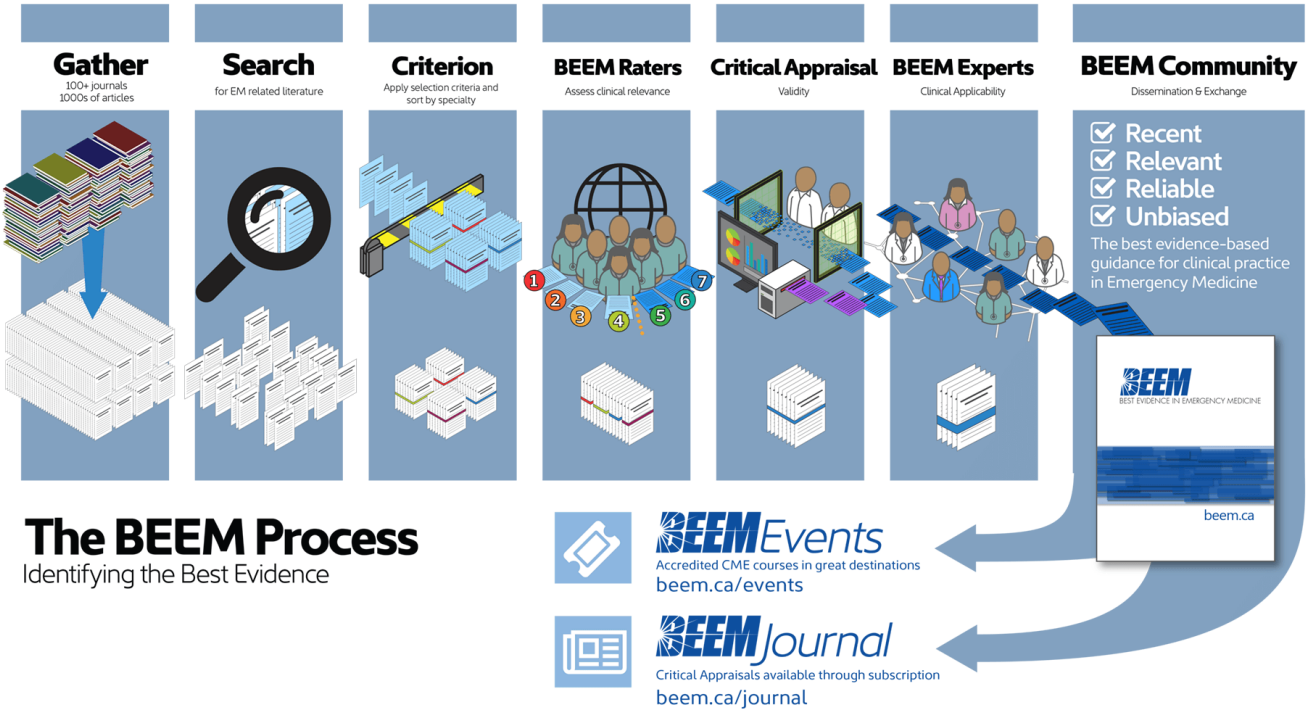
BEEM Vision: The vision of BEEM is to be the most valid, reliable, and unbiased global source of current clinically-relevant patient-centered research for Emergency Physicians.

BEEM Validation: BEEM has the only validated audience rating tool in emergency medicine continuing medical education.

Worster et al. Consensus Conference Follow-up: Inter-rater Reliability Assessment of the Best Evidence in Emergency Medicine (BEEM) Rater Scale, a Medical Literature Rating Tool for Emergency Physicians. Acad Emerg Med Nov 2011.

BEEM Rater Score: The BEEM rater score, to the best of our knowledge, is the only known measure of clinical relevance. It has a high interrater reliability and face validity and correlates with future citations.

Carpenter et al. Best Evidence in Emergency Medicine (BEEM) Rater Scores Correlate With Publications' Future Citations. Acad Emerg Med Oct 2013.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TALK NERDY TO ME

WHAT IS IT?

"*TALK NERDY TO ME*" refers to unique commentary from the SGEM TEAM and Guest Skeptics for every episode of the show. It provides a unique perspective on the topic being discussed so that you, the listener/reader, can immerse yourself in the content and formulate your own opinions on the subjects.

Also, being a "*NERD*" is super IN these days... Right?

SGEM HOP: How does it work?

1. A peer reviewed paper is selected pre-publication from Academic Emergency Medicine (AEM) that we think will be of interest to the SGEMers.
2. We do a structured critical review of the paper using the quality check list developed by the Best Evidence in Emergency Medicine (BEEM) group.
3. The paper is then discussed with one of the paper's authors to give us a better understanding of the strengths and weaknesses of the paper.
4. A blog and podcast are posted encouraging the FOAMed world to engage with us and the author over a one week period.
5. A summary of the critical review and the best social media engagement is then published in AEM to help cut that knowledge translation window down.

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SGEM HOP

Oh Baby, You're too sensitive
High Sensitivity Troponins

Case Scenario:
A 53-year-old woman presents to your emergency department less than two hours after her chest pain peaks. History of hypertension. Normal ECG and high sensitivity troponin is below limit of detection. She feels better and wants to leave.

Q:

Can high sensitivity troponin T (hs-cTnT) levels below the limit of detection on arrival in the emergency department be used to safely exclude acute myocardial infarction in patients with no ECG ischemia?

BOTTOM LINE

hs-cTnT is a new reality for some emergency physicians. We need to know how to use this test correctly to safely evaluate patients presenting with symptoms of ACS.

The Use of Very Low Concentrations of High Sensitivity Troponin T to Rule Out Acute Myocardial Infarction Using a Single Blood Test. Body et al. AEM. 2016

P Adults presenting with new onset chest pain suggestive of ACS that peaked in last 6 hours

I Hs-cTnT on arrival to the emergency department

C Reference Standard

O Primary: Acute MI defined by rise and/or fall of troponin with one value above 99th percentile of a healthy reference in appropriate clinical context. Siemens troponin I ultra assay was the reference standard.
Secondary: Major adverse event: death, acute MI, cath lab in 30 days, recurrence

Author's Conclusion:

"In the absence of ECG ischemia, the detection of very low concentrations of hs-cTnT at admission seems to allow rapid, safe exclusion of AMI in one-third of patients without serial sampling. This could be used alongside careful clinical assessment to help reduce unnecessary hospital admissions." (Body et al., 2016)

Background Patients presenting to the emergency department with chest pain are a daily conundrum. Unfortunately, for the most common acute coronary syndrome, there is no universally agreed on algorithm. In addition to serial ECGs, a variety of different biomarkers are used and repeated at a variety of different intervals.These biomarkers may or may not be followed by admission or further outpatient provocative testing .

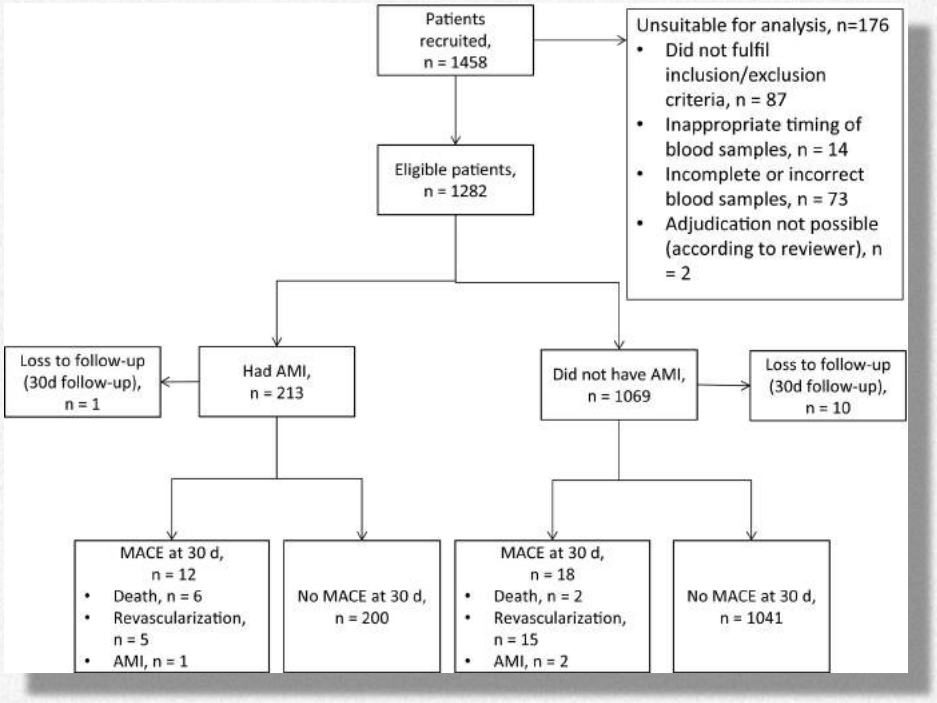
With the advent of high sensitivity troponin tests, it has been argued that there are probably some patients in whom we can exclude the diagnosis of myocardial infarction with just a single blood test. A recent systematic review determined that a single hs-cTnT below the level of detection resulted in a sensitivity of 97.4% and a specificity of 42.4% (Zhelev 2015).

When a non-ischemic ECG is added to the single negative hs-cTnT, one retrospective study of more than 14,000 patients found a sensitivity for myocardial infarction of 98.3%, and a negative predictive value of 99.8% (Bandstein 2014)
.
However, many of the existing studies are small, single-center, and/or retrospective.

Results

The analysis includes a total of 1282 patients. 213 (16.6%) were diagnosed with acute myocardial infarction on their initial visit. Mean age was 62 years and about two thirds being male (62.8%).

For the primary outcome of acute myocardial infarction, using the primary strategy of an initial hs-cTnT below the limit of detection (<5ng/L) and no ECG ischemia (no ST-segment deviation, T-wave inversion, left bundle branch block or a paced rhythm), the test characteristics are:



Results

Primary Outcome

- **Acute Myocardial Infarction**
  - Sensitivity 99.1% (95% CI 96.7-99.5%)
  - Specificity 43.9% (95% CI 40.9-46.9%)
  - PPV 26.0% (95% CI 23.0-29.2%)
  - NPV 99.6% (95% CI 98.5-100.0%)
  - LR+ 1.76 (95% CI 1.67-1.86)
  - LR – 0.02 (95% CI 0.01-0.09)

Secondary Outcome

- **MACE**
  - Total 30 day MACE for primary strategy: 1.3% (95% CI 0.5- 2.8%).
  - The actual numbers were six MACE events, including only one death, no AMI and three revascularizations.

TALK NERDY TO ME

We asked Rick five questions about his research. Listen to the podcast to hear his responses.

1) Secondary Analysis:

This was a secondary analysis of data collected for the international, multicenter TRAPID-AMI (High sensitivity cardiac troponin T assay for RAPID rule out of Acute Myocardial Infarction) study. Was this a pre-planned analysis and how do you think this impacts your results?

2) Gold Standard:

As always with these studies, there is a questionable gold standard. Acute myocardial infarction was based on two independent cardiologists using all available clinical data. They were blinded to the hs-cTnT results, as a different sensitive troponin I test was used clinically for all patients. There is some degree of subjectivity with this process. Can you comment on this imperfect gold-standard and how many times a third cardiologist was needed to adjudicate?

3) Acceptable Miss Rate/Medicolegal Implications:

You found a miss rate of 0.7% (4/560) with hs-cTnT being used alone and 0.4% (2/471) if used with no ECG ischemia (no ST-segment deviation, T-wave inversion, left bundle branch block or a paced rhythm). In addition, the MACE rate at 30 days was 1.3% with most of it being revascularization. So what is an acceptable miss? In addition, your paper mentions medicolegal implications of using hs-cTnT. Can you expand on that point?

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4)ECGs:

When do we ever evaluate a patient suspected of ACS without getting an ECG? Adding the ECG decreased the miss rate 0.7% to 0.4%. However, one investigator retrospectively evaluated the ECG and decided if it had any evidence of ischemia. Who was that one investigator and did you consider having more than one individual interpret the ECGs so inter-rater reliability could be determined?

5) Clinical Judgement:

The primary outcome in this study was acute myocardial infarction. We really liked that you emphasized in your paper that clinicians must still use their clinical judgment. Can you comment further on the role you think clinical judgement plays in these cases?

This was an industry sponsored study, which does not make the results wrong but should make us more skeptical of the paper and the interpretation. Rick discusses this issue and conflicts of interest.

Case Resolution

The patient is offered serial troponins and ECGs but decides to go home knowing there is no *"zero risk".*

Clinical Application

Use of hs-cTnT will all depend on your comfort level, patients' preferences and your current practice environment.

WHAT DO I TELL MY PATIENT?

We cannot find any evidence of a heart attack. Your ECG is normal. Your blood work using a new highly sensitive test is also normal. However, this does not mean you did not have a heart attack. There is a very small risk (less than 1%) that it could be missed on the ECG and blood test. It also does not mean you do not have heart disease. It is possible you could have a major adverse event (including death) in the next 30 days. That possibility is also very low but not zero percent. With your test results, less than 1/500 people die in the next 30 days, but 1% of people have what we call a major event – mostly meaning they have to come back to the hospital to have a heart intervention like a stent or a surgery. Would you like to stay for a further testing in 1-3 hours or go home now?

Observational Trials Checklist

Did the study address a clearly focused issue?	☑
Did the authors use an appropriate method to answer their question?	?
Was the cohort recruited in an acceptable way?	☑
Was the exposure measured to minimize bias	☑
Was the outcome accurately measured to minimize bias?	?
Have the authors identified all important confounding factors?	?
Was the follow up of subjects complete enough?	☑
How precise are the results/is the estimate of risk?	?
Do you believe the results?	☑
Can the results be applied to the local population?	?
Do the results of this study fit with other available evidence?	☑

CONCLUSION VS COMMENTARY COMPARISON

We generally agree with the authors' conclusions.

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SGEM HOP

Break on Through to the Other Side

Sternal Fractures - delayed complications And outcomes

Case Scenario:
49-year-old male presents to ED after a vehicle collision. You diagnose him with an isolated sternal fracture. There are no rib fractures/lung abnormalities identified. Normal ECG/troponin. Are there potential complications from this injury, and how long he should expect to have pain?

Q:

What are the complications and outcomes of patients with isolated sternal fracture discharged from the emergency department compared to those with other minor thoracic injury?

BOTTOM LINE

Patients discharged home with isolated sternal fractures have a risk of delayed hemothorax. These are painful injuries and patients should be provided with adequate analgesia and follow-up.

Delayed Complications and Functional Outcome of Isolated Sternal Fracture After Emergency Department Discharge: a Prospective, Pulticentre Cohort Study

Racine et al. CJEM. 2016

P Patients 16 years and older presenting to the emergency department with minor thoracic trauma defined by the presence of chest abrasion or contusion or rib fracture

I Patients with isolated sternal fracture

C Those with rib fractures or no fracture

O Functional Outcome at 30 and 90 days: This was assessed using a validated instrument called the Medical Outcome Short-Form Health Survey (SF-12). This tool has 12 questions that address eight health elements.

Exclusion criteria: The presence of a hemothorax, pneumothorax, lung contusion or any significant cerebral, thoracic, abdominal or extremity injury on their initial emergency department visit; A follow-up not possible; A delay greater than three days between the injury and the emergency department visit.

Author's Conclusion:

In this prospective study, we found that 12.5% of patients with sternal fracture developed a delayed hemothorax, but the clinical significance of this remains questionable. The proportion of patients with sternal fracture who had moderate to severe disability was significantly higher than that of patients with other minor thoracic trauma.

Background

Sternal fractures are often the result of a significant blunt thoracic trauma and have an incidence between 0.33% of all trauma patients (Recinos et al and 3.7% of patients admitted after a motor vehicle accident (Yeh et al). Poor outcomes in patients with sternal fracture are associated with the severity of other injuries, complications and pre-existing comorbidities (Yeh et al). Many studies have demonstrated that a patient with an isolated fracture of the sternum can be safely discharged from the emergency department after an appropriate investigation (Hossain M, Khoriati et al and Kouritas et al), which should include cardiac biomarkers and ECG (Clancy al).

Background

Therefore, the clinical significance of isolated sternal fracture has change over the past years and admission is no longer required for those patients. When looking at other minor thoracic injuries discharged from emergency department, delayed hemothorax has been reported as a significant delayed complication (Misthos et al and Plourde et al) and a risk factor for poor functional outcome (Emond et al).

Results

They screened 2,866 patients with 969 included in the study. The mean age was 53 years with 63% being male. There were some differences between the groups (age, gender, mechanism of injury and pre-existing airway disease).
Out of 969 patients, 32 (3.3%) had an isolated sternal fracture, 304 (31.3%) had a rib fracture, and 633 (65.3%) had no fracture.
Motor vehicle crash was the most common cause of sternal fractures (78%) while a fall from the patient's own height was the number one cause of rib fractures (38%).

Primary Outcome

Delayed hemothorax within 14 days

- Total: 112/969 (11.6%)
- Sternal Facture Group: 4/32 (12.5%)
- Rib Fracture(s) Group: 70/304 (23%)
- No Fracture Group: 38/633 (6%)

Notably, none of the four patients with delayed hemothorax in isolated sternal fractures required drainage, while three cases in the rib fractures group did require drainage.
No other major complications and no mortality was observed at 90 days.

Other Primary Outcome: Functional Outcome

- Isolated sternal fracture had more significant physical disability at 30 and 90 days as rated on the SF-12 (Medical Outcome-Short Form Health Survey) by patients.

TALK NERDY TO ME

We asked Samuel five questions about his research. He and his supervisor Dr. Marcel Emond response's are in italics. Listen to the podcast to hear their responses.

1) Groups

Differences Between Groups: There were differences between the groups at baseline (ex: age, gender, mechanism). What impact if any do you think this could have on your results?

Age and gender differences could have influenced the functional outcome. That is why our statistical analysis for these results were normalized for age and sex. When looking at delayed hemothoraces, one of our collaborators found in another study that age was not a risk factor for this type of complication. The difference regarding the mechanism of injury was expected. It is well reported in the literature that the main mechanism of injury is fall for rib fracture and motor vehicle crash for sternal fracture. The effect of this difference is to our knowledge minimal on the results when talking about isolated thoracic injuries.

Group Assignment: Chest x-rays are only about 50% sensitive for rib fractures (Hoffstetter et al). How do you know that those with sternal fractures did not have rib fractures and those called negative for any fractures did not have a rib fracture?

That's a very good question. In an ideal situation every patient would have got a CT-Scan as a gold standard investigation but it was not possible in the current design of this study, mainly because of the pragmatic design that tends to reflect day-to-day practice where not all patients get a CT-Scan. We cannot be sure that patients didn't have rib fracture(s) in the sternal fracture or no fracture group. However, 14 patients were excluded during the follow-up because they were diagnosed with rib fracture(s) on the subsequent chest x-rays. That might have increased the sensitivity.

2) Small # of Patients

Only a small number of patients in your study had sternal fractures (32) and even a small number had a delayed hemothorax diagnosed within 14 days (4). These small numbers can limit the precision of your results.

Yes, absolutely these small numbers limit the precision of our results. Isolated sternal fracture was a rare finding and delayed hemothorax was even rarer. We would have needed a bigger cohort and longer time of recruitment to increase these numbers.

Nonetheless to say, sternal fracture are often looked for but not that often diagnosed. It is probably one of the largest cohort. It would have taken years and years to get bigger numbers.

TALK NERDY TO ME

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3) No Baseline Function

You used a validated scale to assess functional status. However, you did not have a baseline level for comparison. Pre-injury functional status is known to be an important factor in assessing post-injury status. Why did you not collect this data?

This decision was made for practical reason. I totally agree that it would have been better to have these baseline levels. The initial data collection was made by the treating physicians, therefore the decision to minimize the information that was collected initially was made to facilitate the recruitment and minimize the time that clinicians would spend for this data collection.

4)Outcomes

Delayed Hemothorax: One of the aims of your study was the incidence of delayed hemothorax but there were other complications observed in follow-up. This included pneumothorax and pneumonia. None were seen in the sternal fracture group. Can you comment on why you focused in on hemothorax?

One of collaborators identified delayed hemothorax as a significant risk factor for a poorer functional outcome in another study, along with the number of broken ribs (Plourde et al). We were wondering if delayed complications could impact the functional outcomes, so we focused our interest on the one that seems the most relevant.

Statistical vs. Clinical Significance: There were some statistical differences identified in your study, however, none of the four patients with sternal fractures who developed a hemothorax required drainage. So how important is the finding?

It is a very good question. We don't have the answer to date. The incidence of delayed hemothorax in the whole cohort was similar to the one reported in other studies looking at delayed complications of minor thoracic injuries. Therefore, we think our finding might not be clinically relevant but further studies will be needed to definitely answer this question.

However, we took a pragmatic approach in this study. Drainage was left to the attending emergency physician or surgeon consultant. Under their discretion and a patient centred approach, many factors may have influence this decision whether or not to have drainage. Compared to Europe, we usually drain less hemothorax in North America.

TALK NERDY TO ME

We asked Samuel five questions about his research. He and his supervisor Dr. Marcel Emond response's are in italics. Listen to the podcast to hear their responses.

5) Follow Up

Lost to Follow-up: Your follow-up for delayed hemothorax was good (92%). The 30-day follow-up for function was not bad (83%) with only a small difference between the groups. However, the 90-day follow up was poor (70%) with big differences between the groups. Only 50% of the sternal fracture patients followed up compared to 80% of the other groups.

Yes, this limits the scope of our results for sure. However, patients lost to follow-up had similar baseline characteristics to those with fully available data, potentially limiting the impact of these losses on the results.

Length of Follow-up for Delayed Hemothorax: Do you think two weeks was long enough to identify all the patients with a delayed hemothorax? You did include one patient in the fractured rib group that did have a hemothorax detected beyond 14 days.

We think clinically significant complications would have presented within 14 days. This cut-off was based on a previous study on minor thoracic traumas where they found that all delayed hemothorax associated with rib fractures were detected within 14 days (Misthos et al). Regarding the patient with a hemothorax detected after 14 days, this was a patient that was kept for analysis because he didn't show up at the 14 days follow-up but at 21 days instead. The decision was made to keep his data for analysis because he didn't have data for the 14 day follow-up visit. Otherwise he would have been excluded.

Length of Follow-Up for Functional Outcome: You say in the discussion that previous research has established that pain persists for a mean of almost eleven weeks. Why did you not evaluate functional outcomes beyond 90 days?

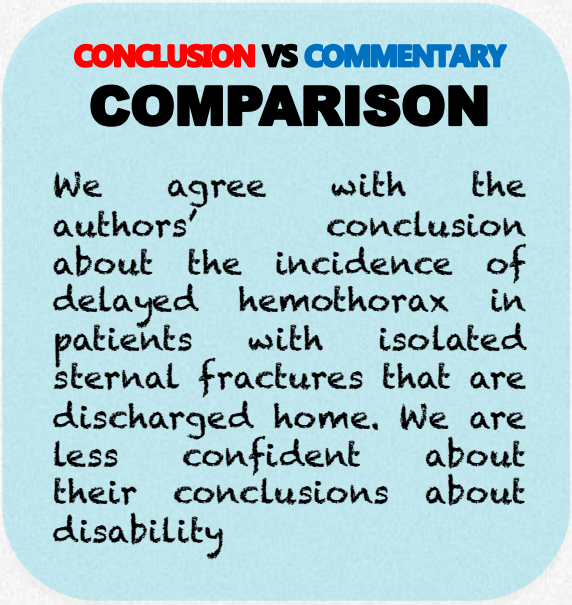
This decision was simply made for practical reason, to make the follow-up easier and minimize the lost to follow-up.5.

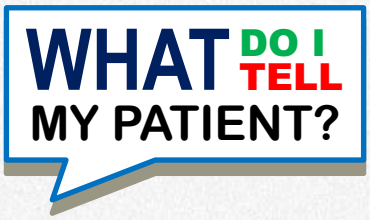
Case Resolution

He is discharged from the emergency department with adequate pain control, warned about when to return and set expectations on how long he might expect to have pain.

Clinical Application

We should be sure to inform patients with sternal fractures of reasons to return to the emergency department and adequately manage pain for these patients.





About one in eight patients with a sternal fracture will develop bleeding in the chest in the next two weeks. If you develop increasing shortness of breath, chest pain, fever or are otherwise concerned please come back to the emergency department.
You can take acetaminophen and/or an NSAID for the pain. I will also give you a prescription for an opiate to be used only if needed. You can expect to have some pain and difficulty with physical function for weeks or even months.

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Guest Skeptic: Dr. Chris Bond, University of Calgary
Clinical Lecturer, University of Calgary
Founder, SOCMOB blog
#FOAM blogger, dogma basher, wine and food supergeek

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Not Stayin' Alive More Often with Amiodarone or Lidocaine in OHCA

Case Scenario:
EMS agency asked your opinion on which anti-arrhythmic medication, if any, their ambulances should stock to manage VFIB or pulseless V-tach refractory to defibrillation. How could they best incorporate these agents into their current resuscitation protocol?

Q:
Does amiodarone or lidocaine improve survival to hospital discharge with good neurologic outcome in non-traumatic out of hospital cardiac arrest secondary to refractory ventricular fibrillation or pulseless ventricular tachycardia?

BOTTOM LINE

Neither lidocaine or amiodarone is likely to provide a clinically important benefit in adult out-of-hospital cardiac arrest patients with refractory ventricular fibrillation or pulseless ventricular tachycardia.

Amiodarone, Lidocaine, or Placebo In Out-of-Hospital Caridac Arrest

Kudenchuk et al. NEJM. 2016

P Adult patients with non-traumatic out-of-hospital cardiac arrest and shock refractory ventricular fibrillation or pulseless ventricular tachycardia after one or more shocks anytime during resuscitation

I Amiodarone or Lidocaine

C Placebo

O Primary: Survival to hospital d/c
Secondary: Modified Rankin Scale 3 or less for Favourable Neuro Function

Exclusion criteria: Patients who had already received open-label intravenous lidocaine or amiodarone during resuscitation or had known hypersensitivity to these drugs (see supplementary appendix in NEJM for complete list of inclusion and exclusion criteria)..

Author's Conclusion:

Overall, neither amiodarone nor lidocaine resulted in a significantly higher rate of survival or favorable neurologic outcome than the rate with placebo among patients with out-of-hospital cardiac arrest due to initial shock-refractory ventricular fibrillation or pulseless ventricular tachycardia.

Background

The American Heart Association estimates there are about 350,000 EMS-assessed out-of-hospital cardiac arrests in the United States each year. Half of these arrests are witnessed with the other half being un-witnessed.
Many out-of-hospital cardiac arrests are due to ventricular fibrillation or pulseless ventricular tachycardia. Defibrillation is the treatment of choice in these cases but do not often result in sustained return of spontaneous circulation (Kudenchuk et al 2006).

Both lidocaine and amiodarone may be considered for the treatment of ventricular fibrillation or pulseless ventricular tachycardia, which is unresponsive to defibrillation (Link et al 2015).

Two randomized control trials demonstrated that the use of amiodarone led to more patients with return of spontaneous circulation at the time of hospital arrival when compared to lidocaine or placebo (Kudenchuk et al 1999 and Dorian et al 2002). But these early benefits did not translate into a benefit in survival to hospital discharge or neurologically intact survival.

Results There were 37,889 patients with non-traumatic out-of-hospital cardiac arrest of which 7,051 (18.6%) had shock-refractory ventricular fibrillation or pulseless ventricular tachycardia. The intention to treat population was 4,653 and the per-protocol population was 3,026.

Primary Outcome

Survival to hospital discharge – No statistical difference (Amiodarone 24.4%, Lidocaine 23.7% and Placebo 21.0%)

Secondary Outcome

Favourable neurologic function at discharge – No statistical difference (Amiodarone 18.8%, Lidocaine 17.5% and Placebo 16.6%)

TALK NERDY TO ME

1) Statistical vs. Clinical Significance

The primary outcome of survival to hospital discharge failed to find a statistical difference. The absolute difference in survival between amiodarone vs. placebo was 3.2% (95% CI, −0.4 to 7.0; P=0.08), and lidocaine vs. placebo was 2.6% (95% CI, −1.0 to 6.3; P=0.16). But there is a difference between statistical significance and clinical significance.

They powered their study to find a 6.3% difference. They would have needed 9,000 patients to establish a three percent difference. A three percent difference, if true, would translate into 1,800 lives saved yearly in North America for OHCA. So this trial may have been under-powered, certainly patients in both the amiodarone and lidocaine groups seem to respond to the antiarrhythmic effects of the drug therapy.

Patients randomized to either the amiodarone or lidocaine arms received less defibrillation attempts before achieving ROSC and survived to hospital admission more frequently than patient randomized to the placebo arm (45.7%, 47.0% and 39.7% respectively).

But these upstream benefits did not translate into clinically important improvements in favorable neurological outcome.

2) Intention-to-Treat vs. Per-protocol Analysis

Even with the cards stacked in favor of finding superiority with treatment they did not find a statistical difference in their primary outcome.

Let us suppose for a moment that the trends observed in the trial describe a true benefit in the treatment of refractory ventricular fibrillation in OHCA. To what end?

The authors' primary endpoint was based off a per-protocol analysis of their cohort. As such they excluded 1,627 patients from their primary analysis. This led to a highly select population, intended to optimize the trials ability to discern benefit for the treatments in question. But such an analysis comes at a cost of its external validity.

These are not the unfiltered patients seen by your EMS agency. They are certainly not the few cardiac arrest patients that reach us in the Emergency Department. Even in this artificial population the authors found only small trends to improvement in survival and had to perform further subgroup analysis to demonstrate statistical benefit.

In the intention-to-treat population even these trends towards improved survival all but disappear. Patient randomized to the amiodarone, lidocaine, placebo group had survived to hospital discharge at a rate of 19.0%, 18.4%, and17.6% respectively.

And the intention-to-treat analysis of favorable neurologic outcome was not statistically different between groups (amiodarone 14.4%, lidocaine 13.5% and placebo 13.8%).

3) Favourable Neurologic Outcome

I think what patients really care about is survival to hospital discharge neurologically intact. Favorable neurologic outcome was a secondary outcome. They seemed to make this result look a little better by defining favorable neurologic outcome as a mRS of 3 (*moderate disability; requiring some help, but able to walk without assistance*) or less. When you read thrombolytics for stroke literature they are usually talking about a mRS of 0-1 or 0-2 not up to 3.

This is not unheard of in clinical trials that examine events that lead to neurologically devastating outcomes. In a sense they lower their standards for a good neurological outcome. We have seen this used in the Nichols et al (NEJM 2015) trial published late last year examining continuous chest compressions.

TALK NERDY TO ME

4) Subgroup Analysis

They made a big deal about some of the subgroup findings. These should be view with some caution.

One pre-specified subgroup was whether or not a bystander witnessed the cardiac arrest. There was a statistically significant increases in patients discharged from the hospital alive in both the amiodarone and lidocaine group when compared to placebo (27.7%, 27.8% and 22.7% respectively).

If one is to believe the benefit observed in bystander witnessed arrest, then one has to conclude that early use of both amiodarone and lidocaine may be efficacious but later in the arrest these drugs are far less effective at achieving ROSC.

It is also important to remember that subgroup analysis can easily be misleading because of the risk of type 1 error increases the more observations an investigator makes.

5) Cognitive Clutter

Finally, one could argue that despite the overall minimal effect, these drugs should be administered to all comers on the rare chance they may help one individual patient. And this position seems reasonable when viewed from this single perspective.

But when each of these low yields, ineffective therapeutic strategies are stacked one on top of another, on top of another on top of another, the resulting system can become unwieldy and ineffective.

Cardiac arrest is a high acuity, time dependent disease state. We should focus on delivering a small number of high yield interventions in a timely fashion.

Continued attention on interventions, which are unable to demonstrate statistically meaningful improvements in neurological outcomes in over 3,000 patients does nothing but add cognitive clutter to an already chaotic milieu.

Clinical Application

I think this depends on your clinical environment and what other resources you have available. Refractory cardiac arrest has a dismal prognosis if return of spontaneous circulation is not achieved by the time the patient arrives to the Emergency Department. If a patient presented in refractory ventricular fibrillation or pulseless ventricular tachycardia, I certainly would not say it is wrong to give these anti-arrhythmics. However, from a big picture we have to start considering discarding ineffective treatments and start investigating more viable options. So if either lidocaine or amiodarone is to be used it should be given in a protocolozed fashion so as to avoid adding to the cognitive load of whomever is running the resuscitation.

Case Resolution

I would tell my local EMS agency that the evidence does not support stocking amiodarone or lidocaine for the management of shock refractory ventricular fibrillation or pulses ventricular tachycardia. This is because it does not appear to significantly improve survival to hospital discharge or favorable neurologic outcome. However, if they do chose to incorporate anti-arrhythmics into their pre-hospital protocol it should be done in a manner to limit the logistically complexity introduced by their addition.

RCT Quality Checklist

The study population included or focused on those in the ED	
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	
The study patients were recruited consecutively (i.e. no selection bias)	☑
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	☑
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	?

CONCLUSION VS COMMENTARY

COMPARISON

The conclusions drawn by the authors are fair.

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Other #FOAMed Resources:

- REBEL EM: ALPS: Amiodarone, Lidocaine or Placebo Study in OHCA
- Scancrit: CPR AND AMIODARONE
- The Bottom Line: Amiodarone, Lidocaine, or Placebo in Out-of-Hospital Cardiac Arrest
- St. Emlyn's: Arrested Developments
- EM Literature of Note: Amiodarone, Lidocaine, or … Nothing

Guest Skeptic: Dr. Rory Spiegel
Clinical Instructor, University of Maryland
Author, EM NERD Blog

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Shuffle off to Buffalo to Talk Thrombolysis for Acute PE

Case Scenario:
75-year-old female presents with chest pain. Pain is sharp and exacerbated with inspiration. Associated dyspnea. Denies syncope/nausea/diaphoresis. Pain is constant for 1 week. Traveled to Florida 3 weeks ago. Denies fever/chills/cough/sputum production. Pain is 5/10, increased to 7/10 with deep breathing.

Q:

Is ultrasound-facilitated, catheter directed, low-dose fibrinolysis safe and effective to for patients with acute massive or submassive pulmonary embolism?

BOTTOM LINE

Ultrasound-facilitated CDT is associated with a low intracranial hemorrhage rate in patients with acute massive or submassive pulmonary embolism but it is difficult to comment on efficacy without a comparison group?

A Prospective, Single-Arm, Multicenter Trial of Ultrasound-Facilitated, Catheter-Directed, Low-Dose Fibrinolysis for Acute Massive and Submassive Pulmonary Embolism

Piazza et al. JACC. 2015

P Adults with proximal PE with symptoms of less than 2 weeks and RV/LV diameter ratio of at least 0.9 on contast CT

I Full-dose IV unfractionated heparin plus ultrasound-fascilitated, catheter directed low dose TPA

C NONE

O Efficacy: Change in RV/LV diameter ratio from baseline on contrast CT at 48 hours
Safety: Major bleeding within 72 hours based on GUSTO bleeding criteria

Exclusion criteria: Stroke or transient ischemic attack, head trauma, or other active intracranial or intraspinal disease within 12 months; major surgery within 7 days; recent active bleeding from a major organ; hematocrit <30%; platelets <100,000/ml; International Normalized Ratio >3; serum creatinine >2 mg/dl; and systolic blood pressure <80 mm Hg despite vasopressor or inotropic support (Online Appendix). Obesity was defined as a clinical diagnosis of obesity in the medical record.

Author's Conclusion:

"*Ultrasound-facilitated, catheter-directed, low-dose fibrinolysis decreased RV dilation, reduced pulmonary hypertension, decreased anatomic thrombus burden, and minimized intracranial hemorrhage in patients with acute massive and submassive PE.*"

Types of PE

Massive PE: Defined as syncope, systemic arterial hypotension, cardiogenic shock or resuscitated cardiac arrest.
Submassive PE: Defined as normotensive patients with PE and evidence of RV dysfunction.

Background

A pulmonary embolism (PE) can be a life-threating condition. The 2015 Chest Guidelines recommend systemically administered thrombolytic therapy in patients with acute PE associated with hypotension (systolic BP<90mmHg) who do not have a high risk of bleeding (Kearon et al 2016).

- *In patients with acute PE associated with hypotension (eg, systolic BP <90 mm Hg) who do not have a high bleeding risk, we suggest systemically administered thrombolytic therapy over no such therapy (Grade 2B).*

Treating patients with full-dose systemic thrombolytics can reduce the risk of death but also increases the risk of major bleeding including hemorrhagic stroke (Chatterjee et al JAMA 2014). To mitigate the risk of bleeding while still maintaining efficacy, low-dose thrombolysis has been tried. Reviews of the literature suggest that this may be a reasonable strategy (Zhang et al 2014) especially in patients with a high risk of bleeding (Brandt et al 2015).

Background

A new method being studied to treat submassive and massive PEs is ultrasound-facilitated catheter-directed thrombolysis (CDT). A small randomized control trial of 59 patients demonstrated that compared to anticoagulation alone, ultrasound-facilitated CDT improved right ventricular function compared with anticoagulation alone with no major bleeding observed (Kucher et al 2014).

However, the Chest Guideline still suggest systemic thrombolytic therapy using a peripheral vein over CDT in patients with acute PE who are treated with thrombolytic agents. They do note that patients with a higher risk of bleeding and have access to CDT are likely to choose CDT over systemic thrombolytic therapy.

- *In patients with acute PE who are treated with a thrombolytic agent, we suggest systemic thrombolytic therapy using a peripheral vein over catheter directed thrombolysis (CDT) (Grade 2C).*

Remarks: *Patients who have a higher risk of bleeding with systemic thrombolytic therapy and who have access to the expertise and resources required to do CDT are likely to choose CDT over systemic thrombolytic therapy.*

Results

150 patients with PE (31 massive and 119 submassive) and a mean age of 59 years.

Primary Efficacy: Significant decrease in mean difference RV/LV diameter ratio
- Mean difference RV/LV diameter ratio -0.42 +/-0.36 SD (P<0.0001)

Primary Safety: Major bleeding within 30 days 15/150 (10%)
- Severe: 1/150 (0.7%) groin vascular access site hematoma with transient hypotension requiring vasopressor support.
- Moderate: 14/150 (9.3%)

Note: There were four deaths (three in-hospital and one out-patient within 30 days) and no intracranial hemorrhages.

TALK NERDY TO ME

1) Conflicts of Interest (COI):

Many authors on this trial had declared COI. This does not make the data wrong but should make us more skeptical of the study and the interpretation.

2) No Comparison Group:

This is the major limitation with this study. Without comparing it to anticoagulation alone, half-dose systemic fibrinolysis or full-dose fibrinolysis, it is not possible to comment on the efficacy and safety of ultrasound-facilitated, catheter-directed, low-dose fibrinolysis in comparison to these other treatments.

3) Incomplete Data:

There were a significant number of patients who did not have their CT measurement at 48hrs (23%). While they observed no difference in baseline data, primary outcome or in-hospital mortality it does weaken the results.

4) Surrogate Markers:

RV/LV diameter ratio is a surrogate marker and what are needed are patient oriented, clinically relevant endpoints.

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Case Resolution

Anticoagulation is initiated. Thrombolysis is discussed with the patient as an option. As she remained hemodynamically stable, and age >65 and being diabetic places her at increased risk of bleeding, CDT is offered. She decided on CDT and the treatment is successful without any major bleeding.

Clinical Application

In certain centers and in certain PE patients with high risk of bleeding, ultrasound-facilitated CDT may be as effective and may have a lower intracranial hemorrhage potential than full-dose systemic thrombolytics but more data in needed. The existing evidence is still stronger for systemic thrombolytics over ultrasound-facilitated CDT for hypotensive PE patients.

WHAT DO I TELL MY PATIENT?

You have a large blood clot in your lung. It is in the artery that travels from your heart to your lungs on the right side. This can be life threatening and is currently putting a strain on your heart.
This can be treated with a clot busting medication. However, due to your age and diabetes, you are at higher risk of bleeding from the clot busting medication.
One option is to place a special catheter that reaches all the way to the site of the clot. This catheter stays there for 24hrs and uses a lower dose of the clot busting medicine. It also has an ultrasound device on the catheter that delivers high-frequency sound wave. The ultrasound waves are thought to help the clot busting medicine work better.
This special catheter is a new way to treat blood clots in the lung. There is not as much evidence for this option but it seems to work well and is associated with less bleeding in the brain.

CONCLUSION VS COMMENTARY
COMPARISON

We generally agree that ultrasound-facilitated CDT improved surrogate outcomes with no observed intracranial hemorrhages in patients with acute massive of submassive PE.

Observational Trials Checklist

Did the study address a clearly focused issue?	☑
Did the authors use an appropriate method to answer their question?	
Was the cohort recruited in an acceptable way?	☑
Was the exposure measured to minimize bias	☑
Was the outcome accurately measured to minimize bias?	☑
Have the authors identified all important confounding factors?	?
Was the follow up of subjects complete enough?	
How precise are the results/is the estimate of risk?	?
Do you believe the results?	☑
Can the results be applied to the local population?	?
Do the results of this study fit with other available evidence?	☑

Guest Skeptic: Dr. Essie Reed
EM Chief Resident, University of Buffalo

****Tune into the podcast to hear bonus commentary from PE experts Dr. Jeff Kline and Dr. David Zlotnick**

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Cuts Like a Knife- But you Might also need antibiotics for Skin abscess

Case Scenario:
40 year-old male with history of MRSA complaining of an area of redness and swelling consistent with an abscess on his arm. He has heard that antibiotics may not be necessary after a friend had an incision and drainage (I&D) and did not give her any antibiotics. He denies allergies to antibiotics and has safely taken Sulfa drugs in the past.

Q:

Does TMP/SMX offer a higher clinical cure rate than placebo in patients with a drained uncomplicated cutaneous abscess?

BOTTOM LINE

The addition of TMP/SMX to the treatment of uncomplicated cutaneous abscesses represents an opportunity for shared decision-making.

Trimethoprim-Sulfamethoxazole Versus Placebo for Uncomplicated Skin Abscess

Talan et al. NEJM. 2016

P Min 12 years old with cutaneous abscess for less than 1 week, minimum 2 cm diameter

I Incision and drainage and treatment with TMP/SMX

C Incision and drainage and treatment with placebo

O Primary: Clinical cured abscess – 7 to 14 days after end of treatment period
Secondary: Composite cure, surgical drainage, changes in erythema size, swelling or induration, tenderness, invasive infection, hospitalizations, days missed from work

Exclusion criteria: Indwelling device; suspected osteomyelitis or septic arthritis; diabetic foot, decubitus, or ischemic ulcer; mammalian bite; wound with organic foreign body; infection or another organ system/site; perirectal, perineal or paronychial location; intravenous drug use within previous month and fever; underlying skin condition; long-term care residence; incarceration; immunodeficiency (e.g., absolute neutrophil count <500/mm3, immunosuppressive drugs, active chemotherapy, or known AIDS assessed by subject history); creatinine clearance <50mL/min; cardiac condition with risk of endocarditis; allergy or intolerance to TMP/SMX; taking warfarin, phenytoin, or methotrexate; known G-6-PD or folic acid deficiency; pregnant or lactating; TMP/SMX treatment within 24 hours; concurrent treatment with topical or systemic antibiotic; or enrolled in the study within 12 weeks. Laboratory testing was done at the discretion of the treating clinician.

Author's Conclusion:

In settings in which MRSA was prevalent, TMP/SMX treatment resulted in a higher cure rate among patients with a drained cutaneous abscess than placebo.

Background

Cutaneous abscesses are a very common complaint in the emergency department and we have discussed the management of these before on the SGEM.

One issue was whether or not to pack after I&D? Our bottom line in 2012 was that routine packing of simple cutaneous abscesses might not be necessary (SGEM#13: Better Out than In).

We recently looked at whether irrigation of a cutaneous abscess after I&D reduces the need for further intervention. The SGEM bottom line from that review was that irrigation is probably not necessary (SGEM#156: Working at the Abscess Wash).

Another issue that has been debated over the years is if antibiotics should be routinely prescribed after I&D. We covered a review by Hankin and Everett from 2007 on SGEM#13. It identified that there was very little high quality evidence available on the subject.

They stated: *"A conclusive, multicenter, double-blind, randomized, placebo-controlled clinical trial is lacking and sorely needed."*

The SGEM conclusion at that time was that the evidence did not support using antibiotics routinely in simple cutaneous abscesses even in the era of MRSA.

Now we have a multicenter, double-blind, randomized, placebo-controlled clinical trial to address this issue.

Results 1,265 patients underwent randomization. The median age was 35, 57% male and 45% had wound cultures positive for MRSA.

Primary Outcome

Primary Outcome Clinical Cure: Significant Difference

Modified Intention-To-Treat Analysis

80.5% TMP/SMX Group vs. 73.6% Placebo Group
6.9% difference (95% CI 2.1 to 11.7; P=0.005)
NNT 14

Per-Protocol Analysis

92.9% TMP/SMX Group vs. 85.7% in Placebo Group
7.2 % difference (95% CI 3.2 to 11.2; P<0.001)
NNT 14

Adverse Events: These were similar between TMP/SMX and placebo with most being mild. The most common adverse event reported was GI issues (43% TMP/SMX vs. 36% placebo group). No cases of *Clostridium difficile*– associated diarrhea, no treatment-associated serious or life-threatening adverse events and the discontinuation rate was similar in both groups. There were two deaths in total with one in each group.

TALK NERDY TO ME

We have a surprise for the SGEMers. Dr. David Talan the lead author of this NEJM paper has agreed to come on the show and answer some questions. Listen to the podcast for his answers!

Dr. Talan is considered an authority in the area of acute infections that result in severe morbidity and death. He is currently on the faculty of the Department of Emergency Medicine, and Department of Medicine, Division of Infectious Diseases at Olive Vie-UCLA Medical Center. Dr. Talan also serves on the editorial board of the *Annals of Emergency Medicine.*

Dr. David Talan

1) Consecutive Recruitment:

It was unclear to us if the recruitment of patients was consecutive?

2) Modified Intention to Treat (mITT):

You did a mITT analysis and a per-protocol analysis. Why did you modify the ITT analysis and do you think that really mattered to your results?

3) Dose of TMP/SMX:

You used four single strength pills of TMP/SMX twice a day based on the recommendation at the time *from The Sanford Guide to Antimicrobial Therapy.* The newer Sanford Guide does not recommend this higher dose except in obese patients (BMI>40). So do you think two single strength pills twice a day will work just as well?

TALK NERDY TO ME

4) Secondary Outcomes:
hese can be used as hypothesis generating. You had a number of secondary outcomes that demonstrated TMP/SMX superior to placebo in the per-protocol analysis. Was there an outcome in particular that you think is especially interesting and should be pursued?

5) MRSA Prevalence:
You had a high rate of MRSA (45%). Do you think these results have external validity to populations without such high prevalence?

6) Proper Incision and Drainage:
As part of this study, you trained everyone on how to do an incision and drainage properly. That included irrigating the abscess and packing the abscess. Both of these may not to be necessary for the successful treatment of a simple cutaneous abscess. As an expert in this area what are your thoughts on the standard treatment and do you irrigate and pack your abscesses?

7) Superiority Trial:
This was designed as a superiority trial with a power of 90% to detect an absolute between-group difference of 7.5 percentage e points, assuming a cure rate of 90% in the trimethoprim–sulfamethoxazole group in the per-protocol population. You only found a 7.2% difference in the Per-Protocol Population?

8) Statistical vs. Clinical Significance:
You found a statistical significant difference but do you think this represents a clinical significant difference?

9) What about the Harm?
Adverse events were similar between the two groups with most being mild. Are you worried about C diff or resistance?

10) Advice to EM doctors?
Based on this study and your expertise in the area, what would be your advice to EM doctors in treating uncomplicated cutaneous abscesses?

Case Resolution

You discuss with your patient that in the past there was some limited evidence suggesting that antibiotics may not be of benefit but that there were limitations due to the studies small size. However, a newer, larger study demonstrates that antibiotics are effective in increasing the cure rate for abscesses. After shared decision-making including the risks, benefits, and potential complications of antibiotics, the patient agrees to receive TMP/SMX for his abscess after the incision and drainage is complete.

Clinical Application TMP/SMX should be considered as part of the treatment regimen for the management of cutaneous abscesses.

WHAT DO I TELL MY PATIENT?

You are right, until recently we did not have good evidence that antibiotics were helpful in treating abscesses. However a new well-done study has shown antibiotics can increase the cure rate by 7%. That means we need to treat 14 patients for one more patient to be cured. Antibiotics are not without risk though and there are certain populations that were not included in the study. We should consider TMP/SMX in the treatment of your abscess.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the author's conclusions

Other FOAMed Resources:

- REBEL EM: Trimethoprim-Sulfamethoxazole for Uncomplicated Skin Abscesses?
- EM Nerd: The Case of the Pragmatic Wound
- EM Literature of Note: Are Antibiotics Back in Favor for Abscesses?
- ALiEM: Sulfamethoxazole-Trimethoprim for Skin and Soft Tissue Infections: 1 or 2 Tablets BID?
- Core EM: TMP-SMX vs. Placebo in the Treatment of Superficial Abscesses

RCT Quality Checklist

The study population included or focused on those in the ED	☑
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	☑
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Guest Skeptic: Chip Lange
Emergency Medicine Physicians Assistant, Missouri

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I Wanna Be Sedated But Do I Need to be NPO?

Case Scenario:
5-year-old girl was bit in the face by a dog. She has a complex lower lip laceration that extends beyond the vermillion border with a flap deformity. It will require repair by an oral and maxillofacial surgeon and the patient will require sedation. The patient ate one hour ago and you consider how long to leave her NPO prior to the sedation.

Q:

Do we need to delay procedural sedation of pediatric emergency department patients based on their NPO status?

BOTTOM LINE

It is reasonable not to delay procedural sedation in a pediatric emergency department patients based on their NPO status.

Major Adverse Events and Relationship of Nil per Os Status in Pediatric Sedation/Anesthesia Outside of Operating Room

Beach et al. Anesthesiology. 2016

P Pediatric patients undergoing procedural sedation = any pharmacological intervention made to facilitate invasive procedure outside of OR

I NPO to solids for min 8 hrs, non clear fluids for 6 hrs, clear fluids for min 2 hrs

C Patients who failed to meet NPO criteria

O
a) Rate of aspiration (emesis or food material in pharyngeal cavity and associated with: cough, wheeze, respiratory effort increase, CXR findings, requirement of O2)
b) Major adverse event: aspiration, death, cardiac arrest, unplanned hospital admit

Author's Conclusion:

The analysis suggests that aspiration is uncommon. NPO status for liquids and solids is not an independent predictor of major complications or aspiration in this sedation/anesthesia data set.

Background

Procedural sedation is a somewhat common practice in the emergency department for a number of pediatric cases such as laceration repair, incision and drainage, closed reduction of fractures, and radiographic studies such as CT scans.

The American Society of Anesthesiologists 2011 Practice Guidelines recommends waiting two hours for clear liquids, six hours for light meals and eight hours may be needed in other cases before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia. They recognize that these guidelines may not apply to emergency care.

The ACEP Clinical Policy on procedural sedation and analgesia in the emergency department from 2013 gives a Level B recommendation of not delaying procedural sedation in adults or pediatric emergency department patients based on fasting time.

Pre-procedural fasting for any duration has not demonstrated a reduction in the risk of emesis or aspiration when administering procedural sedation and analgesia.

Results

They had 139,142 procedural sedation/anesthesia encounters identified in the data set. NPO status was known for 107,947 patients, with 25,401 (24%) were not NPO. They observed 75 major complications (62 unplanned admission, ten aspiration, three cardiac arrest and no death).

Primary Outcome

No statistical association between NPO status and major complications or aspiration.

TALK NERDY TO ME

1) Asking the Right Question:

They did answer their question about if any links existed between NPO status and aspiration, pulmonary adverse events, and major adverse events. A prospective observational study can be used to identify associations. However, what we want to know is cause and effect of NPO status of pediatric emergency department patients requiring procedural sedation. It would take a randomized control trial to investigate causation. The trial would need to be very large given the low event rate. And finally, it would need to take place in the emergency department with pediatric emergency patients.

2) Outcome Bias:

Aspiration had a clear definition that was easily measured. However, the definition of major adverse events or complications was recognized as being arbitrary by the authors. They specifically point out that unanticipated intubation or an emergency anesthesia consult may result in some provider bias.

3) Confounders:

While they were able to collect data on the type of practitioner, ASA status, type of procedure and other things they were not able differentiate the type of solid food eaten and if the care had been transferred to an anesthesiologist in the operating room for intubation.

4) Precision of the Results:

Because there were only a few events, the 95% confidence intervals around the point estimate were wide.

5) Applying the Results to your Local Population:

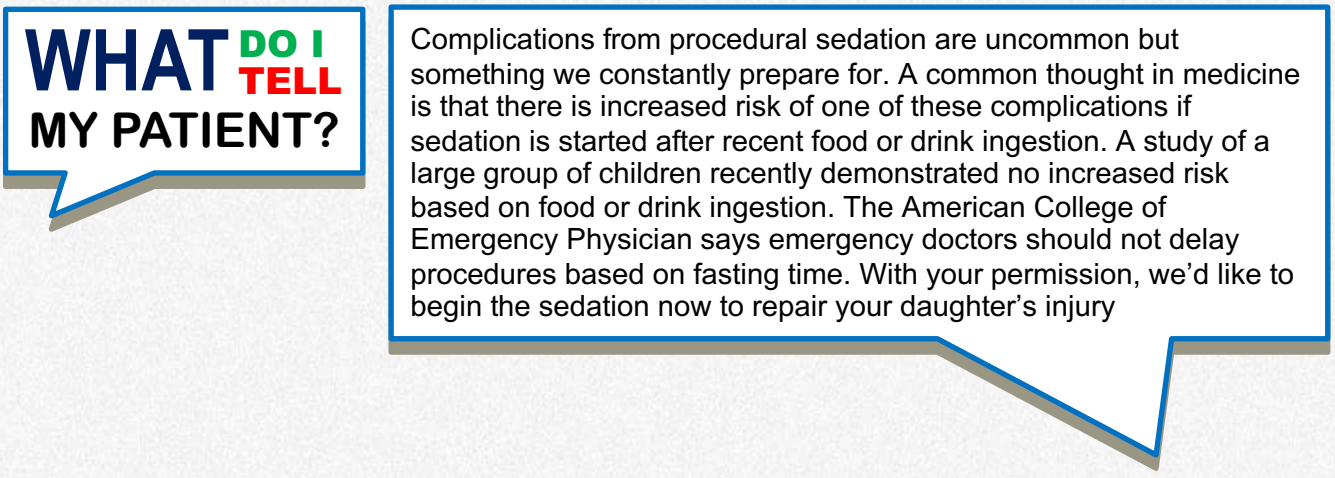
It all depends. The authors note a limitation that *"the providers of the sedation in this particular study were working in high-performance sedation teams*". If your hospital does not have a high-performance sedation team that provides service to your emergency department the results may not apply to your site. In addition, these were mainly elective procedures and only a minority were classified as emergencies and performed by emergency physicians.

Case Resolution

You have an informed discussion with the family regarding their daughter's injury and the risks of sedation. You make a joint decision to proceed with the sedation and have the oral and maxillofacial surgeon perform the laceration repair. The child undergoes the sedation without complications and upon awakening, asks to go home.

Clinical Application

It will always be difficult to risk stratify rare conditions, but this paper offers support to those in favor of more rapid initiation of procedural sedation, regardless of NPO status. I am a little more tacit with adoption of this paper into practice. I support the findings of the paper, but the study was limited for some of the reasons we discussed. The paper does support ACEP's clinical guidelines and adds to the available evidence to support procedural sedation independent of NPO status. However, as always, you must use your judgement.



CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the authors' conclusions.

Other FOAMed Resources:

- LITFL – Peri-procedural Fasting
- PEM Blog – NPO for Sedation
- EMCrit – ACEP Procedural Sedation Update for 2013

Observational Trials Checklist

Did the study address a clearly focused issue?	☑
Did the authors use an appropriate method to answer their question?	☑
Was the cohort recruited in an acceptable way?	☑
Was the exposure measured to minimize bias	☑
Was the outcome accurately measured to minimize bias?	?
Have the authors identified all important confounding factors?	
Was the follow up of subjects complete enough?	☑
How precise are the results/is the estimate of risk?	
Do you believe the results?	☑
Can the results be applied to the local population?	
Do the results of this study fit with other available evidence?	☑

Guest Skeptics: Dr. Bob Edmunds
Emergency Medicine Physician, University of Missouri

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SGEM HOP

Which Febrile Child with Sickle Cell Should get a Chest XRAY?

Case Scenario:
A worried mother brings her 2-year-old child in with a fever of 38.6 C. The female child's medical history is significant for sickle cell disease. The child is uncomfortable appearing, tachycardic, tachypnic and febrile. Mom says the child also has had a runny nose and a mild cough.

Q:
Which febrile children with sickle cell disease presenting to the emergency department should get a CXR to help diagnose acute chest syndrome?

BOTTOM LINE

Adding clinical features such as chest pain, WBC count >18.75 or history of ACS may improve sensitivity of criteria directing the decision to order a CXR in febrile sickle cell children presenting to the ED. A prospective validation study in febrile children with sickle cell disease presenting to the ED using these criteria is needed to determine which children should get a CXR to help diagnose acute chest syndrome.

Which Febrile Children with Sickle Cell Disease Need a Chest XRAY?

Eisenbrown et al. AEM. 2016

P Children 3 months to 21 years with Sickle Cell with a fever over 38.4'C

I Accuracy of WBC count, H & P to rule in or out ACS

C None

O Primary: presence of acute chest syndrome
Secondary: classification and regression tree analysis, sensitivity, specificity, + and – likelihood ratios of constellations of WBC, H & P for ACS

Author's Conclusion:

Children with SCD presenting to the ED with fever and shortness of breath, tachypnea, cough, rales, or chest pain should receive a CXR due to high ACS rates. A higher WBC count or history of ACS in a child without one of those symptoms may suggest the need for a CXR. Prospective validation of these criteria is needed.

Background

Children with sickle cell disease who develop fever are at higher risk of severe bacterial infection than children without sickle cell disease. The National Heart, Lung, and Blood Institute (NHLBI) suggest a routine workup that includes a CBC, blood cultures, and empiric antibiotics (NHLBI Expert Panel Report 2014).

One of the life-threatening infections for which these children are most at risk is acute chest syndrome (ACS). The NHLBI recommend a chest x-ray (CXR) for children with respiratory signs or symptoms (shortness of breath, tachypnea, cough, and/or rales).

Controversy exists as to whether the history and physical exam are sensitive enough to determine which febrile children need a CXR.

Results

There were 1,837 febrile emergency department visits made by 697 children with sickle cell over two years. The median age was 3.5 years and it was a 50/50 male/female 10% (185/1,837) of the febrile sickle cell children presenting to the emergency department met acute chest syndrome criteria.

Primary Outcome

10% (185/1,837) of the febrile sickle cell children presenting to the emergency department met acute chest syndrome criteria.

Secondary Outcome

CART Model

- Using NHLBI guidelines alone, 27 cases of ACS would have been missed if no CXR was done but avoided CXRs in 45% (825/1,838) of children
- Using NHLBI or CP, 23 cases of ACS would have been missed (3%), increased sensitivity to 88% and would avoid CXRs in 43% (781/1,1837) of children
- Using NHLBI or CP or WBC>18.75, 12 cases of ACS would have missed (2), increased sensitivity to 94% and avoid CXRs in 32% (593/1,837) of children
- Using NHLBI or CP or WBC> 18.75 or history of ACS, 4 cases of ACS would have been missed, increased sensitivity to 98% and would avoid CXRs in 23% (430/1,837) of children

Table 2
Test Characteristics of Model in Predicting ACS

	Sensitivity (95% CI)	Specificity (95% CI)	Positive Predictive Value (95% CI)	Negative Predictive Value (95% CI)	Positive Likelihood Ratio	Negative Likelihood Ratio	AUC
NHLBI guideline or chest pain	87.6% (81.9%–92.0%)	45.9% (43.5%–48.3%)	15.3% (13.2%–17.7%)	97.1% (95.6%–98.1%)	1.6	0.3	0.667
NHLBI or chest pain or WBC count >18.75 × 10^9/L	93.5% (88.9%–96.6%)	35.2% (32.9%–37.5%)	13.7% (12.0%–16.0%)	98.0% (96.5%–99.0%)	1.4	0.2	0.643
NHLBI or chest pain or WBC count >18.75 × 10^9/L or history of ACS	97.8% (94.6%–99.4%)	25.8% (23.7%–28.0%)	12.9% (11.2%–99.8%)	99.1% (97.6%–99.8%)	1.3	0.1	0.618

ACS = acute chest syndrome; AUC = area under the curve; NHLBI = National Heart, Lung, and Blood Institute.

TALK NERDY TO ME

Listen to the podcast to hear Dr. Brousseau's responses to our questions!

- You used ICD-9 codes to identify children with sickle cell disease. Is this a validated method?
- You considered a patient having shortness of breath if something was documented on the chart but the absence of documentation of respiratory symptoms was treated as a negative. How do you think that could have influenced your results?
- We were impressed you used Fleming et al. Lancet 2011 to determine tachypnea, a paper we have covered on SGEM #68.
- Why did you pick WBC as the laboratory test when other tests also had significant differences?
- How did you decide >18.75 would be the cut off?
- You used CART analysis to determine predictive factors for a diagnosis of ACS. Can you explain the CART process?
- What is an acceptable miss rate for acute chest syndrome?
- This was a retrospective chart review. While providing some information you do need to prospectively validate the results.

Case Resolution

You obtain a CXR in your febrile patient with sickle cell disease, along with a complete blood count and blood cultures, and start empiric antibiotics. The CXR is negative for an acute infiltrate, and the patient is admitted to the hospital for further care.

Clinical Application

Getting a CXR in pediatric sickle cell disease patients presenting to the emergency department with NHLBI consensus criteria or chest pain will identify most cases of acute chest syndrome. However, getting a CXR in patients with WBC >18.75 count or history of acute chest syndrome is associated with an increased sensitivity while decreased.

WHAT DO I TELL MY PATIENT?

During your discussion with the patient's mother, you explain that the minimal respiratory symptoms her daughter has combined with a negative CXR make you feel comfortable that the patient does not have acute chest syndrome. However, febrile patients with sickle cell disease are still at high risk of serious bacterial illness, and you would like to admit her daughter to the hospital for treatment.

Checklist for Chart Review

Abstract Training – Were the abstractors trained before the data collection?	☑
Case Selection Criteria –Were the inclusion and exclusion criteria for case selection defined?	☑
Variable Definition – Were the variables defined?	☑
Abstraction Forms – Did the abstractors use data abstraction forms?	☑
Performance Monitored – Was the abstractors' performance monitored?	☑
Binding to Hypothesis– Were the abstractors aware of the hypothesis/study objectives?	
Inter Rater Reliability (IRR) Mentioned – Was the interobserver reliability discussed?	☑
IRR Tested – Was the interobserver reliability tested or measured?	☑
Medical Record Identified – Was the medical record database identified or described?	☑
Sampling Method – Was the method of sampling described?	☑
Missing Data Management Plan – Was the statistical management of missing data described?	
Institutional Review Board Approved – Was the study approved by the institutional or ethics review board?	☑

Other FOAMed Resources:

- EM Best Case Ever 38: Sickle Cell Acute Chest Syndrome
- EM Cases Episode 68: Emergency Management of Sickle Cell Disease
- St.Emlyn's: NICE faces the sickle
- Pediatric EM Morsels: Acute Chest Syndrome

Guest Skeptic: Dr. Corey Heitz
Associate Professor, Virginia Tech Carilion School of Medicine
CME Editor, Academic Emergency Medicine
Associate Editor, AAEM MedEdPORTAL

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SGEM HOP

The Management of Bronchiolitis in Community Hospitals

Case Scenario:
6 month-old has cough, fever, and *"noisy breathing."* Otherwise healthy. Immunizations UTD. She is febrile, pulse 150bpm, RR 50bpm, and O2 sat 93% on room air, BP is 78/48. Clear nasal discharge and increased work of breathing, with subcostal indrawing. Cardiac exam is unremarkable, there is diffuse wheezing throughout for this first time.

Q:

How is bronchiolitis managed in community hospitals?

BOTTOM LINE

There seems to be a knowledge gap when it comes to managing bronchiolitis in the community hospital setting.

Management of Bronchiolitis in Community Hospitals in Ontario: a Multicentre Cohort Study

Plint et al. CJEM. 2016

P Children less than 12 months in community ED with discharge dx of bronchiolitis

I N/A

C N/A

O Primary: Patient disposition (admit, discharge, transfer)
Secondary: ED and inpatient management (medications, investigations, discharge meds)

Author's Conclusion:

Infants with bronchiolitis receive medications and investigations for which there is little evidence of benefit. This suggests a need for knowledge translation strategies directed to community hospitals.

Background

It has been said that there are two seasons in North America… Bronchiolitis season and August. We know that bronchiolitis presents a significant burden of disease not only to patients and families, but the health-care system as well.

Although the vast majority of infants with bronchiolitis can be managed with supportive care at home, due to its high incidence, it is the number one reason for infants to be hospitalized (Njoo et al 2001, Langley et al 2003, Craig et al 2007 and Shay et al 1999).

Since bronchiolitis is a clinical diagnosis, there is no test, including viral testing and radiography, which rules it in or out (Schuh et al 2007).

Background

Sadly, despite multiple guidelines (NICE, AAP, CPS), there has also been no "*magic bullet"* in terms of treatment.

Although there has been some benefit shown with inhaled hypertonic saline (Zhang et al 2015) and early research on combining nebulized epinephrine and systemic steroids is promising, there is concern about the ongoing use of unproven therapies such as beta-agonists, steroids alone and antibiotics.

Existing research has helped to quantify the bronchiolitis practice patterns of physicians in children's hospitals. Plint et al, in 2004, found that Canadian pediatric emergency departments continued to use bronchodilators and steroids for children with bronchiolitis.

Since a number of these infants are seen in community hospital settings, the practice patterns of physicians in these environments needs further illumination.

Results

There were 543 children included in this study from 28 hospitals. The average age was 6 months and 60% of children were male. The mean gestational age was just under 39 weeks.

Results

Primary Outcome

Patient disposition

- Admissions: 30% of patients were admitted to hospital (28% on index visit and 2% on repeat visit within 21 days).
- Transferred: 3% were transferred to another hospital
- Return Visit: 7% returned to the Emergency department within 21 days

Secondary Outcome

- 80% received bronchodilators in the emergency department and 45% were prescribed them at discharge
- 31% received corticosteroids in the emergency department and 24% were prescribed them at discharge
- 5% received antibiotics in the emergency department and 13% were prescribed them at discharge
- 55% had a chest x-ray
- 23% had a nasal viral studies swab
- 7% had blood work
- 3% had a urine studies

This study also examined community inpatient management of children with bronchiolitis and found that almost all received bronchodilators (94%) and half received corticosteroids. Inpatients had more investigations than children seen in the emergency department except for chest x-rays. Inpatients also received more bronchodilators (49%), corticosteroids (36%) and oral antibiotics (19%) at discharge.

Results

Table 3. Medications received during the initial emergency department visit, during admission, and prescribed upon discharge

	ED (n = 543)				Inpatient wards (n = 161)*			
Medication Received	n (%)	95% CI for %	IQR† (%)	ICC‡	n (%)	95% CI for %	IQR (%)§	ICC§
Any bronchodilators	433 (79.7)	75-84.5	70.3-88.3	0.030	152 (94.4)	90.2-98.6	92-100	0.020
Salbutamol	398 (73.3)	67.0-79.6	59.3-85.4	0.060	148 (91.9)	86.9-97.0	86-100	0.023
Epinephrine	31 (5.7)	3.3-8.0	0-8.1	0.013	27 (16.8)	11.6-21.9	0-20	0
Ipratropium bromide	92 (16.9)	11.9-22.0	0-21.1	0.049	18 (11.2)	4.3-18.1	0-17	0.068
Any corticosteroids	167 (30.8)	22.7-38.8	19.1-47.9	0.107	81 (50.3)	37.7-63.0	29-75	0.120
Oral corticosteroid	106 (19.5)	14.1-24.9	10.1-31.7	0.050	40 (24.8)	12.9-36.8	0-33	0.161
Inhaled corticosteroid	87 (16.0)	8.6-23.4	1.0-31.7	0.153	54 (33.5)	18.2-48.9	9-63	0.254
IV corticosteroids	0	-	-	-	5 (3.1)	-	-	0.046
Any antibiotics	29 (5.3)	2.1-8.6	0-9.9	0.060	49 (30.4)	21.1-39.8	17-50	0.047
Oral antibiotic	22 (4.0)	1.4-6.8	0-6.4	0.048	47 (29.1)	19.8-38.6	11-45	0.052
IV antibiotics	7 (1.3)	0.0-2.6	0-0	0.029	6 (3.7)	0.0-9.0	0-0	0.164
IV fluids	30 (5.5)	-	0-5.9	0.040	19 (12.1)	-	0-18	0.171
Oxygen	17 (3.1)	-	0-3.2	0.010	29 (18.0)	-	0-18	0.239
Medication Prescribed	ED discharge (n = 378)				Inpatient wards discharge (n = 161)			
Any bronchodilators	169 (44.7)	37.5-51.9	21.5-50.0	0.047	79 (49.0)	30.0-68.1	25-70	0.378
Oral bronchodilator	35 (9.3)	4.2-14.3	0-16.3	0.094	25 (15.5)	0.8-30.2	0-22	0.441
Salbutamol MDI	137 (35.7)	27.0-44.5	6.7-37.5	0.106	54 (33.5)	22.3-44.8	8-67	0.098
Any corticosteroids	89 (23.5)	14.4-32.7	5.4-31.7	0.168	58 (36.0)	24.3-47.7	14-56	0.106
Oral corticosteroid	39 (10.3)	6.4-14.3	0-18.3	0.028	23 (14.3)	7.8-20.8	0-22	0.025
Inhaled corticosteroid	57 (15.0)	5.6-21.9	0-19.4	0.200	46 (28.6)	14.4-40.3	9-56	0.173
Oral antibiotic	48 (12.70)	7.4-18.0	0-29.2	0.070	30 (18.6)	11.2-26.0	0-25	0.029

*Children admitted to the inpatient wards have their ED management described under the "ED" column and their inpatient management described separately under "inpatient" management.
†Interquartile range (IQR) of the percentage of patients with the specified outcome across the study hospitals.
‡Intracluster correlation co-efficient (ICC)
§Data from only 18 hospitals included in these calculations, as the remaining hospitals had no inpatient admissions.

Table 4. Investigations completed during the index emergency department visit and during admission on inpatient wards

	ED (n = 543)				Inpatient wards (n = 161)			
Investigation	n (%)	95% CI for %	IQR*	ICC†	n (%)	95% CI for %	IQR‡	ICC‡
Chest x-ray	296 (54.5)	46.1-62.9	30.9-60.7	0.098	49 (30.4)	20.9-39.9	0-36	0.051
Nasal viral studies	123 (22.7)	10.3-34.9	1.0-28.0	0.360	53 (32.9)	15.9-50.0	6-73	0.337
Any blood work	37 (6.8)	3.8-9.8	0-8.5	0.030	47 (29.2)	17.6-40.8	10-50	0.128
CBC	28 (5.2)	-	0-7.7	0.009	33 (20.5)	-	0-36	0.101
Electrolytes	9 (1.7)	-	0-0	0.020	19 (11.8)	-	0-30	0.182
Urea and/or creatinine	9 (1.7)	-	0-0	0.020	23 (14.3)	-	0-50	0.242
Blood gas	4 (0.7)	-	0-0	0	10 (6.2)	-	0-10	0.023
Blood culture	22 (4.1)	-	0-3.7	0.016	15 (9.3)	-	0-14	0.054
Any urine studies	16 (3.0)	1.3-4.5	0-3.2	0.007	17 (10.6)	5.5-16.6	0-17	0.022
Urine routine only	12 (2.2)	-	0-3.1	0.003	7 (4.4)	-	0-6	0
Urine microscopy	10 (1.8)	-	0-1.4	0.007	15 (9.3)	-	0-17	0.005
Urine culture	3 (0.6)	-	0-0	0	3 (1.9)	-	0-0	0.053

*Interquartile range (IQR) of the percentage of patients with the specified outcome across the study hospitals.
†Intracluster correlation co-efficient (ICC)
‡Data from only 18 hospitals included in these calculations as the remaining hospitals had no inpatient admissions.

TALK NERDY TO ME

Listen to the podcast to hear Dr. Plint's responses to our questions!

Participation Rate:

Only 28 out of 76 community hospitals agreed to participate. How do you think this impacted the results if at all?

Hypertonic Saline:

Zhang et al 2015 showed that inhaled hypertonic saline not only benefits inpatients with bronchiolitis, but also significantly reduced the risk of hospitalization from the emergency department. We notice that the use of inhaled hypertonic saline was not studied in this research. Could you please explain why?

Site Differences:

You had very different types of community hospitals participate. They ranged from <10,000 visits/year to >100,000 visits/year. Some were less than 40km from a pediatric referral site while one was more than 1,500km away. Seven sites had clinical practice guidelines for managing patients with bronchiolitis. Can you comment on the strengths and weaknesses of such a diverse participating community hospitals and do you think the results would have been different from a referral hospital?

Old Date:

Data was collected from two bronchiolitis seasons about 10 years ago (December 2005 to April 2006 and December 2006 to April 2007). Do you still think the management of bronchiolitis is the same in 2016-2017 bronchiolitis season?

Knowledge Gap:

We are always talking about how it can take over ten years for high-quality, clinically relevant information to reach the patient's bedside. What do you think is the main reason for a knowledge gap observed for the management of bronchiolitis and how do you think this gap could be closed?

Case Resolution

After a thorough history and careful physical exam, you reassure the parents that their child has bronchiolitis without any ancillary tests or treatments. The child is feeding well in the emergency department and is discharged home with advice around supportive care, including nasal toileting, and appropriate return to emergency department instructions.

Clinical Application

In children with bronchiolitis, clinicians should not be tempted to perform investigations and prescribe treatments that have little benefit or are unproven. Bronchiolitis is a clinical diagnosis and does not require any specific investigations or treatment.
Although it was not discussed in this article, there has been some benefit shown with the use of hypertonic saline. However, conservative treatment with supportive therapy alone is the mainstay.

WHAT DO I TELL MY PATIENT?

Your child has a very common virus infection in their chest that is making them congested and wheezy. I wish there was a medicine that I would know could make this better but there doesn't seem to be much that works for children like yours. The good news is that almost all children with this infection get fine at home. We are going to teach you how to keep your child's nose clear. If your child gets worse, starts to have more trouble breathing, isn't drinking, is becoming tired or unresponsive, or if you're just worried they look sicker we want you to return to the emergency department.

Thank you to PedsEM super hero Dr. Anthony Crocco from SketchyEBM for filling in on this SGEMHOP episode. We are really interested in engaging the EM community and to find out what you think about this SGEMHOP episode? What questions do you have for Dr. Amy Plint and her team on the management of bronchiolitis? Join the conversation on Twitter (#SGEMHOP), Facebook or the SGEM blog. The best social media feedback will be published in CJEM.

Observational Study Checklist

Did the study address a clearly focused issue?	☑
Did the authors use an appropriate method to answer their question?	☑
Was the cohort recruited in an acceptable way?	☑
Was the exposure measured to minimize bias	☑
Was the outcome accurately measured to minimize bias?	☑
Have the authors identified all important confounding factors?	☑
Was the follow up of subjects complete enough?	☑
How precise are the results/is the estimate of risk?	
Do you believe the results?	☑
Can the results be applied to the local population?	☑
Do the results of this study fit with other available evidence?	☑

Other FOAMed Resources:

- EM Cases Episode 59b: Amy Plint on the Management of Bronchiolitis
- EM Cases Episode 59 – Bronchiolitis
- Paediatrics for Primary Care – Why bronchiolitis doesn't get better with inhalers and how understanding "why?" is better than "do that!"
- Pediatric EM Playbook – Bronchiolitis
- Don't Forget the Bubbles – Bronchiolitis

Guest Skeptic: Dr. Chris Bond, University of Calgary
Clinical Lecturer, University of Calgary
Founder, SOCMOB blog
#FOAM blogger, dogma basher, wine and food supergeek

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HYPRESS - Doesnt Got the Power

Case Scenario:
66-year-old female with fever and cough. PMH of DM, HTN, and hyperlipidemia. Initial vitals, BP 154/87 mmHg, HR 132 BPM, RR 28 bpm, O2 sat 94%, T of 38.8C. You get two peripheral IV lines, 2L O2 Nasal cannula, and cardiac monitor. Start 2: NS bolus, pan-cultures, and give empiric antibiotics for community acquired pneumonia (CAP). CXR confirms CAP. Despite IV fluids and antibiotics, patient's sys BP trends down toward 120s. You remember reading about a recent study that talked about giving hydrocortisone early in the spectrum of sepsis before shock.

Q:

Does the use of hydrocortisone in patients with severe sepsis prevent the development of septic shock?

BOTTOM LINE

The use of hydrocortisone in adult patients with severe sepsis to prevent septic shock cannot be recommended at this time.

Effect of Hydrocortisone on Development of Shock among Patients with Severe Sepsis: The HYPRESS Randomized Clinical Trial

Keh et al. JAMA. 2016

P Adults in intermediate care units or ICU's in Germany that met criteria of: evidence of infection, 2 SIRS, evidence of organ dysfunction for more than 48 hours

I Hydrocortisone IV bolus of 50 mg, then 24 hour infusion 200 mg for 5 days, 100 mg on day 6 and 7, 50 mg on days 8 and 9, 25 mg on days 9 and 10

C Placebo – 155 mg of lyophilized mannitol

O Primary: Septic shock within 14 days
Secondary: Time until septic shock or death, mortality and duration in ICU/hospital, vital status at 28,90 and 180 days
AE: Secondary infection, weaning failure, weakness, GI bleed, Hyperglycemia

Exclusion criteria:

Main exclusion was septic shock (hypotensive despite adequate fluid resuscitation or needing vasopressors for more than four hours). Other exclusions included: younger than 18 years of age, hypersensitivity to hydrocortisone or mannitol, having a history of regularly on glucocorticoids, pregnant, breast feeding, moribund or had a do not resuscitate order.

Author's Conclusion:

"Among adults with severe sepsis not in septic shock, use of hydrocortisone compared with placebo did not reduce the risk of septic shock within 14 days. These finding do not support the use of hydrocortisone in these patients."

Background

We have covered sepsis a number of times on the SGEM.
SGEM#44: Pause (Etomidate and Rapid Sequence Intubation in Sepsis)
SGEM#69: Cry Me A River (Early Goal Directed Therapy) ProCESS Trial
SGEM#90: Hunting High and Low (Best MAP for Sepsis Patients)
SGEM#92: ARISE Up, ARISE Up (EGDT vs. Usual Care for Sepsis)
SGEM#113: EGDT – ProMISe(s) ProMISe(s)

One thing we have not covered is the use of steroids in treating sepsis.

The Surviving Sepsis Campaign 2016 was just published updating the 2012 guidelines. The new guidelines continue to give a weak recommendation based on low quality evidence for the use of intravenous hydrocortisone at a dose of 200mg per day in patients with refractory septic shock (i.e. inadequate response to fluid resuscitation and vasopressor therapy).

There have been some changes in the definitions for sepsis and septic shock Singer et al JAMA 2016. This is important to consider when looking at the study we are going to be reviewing today.
REBEL EM did a summary piece of the Singer et al paper entitled Sepsis 3.0.

The overall summary points were:

Sepsis = life-threatening organ dysfunction caused by a dysregulated host response to infection
Septic Shock = Need for Vasopressors and Lactate >2 mmol/L
Severe Sepsis is out
SIRS is out and qSOFA/SOFA are in

Background

SEPSIS

Systemic Inflammatory Response Syndrome (SIRS) Criteria:

A temperature over 38C or less than 36C
A heart rate over 90 beats/min
A respiratory rate over 20 breaths/min or PCO2 less than 32mmHg
A WBC count less than 4,000 or over 12,000 or greater 10% immature forms

Sepsis: At least two of the four SIRS + infection

Severe Sepsis: Sepsis + hypotension and end organ failure
Hypoxia, renal failure, hepatic failure, coagulopathy, hypotension or lactate greater than 2mmol/l

Septic Shock: Severe sepsis and hypotension refractory to fluid treatment or lactate greater than 4mmol/l

#FOAMed resources available that discuss the issue:

- FOAMCast: Sepsis – Redefined
- St. Emlyn's Blog: Holy Smokes! Batman, the SOFA and the Latest Sepsis Definitions
- First10EM: Sepsis 3.0?
- PulmCrit(EMCrit): Top 10 Problems with the new Sepsis Definition
- Intensive Care Medicine Working Knowledge: Sepsis 3 – The Rise of the SOFA
- EMCrit: Sepsis 3.0 with Melv Singer
- EMCrit: Wee – Cliff Deutschman with Additional Thoughts on Sepsis 3.0
- Intensive Care Network: Sepsis is Not a Disease
- PulmCrit(EMCrit): Bad news for Sepsis-3.0: qSOFA Fails Validation

The recommendations for hydrocortisone in refractory septic shock are mostly based on two randomized clinical trials (Annane et al JAMA 2002 and Sprung et al NEJM 2008), but subsequent meta-analyses have had more mixed results (Sligl et al Clin Infect Dis 2009 and Annane et al Cochrane 2015). Shock reversal was consistently improved irrespective of disease severity; however, mortality outcomes were not as consistently improved.
Therefore, it has been hypothesized that early hydrocortisone administration could possibly prevent septic shock by attenuating a patient's inflammatory response.

Results

There were 9,953 patients with severe sepsis or septic shock screened for inclusion. A total of 380 were randomized to receive hydrocortisone (n=190) or placebo (n=190). The mean age was 65 years with 65% being male. See table below for details on the primary outcome, secondary outcomes and adverse events.

Primary Outcome

No statistical difference in developing septic shock within 14 days. 21% (36/170) hydrocortisone vs. 22.9% (39/170) placebo, p= 0.70.

Outcome	Placebo Arm	Hydrocortisone Arm	p Value
Septic Shock	22.9%	21.2%	0.70
28d Mortality	8.2%	8.8%	0.86
90d Mortality	16.7%	19.9%	0.44
180d Mortality	22.2%	26.8%	0.32
Secondary Infections	16.9%	21.5%	0.26
Weaning Failure	8.5%	8.6%	0.96
Muscle Weakness	23.8%	30.7%	0.16
Hyperglycemia	81.5%	90.9%	0.009
Delerium	24.5%	11.2%	0.01

Secondary Outcome

No statistical differences in mortality at 28, 90 or 180 days. More delirium was noted in the placebo arm (24.5%) vs. hydrocortisone arm (11.2%).

Adverse Events

No statistical difference in adverse events except more episodes of hyperglycemia with hydrocortisone arm (90.9%) vs. placebo arm (81.5%).

TALK NERDY TO ME

This was a well done, double-blinded, placebo controlled, randomized, multi-centered trial.

1) Statistical Analysis:

2) One of the main issues with this study was the statistical analysis. The study was planned to detect an absolute difference of 15% between the treatment group and placebo group with a significance level of 0.05 and power of 0.8. They assumed 40% of the patients in the placebo group would have septic shock. Then they did a modified Intention-to-treat analysis.

- **Over Estimated Prevalence** – They over estimate the prevalence of patients in the placebo group that would have septic shock. The assumption was 40% and the observed rate was only 23%. This can happen in research studies but as prevalence goes down the required sample size goes up.
- **Effect Size** – They designed the study to detect an absolute difference of 15% between the treatment group and the placebo group. It was postulated in part that 15% represented a meaningful difference that could change clinical practice. This would mean a NNT of 7 to prevent one patient from progressing to septic shock. There are many other treatments we provide that have much lower NNTs. Perhaps a 5% difference or NNT of 20 would be enough to change clinical practice?
    - This study ended up being underpowered. Check out Josh Farkas' great post about power on the PulmCrit (EMCrit) blog.
- **Modified Intention-to-Treat Analysis:** They did not analyse all patients randomized but rather did a modified ITT. This could have introduced bias into the results, which would favour the treatment group.

2) Measurement Bias:

Another issue is measurement bias. Progression from severe sepsis to septic shock is not a very precise measure. It is somewhat subjective despite being based on quantitative measures. They did define septic shock as *"sepsis-induced hypotension despite adequate volume status for longer than 4 hours (ie, mean arterial pressure <65 mm Hg, systolic arterial pressure <90 mm Hg, or the use of vasopressors to keep mean arterial pressure ≥65 mm Hg or systolic arterial pressure ≥90 mm Hg)."* So how much fluid is *"adequate"* to treat hypotension?

3) Clinical vs. Statistical Significance:

Another issue in this study is the issue of clinical vs. statistical significance. Even if the study was properly sized to detect smaller difference (5%) and that was statistically significant it may not be clinically significant.

- Do patients care if they progress from severe sepsis to septic shock? This is a disease-oriented outcome not a patient oriented outcome. A more patient oriented outcome would be survival with good function.

In the end this was an underpowered study that failed to detect a statistical difference in a surrogate marker between hydrocortisone and placebo in patients with severe sepsis. Therefore we cannot reject the null hypothesis.

Case Resolution

In our patient despite the steadily dropping blood pressure, we choose not to give a dose of hydrocortisone.

Clinical Application

In patients with severe sepsis without septic shock, continue IV fluids, antibiotics and vasopressors. Only consider hydrocortisone to blunt the inflammatory response in patients with refractory septic shock.

WHAT DO I TELL MY PATIENT?

Your blood pressure has begun to drop. We are going to try and improve your blood pressure by giving you intravenous fluids and a special drug. This will hopefully work for you and give more time for the antibiotics to help fight the infection. Steroids have been tried in the past but we do not have any good evidence that they work.

CONCLUSION VS COMMENTARY COMPARISON

We generally agree with the authors' conclusions with the caveat that it was an underpowered study.

Other FOAMed Resources:

REBEL EM: The HYPRESS Trial: Early Steroids to Prevent Septic Shock

The Bottom Line: HYPRESS – Do Steroids Prevent Shock in Patients with Sepsis

PulmCCM: Corticosteroids for sepsis didn't prevent septic shock (HYPRESS trial)

Wiki Journal Club: HYPRESS

RCT Quality Checklist

The study population included or focused on those in the ED	
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	
The study patients were recruited consecutively (i.e. no selection bias)	
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	☑
All groups were treated equally except for the intervention	?
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Guest Skeptic: Dr. Salim Rezaie
Faculty Physician, Greater San Antonio Emergency Physicians
Founder/Creator: REBEL EM and REBEL Cast
Co-creator/Co-founder: Teaching Institute

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Stuck in the Middle with Food (Glucagon for Esophageal Foreign Body Impaction)

Case Scenario:

28-year-old man that presents to the ED with difficulty swallowing. He was eating then said it felt like *"something got stuck"* in his throat. History of esophageal strictures, and this has happened to him before but he thought if he washed the food down with enough fluids he wouldn't have a problem.

Q:

Is glucagon safe and effective for the management of esophageal foreign body impaction?

BOTTOM LINE

Glucagon has a low success rate for EFBI, does not seem to offer much benefit over observation alone and is associated with adverse events like vomiting.

Effectiveness of Glucagon in Relieving Esophageal Foreign Body Impaction: a Multicenter Study

Bodkin et al. AJEM. 2016.

P Any adults or pediatric patient with EFBI

I Glucagon Administration

C Patients who did not receive glucagon for EFBI

O Efficacy was defined as resolution of symptoms within 60 minutes after administration of glucagon. Patients who vomited within 60 minutes of receiving glucagon were considered not successful.

Author's Conclusion:

Glucagon-related resolution occurred in 14.2% of patients and was not significantly different compared with those that did not receive glucagon (10.3%). Concomitant medication administration was associated with lower success. Overall, glucagon had a low success rate, was related to adverse effects, and does not offer advantages for treatment.

Background

Esophageal foreign body impaction (EFBI) is the most common foreign body impaction seen in emergency departments in the United States and accounts for about 75% of cases. Although estimates vary, the majority of foreign body impactions are meat boluses. In addition, the clinical presentation of these cases is complicated by the presence of baseline esophageal pathology, ranging anywhere from 30 to 90% (Weant and Weant, Eisen et al, Sodeman et al, Al-Haddad et al and Tibbling et al).

Current guidelines for the management of foreign body impaction include endoscopic treatment options like food extraction and advancement of the bolus into the stomach, pharmacologic interventions such as glucagon, and plain old observation or expectant management (Eisen et al).

Guidelines on the management of ingested foreign bodies state that glucagon may be used in the setting of food bolus impaction while endoscopic therapy is being coordinated due to the fact that it is relatively safe but its use shouldn't delay definitive endoscopic removal (Eisen et al).

Glucagon exerts its effect by relaxing smooth muscle and lowering esophageal sphincter resting pressure (Christiansen et al). Glucagon monotherapy is frequently used to manage food bolus impaction despite having variable success rates (ranging from 9% to 38%) (Al-Haddad et al) and a financial cost.

Glucagon administration also has the potential to cause adverse effects such as hypersensitivity reactions, hypotension, nausea, vomiting, and dizziness (Eli Lilly and Company).

Results

This study identified 127 patients who received IV or IM glucagon in the study period, accounting for 133 doses of glucagon.
Most patients were male (67%) with a median age of 35 years (range of 2 to 89 years). Underlying esophageal abnormalities were present in 17% of patients. Food was the most common EFBI and 84% of patients required endoscopy.
The control group was made up of 29 patients who did not receive glucagon for their EFBI. These patients were about 20 years older (median age 35.5 glucagon vs. 55 control) and received less concomitant medication (56% glucagon vs. 7% control).

Primary Outcome

No difference 14.2% (glucagon) vs. 10.3% (control) p=0.59

Adverse Events

Vomiting occurred in 16/127 (12.6%) of patients who received glucagon.

Of the patients who did not experience resolution of their symptoms after glucagon, a large majority (n=92 or 84.4%) required endoscopy; 89.7% of control patients required endoscopy. When endoscopy was performed, no major adverse events were reported.

Glucagon for Esophageal Foreign Bodies

Lead Author	Total Patients	Type of Study	Outcome	Glucagon Success Rate	Placebo Success Rate	N/V
Bodkin et al (2016)	156	Retrospective Review	Relief of Obstruction	14.2%	10.3%	12.6%
Haas et al (2016)	750	Retrospective Review	Relief of Obstruction	39.5%	---	2.5%
Thimmapuram et al (2013)	192	Retrospective Review	Relief of Obstruction	32.8%	---	???
Al-Haddad et al (2006)	85	Retrospective Review	Relief of Obstruction	32.6%	---	0%
Sodeman et al (2004)	222	Retrospective Review	Relief of Obstruction	9.4%	17.2%	---
Tibbling et al (1995)	43	Prospective Double-Blind RCT	Relief of Obstruction	37.5%	31.6%	0%
Berggreen et al (1993)	76	Prospective Cohort	Relief of Obstruction	25%	---	---
Trenkner et al (1983)	19	Prospective Cohort	Relief of Obstruction	37%	---	---

TALK NERDY TO ME

1) Low Success Rate:

The success rate in this trial for glucagon was only about 14%, compared to several other trials where the success rate for both glucagon and placebo arms hovers around 30%. The authors explain the potential reason for this difference as lying in their definition for efficacy as resolution of symptoms within 60 minutes after administration of drug, where other studies have defined success as resolution of symptoms at any point during the emergency department visit.

This seems like an appropriate method to be able to attribute the success to the glucagon, but if other medications were co-administered (as they were in more than 50% of the glucagon patients), it might be difficult to say that the resolution of symptoms was definitely due to the glucagon versus one of the other interventions or just spontaneous resolution.

2) Confounding Variables:

Some confounding variables were collected (age, sex, type of foreign body, esophageal abnormality and concomitant medication) while others were not. They only described the type of EFBI in terms, of food, coins, etc.

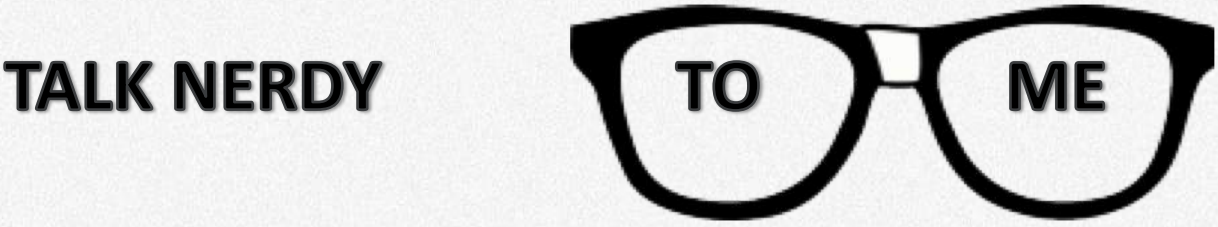
There is literature to suggest different types of food may matter. For example, meat causing an EFBI is less likely to respond to glucagon, probably because of its rigid structure (Sodeman et al).

The authors also failed to describe whether or not patients had experienced an EFBI in the past. I think they tried to get at this by describing underlying esophageal abnormalities, but again it seems like a previous visit for an EFBI is predictive of success/failure (Sodeman et al).

3) Vomiting:

Patients who vomited within 60 minutes of glucagon administration were not deemed successful. This was because it is not the proposed mechanism of action of glucagon for the relief of EFBI. However, vomiting is a known side effect of glucagon and they reported 16 patients (13%) receiving glucagon vomited. How many of those had resolution of the EFBI?

Also, even though the authors commented that the intervention (glucagon) had the potential to result in adverse effects, they didn't describe this in the control group. One might assume that this meant that 16 patients (or 13%) in the glucagon group vomited compared with zero in the control group, but this wasn't described. Therefore, it's not clear that they can actually draw this conclusion.



4) Small Numbers and Unknown Precision:

The number of patients in the control group was small, only 29. Even though the authors didn't find a difference between the groups with regard to symptom resolution, there was no discussion of how large of a sample size they would have needed to detect a certain difference between groups (e.g. power discussion). However, they did try to increases their numbers by performing this at two sites.

The other point is the precision of the point estimate. They provided the percentage of patients who had resolution of their EFBI with glucagon and in the control group but they did not give a 95% confidence interval. This means we do not know the precision of the point estimate.

5) Retrospective Chart Review (Observational Study):

This is the biggest limitation of this study. We can only conclude associations. What we would like to see is a multicenter, blinded, randomized control trial, with a standardized protocol, properly powered with a patient oriented outcome and an intention to treat analysis to determine the efficacy and safely of glucagon in treating EFBI.

One of the author, Dr. Kyle Weant (EM Pharmacist), was not available to join us in recording the SGEM episode but kindly sent some comments:

"So the challenge with this study was that everyone gets glucagon, that's why the control group was so small. We would have loved more but current practice prohibits this unfortunately. The time frame was chosen largely based on the change in CPOE systems and so we were limited by that in acquiring data. That being said, it still ended up being one of the largest trials of this therapy. There was no discussion of power because this was a retrospective trial whose patient numbers were dictated by time, not enrollment. Also, it would be challenging to do a power calculation that would be accurate because it relies on existing data on the incidence of success of this therapy, which we don't really have a good handle on. This is definitely a limitation and it could be that we didn't have enough patients. That being said, if we don't find a difference over a multiyear, multisite investigation, one could suggest that any difference that does exist isn't clinically relevant."

Clinical Application

Glucagon doesn't appear to offer additional benefit over expectant management for EFBI, may potentially result in adverse effects, and also has costs associated with it. The data makes sense in that it generally fits with what else is out there, but it doesn't seem like it is strong enough to change practice on its own. Endoscopy for either management or diagnosis of underlying abnormal esophageal anatomy should be performed.

Case Resolution

You discuss with the patient that glucagon is sometimes used to treat esophageal foreign body impactions, but it doesn't work much better than just observation alone and could result in nausea or vomiting. You call the gastroenterologist consultant to arrange for an emergent endoscopy for your patient if the impaction doesn't resolve spontaneously.

WHAT DO I TELL MY PATIENT?

You probably have food stuck in your throat. Glucagon is a medicine that has been used to get the food unstuck. However, there is not good evidence that it works any better than just watching you for a bit. Glucagon also has side effects like vomiting. Our plan is to watch you and if the food is still stuck we will call a specialist. They will come and talk about putting a tube down your throat with a camera on the end the tube to see what is wrong and fix the problem.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the authors' conclusions.

☑

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Other FOAMed Resources:
EM PharmD: A Closer Look at Glucagon for the Foreign Body
The Blunt Dissection: The Steak is Stuck
REBEL EM: Question Tradition: Glucagon for Food Boluses
LITFL: Glucagon Therapy

Guest Skeptic: Meghan Groth
EM Pharmacist

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SGEM HOP

Dont Go Breaking My Heart Ottawa HF Risk Scale

Case Scenario:

68-year-old woman with a history of CHF, HTN, and hyperlipidemia presents to the ED with 3 history of dyspnea on exertion, orthopnea, and leg edema. Normal vital signs. Renal function is normal and troponin is negative. ECG is normal. After a dose of intravenous furosemide, she feels a lot better and would like to go home.

Q:

Can the Ottawa Heart Failure Risk Scale (OHFRS) help make disposition decisions by accurately predicting the 30-day rate of serious adverse events in patients with acute heart failure?

BOTTOM LINE

The Ottawa Heart Failure Risk Scale (OHFRS) can probably help make disposition decisions by accurately predicting the 30-day rate of serious adverse events in patients with acute heart failure. However, we would love to see this scale validated in a RCT so that we can see patient oriented outcomes before it is used widely.

Prospective and Explicit Clinical Validation of the Ottawa Heart Failure Risk Scale With and Without Use of Quantitative NT-proBNP

Stiell et al. AEM. 2017

P Adults with SOB (less than 7 days), due to CHF

I Ottawa Heart Failure risk scale

Items	Points
1. Initial Assessment	
a) History of stroke or TIA	(1) ___
b) History of intubation for respiratory distress	(2) ___
c) Heart rate on ED arrival ≥ 110	(2) ___
d) Room Air SaO_2 < 90% on EMS or ED arrival	(1) ___
2. Investigations	
a) ECG has acute ischemic changes	(2) ___
b) Urea ≥ 12 mmol/L	(1) ___
c) Serum CO_2 ≥ 35 mmol/L	(2) ___
d) Troponin I or T elevated to MI level	(2) ___
e) NT-ProBNP ≥ 5,000 ng/L	(1) ___
3. Walk test* after ED treatment	
a) SaO_2 < 90% on room air or usual O_2, or HR ≥ 110 during 3-minute walk test, or too ill to walk	(1) ___
Total Score (0 - 15):	____

Heart Failure Risk Categories for Serious Adverse Events within 14 days

Total Score	Risk	Category
0	2.8%	Low
1	5.1%	Medium
2	9.2%	Medium
3	15.9%	High
4	26.1%	High
5	39.8%	Very High
6	55.3%	Very High
7	69.8%	Very High
8	81.2%	Very High
9	89.0%	Very High

C NONE

O **Primary: Serious adverse events – death from any cause by 30 days, admit to unit, intubation, non-invasive ventilation, MI, readmit to hospital, major procedure required**
Secondary: Performance of the predictor variables, performance of the OHFRS with and without NT-proBNP and physician accuracy and acceptability

Exclusion criteria:

Patients who did not fit definition of acute heart failure or were too sick to be considered for discharge after 2-12 hours of emergency department management (Resting oxygen saturation < 85% on room air or after being on home oxygen level for 20 minutes; 2. Heart rate greater than or equal to 120 bpm; 3. Systolic blood pressure < 85 mm Hg; 4. Confusion, disorientation, dementia; 5. Primary presentation is for ischemic chest pain requiring treatment or with acute ischemic ST-T changes on initial ECG; 6. ST-elevation MI on initial ECG; 7. Terminal status – death expected within weeks from chronic illness; 8. From nursing home or chronic care facility (not seniors residence); 9. Enrolled in previous 2 months; or, 10. On chronic hemodialysis.)

Author's Conclusion:

Prospective clinical validation found the OHFRS tool to be highly sensitive for SAEs in acute heart failure patients, albeit with an increase in admission rates. When available, NT-proBNP values further improve sensitivity. With adequate physician training, OHFRS should help improve and standardize admission practices, diminishing both unnecessary admissions for low-risk patients an unsafe discharge decisions for high-risk patients.

Background

Heart failure is a serious condition that often presents to the emergency department. Guidelines exist to help physicians on the diagnosis and treatment of heart failure but none offer recommendations on who to admit (Yancy et al, Arnold et al, McMurray et al, and McKelvic et al).

Heart failure patients often have other co-morbid conditions increasing their rate of hospitalization (Blecker et al). In addition, patients hospitalized for heart failure have a high risk of readmission to hospital after discharge (McAllister et al, Richter et al, and Yeung et al).

Patients in Canada are more often treated in the emergency department and discharged home compared to the U.S. (Stiell et al, Pang et al, Collins et al, and Schrader et al). This difference in admission rates is similar to what is seen in patients diagnosed with pulmonary embolism. We have discussed this issue on SGEM#51.

So who can go home and who needs to come in to hospital is a question faced regularly by emergency physicians. There are published risk-stratification tools to predict mortality in patients with acute heart failure but they are limited in their ability to inform the emergency physician in deciding disposition (admit or discharge home). See reference #19-28 in Dr. Stiell's Hot Off The Press publication in AEM for these risk-stratification tools.

Results

The study enrolled 1,100 patients with a mean age of 78 years, 53% being male and 44% arriving by ambulance. Of the study population, 43% were discharged home from the emergency department and 57% were admitted to hospital at the index emergency department encounter.

It is important to note that NT-proBNP, which is part of the OHFRS was measured in only 62.2% (684/1,1000) of the patients.

Overall morality was 3.7%. There were numerous other serious adverse events (SAE) that we would consider important when considering a potential discharge, such as need for non-invasive ventilation, intubations, and myocardial infarctions. These can all be found in Table 3 of the paper.

Because these are decision tools and not rules, we might be able to use different cut-offs to guide shared decision making. Using a score of ≥ 2 had a similar sensitivity for SAEs when compared to physician judgement (71.2% vs 71.8%), but would have decreased admission rates (57.2 vs 48.3%)

Primary Outcome

Serious adverse event rate was 15.5% (19.4% for patients admitted and 10.2% for those discharged from the emergency department).

Results

Secondary Outcome

When you look at each of the individual components of the score, most seem to perform well in predicting adverse events (see Table 3) .

Performance of the OHFRS without NT-proBNP: A score of ≥ 1 was 91.8% sensitive for SAEs (as compared to emergency department physician decision which was 71.8% sensitive). However, this would have raised the admission rate from 57.6% to 77.6%.

Performance of the OHFRS with NT-proBNP: A score of ≥ 1 was 95.8% sensitive for SAEs (as compared to emergency department physician decision which was 69.8% sensitive). However, this would have raised the admission rate from 60.8% to 88.0%.

Physician Accuracy: Physicians were asked to place the patients into four different risk categories (low, medium, high or very high). This was compared to criterion interpretation (see table above) and resulted in agreement of 59%.

Physician Acceptability: Physicians rated on a five-point scale whether or not they were comfortable using the OHFRS (very comfortable to very uncomfortable). Physicians reported being uncomfortable or very uncomfortable in using OHFRS 12% of the time.

The study enrolled 1,100 patients with a mean age of 78 years, 53% Because these are decision tools and not rules, we might be able to use different cut-offs to guide shared decision making. Using a score of ≥ 2 had a similar sensitivity for SAEs when compared to physician judgement (71.2% vs 71.8%), but would have decreased admission rates (57.2 vs 48.3%)

TALK NERDY TO ME

Dr. Ian Stiell is Professor, Department of Emergency Medicine, University of Ottawa; Distinguished Professor and Clinical Research Chair, University of Ottawa; Senior Scientist, Ottawa Hospital Research Institute; and Emergency Physician, The Ottawa Hospital. He is internationally recognized for his research in emergency medicine with a focus on the development of clinical decision rules and the conduct of clinical trials involving acutely ill and injured patients. Dr. Stiell is best known for the development of the Ottawa Ankle Tules and Canadian C-Spine Rule, and as the Principal Investigator for the landmark OPALS Studies for prehospital care.

Listen to the SGEM Podcast on iTunes to hear Dr. Stiell's answers to our nerdy questions.

1) Eligibility:

Many patients were screened but only 37% (1,869/4,999) ended up being eligible for the study. Let's look at the top five of reasons why patients were not eligible:

Shortness of Breath for Greater than Seven Days (788) –Many patients have chronic shortness of breath with heart failure who decompensate and present to the emergency department. Why did you exclude these patients?

No Clear Heart Failure on Chest X-Ray (394) – We know that chest X-ray lacks sensitivity for congestive heart failure so why not include patients that physicians felt were in acute heart failure regardless of the chest X-ray?

Off Study Hours (387). Patients were not enrolled consecutively. Only patients presenting between 8am and midnight were included. Congestive heart failure patients presenting at night might be different from those presenting during daytime hours and night time discharges could be higher risk than those during the day.

Patients from Nursing Home or Long Term Care Facility (376). Why did you specifically exclude nursing home or long-term care facility patients? These represent a significant proportion of heart failure patients we see and would like to be able to send back to their "*home*". Do you think the OHFRS could be applied to these patients?

Patients with Confusion, Disorientation or Dementia (276). Did they use a validated score to assess confusion, disorientation or dementia or was it based on clinical gestalt?

TALK NERDY TO ME

2) Enrolment:

In addition, 41% (769/1,869) patients were not enrolled if clinical staff were too busy with other patient care responsibilities. Does this mean the OHFRS would be too time consuming to adopt into clinical practice a large part of the time?

3) Scoring:

Physicians were aware of the patient's risk category on the OHFRS when they were making their disposition decisions. Although they were explicitly told not to base their decisions solely on this instrument, there is a risk of incorporation bias here.

Physicians were not very accurate when using this score. Furthermore, more than 10% of physicians indicated they were uncomfortable using this score. How will that affect its generalizability and impact going forward?

The primary outcome was based on the criterion interpretation of the individual score components rather than the treating physician's interpretation. Given the inaccuracy of the treating physicians in using this score, this would result in an over-estimation of the accuracy of the score and limit generalizability.

4) Primary Outcomes:

There were two primary outcomes (death at 30 days and serious adverse events by 14 days). Why not just have one primary outcome and the rest secondary?

The other serious adverse events are not all equal (admission to a monitored unit, endotracheal intubation or non-invasive ventilation, myocardial infarction, major procedure, or relapse and hospital admission for those patients originally discharged home). Let's look at relapse with admission to hospital specifically because we are not sure classifying that as a SAE makes sense. Unless something else accompanied that admission, like an intubation or and myocardial infarction, which would have been caught in the other SAEs, the admission by itself is not a bad thing, because the only other option was admitting the patients to hospital on the index visit. Having a few patients come back is just good medicine. Admitting 100 patients to prevent 20 of them having to come back for an admission without any other complications is crazy.

Mentioned in the discussion that admission of the patient could be a confounder because intensive treatment could prevent an adverse event. The opposite could also be true, with admission causing adverse events, such as clots, stress GI bleeds, unnecessary testing, or even unnecessary interventions (such as revascularization) just because the patient is in hospital.\.

TALK NERDY  TO ME

The decision being considered here is: to admit or not to admit. We think it is reasonable to ask whether admission would have prevented the adverse events that were seen here. If admission cannot prevent the adverse events, it is unclear how this scale will help us. We will probably only be able to see those patient oriented outcomes if this scale is prospectively tested in a randomized, controlled trial. While the OHFRS may improve sensitivity, this study does not allow us to see whether increasing admissions would decrease SAEs, and in a system that is already full, it is unclear what benefit exists to admitting more people.

5) Follow-Up:

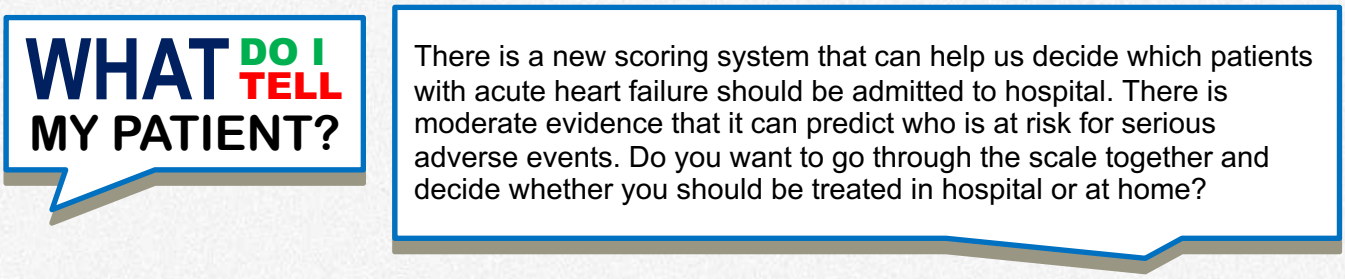
Serious adverse events within 30 days is exactly what we care about when making disposition decisions. However, most of the follow-up data was from health records and telephone follow up. They say there follow up was very complete, but I don't see any numbers for how often they relied on hospital records versus phone follow up, and even though the Canadian system is pretty good, we know lots of patients move between hospitals and even provinces and can therefore get lost.

Case Resolution

You perform a walk test, and your patient remains asymptomatic with a heart rate below 100 and an oxygen saturation over 90% for 3 minutes. You determine that she is low risk, both by your clinical assessment and using the components of the Ottawa Heart Failure Risk Scale. Based on this assessment, you engage in a shared decision making conversation, and she decides she would like to be treated as an outpatient, but will follow up as soon as possible with her primary care physician

Clinical Application

This information can help in making shared decisions with patients presenting to the ED with acute heart failure.



Quality Checklist for Clinical Decision Tools

The study population included or focused on those in the ED	☑
The patients were representative of those with the problem	?
All important predictor variables and outcomes were explicitly specified	☑
This is a prospective, multicenter study including a broad spectrum of patients and clinicians (level II)	☑
Clinicians interpret individual predictor variables and score the clinical decision rule reliably and accurately	
This is an impact analysis of a previously validated CDR (level I)	
For Level I studies, impact on clinician behavior and patient-centric outcomes is reported.	
The follow-up was sufficiently long and complete.	☑
The effect was large enough and precise enough to be clinically significant	?

CONCLUSION VS COMMENTARY

COMPARISON

We agree that the OHFRS has potential utility to standardize admission practices

Other FOAMed Resources:

- EM Cases – Episode 56 The Stiell Sessions: Clinical Decision Rules and Risk Scales

Guest Skeptic: Dr. Justin Morgenstern
Emergency Physician, Markham Stouffville Hospital
Director of Simulation Education, Markham Stouffville Hospital
Author, First10EM.com

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Step by Step Approach to Febrile Infant

Case Scenario:

25-day-old girl with fever. No history of congestion, cough, vomiting, diarrhea, dyspnea or other focus of infection. Appears well on exam, vitals normal except for a rectal temperature of 38.3C. You wonder how much of a work up to do (septic workup, IV antibiotics, admit to hospital, blood/urine tests)?

Q:

In infants 90 days or younger of age with fever without focus, how does the *"Step-by-Step"* approach compare to using the Rochester criteria or using the *"Lab-score"* method in identifying patients at low risk of invasive bacterial infections (IBI)?

BOTTOM LINE

If you have availability of serum procalcitonin measurement in a clinically-relevant time frame, the *Step-by-Step* approach to fever without source in infants 90 days old or younger is better than using the Rochester criteria or *Lab-score* methods. With the caveat that you should be careful with infants between 22-28 days old or those who present within two hours of fever onset

Validation of the Step-by-Step Approach in the Management of Young Febrile Infants

Gomez et al. Pediatrics. 2016

P Infants 90 days old or younger – with fever without source (over 38' C, normal physical, no respiratory signs or diarrhea) **excluded if source found or no fever on arrival

I Use of "Step by Step" Approach

C Rochester Criteria and Lab Score method

O Performance metrics to identify patients at low risk of invasive bacterial infection (defined as positive blood culture or CSF culture). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood (LR+) and negative likelihood ratio (LR-).

Author's Conclusion:

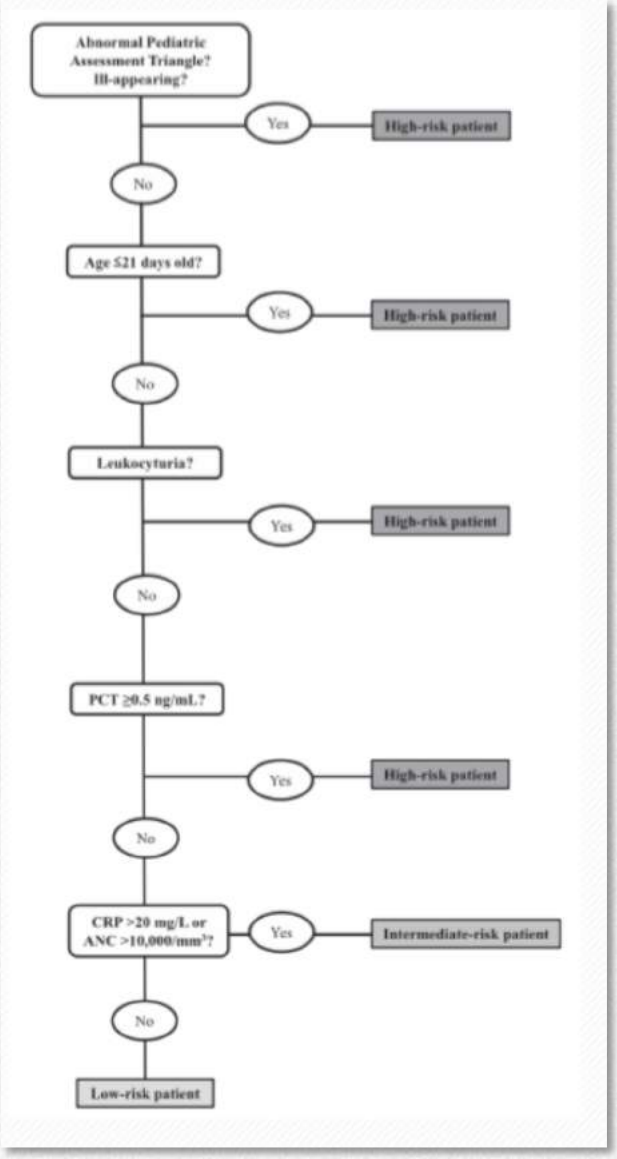
"The Step-by-Step approach revealed a high sensitivity, being more accurate than the Rochester criteria and the Lab-score at identifying children at low risk of IBI, and appears to be a useful tool for the management of the febrile infant in the ED. However, as no perfect tool exists, the Step by Step is not 100% sensitive and physicians should use caution especially when assessing infants with very short fever evolution. For this subgroup of patients, we strongly advise for an initial period of close observation and monitoring in the ED, even when all the complementary test values are normal".

Background Fever without source in infants less than three months old represents a significant diagnostic dilemma for clinicians. Several criteria had been developed previously, including the Rochester (Jaskiewicz et al 1994), Boston (Baskin et al 1992) and Philadelphia (Baker et al 1993) criteria to help clinicians stratify the risk of significant bacterial infections.

Background

These criteria, however, are out-dated in our current era of vaccinations, but to date, have represented our best option. A new algorithm has been developed by a European group of pediatric emergency physicians called the *"Step-by-Step"* approach.

Mintegi et al did a retrospective study of this *"Step-by-Step"* approach in 2014. They concluded: *A sequential approach to young febrile infants based on clinical and laboratory parameters, including procalcitonin, identifies better patients more suitable for outpatient management.* (EMJ 2014).



Results There were 2,185 patients included in the study with 87 (4%) being diagnosed with an invasive bacterial infection. The median age was 47 days with 60% being male.

TABLE 4 Sensitivity, Specificity, PPVs, NPVs and Positive and Negative LR, with 95% CI, of Each Approach for Identifying IBIs

	Sensitivity, %	Specificity, %	PPV	NPV	Positive LR	Negative LR
Rochester criteria	81.6 (72.2–88.4)	44.5 (42.4–46.6)	5.7 (4.6–7.2)	98.3 (97.3–99.0)	1.47 (1.32–1.64)	0.41 (0.26–0.65)
Lab-score	59.8 (49.3–69.4)	84.0 (82.4–85.5)	13.4 (10.4–17.2)	98.1 (97.3–98.6)	3.74 (3.07–4.56)	0.48 (0.37–0.62)
Step by Step	92.0 (84.3–96.0)	46.9 (44.8–49.0)	6.7 (5.4–8.3)	99.3% (98.5–99.7)	1.73 (1.61–1.85)	0.17 (0.08–0.35)

The *Step-by-Step* approach had the lowest prevalence of significant bacterial infections in their *"low risk"* group: 1.1% (95%CI 0.5-1.8) compared with the Rochester criteria 2.1% (95%CI 1.2-3.0) and the Lab-score 10.8% (95%CI 9.4-12.3).

In terms of identifying invasive bacterial infection, defined as a positive blood culture or CSF culture, the *Step-by-Step* approach had better diagnostic metrics compared to the Rochester criteria and *Lab-score* (see above).

TALK NERDY TO ME

Overall this is a well-conducted prospective multi-center study. The *Step-by-Step* approach to fever without source in infants 90 days or younger is better than the Rochester criteria and *Lab-score*.

1) External Validity:

This study was conducted in eight Spanish, two Italian and one Swiss pediatric emergency departments. Thus, we must be cautions when extrapolating the results to our own work environments.

2) Most Important Metric:

The *Lab score* did outperform the Rochester criteria and the *"Step-by-Step"* approach in terms of specificity, positive predictive value (PPV) and positive Likelihood Ratio (LR). However, with a clinical decision instrument for infants with fever without focus, our primary interest is in ensuring that we not sending home infants with significant bacterial infections, invasive or non-invasive. The metrics that are most important include sensitivity, negative predictive value (NPV) and negative Likelihood Ratio. The *Lab-score* method did very poorly with these metrics, and as such is not a contender for a clinical decision instrument in this circumstance. The Rochester criteria had better sensitivity, NPV and negative LR but the best results were seen with the *Step-by-Step* approach (Sensitivity 92%, NPV 99.3% and negative LR 0.17).

3) Subjective Criteria:

Most of the criteria used in the *Step-by-Step* approach were objective (age, leukocyturia, procalcitonin, CRP and ANC). However, there were some subjective criteria. A well appearing infant was defined by a normal Pediatric Assessment Triangle (PAT). The PAT has some subjective components. Additionally, not all of the participating sites systematically used the PAT and documentation in the medical record was used to determine if the infant was well-appearing

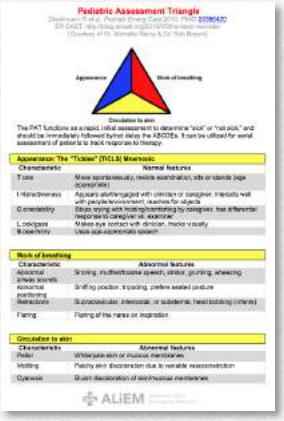
4) Procalcitonin:

The one major limitation with application of this research is availability of timely procalcitonin measurement. This test is not currently universally available in a clinically relevant time-frame, an essential component of the *Step-by-Step* approach.

TALK NERDY TO ME

5) Age and Duration of Fever:

This is something the authors comment on in their paper. The *Step-by-Step* approach uses 21 days and younger as a cut-off for being high risk. However, of the seven patients that were missed by the *Step-by-Step* approach, four were between the ages of 22 and 28 days. This makes us very worried about all infants less than 28 days not just 21 days. Secondly, six of the seven patients missed by the *Step-by-Step* approach had fevers lasting less than two hours suggesting the biomarkers may not have had time to rise and flag the child as high risk. We worry about children presenting really early in their illness and whether they need a period of observation in the emergency department or very strict follow-up.



Pediatric Assessment Triangle

Case Resolution

In this case, since procalcitonin was not available and the child was less than 28 days old, the clinician did a full septic workup, started intravenous antibiotics and admitted the child to pediatrics. The infant was sent home two days later when the blood, urine and CSF cultures came back negative. You set up a meeting with laboratory services at your hospital to discuss getting procalcitonin testing.

Clinical Application

For infants 90 days old or younger in an environment where procalcitonin testing is available, the *Step-by-Step* approach to fever without source is currently the best clinical decision instrument. We also suggest caution with infants between 22-28 days old and those with fever less than two hours.

WHAT DO I TELL MY PATIENT?

Depending on availability of procalcitonin, we are going to use either the Rochester criteria or the *Step-by-Step* approach to help us decide if your child is at high risk of a invasive bacterial infection.

Quality Checklist for Clinical Decision Tools

The study population included or focused on those in the ED	☑
The patients were representative of those with the problem	☑
All important predictor variables and outcomes were explicitly specified	☑
This is a prospective, multicenter study including a broad spectrum of patients and clinicians (level II)	
Clinicians interpret individual predictor variables and score the clinical decision rule reliably and accurately	?
This is an impact analysis of a previously validated CDR (level I)	
For Level I studies, impact on clinician behavior and patient-centric outcomes is reported.	☑
The follow-up was sufficiently long and complete.	☑
The effect was large enough and precise enough to be clinically significant	☑

CONCLUSION VS COMMENTARY COMPARISON

We generally agree with the authors' conclusion.

Other FOAMed:

- Don't Forget the Bubbles – A New Approach to Febrile Infants

Guest Skeptic: Dr. Anthony Crocco
Pediatric Emergency Physician, McMaster Children's Hospital
Medical Director and Division Head or Pediatric Emergency, McMaster Children's Hospital

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Dont Bring My BP Down (intensively) - ATACH2 Trial

Case Scenario:
68 year-old female with left sided weakness starting two hours prior to arrival in the ED. Does not take blood thinners and lives independently. Head CT without contrast demonstrates bleed in R parietal region measuring 52cm^3. On arrival BP is 220/140, consistent with EMS BP. Nurse asks you what BP target you wan to aim for.

Q:

In patients with an acute intracerebral hemorrhage, does intensive blood pressure lowering to a systolic blood pressure target of 110-139 mm Hg result in a lower rate of death or disability than a systolic blood pressure target of a 140-179 mm Hg?

BOTTOM LINE

Intensive blood pressure reduction (SBP 110-139 mm Hg) does not provide benefit over standard blood pressure reduction (SBP 140-179 mm Hg) in patients with acute intracerebral hemorrhage.

Intensive Blood Pressure Lowering in Patients with Acute Cerebral Hemorrhage

Qureshi et al. NEJM. 2016

P Patients with intracerebral hemorrhage, at least 18 years old, GCS 5+ on arrival with stroke symptoms, INR less than 1,5, intraparenchymal hematoma less than 60 cm on CT, one systolic BP reading of 180 mmHg or more between symptoms and management

I Target systolic BP of 110-139

C Target systolic BP of 140-179 mmHg (standard treatment)

O Primary: Death or disability on modified Rankin Scale at 3 months
Secondary: Quality of life, hypotension, AE, hematoma expanded more than 33%, neuro deterioration within 24 hours (decrease of 2 or more on GCS or increase of 4 on NIHSS)

Exclusion criteria:

Systolic blood pressure reduced to <150 mm Hg before randomization or randomization occurred 4.5 hours after symptom onset. Patients with ICH due to previously known neoplasms, AVM, or aneurysms or those with ICH from trauma, ICH located in infratentorial regions such as pons or cerebellum, intraventricular hemorrhage associated with intraparenchymal hemorrhage and blood completely fills one lateral ventricle or more than half of both ventricles, patient to receive immediate surgical evacuation, current pregnancy (or parturition within previous 30 days) or active lactation, use of dabigatran within last 48 hours, platelet count <50,000 mm^3, known sensitivity to nicardipine, pre-morbid disability requiring assistance in ambulation or activities of daily living, subject's living will precludes ICU management, or subject is currently participating in another interventional clinical trial.

Author's Conclusion:

"The treatment of participants with intracerebral hemorrhage to achieve a target systolic blood pressure of 110 to 139 mm Hg did not result in a lower rate of death or disability than standard reduction to a target of 140 to 179 mm Hg."

Background Bleeding in the brain can be bad and can result in morbidity and mortality. There is limited data about the target for systolic blood pressure when treating acute hypertensive response in patients with intracerebral hemorrhage (ICH).
Prior to this study there was the INTERACT-2 trial by Anderson et al that randomized almost three thousand patients with ICH within six hours of symptom onset to either intensive treatment (target systolic blood pressure <140 mm Hg) or control group (target systolic blood pressure <180 mm Hg). Overall, that study found no statistical significance in their primary endpoints of death and disability at 90 days or safety.
There were a number of problems with INTERACT-2 that were discussed on SGEM#73 (How Low Can You Go). One of the main controversies was the secondary ordinal analysis showing a significantly lower modified Rankin Scale (mRS) with intensive treatment OR 0.87 (95% CI 0.77 to 1.00; P = 0.04). Overall, the evidence for lowing blood pressure in patients with acute ICH is limited.

Results 8,532 patients were screened to be included in ATACH-2 with 1,000 patients undergoing randomization. About 60% were male, the average age was about 60 years and the mean systolic blood pressure was 200.6 ± 27.0 mmHg.

Primary Outcome

Death or disability defined as a modified Rankin Scale (mRS) was 38.7% (186 of 481) in the intensive-treatment group and in 37.7% (181 of 480) in the standard-treatment group (relative risk, 1.04; 95% confidence interval, 0.85 to 1.27; analysis adjusted for age, initial GCS, and presence or absence of intraventricular hemorrhage).

Secondary Outcome

Treatment related serious adverse events that occurred within 72 hours after randomization was present in 1.6% of patients in the intensive-treatment group and 1.2% in the standard-treatment group. There were significantly more renal adverse events within seven days after randomization in the intensive-treatment group compared to the standard-treatment group (9.0% versus 4.0%, P=0.002).

TALK NERDY TO ME

1) Inclusion/Exclusion Criteria:

While we do not have a problem with the inclusion criteria, it did change during the middle of the study. Any time a study changes its criteria midway it should be a concern. The logic expressed by the group for this study was that the timeframe for enrolling patients was expanded to 4.5 hours from 3 hours after new data demonstrated that hematoma expansion was equally prevalent whether from 0 to 3 hours or 3 to 4.5 hours. There were also a lot of exclusion criteria, which makes this study less pragmatic. One argument though is that given these patients were most likely the ideal candidates according to the study group and since they still did not meet significant findings this method of management may not be effective. Be careful in drawing such conclusions though as any research has its limitations including only in really applying to the type of patients in that particular study and population (i.e. do not over-generalize).

2) Lack of Blinding:

This was an open-label trial, which can introduce bias into the study. However, the bias would have most likely favoured the intervention. Given that the findings were not significant it actually makes me believe the results even more.

3) Failure to Reach Blood Pressure Targets:

There was a significant amount of failure to achieve target blood pressure within two hours. This was seen in 12.2% of patients in the intensive-treatment group versus 0.8% in the standard-treatment group. Not only could this reduce the treatment effect, but should act as a reminder that it is difficult to drop blood pressures this much in this patient population.

4) Lack of Power:

They did a power calculation based on an event rate of 60% but the observed rate was only 38%. In addition, they stopped the trial early due to futility after a pre-specified interim analysis. This leads to an underpowered study with an increased risk of making a type II error (accepting the null hypothesis that there is no difference when there actually is a difference).

5) Ordinal Analysis:

An ordinal analysis was used in this trial as in other stroke trials. This type of analysis has multiple flaws including the fact that grouping does not make it necessarily a clean cut-off, especially with the subjective points in the mRS and lack of blinding could in turn lead to bias. One of the best examples of an ordinal analysis being spun into something positive is the IST-3 trial that was covered on SGEM #29. We should point out that ATACH-2 used a different cut-off from the INTERACT-2 Trial (mRS 4-6 vs. mRS 3-6). This makes comparing the two studies more challenging.

Case Resolution

You discuss with both the nurse and the patient the plan to lower the blood pressure. In your discussion, you review how intensively lowering of the systolic blood pressure beyond 140-179 mm Hg does not appear to be of benefit and could potentially lead to harm such as with the increased risk of renal injury. The healthcare team agrees with this plan and standard lowering of the blood pressure is initiated.

Clinical Application

ATACH-2 fits in with the other limited literature that acute ICH patients do not need to have their blood pressure intensively lowered beyond the standard goal of a systolic blood pressure of 140-179 mm Hg.

CONCLUSION VS COMMENTARY

COMPARISON

We agree with the conclusion that patients with an acute ICH did not have a lower rate of death or disability with intensive blood pressure lowering compared to the standard blood pressure lowering.

WHAT DO I TELL MY PATIENT?

There is bleeding in your brain and your blood pressure is high. We want to reduce your blood pressure to reduce the risk of further complication. However, there is some research suggesting your blood pressure does not have to be intensively lowered, as it shows little to no benefit and could be harmful. Our goal is to bring that systolic number which is the top number to a range of 140-179 mm Hg.

RCT Quality Checklist

The study population included or focused on those in the ED	☑
The patients were adequately randomized	☑
The randomization process was concealed	
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	?
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Other FOAMed Resources:

- EMNerd: The Case of the Differing Perspectives
- REBEL EM: Intensive Blood Pressure Control Doesn't Benefit Patients with Acute Cerebral Hemorrhage (ATACH-2)
- The Bottom Line: ATACH-2 Trial
- CORE EM: Intensive Blood Pressure Lowering in Intracerebral Hemorrhage (ATACH-2 Trial)

Guest Skeptic: Chip Lange
Emergency Medicine Physicians Assistant
Host, Total EM Podcast

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Diazepam Wont Get Back Back Pain Down

Case Scenario:

43-year-old woman with acute onset back pain. Slipped carrying heavy boxes felt her back wrench without falling. No *"red flags"* on history and physical exam. After some treatment with a NSAID and dose of morphine, the patient improved. Still has pain, difficulty walking and bending due to discomfort. You consider discharge home with short course of diazepam to improve functionality.

Q:

Does the addition of diazepam to naproxen in patients presenting with acute, nontraumatic, nonradicular low back pain improve functional outcomes at one week?

BOTTOM LINE

Based on the best available data, it does not appear that diazepam should be routinely added to an NSAID for outpatient management of acute, nontraumatic low back pain.

Diazepam is No Better Than Placebo When Added to Naproxen for Acute Low Back Pain

Friedman et al. Ann Emerg Med. 2017

P Adults (21 to 69) presenting to ED with acute lower back pain, 2 weeks or less, functionally impairing back pain over 5 on Roland-Morris Disability Questionnaire, patient ready for discharge

I Naproxen 500 mg PO Q12 PRN Pain + Diazepam 5-10 mg PO Q12 pain and 10 min educational intervention

C Naproxen 500 mg PO Q12 PRN Pain + 1-2 Placebo pills PO Q12 pain and 10 min educational intervention

O Primary Outcome: Improvement in the RMDQ score between discharge and 1 week follow up
Secondary Outcomes: Pain intensity at 1 week and 3 months measured on four-point descriptive scale

Exclusion criteria:

Radicular pain (pain below the gluteal folds, pain duration > two weeks or a baseline low pain frequency of at least once per month, absence of other non-musculoskeletal causes of pain, no direct trauma to the back, unavailable for follow-up, pregnant or breast-feeding, chronic pain syndrome and those allergic or intolerant to the use of the investigational medications.

Author's Conclusion:

"Among ED patients with acute, nontraumatic, nonradicular low back pain, naproxen + diazepam did not improve functional outcomes or pain compared with naproxen + placebo 1 week and 3 months after ED discharge."

Background

Low back pain is an extremely common presentation to US Emergency Departments representing 2.4% or 2.7 million visits annually. The vast majority of presentations are benign in etiology but can be time consuming and frustrating for both patients and physicians.

Physician frustrations with managing acute non-traumatic low back pain are multifaceted – preoccupation for finding the rare dangerous back pain patient (epidural abscesses, osteomyelitis, pathological fractures, etc), patients demanding imaging, difficulty in relieving pain and concern for secondary gain (i.e. opiate abuse or diversion).

There are multiple *"Red Flag"* lists to help identify patients at risk for more serious causes of their back pain. No list is comprehensive. A simple red flag list from our friend Salim Razaie (@srrezaie) at REBEL EM is called TUNA FISH.

Other things to consider would be immunocompromised patients besides just those on steroids (patients with HIV, diabetes, alcoholics or taking biologic agents) who are at risk for spinal epidural abscess, discitis, or osteomyelitis.
When it comes to patient demands for imagine, Choose Wisely from ACEP and CAEP encourages emergency physicians to avoid ordering lumbar spine imaging in patients without serious underlying conditions (red flags).

- *ACEP: Avoid lumbar spine imaging in the emergency department for adults with non-traumatic back pain unless the patient has severe or progressive neurologic deficits or is suspected of having a serious underlying condition (such as vertebral infection, cauda equina syndrome, or cancer with bony metastasis).*
- *CAEP: Don't order lumbosacral (low back) spinal imaging in patients with non- traumatic low back pain who have no red flags/pathologic indicators.*

Background

Many different treatment modalities have been tried to treat low back pain with limited success. Williams et al (Lancet 2014) showed acetaminophen did not affect recovery time compared with placebo in low-back pain. However, these were not patients recruited from the emergency department.

Friedman et al (JAMA 2015) showed that adding a muscle relaxant (cyclobenzaprine) or oxycodone/acetaminophen to an NSAID (naproxen) alone did not improve functional outcomes or pain one week after emergency department presentation.

Machado et al (Ann Rheum Dis 2017) demonstrated in a SRMA that NSAIDs did not provide clinically important effects over placebo for spine pain. They included patients with acute and chronic lumbar and cervical pain. However the point estimate for the subgroup analysis of acute low back pain was less than the pre-specified 10 point between-group difference considered clinically significant.

> ***Conclusions:*** *NSAIDs are effective for spinal pain, but the magnitude of the difference in outcomes between the intervention and placebo groups is not clinically important. At present, there are no simple analgesics that provide clinically important effects for spinal pain over placebo. There is an urgent need to develop new drug therapies for this condition.*

ACEP has some guidelines with the American Pain Society from 2007 on the use of opioids. They state opioids should be reserved for severe, disabling pain that is not controlled or not likely to be controlled with NSAIDs or acetaminophen. This will be a challenge considering the limited effectiveness of NSAIDs and acetaminophen.

Background

The issue of opioid abuse and diversion is very large topic and will not be discussed in detail. ACEP has a clinical policy on prescribing opioids and specifically addresses patients with acute low back pain. They give three level C recommendation:

1. *For the patient being discharged from the ED with acute low back pain, the emergency physician should ascertain whether nonopioid analgesics and nonpharmacologic therapies will be adequate for initial pain management.*

2. *Given a lack of demonstrated evidence of superior efficacy of either opioid or nonopioid analgesics and the individual and community risks associated with opioid use, misuse, and abuse, opioids should be reserved for more severe pain or pain refractory to other analgesics rather than routinely prescribed.*

3. *If opioids are indicated, the prescription should be for the lowest practical dose for a limited duration (eg, 1 week), and the prescriber should consider the patient's risk for opioid misuse, abuse, or diversion.*

One final thing to remember is to manage patients' expectations and not set them up for failure. They need to know their pain might not be completely relieved in the emergency department and that most patients will have persistent symptoms a week after presentation and many will have continued pain and functional impairment months after symptom onset (Itz et al 2013, Donelson et al 2012 and Costa et al 2012). We need to be supportive and realistic when discussing the natural history of acute low back pain with patients.

Results

545 patients were screened for enrolment with 114 patients included based on inclusion criteria. Mean age was in the mid 30's with about 55% being men.

Primary Outcome

Both the naproxen and the naproxen + diazepam group improved by 11 points on the RMDQ

Secondary Outcome

These were also comparable between the two groups.

	RMDQ Score Mean Improvement at 1 week (Primary Outcome)	Pain Intensity at 1 week (moderate or severe)	Pain Intensity at 3 months	Adverse Events
Naproxen + Diazepam	11 (9-13)	32% (21-45)	12% (5-24)	21% (12-33)
Naproxen + Placebo	11 (8-13)	22% (13-35)	9% (4-21)	15% (7-26)
Completed Follow-Up	98%	98%	91%	

TALK NERDY TO ME

1) Inclusion/Exclusion Criteria:

Almost 80% of patients approached for enrolment were not enrolled. The inclusion criteria were quite narrow so the results really only pertain to a specific subset of acute back pain patients.

2) Recall Bias:

Many of the inclusion/exclusion criteria are susceptible to recall bias (i.e. pain greater than two weeks and the RMDQ).

3) Patient Population:

The study took place in one urban health care system (two hospitals) serving a socioeconomically depressed population. Socioeconomic factors may be associated with back pain outcomes.

4) Prognostic Factors:

Patients in the diazepam arm were more likely to be unemployed – a known factor in recovery in back pain patients. It was 11 (19%) for the diazepam group vs. 3 (5%) for the placebo group but still, different.

5) Blinding:

The participants may have been unblinded in the diazepam group. They report how many patients were dizzy or tired *"a lot"*, which was not different. However, it is not clear how many responded *"a little ".* The side effects of diazepam may not have been great enough for the patient to report being dizzy or tired a lot, as an adverse event but it may have been enough to know they were getting a diazepam. One way researchers can investigate the integrity of their blinding is to ask the patients which group they thought they were assigned. That being said, you would think any bias would have been in favour of the treatment group. Because there was not a difference found between groups it makes me believe the results even more.

Case Resolution

Based on this data and previous work from the same group on the absence of significant benefit of opiates in acute nontraumatic back pain, I would prescribe the patient naproxen and acetaminophen for pain, make sure they have appropriate follow up and instruct the patient to stay active .

Clinical Application

The addition of diazepam to naproxen does not appear to improve acute nontraumatic low back pain outcomes. While adverse events were not significantly increased, the absence of benefit should limit this practice. Further multi-center data validating these results would be helpful.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the

Authors' conclusions.

WHAT DO I TELL MY PATIENT?

I understand you've got a considerable amount of pain and we're going to give you some medications that may bring your pain down a bit but it's unlikely that we'll be able to get rid of it completely. No matter what we do, it's likely that you'll continue to have this pain over the next couple of weeks or months. What we're going to do here is make sure there isn't a dangerous cause to your pain and then come up with a plan to help you manage it. The key after discharge is going to be staying active and moving about so that this pain doesn't worsen.

RCT Quality Checklist

The study population included or focused on those in the ED	☑
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	☑
The patients in both groups were similar with respect to prognostic factors	
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	?
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Other FOAMed Resources:

- St. Emlyn's: Turn it Down to 11 – Benzos for Back Pain
- REBEL EM: Effectiveness of Diazepam Adjunct Therapy in Acute Low Back Pain
- SinaiEM: Does diazepam work for acute lower back pain?
- RCEM FOAMed Network: March 2017 New in EM
- CoreEM: Treatment of Acute, Non-Traumatic Low Back Pain

Guest Skeptic: Dr. Anand Swaminathan
Assistant Professor, NYU-Bellevue Hospital Department of Emergency Medicine

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Don't Believe The Hype: Vit C Cocktail For Sepsis

Case Scenario:

60 year-old man admitted to ICU with severe sepsis from pneumonia. History of HTN and DM. You are providing him with IV fluids and appropriate antibiotics. His son asks about a vitamin C cure he just read about?

Q:

Does a vitamin C, hydrocortisone, and thiamine protocol decrease mortality in patients with severe sepsis or septic shock?

BOTTOM LINE

Vitamin C, hydrocortisone and thiamine was associated with lower mortality in severe septic and septic shock patients in this one small, single centre retrospective before-after study but causation has yet to be demonstrated.

Hydrocortisone, Vitamin C, and Thiamine for the Treatment of Severe Sepsis and Septic Shock: a Retrospective Before-After Study

Marik et al. CHEST. 2016

P Adult patients admitted to ICU with severe sepsis or septic shock, procalcitonin above 2 ng/ml (Excluding: less than 18 years old, pregnant, limited care

I Vitamin C protocol (Vitamin C 1.5gm IV q6hr x four days or until ICU discharge, hydrocortisone 50mg IV q6h for seven days or until ICU discharge followed by a taper of three days and thiamine 200mg IV q12h for four days or until ICU discharge

C Hydrocortisone 50 mg q6hr IV

O Primary: Hospital survival
Secondary: Duration of vasopressor therapy, requirement for renal replacement therapy, change in procalcitonin, and SOFA score over first 72 hrs

Author's Conclusion:

"Our results suggest that the early use of intravenous vitamin C, together with corticosteroids and thiamine may prove to be effective in preventing progressive organ dysfunction including acute kidney injury and reducing the mortality of patients with severe sepsis and septic shock. Additional studies are required to confirm these preliminary findings."

Background

We have covered sepsis many times on the SGEM (#44, 69, 90, 92 and 113). Most recently we covered the HYPRESS Trial on SGEM #168. The primary outcome was that hydrocortisone did not prevent the development of septic shock. The secondary outcomes also showed no difference in mortality.
There has been a huge buzz in the media about a vitamin C cocktail (vitamin C, hydrocortisone and thiamine) as a possible cure for sepsis. Many FOAMed sites have joined the conversation:

- The Bottom Line: An Orange a Day Keeps Sepsis at Bay?
- EMLit of Note: Vitamin C for Sepsis
- EMCrit: Paul Marik on the Metabolic Resuscitation of Sepsis
- Pharmacy Joe: Vitamin C, Hydrocortisone, and Thiamine for Severe Sepsis and Septic Shock
- Everyday EBM: Vitamin C in Sepsis – Splashes in the Popular Press
- St. Emlyn's: Vitamin SCepTiC?
- REBEL EM: The Marik Protocol: Have We Found a "Cure" for Severe Sepsis and Septic Shock?
- ZdoggMD: Vitamin C Cures Sepsis and other fake news?

For the scientific rationale why vitamin C therapy may help septic patients check out Josh Farkas' post on PulmCrit.

People have searched and people have failed to find an effective treatment for sepsis (DC Angus JAMA 2011). A classic example is the story of recombinant activated protein C (ADDRESS NEJM 2005 and FDA).

Dr. Paul Marik is a well-known critical care physician and professor of medicine from the Eastern Virginia School of Medicine. Based on some information discussed in Josh Farkas' post and specifically a paper by Fowler and colleagues, Dr. Marik had the idea to treat three patients suffering from septic shock with vitamin C as a life-saving measure (Fowler et al J Transl Med 2014). He also added some hydrocortisone for its theoretical synergistic effect.

All three patients made a dramatic recovery with no reported residual organ dysfunction. From a statistical stand point three consecutive patients surviving from sepsis should not have been that unusual giving its known mortality rate. And of course the plural of anecdote is not data but hypothesis generating.

Background

This did inspire Dr. Marik to design a study to investigate the hypothesis of vitamin C as a treatment for sepsis. He designed a retrospective before and after study that included intravenous vitamin C, hydrocortisone and thiamine. This was because they were unable to initiate a RCT at his hospital due to the perceived lack of clinical equipoise and it being unethical to withhold a potentially life saving treatment. However, Dr. Marik correctly did not include those first three patients in the data set. You can see an interview with Dr. Marik about this on YouTube.

Results

There were 47 patients in the comparison group and 47 patients after in the vitamin C protocol treatment group.

Primary Outcome

- Mortality 19/47 (40.4%) Control Group vs. 4/47 (8.5%) Treatment Group
- Absolute difference 31.9% NNT 3

Secondary Outcome

Secondary Outcomes	Comparison	Treatment
Duration of Vasopressors	54.9hrs ± 28.4	18.3hrs ±9.8
Renal Replacement Therapy	37%	10%
72-hr Delta SOFA Scores	0.9 ± 2.7	4.8 ±2.4

TALK NERDY TO ME

Normally the guest skeptic and I go through five points that threaten the validity of the study. This time it is going to be a little different.

Dr. Marik was asked some *"tough questions"* by Scott Weingart on EMCrit. One question was *"Does [he] think there is any possibility his result could be false due to chance or systemic bias?".* His answer was:

"No.Why don't the skeptics speak to the patients who have left our ICU alive and without residual organ failure?"

It seems like Dr. Marik might be committing a logical fallacy and making an appeal to emotion (argumentum ad passiones). Rather than speaking to the patients who have left Dr. Marik's ICU alive, I contacted some fellow skeptics from around the world to speak to the data as scientific skeptics.

We have skeptics from Canada, the USA, Australia and the UK. They are critical care physicians, academics, Physician Assistants, EBM experts, community EM physicians, and an EM pharmacist. These skeptics provide care in small rural hospitals all the way up to very large urban teaching centers.

I have asked each of them to introduce themselves, where they practice, provide one limitation of the study and whether or not they would change their practice based on this data.

Click on the names below to hear what these skeptics have to say about Dr. Marik's study or listen to the whole SGEM podcast on iTunes:

1. Andrew Worster (BEEM): Retrospective Study
2. Salim Rezaie (REBEL EM): Association vs. Causation
3. Rory Spiegel (EM Nerd): Lack of Randomization
4. Lauren Westafer (FOAMCast): Lack of Blinding
5. Chris Carpenter (EMA): Hawthorne/Observer Effect
6. Chris Nickson (LITFL): External Validity
7. Daniel Horner (St. Ellyn's): Cost Effectiveness:
8. Anand Swaminathan (EM Rap): Attention
9. Chip Lange (TOTAL EM): Harm
10. Meghan Groth (EM Pharm Girl): Synergistic Effects
11. Jerome Hoffman (EMA): 30,000 Foot View

Case Resolution

You continue with your intravenous fluids and antibiotics and the man recovers from his pneumonia and is discharged out of the ICU after four days doing well and expected to make a full recovery.

Clinical Application

While this provides some weak evidence of the effectiveness of a vitamin C cocktail it is not strong enough to reject the null hypothesis that there is no effect. Therefore, I will not be providing this treatment at this time based on this information.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the authors' conclusions that the data suggests this treatment may (may not) prove to be effective and these preliminary results need confirmation.

WHAT DO I TELL MY PATIENT?

You tell the son you have read the original published study. It was a small observational study done at one hospital showing unusually good results. It demonstrated association not causation of vitamin C, hydrocortisone and thiamine reducing mortality. This is weak evidence but encouraging. Even the lead author of the study said the results were preliminary and needed to be confirmed. Our hospital is going to look at this information and decide if it is in the best interest of patients to use the treatment or not. For now, your dad will get the best medical care based on the best evidence.

Observational Study Checklist

Did the study address a clearly focused issue?	☑
Did the authors use an appropriate method to answer their question?	?
Was the cohort recruited in an acceptable way?	?
Was the exposure measured to minimize bias	☑
Was the outcome accurately measured to minimize bias?	☑
Have the authors identified all important confounding factors?	?
Was the follow up of subjects complete enough?	☑
How precise are the results/is the estimate of risk?	?
Do you believe the results?	
Can the results be applied to the local population?	?
Do the results of this study fit with other available evidence?	☑

Quality Checklist for Chart Review

Were the abstractors trained before data collection?	?
Were the inclusion and exclusion criteria for case selection defined?	☑
Were the variables defined?	☑
Did the abstractors use data abstraction forms?	☑
Was the abstractors' performance monitored?	?
Were the abstractors aware of the hypothesis/study objectives?	?
Was the interobservere reliability discussed?	
Was the interobservere reliability tested or measured?	
Was the medical record database identified or described?	☑
Was the method of sampling described?	☑
Was the statistical management of missing data described?	?
Was the study approved by the institutional or ethics review board?	☑

Guest Skeptic: Dr. Jeremy Faust
Attending Physician, Brigham and Women's Hospital
Instructor, Harvard School of Medicine
Co-host, FOAMcast

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Dancing on the Ceiling with Ketorolac for Pain

Case Scenario:
37-year-old with sudden right-sided flank pain, hematuria and vomiting. He rates his pain as 8/10 and is writhing around. Feels like his previous kidney stones. Vital signs normal. Bedside U/S, which reveals right-sided hydronephrosis. Diagnosed with renal colic and he is requesting analgesia. Morphine made him nauseous in the past. A shot of 30mg of ketorolac has helped. You decide to start by giving ketorolac and an anti-emetic. What dose do you give?

Q:

Does 10mg of ketorolac intravenously (IV) provide similar analgesic efficacy for treatment of acute pain compared to doses of 15mg or 30mg?

BOTTOM LINE

Use 10mg IV ketorolac when treating moderate to severe pain in the emergency department.

Comparison of Intravenous Ketorolac at Three Single Dose Regimens for Treating Acute Pain in The Emergency Department: A Randomized Control Trial

Motov et al. Ann Emerg Med. 2016

P Adults 18-64 with acute flank pain, abdominal, back, MSK, headache or dental pain – over 5 on numerical rating scale

I 10 mg, 15 mg, 30 mg of ketorolac IV

C None

O Primary: Reduction in numeric rating scale scores at 30 minutes
Secondary: AE and rescue analgesia

Exclusion criteria:

Age ≥65, pregnancy or breastfeeding, active peptic ulcer disease, acute GI hemorrhage, known history of renal or hepatic insufficiency, allergy to NSAIDs, unstable vital signs (SBP < 90 or >180; heart rate < 50 or >150)

Author's Conclusion:

"Ketorolac has similar analgesic efficacy at intravenous doses of 10, 15, and 30 mg, showing that intravenous ketorolac administered at the analgesic ceiling dose (10 mg) provided effective pain relief to ED patients with moderate to severe pain without increased adverse effects".

Background

Ketorolac is a commonly used non-steroidal anti-inflammatory drug (NSAID) used in the emergency department for treatment of moderate to severe acute pain (1)

Unlike opioid analgesics, NSAID dosing is limited by their *"analgesic ceiling"*, meaning there is a dose-analgesic response. Above certain doses, NSAIDs produce more side effects or harms, without providing additional analgesia (2). Previous literature suggests that the ketorolac analgesic ceiling dose is 10 mg, which is much lower than the doses of 30mg to 60 mg recommended in textbooks (3-7).

This is especially important as ketorolac has a greater gastrointestinal hemorrhage risk than other NSAIDs, and this appears to increase at higher doses (8) Furthermore, intramuscular doses of 15mg, 30mg and 60mg appear to increase post-operative bleeding (9-10).

Results

There were 240 patients enrolled in the study with 80 in each group. Mean age was around 40 years with about 2/3 being male. The mean pain score was in the mid seven's out of ten.

Primary Outcome

- 10mg Group: Reduced NRS from 7.7 to 5.2 (difference 2.5)
- 15mg Group: Reduced NRS from 7.5 to 5.1 (difference 2.4)
- 30mg Group: Reduced NRS from 7.8 to 4.8 (difference 3.0)

Secondary Outcome

- No concerning adverse events with the most common adverse effects were dizziness, nausea and headache with no difference across the three doses.
- No difference between the groups in need of rescue morphine at any time.

Exploratory outcomes showed no statistically significant differences in pain score reduction across the three groups from 15 to 120 minutes after ketorolac administration.

TALK NERDY TO ME

We asked Sergey five questions about his study. Listen to the podcast on iTunes to hear his responses.

1) Selection Bias:

You did not enrol patients consecutively but rather from 8am-8pm Monday to Friday when an emergency department pharmacist was available for blinded medication preparation. Do you think this could have introduced some selection bias?

2) Blinding:

Providers, participants and data collectors were blinded but pharmacist, research manager and statistician were aware of group allocation. Do you think that could have introduced some bias?

3) Primary Outcome:

Why did you choose 30-minute pain scores as the primary endpoint? Why did you stop recording pain scales at two hours? Some may argue that the longer duration of action of ketorolac is one of its benefits.

4) Intention-to-Treat:

Data was based on the intention to treat principle but technically it was not a pure intention-to treat analysis. Can you explain what you did to account for missing data and to fulfill this requirement?

5) Single Center:

This was done in large urban community teaching hospital with you as a pain treatment champion. Even your twitter handle is @PainFreeED. Do you think these results would apply to other practice environments without your leadership?

Case Resolution

You give the patient 10mg IV of ketorolac, his pain improves from a 8/10 to 5/10 and he would like to go home. He is given a prescription for analgesic to take home and discharge instructions.

Clinical Application

Based on this high quality randomized control trail and other information, I am going to begin using 10mg IV ketorolac for the management of moderate to severe pain in the emergency department.

CONCLUSION VS COMMENTARY

COMPARISON

We agree with the author's conclusion.

Other FOAMed:

- PharmERToxGuy: The Ceiling Effect of IV Ketorolac
- SOCMOB: NSAID Part 2: The Ceiling Effect
- REBEM EM: The Ketorolac Analgesic Ceiling
- RCEM FOAMed Network: February 2017 New In EM

RCT Quality Checklist

The study population included or focused on those in the ED	☑
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	
The patients in both groups were similar with respect to prognostic factors	?
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	?
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	☑

WHAT DO I TELL MY PATIENT?

I can see you are in a lot of pain. We are going to give you a powerful drug called ketorolac through the intravenous line. Traditionally doctors have used 30mg of this drug but a recent high quality study showed there is a *ceiling* to the effective dose and 10mg works just as well.

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Guest Skeptic: Dr. Ken Milne

Chief of Staff and Attending Physician, South Huron Hospital
Creator, The Skeptics Guide to Emergency Medicine
Faculty member, Best Evidence in Emergency Medicine

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Somebody's Watching Me! Cardiac Monitor for Chest pain

Case Scenario:

52 year old male with CAD and HTN presents with chest pain. He is triaged and put in monitored area. He describes exertional retrosternal chest pain which is resolved. His initial ECG shows non-specific t-wave changes. A two-hour troponin is negative, repeat pending. Nurses are asking for more monitored beds, pressuring you to wonder whether it's safe to take this patient off monitors.

Q:

Do all patients presenting to the emergency department with chest pain need to be placed on cardiac monitoring or could some be safely removed?

BOTTOM LINE

Some patients presenting with chest pain who are chest pain free and have normal/non-specific ECG findings could potentially be safely removed from cardiac monitoring using the Ottawa CPCM Rule.

Prospective Validation of a Clinical Decision Rule to Identify Patient Presenting To the Emergency Department with Chest Pain Who Can be Removed From Cardiac Monitoring

Syed et al. CMAJ. 2017

P Adults with Chest Pain and place on cardiac monitor
Exclusion: cardiac arrest before arrive at hospital or STEMI on first ECG

I Ottawa Chest Pain Cardiac Monitor Rule – remove from monitor if:
- Chest pain subsides, ECG NORMAL or nonspecific chronic changes

C None

O Primary: Arrhythmias requiring intervention within 8 hours of ED arrival
Secondary: Diagnostic characteristics of the Ottawa CPCM Rule

Author's Conclusion:

"Ketorolac has similar analgesic efficacy at intravenous doses of 10, 15, and 30 mg, showing that intravenous ketorolac administered at the analgesic ceiling dose (10 mg) provided effective pain relief to ED patients with moderate to severe pain without increased adverse effects".

Background

Currently patients with chest pain in Canada that are triaged by the Canadian Triage and Acuity Scale (CTAS) to require frequent re-assessment and are placed on a cardiac monitor. Cardiac monitoring in the emergency department in those presenting with chest pain suggestive of acute coronary syndrome (ACS) is routine care in capturing malignant ischemic or reperfusion arrhythmias.

The 2004 AHA Guidelines suggests cardiac monitoring in all those with chest pain for at least 24 hours after being symptom free. A tool was previously derived that suggested with 100% sensitivity that patients with chest pain and normal ECG can be placed in a non-monitored bed without risk of arrhythmia (Gatien et al 2017)

Results

Almost 71% (796/1125) of patients presenting to the emergency department were put on monitors and enrolled in this study. The mean age was 64 years with 56% being male and 9% being admitted to hospital.

Primary Outcome

15/796 (2%) were identified as having a clinically important arrhythmia and the Ottawa CPCM Rule detected all 15 patients.

Secondary Outcome

The Ottawa CPCM Rule had the following test characteristics:

- Sensitivity 100% (95% CI; 78.2% to 100%)
- Specificity 36.4% (95% CI; 33.0% to 39.6%)

Application of the Ottawa CPCM Rule would have allowed 36% of patients to be safely removed from cardiac monitoring.

TALK NERDY TO ME

Listen to the podcast to hear Dr. Venk's responses to our questions!

Dr. Venkatesh Thiruganasambandamoorthy is one of the authors of the Ottawa CPCM Rule study. We asked him five questions about the publication and you can listen to the podcast on iTunes to hear his responses.

Small Numbers:

There were a small number of patients who had the outcome of interest. This causes a few concerns:

Wide confidence intervals around the point estimate for sensitivity (all the way down to 78.2% – potentially missing 27.8% of true positives).

NPV looks great at 100% but it is dependent on prevalence. Any prediction rule or no rule would look good with only 1.9% having an arrhythmia.

Consecutive Patients:

These were not consecutive patients: *"A small proportion of eligible patients (121 of 1246 patients; 9.7%) were not enrolled because the emergency physicians were busy and did not complete the study form."* This introduces a potential 1 in 10 selection bias. All the physician had to do not to enrol the patient was claim they were too busy. This may have been consciously or unconsciously done.

ECG Interpretation:

The treating emergency department doctor did not interpret the ECGs. How can we then apply this to practicing front line physicians?

TALK NERDY TO ME

Listen to the podcast to hear Dr. Venk's responses to our questions!

Time Issues/External Validity:

You say 90% of emergency physicians would forgo cardiac monitoring of chest pain patients if an appropriate low-risk subset could be identified. This was a study of 199 residents and doctors from Canada from over a decade ago (Atzema et al 2008). What would the attitudes be now in Canada?

- Other health care systems are different and have different medical/legal issues and patient expectations. What is the external validity of these respondents from 10 years ago to emergency doctors in USA, AUS and the UK/Europe that have different health care systems, different medical/legal systems and potentially different patient expectations?
- The derivation study was published in 2007 based on data collected in 2000 (Gatien et al 2007). Why the long delay to do the validation study?
- You acknowledge the time lag but dismiss the possibility of temporal bias because the two studies were done at the same institution. Medicine has changed in the last 10-15 years with the work up of chest pain and all these new cardiac markers being done at time zero or with a one or two hour delta. How do you think these new high-sensitivity troponins would impact your rule?
- Doing the derivation and validation study in the same institution does impact the external validity as you correctly identify.

Future Studies:

Does your group have plans to externally validate the Ottawa CPCM Rule in different populations? Will you include a comparison to clinical gestalt?

GRAND ROUNDS at: McGill

I was invited to give Grand Rounds at McGill University. This was a three hour session that was broken up into three sections. The first section was a presentation on evidence based medicine, knowledge translation and social media.

The second section was medical myth busting with a Star Wars theme. It was called The Medical Myth Menace. I did a quick presentation of six recent SGEM episodes.

The third section of Grand Rounds was a live recording of the SGEM Journal Club. The first SGEM-JC was done at McGill University in October of 2014 (SGEM #50). The question from that episode was: Does a vasopressin, epinephrine and corticosteroid (VSE) protocol for in-hospital cardiac arrest resuscitation improve survival with favourable neurological outcomes compared to epinephrine alone? Clink on the link to find out the answer.

It was Dr. William Osler who was credited for starting the first formal journal club at McGill University in 1875. The original purpose of his journal club was *"for the purchase and distribution of periodicals to which he could ill afford to subscribe."*

Dr. Osler was ahead of his time. The purpose of his journal club seems to align with some of those from the FOEMed movement. The SGEM JC endeavours to combine Journal Club with FOAMed in order to cut the knowledge translation window down from over ten years to less than one year. The ultimate goal of the SGEM is to provide patients with the best care, based on the best evidence and to make the world a better place.

5 Rules of SGEM JC:

Rule	
1	You must talk/tweet about SGEM-JC
2	The evidence based medicine answer is: *"it all depends"*
3	Don't Panic - Even your faculty is not sure of some of the answers
4	It's all about the methods
5	Be skeptical of anything you learn, even if you heard it on SGEM-JC

Case Resolution

You remove the patient from cardiac monitoring. A second ECG and troponin are normal. You discharge him home as a low risk patient with your local standard outpatient follow-up.

Clinical Application

The Ottawa CPCM Rule can help support physicians in crowded emergency department how to allocate their scarce resources safely. However, the Ottawa CPCM Rule should not replace clinical judgment but rather guide our care. It should only be applied for those patients that do not have risk factors of other urgent chest pain differentials such as pulmonary embolism, aortic dissection, esophageal rupture or pneumothorax.

WHAT DO I TELL MY PATIENT?

Your work up for your chest pain is reassuring so far. You no longer need to be monitored and will go back to the waiting area. Should you develop any chest pain, palpitations, shortness of breath or feel otherwise unwell while waiting for your lab results, please notify the nurses immediately.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the author's conclusion.

Quality Checklist for Clinical Decision Tools

The study population included or focused on those in the ED	☑
The patients were representative of those with the problem	☑
All important predictor variables and outcomes were explicitly specified	☑
This is a prospective, multicenter study including a broad spectrum of patients and clinicians (level II)	☑
Clinicians interpret individual predictor variables and score the clinical decision rule reliably and accurately	
This is an impact analysis of a previously validated CDR (level I)	
For Level I studies, impact on clinician behavior and patient-centric outcomes is reported.	N/A
The follow-up was sufficiently long and complete.	☑
The effect was large enough and precise enough to be clinically significant	?

Guest Skeptics:
Dr. Ryan Tam
Chief Resident, McGill EM Residency Program
Dr. Anthony Robert
Chief Resident, McGill EM Residency Program

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SGEM HOP

POCUS – A New Sensation for Diagnosing Pediatric Fractures

Case Scenario:

An anxious father brings in his 8 year old who was playing at the park, and fell onto his outstretched right hand. He has pain over the distal forearm with mild swelling, no deformity. You've gotten pretty good with point of care ultrasound, and are curious about how good it is to diagnose forearm fractures.

Q:

Is point of care ultrasound for non-angulated suspected forearm fractures in children just as accurate, faster and less painful than getting x-rays?

BOTTOM LINE

Point of care ultrasound, performed by experienced ultrasonographers, has high diagnostic accuracy for distal forearm fractures, takes less time, and has low level of reported pain.

Point-of-care Ultrasound for Non-angulated Distal Forearm Fractures in Children: Test Performance Characteristics and Patient-Centered Outcomes

Poonai et al. Acad Emerg Med. 2017

P Children (4-17 years old) with suspected non displaced distal forearm fracture less tha n48 hours from injury after fall on outstretched hand

I Bedside ultrasound (POCUS)

C X-Ray

O Primary: Sensitivity of POCUS as compared to x-ray
Secondary: Pain, caregiver satisfaction and procedure duration

Exclusion criteria:

Children who received analgesia (pharmacologic or non-pharmacologic) prior to arrival, known metabolic bone disease, congenital malformation of distal radius, suspected open fracture, known radius or ulna fracture, signs and symptoms consistent with neurovascular compromise, distracting injuries, and gross angular deformity.

Author's Conclusion:

"We concluded that "POCUS assessment of distal forearm injuries in children is accurate, timely, and associated with low levels of pain and high caregiver satisfaction."

Background

Point of care ultrasound (POCUS) has become the stethoscope of the 21st century in emergency medicine. POCUS can be used for so many conditions and we have done a number of shows on the topic:

SGEM#41: Ultra Spinal Tap (Ultrasound Guided Lumbar Puncture)
SGEM#94: You Better Think Ultrasound for Acute Abdominal Aneurysm
SGEM#97: Hippy Hippy Shake – Ultrasound Vs. CT Scan for Diagnosing Renal Colic
SGEM#119: B-Lines (Diagnosing Acute Heart Failure with Ultrasound)
SGEM#124: Ultrasound for Skull Fractures – Little Bones
SGEM#153: Simulation for Ultrasound Education

Pediatric fractures are a common type of injury seen in the emergency department. The most common type of fractures seen in children are distal forearm fractures.

Fractures are a painful condition and appropriate analgesic should be provided to avoid oligoanalgesia. It has been shown that children represent one group known to be at risk for inadequate pain control (Brown et al, and Selbst and Clark).

We have covered the issue of pediatric pain control on SGEM #78. Pediatric EM Super Hero Dr. Anthony Crocco did a RANThony on pediatric pain on YouTube. In that 2015 rant he warned about using codeine for pain control in children.

Just last month the FDA put out a Drug Safety Communication stating that codeine is contraindicated in children younger than 12 years of age. This was due to the serious risks of using codeine in children, including death.

One aspect of pain management in pediatric patients with fractures is the discomfort caused in obtaining x-rays, even in non-displaced fractures.

Point of care ultrasound represents a possible solution. POCUS has been described as highly accurate for long bone and forearm fractures. However, many of these studies included patients with obvious angulations, potentially inflating the accuracy estimates.

Results

There were 169 patients included in this study with 76 fractures identified. The mean age was 11 years of age with 52% being male. The majority of the fractures 61/76 (80.3%) were buckle fractures.

Primary Outcome

POCUS Characteristics:

- Sensitivity 94.7% (95% CI; 89.7% to 99.8%)
- Specificity 93.5% (95% CI; 88.6 to 98.5%)
- PPV 92.3 % (95% CI; 86.4% to 98.2%)
- NPV 95.6% (95% CI; 91.4 to 99.8%)
- +LR 14.6
- -LR 0.6

Secondary Outcome

Interrater agreement was 0.74. Pain scores were lower with POCUS, as was procedure duration. 90% of caregivers were “satisfied” or “very satisfied” with POCUS.

TALK NERDY TO ME

1) Convenience Sample:

These were not consecutive patients presenting to the emergency department with suspected distal forearm fractures. Children were screened three days a week between 5-11pm when both the research assistant and the study physician trained in POCUS were available. Do you think this could have introduced some selection bias?

- There absolutely remains the possibility of selection bias but unfortunately without moving out of my house and into the paeds ED for a year, this was the single best approach to recruitment. One factor mitigating against selection bias is that participants were recruited consecutively during availability of research personnel.

2) POCUS EXPERTS:

Ultrasound was done by one of four pediatric emergency physicians with a minimum of two years POCUS experience, have performed 25 satisfactory trainings scans and viewed a four-minute training video. Most community emergency physicians will not have this level of expertise. How do you think that may affect the results?

- The short answer is that it limits our findings' external generalizability to more experienced sonographers. What's important to note however, is that many rural health care settings including disaster and conflict zones around the world may not have ready access to x-ray technology and POCUS is arguably one of the fastest growing skill sets that community physicians are acquiring. I think our findings provide a good rationale for emergency providers to acquire this skill set.
- One physician performed about 50% of the scans. Do you think that too may have impacted the results?
    - Definitely, and this too may have limited external generalizability to more experienced POCUS providers. But I would like to point out that there were no glaring differences in test performance characteristics between sonographers.

3) Analgesia, XRAY and then POCUS:

Over half of patients received analgesia at triage with a median (IQR) until x-ray being 24 minutes while the median IQR to POCUS was 61 minutes. It is known to take about 30 minutes for acetaminophen and ibuprofen to provide effective analgesia. More than four out of five times the x-ray was done before the ultrasound. Could it be that there was just more time before the POCUS and that is why patients reported less pain?

- This is definitely possible and in designing this study, we wrestled with how best we would account for this limitation. We couldn't control for the timing of diagnostic imaging so we performed an exploratory analysis which showed that pain scores were unrelated to order of the imaging modality or provision of analgesia.

TALK NERDY TO ME

4) Outcomes:

There were four missed fractures but are these clinically important misses (three styloids and one buckle)?

- As far as clinical outcomes go, I would have to say no Ken. The missed fractures were all undisplaced. Our results are in line with what has been described as a lower diagnostic accuracy at the ends of long bones. And what this does teach us is that POCUS education programs should emphasize the importance of this region for novice ultrasonographers.
- POCUS was associated with significantly lower median pain scores statistically but this was not considered clinically significant?
    - That's right, a clinically significant difference on the Faces Pain Scale – Revised, is one face. However, for both x-ray and POCUS, pain was largely in the mild range. One possible explanation is that non-angulated fractures, which made up our study sample, may be inherently less painful than angulated fractures during manipulation for x-rays. And what we have shown is that clinicians can confidently reassure patients that POCUS assessment of an injured limb is not painful.
- It took less time to do the POCUS (30min) but is this clinically significant to the patients/caregivers and did it impact their overall length of stay significantly?
    - That's a good question and it's one that we couldn't answer easily because each participant served as their own control and got both POCUS and an x-ray. What we have shown is that POCUS is more than an order of magnitude faster than x-ray, which may or may not be important to patients, clinicians, and administrators.
- The primary outcome (sensitivity) had wide confidence interval going down to 89.7%. Should we be concerned about that lack of precision?
    - Yes and we tried to avoid that by performing a sample size calculation. Most clinicians are concerned about missing a fracture and so we should focus on the lower bound of the confidence interval for the sensitivity estimate, which is as you stated, 89.7%. To interpret this with some perspective however, we would ideally have liked to compare sensitivity of POCUS to the treating clinician's interpretation of the x-ray. This wasn't possible in this study but I suspect that sensitivity of the clinician's interpretation may be similar.

TALK NERDY TO ME

5) X-ray Gold Standard :

While x-rays are the clinical standard used they are not perfect and fractures can be missed. Certainly we do not want to get CT scans on these children. How do we know all the negative x-rays were true negatives without follow-up performed on these patients?

- Another good point. Truthfully, we don't know because not all patients with non-displaced fractures receive follow-up x-rays. So the presence or absence of callus formation couldn't be determined.

Is there anything else you would like the SGEMers to know about this study or how to interpret the results?

- One of our key findings was a specificity of 94%. This suggests that if a fracture is identified using POCUS, an x-ray be unnecessary, depending of course on a reliable history and a cooperative patient.

Case Resolution

You perform POCUS on your patient and diagnose a distal radius fracture without any need for manipulation. You offer the patient an x-ray, which confirms your diagnosis, and you splint the patient prior to discharge.

Clinical Application

POCUS can be used to confirm a distal forearm fracture, but misses a few minor fractures. X-ray should continue to be the clinical standard, but shared decision making may reduce the use of x-ray in some cases.

WHAT DO I TELL MY PATIENT?

The ultrasound shows your son broke their arm. We are going to confirm that with an x-ray. The nurse already gave him some acetaminophen for pain and he can take some more in about four hours. If it truly is broken it will be placed in a splint and we will refer him to the broken bone doctors called orthopaedic surgeons.

CONCLUSION VS COMMENTARY

COMPARISON

We agree with the author's conclusion.

Quality Checklist

The clinical problem is well defined	☑
The study population represents the target population	☑
The study population included or focused on those in the ED	☑
The study patients were recruited consecutively	
The diagnostic evaluation was sufficiently comprehensive and applied equally to all patients	☑
All diagnostic criteria were explicit, valid and reproducible	☑
The reference standard was appropriate	?
All undiagnosed patients underwent sufficiently long and comprehensive follow-up	?
The likelihood ratio(s) of the test(s) in question is presented or can be calculated from the information provided	☑
The precision of the measure of diagnostic performance is satisfactory	?

Guest Skeptic: Dr. Corey Heitz
Associate Professor, Virginia Tech Carilion School of Medicine
CME Editor, Academic Emergency Medicine
Associate Editor, AAEM MedEdPORTAL

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Mindfulness- It's not Better To Burnout than it is to Rust

Case Scenario:

A resident comes to you looking for advice. He is having trouble feeling tired, short-tempered and it is affecting his work interactions and personal sense of satisfaction with his job. You suspect he is suffering from early burnout.

Q:

Can a mindfulness program reduce stress and burnout among interns on an emergency medicine rotation?

BOTTOM LINE

Mindfulness meditation is something to consider when dealing with the stress of an emergency medicine rotation.

A Randomized Controlled Trial of Mindfulness to Reduce Stress and Burnout Among Intern Medical Practitioners

Ireland et al. Medical Teacher. 2017

P Intern doctors completing their emergency department rotation

I 10 week mindfulness training intervention

C 1 hour extra break per week

O Burnout: Copenhagen Burnout Inventory questionnaire
Stress: Perceived Stress Scale

Author's Conclusion:

"Mindfulness interventions may provide medical practitioners with skills to effectively manage stress and burnout, thereby reducing their experience of these symptoms. It is likely that doctors would benefit from the inclusion of such a training program as a part of their general medical education."

Background

Burnout is certainly a hot topic, and mindfulness has hit the front pages of the New York Times and Time Magazine, putting it front and center in the public eye. Burnout was a term coined by Herbert Freudenberger in 1974 (1). There are a number of ways to define burnout but one of the most widely known is by Maslach, known for the Burnout Inventory (MBI) Score. It has three components including emotional exhaustion, depersonalization and reduced feelings of personal accomplishment (2). Some ACEP members know about the MBI as it has been available as part of the Wellness Booth at the ACEP Scientific Assembly for over 20 years.

Physicians have reported a high level of burnout. A recent study of US physicians showed that more 50% had at least one symptom of burnout. Emergency physicians reported the highest prevalence of burnout at around 70% (3).

Burnout can have negative consequences on physicians and may lead to depression (4), suicidal ideation (5), illness (6), and increased alcohol use (7). It has also been associated with negative impacts on patient care including self-perceived medical error (8), risk of medical errors (9), and quality of care (10 and 11). Many factors are correlated with burnout during emergency medicine residency (12), and a significant concern is the number of young physicians identified as suffering from burnout early in their careers.

A systematic review and meta-analysis has been published on interventions to prevent and reduce physician burnout (13). One intervention shown to have a positive impact on reducing burnout is mindfulness-based approaches.

Mindfulness is paying attention to both the internal and external world, being in the present moment and being non-judgmental. Mindfulness meditation was started about 2,500 years ago by Buddha, not to cure illness but rather to end mental suffering. It spread out from Northeastern India near Nepal and eventually was discovered by the Western world in the 1,800's with British Colonization.
There was another wave of mindfulness into the west in mid 20th Century. The Beatles were a huge part of bringing meditation and mindfulness to the West when they became practitioners. It was in 1975 that a group of individuals started the Insight Meditation Society in Massachusetts.

Then in 1979 a molecular biologist from MIT named Dr. Jon Kabat-Zinn started the Mindfulness Based Stress Reduction (MBSR) program that consisted of an 8-week course. It was first used as an adjunct to regular medical treatment for patients with chronic pain and other chronic illnesses.

Researchers have been looking at the therapeutic effects of mindfulness ever since. If you search *"mindfulness meditation"* in PubMed you get over 1,300 hits.

Results

All 44 interns (100%) agreed to be in the study. The mean age was 27 years with about 2/3 being female.

Burnout:

Significant reduction with mindfulness.

Stress:

Significant reduction with mindfulness.

TALK NERDY TO ME

1) Randomization:

They do not explain how randomization was done but rather just that *"participants were randomly assigned to the intervention or control group."* So did they assign every other intern that signed up, or did they have a random number generator or some other method?

2) Blinding:

Participants were not blinded to group assignment. This could have biased the study towards a positive treatment effect.

3) Similar at Base Line:

We do not know if the two groups were equal at baseline for things like age or gender. Pretest conditions for experience with mediation/mindfulness, appeal of mediation/mindfulness and expectations of the potential helpfulness of mediation/mindfulness was equivalent. However, the treatment group reported higher perceived stress at baseline, which could inflate the treatment effect.

4) Treated Equal

It is unsure if both groups were treated equal except for the mindfulness intervention. The authors recognize that there could have been some contamination between the treatment group and the control group. Transfer of information may have taken place but would have decreased the effect size.

5) Effect Size

While the effect size on stress and burnout were statistically significant it is not clear if they are clinically significant. For more intern oriented-outcomes, a large sample size would be needed to check for decreases in alcohol use, drug use, depression, and suicide. It would also be very difficult to tease out *"patient oriented outcomes"* like medical errors in a complex health system.

Case Resolution The resident who was suffering early burnout had a clear and remarkable benefit from starting a daily, app-based mindfulness and meditation practice. Everyone who works with him noticed the change (without knowing why he was different), and he tells me the practice is now a vital and required part of his daily routine.

Clinical Application We are not sure if it has a clinical impact at this point. More studies are needed, but a calmer and happier doctor should logically translate into a better clinical impact.

WHAT DO I TELL THE RESIDENT

Thank you for letting me know you are having difficulties coping. Residency is stressful and you are not the only one who has had trouble with stress, but there are ways to mitigate the stress and stay healthy. In addition to eating well, getting enough sleep, exercising regularly and staying socially connected, mindfulness meditation may help.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the author's conclusion.

Other FOAMed Resources:

- EMCrit: Kettlebells for the Brain
- LiTFL: Burnout
- St. Emlyn's: Burnout and Stress in Emergency Medicine
- EMToxCast: Mindfulness in medicine: Physician heal thyself
- Bounce Back Project
- Phenomenal Docs
- Steps Forward
- ePhysicianHealth
- Broken Toy
- MindfulNurse
- CAEP Wellness Resources

RCT Quality Checklist

The study population included or focused on those in the ED	☑
The patients were adequately randomized	?
The randomization process was concealed	?
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	☑
The patients in both groups were similar with respect to prognostic factors	
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	
All groups were treated equally except for the intervention	?
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	?
The treatment effect was large enough and precise enough to be clinically significant	?

Guest Skeptic: Dr. Diane Birnbaumer
Senior Clinical Faculty, Harbor-UCLA Medical Center
Emeritus Professor, David Geffen School of Medicine at UCLA

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Chase the Dragon and Naloxone

Case Scenario:

45-year-old male arrives via EMS but he wants to be discharged. EMS found him unresponsive with paraphernalia for IV heroin use. Prehospital vitals were O2 sat 89% and RR of 6 breaths per minute prior to administration of O2 and 1 mg naloxone. After naloxone he is A and O X3 with a normal pulse OX and clear lungs. 20 minutes post naloxone he is asking to be discharged.

Q:

1) What are the medical risks to a heroin user treated with naloxone who refuses transport to the emergency department?
2) When a heroin user is treated in the emergency department with naloxone how long must they be observed before discharging?
3) How effective is naloxone administration in heroin users by first responders and bystanders and what are the risks associated with naloxone distribution programs?

BOTTOM LINE

Delayed opioid toxicity is more likely overlooked opioid toxicity rather than rebound toxicity. There are patients that are safe to discharge, but perform a careful clinical exam and be certain to observe the patient's respiratory pattern and mental status in a non-stimulated state. Of course, exercise caution in the ever changing world of heroin abuse and all its adulterants.

Do Heroin Overdose Patients Require Observation After Receiving Naloxone

Willman et al. Clinical Toxicology. 2017

P Patients suspected of heroin overdose

I Naloxone administered, transport to hospital, observation, and naloxone programs

C N/A

O
- Risks to heroin user given Naloxone and not transported to ED
- Length of observation in ED
- Effectiveness of naloxone administration in heroin users by first responders and risks of naloxone programs

Author's Conclusion:

"Patients revived with naloxone after heroin overdose may be safely released without transport if they have normal mentation and vital signs. In the absence of co-intoxicants and further opioid use there is very low risk of death from rebound opioid toxicity."

Background

Heroin use has been increasing in the USA since 2007 (1). Opioids depress the heart rate and breathing and overdoses can result in death. With the increase in heroin use there has also been an increase in the number of heroin deaths (2).

Naloxone is the specific treatment for heroin overdoses and is becoming widely available to first responders of all sorts (Police, Fire, First Aiders, lay people and EMS). It is an opioid antagonist that binds competitively to opioid receptors in the central nervous system and gastrointestinal tract. It can be administered in multiple ways (intranasal, subcutaneously, intramuscularly, intravenously, nebulization or endotracheal tube).

The American Heart Association (AHA) discussed opioid overdoses and the use of naloxone Part 10: Special Circumstances of Resuscitation in their 2015 Guidelines (3). There were two new recommendations.

One was about education and naloxone training and distribution. The second new recommendation was about opioid overdose treatment.

CanadiEM summarized the Top 5 changes to AHA 2015 Guidelines in a series of infographics (4). One infographic focused on Special Circumstances and said *"trained providers should administer naloxone to respiratory arrest patients with suspected opioid overdose. Lay-people likely to see opioid overdoses may be trained to administer naloxone during targeted BLS training" (5).*

Some heroin users may refuse further treatment or transport to the emergency department after receiving naloxone in the field and awaking. If transported to hospital, they may also refuse further treatment or observation in the emergency department.

3 Clinical Q's

1. What are the medical risks to a heroin user treated with naloxone who refuses transport to the emergency department?

2. When a heroin user is treated in the emergency department with naloxone how long must they be observed before discharging?

3. How effective is naloxone administration in heroin users by first responders and bystanders and what are the risks associated with naloxone distribution programs?

Results

Seven studies were relevant to answering the first question. There are 5443 patients treated with naloxone and not transported to the emergency department. Only two of the studies exclusively looked at heroin (n=1,069) and there were no deaths.

Author	Study Type	Location	Cases	Outcome	Other
Vilke et al 2003	Retrospective Chart Review	San Diego, USA	998	No deaths within 12hrs	Medical Examiner's database
Boyd et al 2006	Retrospective Chart Review	Helsinki, Finland *	71	No deaths within 12hrs	Medical Examiner's database
Buajordet et al 2004	Prospective Observational	Oslo, Norway	1009	Unknown	Observed in field until alert and able to stand
Heyerdahl et al 2008	Prospective Observational	Oslo, Norway	750	One death due to heroin OD 2 days later	12% not followed up
Wampler et al 2011	Retrospective Chart Review	San Antonio, USA	552	No deaths within 48hrs	Medical Examiner's database
Rudolph et al 2011	Retrospective Chart Review	Copenhagen, Denmark	2241	14 deaths 3 from rebound toxicity	1427 lost to follow up (no identification on scene)
Levine et al 2016	Retrospective Chart Review	Los Angeles, USA	205	One death (CAD/Cirrhosis) within 24hrs	Medical Examiner's database

Five studies were considered relevant to answer the second question. Observation period recommendations appear to be anywhere from 4-6 hrs up to 24 hrs.

A retrospective chart review by Smith et al included 124 patients presenting to the emergency department following a heroin overdose. There were 46 patients discharged home, 42 patients left against medical advice, and 19 patients eloped from the emergency department. No patients were transported back to the emergency department or were found dead within six days. Most patients left the emergency department within two hours. The other studies showed similar results.

A clinical prediction rule was developed by Christenson et al to identify patients who could be safely discharged one hour after naloxone administration. The rule consisted of three variables:

1. **Ability to Mobilize as Usual**
2. **Normal Vital Signs**
3. **Glasgow Coma Scale of 15**

They had 573 patients included in the study. The rule had a sensitivity of 99% (95% CI; 96%-100%) and specificity of 40% (95% CI; 36-45%) for predicting adverse events within 24hrs. The rule requires validation before it can be recommended for use.

TALK NERDY TO ME

1) Limited Search:

The search for relevant articles was not detailed and exhaustive. They only searched two data bases (PubMed and Google Scholar) and was limited to the English language. They also did not mention speaking to experts in the field or searching the grey literature.

2) Methodology Quality:

We are unsure of the methodological quality of the included studies. They did not formally rate individual studies using an assessment tool to characterize the quality of the studies.

3) Level of Evidence:

The included studies were mostly retrospective chart reviews and other observational studies. These are a low level of evidence on the evidence based medicine pyramid.

4) Precision of Results:

Due to the level of evidence and missing data we are unsure of the precision of the results in this review.

5) Pre-Date Fentanyl Adulteration

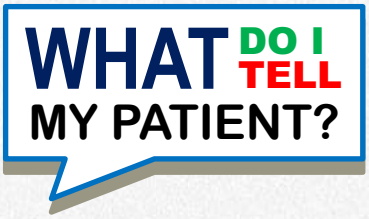
Most of the studies included in the review predate heroin adulterated with fentanyl and other similar drugs. As Leon Gussow says *"There's no such thing as just plain heroin anymore".* What does this mean for this study? In general, heroin mixed with fentanyl requires larger doses of naloxone to reverse and patients will have, for example, difficult to treat respiratory depression. Therefore, this group will be clinically evident to most providers. Can we apply these findings to our new era of heroin laced fentanyl? Unsure, but as an educated guess, a well appearing patient revived with naloxone is still probably okay to discharge.

Case Resolution

When observed from the entrance to the room without stimulation, it was obvious that when not stimulated the patient's respiratory rate would decrease and their oxygen saturation would dip to 90%. Rather than administering additional naloxone, you apply supplemental oxygen and allow the patient to sleep for another hour. At that time, you remove the oxygen and recheck the patient without overly stimulating him. He appears to be alert and oriented times three with clear lung fields and had no signs of respiratory depression; he can walk to the bathroom on his own and back without assistance. The patient is safe for discharge and receives a referral to addiction counselling and treatment.

Clinical Application

The results of this study provides weak evidence applicable to EMS determining refusal of transport decisions after heroin overdoses, emergency department physicians assessing the same patients once brought into the emergency department, and naloxone distribution programs using bystanders or lay people



You have just had a heroin overdose and you feel better because we gave you drug that blocks the effects (naloxone). If you feel like you are getting worse you should return immediately. Preferably go home or be with someone that can observe you for a period of time. If you would like to be referred to a detox program or perhaps even get a prescription for naloxone to take home we can start talking about that as well.

References:
1.NIH: What is the scope of heroin use in the United States?
2.CDC: Division of Vital Statistics, Mortality Data
3.AHA 2015 Guidelines Part 10: Special Circumstances of Resuscitation
4.CanadiEM: The 'Top Five Changes' Project: 2015 AHA guidelines on CPR + ECC update infographic series
5.CanadiEM: Top 5 Changes to Special Circumstances

CONCLUSION VS COMMENTARY
COMPARISON

We generally agree with the authors' conclusions. However, when we podcasted on this article at EMToxCast we were careful to point out one specific subtlety. Opioid overdoses may have respiratory depression and hypoxia when not stimulated, but when stimulated might meet all of the criteria from the Christenson study. It is important to not stimulate the patient when you are making your assessment as to whether they can be discharged. Then once you observe a lack of respiratory depression or desaturation, perform a careful pulmonary auscultation so as not to overlook rales from pulmonary edema and observe that they are able ambulate unassisted. This represents the type of heroin overdose patient revived with naloxone that may be discharged.

There was a letter to the Editors by Eggleston and Clemency expressing concern with a response from Willman et al.

Quality Checklist for Therapeutic Systematic Review

The clinical questions are sensible and answerable	☑
The search for studies was detailed and exhaustive	
The primary studies were of high methodological quality.	?
The assessment of studies were reproducible.	?
The outcomes were clinically relevant	☑
There was low statistical heterogeneity for the primary outcomes.	?
The treatment effect was large enough and precise enough to be clinically significant.	?

Other FOAMed Resources:

- EM Tox Cast: Heroin overdoses and naloxone reversal: ok for discharge or mandatory observation?
- St. Emlyns: Opiate Overdose in the ED
- EM Cases: Episode 74 Opioid Misuse in Emergency Medicine
- EM Basic: Opioids Part 1 by Dr. Sheyna Gifford
- EM Basic: Opioids Part 2 by Dr Sheyna Gifford
- ALiEM: Treat and Release' after Naloxone – What is the Risk of Death?
- TPR: Treating "heroin" overdose: the past is no guide
- TPR: Keys to the safe use of naloxone
- AmboFOAM: Angling for Trouble? Catch and Release for Heroin Overdose.

Guest Skeptic: Dr. Richard Hamilton
Chair of the Department of Emergency Medicine, Drexel University
Host, EMToxCast

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The First Cut is the Deepest N.O.T. for Pediatric Appendicitis

Case Scenario:

12 year old complains of a belly ache, pointing to his right iliac fossa. It has been 36 hours, initially peri-umbilical and associated with nausea, poor appetite and malaise. It increased in severity and now localized in his right iliac fossa. His blood work shows an elevated WBC count and the ultrasound is consistent with acute uncomplicated appendicitis (AUA).

Q:

Is non-operative treatment (N.O.T.) for acute uncomplicated appendicitis safe and effective in children?

BOTTOM LINE

Non-operative treatment of acute uncomplicated appendicitis is not ready for prime time.

Efficacy and Safety of Nonoperative Treatment for Acute Appendicitis: A Meta-analysis

Georgiou et al. Pediatrics. 2017

P Pediatric patients, diagnosed with acute uncomplicated appendicitis (AUA)

I Course of IV antibiotics to treat AUA

C Primary appendectomy

O Primary: Discharge from hospital without appendectomy during initial hospital episode
Secondary: Adverse effects of N.O.T., complications, long term efficacy, recurrent appendectomy, hospital length of stay

Exclusion criteria:

Complicated appendicitis (perforation, rupture, abscess, or appendix mass), studies of mixed adults and children or studies of acute appendicitis in only in children with malignancy.

Author's Conclusion:

"*Current data suggest that NOT is safe. It appears effective as initial treatment in 97% of children with AUA, and the rate of recurrent appendicitis is 14%. Longer-term clinical outcomes and cost-effectiveness of NOT compared with appendicectomy require further evaluation, preferably in large randomized trials, to reliably inform decision-making.*"

Background

Appendicitis is the most common paediatric surgical emergency. It has a lifetime risk of over 7% but the peak incidence is in the second decade of life. Acute, uncomplicated appendicitis if promptly diagnosed can be effectively treated by surgery, the recovery from which, is relatively short.

There is a small but increasing number of publications in the adult literature proposing management of the problem using simply intravenous antibiotics. This is called Non Operative Treatment of Appendicitis (N.O.T.A). This would avoid the risks of general anaesthesia, any surgical scar and allow quicker return to full activity.

We have covered N.O.T.A. on the SGEM #115– Complicated. Appendicitis management used to be so easy. The diagnosis was made, the surgeon was called and the appendix was removed.

For over a century the mainstay treatment of acute appendicitis has been an appendectomy. There have been refinements to the surgical procedure since Fitz first described it in 1886. My approach in this case would be to remove the appendix thru a small, 3cm incision particularly in a boy: less number of scars, quicker procedure, similar pain relief and recovery. In girls I would probably use a laparoscope.

REBEL EM covered the issue of N.O.T.A. in adults when it reviewed a pilot study by Dr. David Talan (Ann Emerg Med 2016). Paediatric surgery is completely separate from adult surgery and the implications of practice in adults is not the same in children. There is not a lot of cross over for physicians who have both an adult and paediatric practice in the understanding that children are different.

Results

The study identified 413 patients who were selected or randomized to non-operative treatment of acute uncomplicated appendicitis. N.O.T. was successful in 396/413 of cases.

Primary Outcome

17/413 patients failed N.O.T. and required surgery during the primary admission. This gave a result of 97% (95% CI; 95%-99%) of patients treated with N.O.T. were successful.

Secondary Outcome

- Adverse effects of N.O.T. – None were reported
- Long term efficacy of N.O.T. (no appendicectomy at final reported follow-up) – 336/413 or 82% (95% CI; 77% to 87%)
- Recurrent episode of appendicitis (confirmed by histology or treated with second course of N.O.T.) – 68/396 or 14% (95% CI; 7% to 21%)
- Hospital length of stay – Mean difference of 0.5 days less with appendicectomy (95% CI; 0.2 t o 0.8)

TALK NERDY TO ME

This study attempts to answer an important question that challenges the current standard of care. There are no perfect studies and one of the big problems with systematic reviews is they are only as good as the included studies.

Unfortunately, there are not many high-quality studies on the topic of non-operative treatment of appendicitis.

Through the power of the social media we reached out to one of the authors to help us understand the paper better. Dr. Nigel Hall is an Associate Professor of Paediatric Surgery University of Southampton and a Consultant Paediatric and Neonatal Surgeon at the Southampton Children's Hospital.

Listen to the podcast on iTunes to hear Dr. Hall's responses to our nerdy questions.

TALK NERDY TO ME

1) Included Studies:

Observational Studies: Nine of the studies were non-randomized (six prospective and three retrospective) which introduces bias. It also means these studies can only concluded association not causation.

Non-Comparator Studies: Four of the included studies did not have a comparison group so we do not know how non-operative treatment would compare to traditional treatment in that study population.

Randomized Control Trial: Only one of the included studies was an RCT. This was a small pilot study of 50 patients in Sweden that had its own limitations. The biggest issue besides study size was lack of blinding. Patients, caregivers and the surgeons were all aware of treatment allocation, which introduces bias.

2) Diagnostics of Acute Uncomplicated Appendicitis:

This is another problem with this study because the exact diagnosis of AUA itself is problematic. The paper utilises either ultrasound or CT to make the diagnosis. The literature suggests a diagnostic accuracy for ultrasound of between 80 and 90% for AUA and similar for CT. The spread includes male and female patients, with differing pathologies. There is no proof, nor can there be, of diagnosis but similarly no comment on the diagnostic accuracy of these investigations. In addition, It is important to emphasise that AUA is appendicitis without gross surrounding inflammation, bowel wall thickening, free fluid or pus and, as such, is a more challenging diagnosis than complicated appendicitis.

TALK NERDY TO ME

3) Treatment with Antibiotics or Appendicectomy:

All ten studies had different antibiotic treatment protocols. This included different intravenous and oral antibiotics regimes making it hard to know what would be the best strategy to use.

- Many surgeons would identify appendicectomy as a further investigation such that the procedure allows more accurate visualisation of the intra-abdominal milieu, alternative pathologies including ovarian, Meckel diverticulum and unsuspected alternates as well as exclusion of such in recurrent abdominal pain. Comparison of non-operative treatment and appendicectomy is not identical.

4) Safety:

It is well recognized that adverse events are under reported in the medical literature. Even if the included studies had rigorous reporting mechanisms for adverse events there were just over 400 patients treated with non-operative treatment. This is too small to claim safety of rare events but rather that no adverse events were observed.

5) You Said There Would be no Math:

We were a little confused by the statistics presented in the paper. Some of the numbers did not make sense. As an example, 17 out of 413 patients required surgery in first admission calculates to 95.9% (396/413) success rate as the primary endpoint, not 97% as stated. We noticed the same slight differences for some of the secondary outcomes as well.

TALK NERDY TO ME

One more comment from pediatric surgeon Dr. Ross Fisher:

This interesting question about understanding the natural history of appendicitis. Lots of people are throwing scoring techniques, blood tests, ultrasound and even as we discussed the use of intense abdominal radiation in CT scanning to try and increase our accuracy in diagnosis and we are still at the same place we have been before.

What even is "*acute uncomplicated appendicitis*"? Is it a starting point for further and progressive inflammation, is it simply mild self limiting inflammatory response, or is it an acute bacterial infection. The evidence of progression of appendicitis is not available. If it is an acute bacterial infection, why does it get better simply by removing it? If it is a self limiting inflammation, why give antibiotics or even intervene when clearly their may be children who do not present to hospital and better without intervention? There is more that we need to know even to understand appendicitis before we can fully understand the management of it.

Case Resolution

As the surgeon, I would come and discuss the diagnosis of acute uncomplicated appendicitis with the patient and family. I would recommend appendicectomy and encourage them if all goes well Bobby should recover quickly and he should be back on the ice in time for the finals.

Clinical Application

Non-operative treatment of acute uncomplicated appendicitis is interesting. More and better-quality evidence is needed before applying non-operative treatment in the paediatric population.

WHAT DO I TELL MY PATIENT?

I would tell Bobby and his parents that he has appendicitis. The appendix has not ruptured and he needs to be seen by the surgeon and they will probably recommend taking out his appendix today. If all goes well he should be able to play in the hockey finals.

CONCLUSION VS COMMENTARY
COMPARISON

The authors conclude that the current data suggests that non-operative treatment is "safe." It would be more accurate to conclude that the current data suggests that non-operative treatment is not associated with any adverse events.

Quality Checklist for Therapeutic Systematic Review

The clinical questions are sensible and answerable	☑
The search for studies was detailed and exhaustive	☑
The primary studies were of high methodological quality.	
The assessment of studies were reproducible.	☑
The outcomes were clinically relevant	☑
There was low statistical heterogeneity for the primary outcomes.	☑
The treatment effect was large enough and precise enough to be clinically significant.	

Other FOAMed:

- Skeptical Scalpel: Nonoperative treatment of appendicitis in children: Is it safe?
- EM Cases: Episode#43 – Appendicitis Controversies

Guest Skeptic: Dr. Ross Fisher
Pediatric Surgeon, Sheffield Children's Hospital

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Did You Ever Have to Make Up Your Mind, Pan Scan or Leave Other Scans Behind

Case Scenario:

53-year-old woman brought to ED with EMS after a motor vehicle collision. No loss of consciousness but hit her head. Complaint is chest pain with difficulty breathing. She is tachycardic, tachypnic and has mild abdominal pain. You suspect a flail chest on examination. FAST examination is negative.

Q:

Should trauma patients get an immediate total-body (pan scan) CT or should you do usual X-rays followed by selective CT scanning?

BOTTOM LINE

There is no clear evidence that immediate total body scanning of trauma patients provide better clinically important patient oriented outcome but does result in more radiation exposure.

Immediate Total-Body CT scanning versus Conventional Imaging and Selective CT Scanning in Patients with Severe Trauma (REACT-2): a randomized controlled trial.

Sierink et al. Lancet. 2016

P Adults with severe injury, suspicion of life-threatening injury or weak vitals

I Immediate total body CT scan (Vertex to pubic symphysis)

C Primary Standard ATLS guideline directed workup with pelvic and chest XRAY, FAST

O Primary: In-hospital mortality at initial hospital or secondary hospital if transferred
Secondary: 24 hour and 30 day mortality, imaging time, time to diagnosis, length of stay in trauma room or ICU, number of days on mechanical ventilation, cumulative radiation dose, serious adverse events, transfusion requirements, number of missed injuries
Pre-determined Sub-Group Analysis: Mortality for patients with ISS over 16 mortality for TBI

Exclusion criteria:

Pregnant, referred from another hospital, low-energy trauma with blunt injury mechanism, stab wound in only one body region, and patients too unstable to undergo a CT scan who require CPR or immediate operation because death is imminent

Author's Conclusion:

"Diagnosing patients with immediate total-body CT does not reduce in-hospital mortality compared to standard radiological work-up. Because of the increase radiation use, future research should focus on the selection of the patient that will benefit from immediate total-body CT.

Background

When we assess head or cervical spine injuries there are good clinical decision tools available to Emergency Physicians to guide our care (Canadian CT head rules and Canadian C-Spine Rules).

However, when we assess major trauma that includes chest, abdominal and pelvic trauma, the initial radiologic evaluation is left to the treating physician's judgement. There is no validated clinical decision tool to help guide our decisions.

Many studies (most retrospective) have assessed the use of pan scanning as an initial radiologic evaluation. Huber-Wagner et al (Lancet 2009) showed a mortality reduction in a retrospective database study of patients who have had a pan scan. The NNT varied from 17 to 32 according to the injury severity.

A systematic review by the authors of the present study confirmed a possible benefit of the pan scan, but it showed a need for a well-designed, large, prospective randomized clinical trial with patient oriented outcomes (Sierink et al 2012).

Results

There were 5,475 patients assessed for eligibility with 3,860 being excluded for a variety of reasons. The most common reason was that they did not meet inclusion criteria.

This left 1,403 patients to be randomly assigned to total-body CT scanning or standard work up. However, another 203 were excluded after randomization, and even more after receiving the allocated intervention. This ultimately left 1,083 for the primary analysis.

Primary Outcome

Mortality 16% vs. 16% p=0.92.

Results

Secondary Outcome

- 24 Hour Mortality – 8% vs. 6% (p=0.23)
- 30 Day Mortality – 17% vs. 16% (p=0.69)
- Imaging Time – 30min vs. 37min (p<0.0001)
- Time to Diagnosis – 50min vs. 58min (p<0.001)
- LOS in Trauma Room – 63min vs. 72min (p=0.067)
- LOS in the ICU – 3 days vs. 3 days (p=0.83)
- Number of Days of Mechanical Ventilation – 2 days vs. 1 day (p=0.78)
- Readmission within Six Months – 17% vs. 11% (p=0.01)
- Cumulative Radiation Dose ED (median) – 20.9mSv vs. 20.6mSv (p<0.0001)
- Cumulative Radiation Dose Hospital Admission (median) 21.0mSv vs. 20.6mSv (p<0.0001)
- Serious Adverse Events – 5 deaths (two in total-body CT group, one in the standard work-up and one patient excluded after randomization)
- Transfusion Requirements – 27% vs. 28% (p=0.91)
- Number of Missed Injuries – 9% vs. 10% (p=0.45)
- Hospital Costs – No significant difference

Predetermined Analysis

No difference

- Mortality for patients with ISS ≥16 – 22% vs. 25% (p=0.46)
- Mortality for Traumatic Brain Injury (TBI) – 38% vs. 44% (p=0.31)

Of note, 46% (n=250) of the control group underwent sequential CT scan of all body regions, equivalent to a total-body scan. Another important point is that there were approximately 10% protocol violators in the two groups.

TALK NERDY TO ME

1) Intervention Choice Bias

This bias may be present in the control group since 46% had an equivalent total-body scan at the end of the radiological work-up. The control group initially had a chest/pelvic CT followed by a protocolized selective CT. One out of two control patients got *"selective"* head to pelvis evaluations. This may represent a more pragmatic approach.

2) Intention to Treat Analysis, Cross Over and Protocol Violation:

They say the primary analyses were done *"according to the intention-to-treat principle".* In other words, a modified ITT or not an ITT. There were 203 (14%) patients excluded after randomization. Another 117 (8%) patients were excluded after receiving the allocated intervention. So only 78% of the randomized patients were included in the primary analysis.

There were a number of patients who crossed over to the other group (1% intervention group vs. 3% control group). There were also a number of protocol violators (9% Intervention Group vs. 11% Control Group).

3) External Validity

This study took place in Level 1 Trauma centres in the Netherlands and Switzerland. All were academic teaching hospitals with a trauma team leader and a 64 slice CT scanner. Their results may not be applicable to North American Level 1 Trauma centres or smaller community hospitals without a trauma team leader or 64 slice CT scanner.

TALK NERDY TO ME

4) Statistics vs. Clinical Significance

While some secondary results were statistically significant, it is unlikely that they were clinically significant. Specifically, the slight decrease in time to imaging completed, time to diagnosis and time spent in the trauma room probably are not important.

However, the statistically significantly more radiation in the total-body CT intervention group may/may not be clinically significant. An increase of 0.3 mSv represents an increase cancer risk of 1:30,000.

5) Incidentalomas:

The authors mention the risk and complications of incidental findings with total-body CT but they don't report it. As more and more scans are done there will be more findings of things that will never cause disease (overdiagnosis). However, it can lead to increased stress, anxiety and cost of working up and monitoring the incidentaloma.

Case Resolution

Your patient has a selective strategy getting a thoracic CT with plain X-rays of the spine and pelvis. A flail chest was identified along with a pneumothorax, which we drained. The patient was then admitted to the trauma service.

Clinical Application

Although this study has some limitations, this paper supports a selective strategy rather than an immediate total body scan in the evaluation of trauma patients. Radiation exposure should be considered before *"routinely"* using a total-body CT protocol.

WHAT DO I TELL MY PATIENT?

You have been in a car accident. We need to get some x-rays and a CT scan. This will show us what you have injured and help us give you the best care possible.

CONCLUSION VS COMMENTARY
COMPARISON

We generally agree with the authors' conclusion.

Other FOAMed:

- EMNerd: The Case of the Anatomic Injury Part II
- The Bottom Line: REACT-2
- St.Emlyn's: Do we always need a whole body CT in trauma?
- FOAMShED: To pan-scan or not pan-scan REACT2

RCT Quality Checklist

The study population included or focused on those in the ED	☑
The patients were adequately randomized	☑
The randomization process was concealed	
The patients were analyzed in the groups to which they were randomized	
The study patients were recruited consecutively (i.e. no selection bias)	?
The patients in both groups were similar with respect to prognostic factors	
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	
All groups were treated equally except for the intervention	?
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Guest Skeptic: Dr. Marcel Edmond
Associate Professor, Laval University
Attending Physician, CHU de Quebec
Chair, CAEP Trauma and Injury Prevention
Host, SGEM Global French
Faculty, BEEM

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Platelet Transfusions for Intracerebral Hemorrhage (PATCH) – Don't Do It!

Case Scenario:

68-year-old with sudden onset right sided hemiparesis and facial droop. Non-contrast head CT shows a hemorrhagic stroke. On review of the patient's medications you notice the patient is taking daily aspirin. You wonder if they would benefit from a platelet transfusion.

Q:

Does platelet transfusion reduce death or dependency in acute hemorrhagic stroke for patients on antiplatelet agents?

BOTTOM LINE

There appears to be evidence of harm if platelet transfusion is given to reverse antiplatelet agents in patients with atraumatic intracerebral hemorrhage, so this practice cannot be recommended.

Platelet Transfusion Versus Standard Care After Acute Stroke Due to Spontaneous Cerebral Hemorrhage Associated with Antiplatelet Therapy (PATCH): a Randomized, Open-label, Phase 3 Trial

Baharoglu et al. Lancet. 2016

P Adults with non traumatic intracerebral hemorrhage with a GCS of greater than 7 in whom platelets could be transfused within 6 hours of symptoms, and used antiplatelets for 7 days

I Platelet transfusion within 6 hours of ICH symptoms and within 90 mins of imaging

C Standard Care

O Primary: Shift towards death or dependence scored with modified Rankin scale after 2 mo
Secondary: Survival, poor outcome (mRS 4-6), poor outcome (mRS 3-6), hemorrhage growth after 24 hours, transfusion issues and serious AE

Exclusion criteria:

Epidural or subdural hematoma, underlying aneurysm or arteriovenous malformation, planned surgery within 24hrs, intraventricular blood more than sedimentation in the posterior horns, previous adverse reaction to platelet transfusion, known use of vitamin K antagonists or history of coagulopathy, know thrombocytopenia, lacking mental capacity or death appeared imminent.

Author's Conclusion:

"Platelet transfusion seems inferior to standard care for people taking antiplatelet therapy before intracerebral haemorrhage. Platelet transfusion cannot be recommended for this indication in clinical practice."

Background

In the US, daily or every other day aspirin use has been reported to be as high as 61% in adults aged 65 or older (Ajani et al Am J Prev Med 2006). Taking antiplatelet therapy prior to a hemorrhagic stroke raises the risk of death by 27% and in high income countries more than 25% of patients with incident intracerebral hemorrhages were taking antiplatelet therapy (Thompson et al Neurology 2010). Many physicians are faced with patients with intracerebral hemorrhage on antiplatelets, and how to best manage them.

The reversal of antiplatelet medications in intracerebral hemorrhage was covered in a Best Available Evidence (Martin and Conlon Ann Emerg Med 2013). It stated that *"none of these studies showed a mortality benefit or improved functional outcome with platelet transfusion in patients with spontaneous or traumatic intracerebral hemorrhage who were receiving antiplatelet medications."*

That review further elaborated that for these patients there were *"no compelling data currently supporting the use of platelet transfusion"* and that *"it would be within the standard of care to withhold platelet transfusion in patients with either spontaneous or traumatic intracerebral hemorrhage who are receiving antiplatelet therapy."* The review did note that the existing evidence at that time were all based on relatively small and retrospective.

However, recommendations from the neurosurgical perspective differ. A 2010 World of Neurosurgery literature review on the topic by Campbell et al *"at present, the literature contains insufficient information to establish any guidelines or treatment recommendations. In light of this, the current authors have proposed a protocol for antiplatelet reversal in both spontaneous and traumatic acute ICH."*

The Modified Rankin Scale (mRS) [edit]

The scale runs from 0-6, running from perfect health without symptoms to death.

- 0 - No symptoms.
- 1 - No significant disability. Able to carry out all usual activities, despite some symptoms.
- 2 - Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities.
- 3 - Moderate disability. Requires some help, but able to walk unassisted.
- 4 - Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted.
- 5 - Severe disability. Requires constant nursing care and attention, bedridden, incontinent.
- 6 - Dead.

Results

There were 190 patients randomized in this study (97 in the treatment group and 93 in the standard care group) with a mean age of 74 years.

Primary Outcome

- Unadjusted OR of mRS 4-6 was 1.84 (95% CI; 1.10 to 3.08, p=0.02) in the treatment group
- Adjusted OR of mRS 4-6 was 2.05 (95% CI; 1.18 to 3.56, p=0.0114) in the treatment group (note the adjustment was for pre-intracerebral hemorrhage antiplatelet therapy and known prognostic factors)

Secondary Outcome

	Platelet transfusion group (n=97)	Standard care group (n=93)	Odds ratio (95%CI)	p value
Alive at 3 months (survival)	66 (68%)	72 (77%)	0·62 (0·33–1·19)	0·15
mRS score 4–6 at 3 months	70 (72%)	52 (56%)	2·04 (1·12–3·74)	0·0195
mRS score 3–6 at 3 months	86 (89%)	76 (82%)	1·75 (0·77–3·97)	0·18
Median ICH growth at 24 h (mL)*	2·01 (0·32–9·34)	1·16 (0·03–4·42)	..	0·81

Data are n (%) or median (IQR). mRS=modified Rankin Scale. ICH=intracerebral haemorrhage. *n=80 in platelet transfusion group and 73 in standard care group.

Table 2: **Secondary outcomes in the intention-to-treat population**

- Transfusion issues (reactions and thrombotic complications: One patient had a minor transfusion reaction while there was no difference in thrombotic complications (four in treatment vs. one in standard)
- Any Serious Adverse Events: 42% treatment vs. 29% standard OR 1.79 (95 CI; 0.98 to 3.27) in the intention-to treat analysis.

TALK NERDY TO ME

1) Emergency Department Patients:
We are not sure if these patients were emergency department patients because it was not explicitly stated in the paper. Given the nature of the complaint, it seems likely that they were.

2) Consecutive Recruitment:
It was not documented whether patients were recruited consecutively. However, it does say in the paper that PATCH investigators did not need to keep a screening log. This means we are unable to know if there was any selection bias introduced into the study.

3) Lack of Binding:
Participants and local investigators were not masked to treatment allocation and this does have the potential to introduce some bias. However, it was contrary to the study hypothesis that platelet transfusion would have positive patient oriented effect. This makes the results more believable.

4) Statistics vs. Clinical Significance:
The adjusted OR for the primary outcome was 2.05 but the lower end of the 95% confidence interval was close to one. In addition, the confidence interval was fairly wide.

5) More Data:
They say in the discussion that a similar RCT is nearing completion (NCT00699621). When that study is searched for on ClinicalTrials.gov no results are posted and the page says: "*The recruitment status of this study is unknown. The completion date has passed and the status has not been verified in more than two years".*

Case Resolution You discuss care with the patient and manage their case without the use of a platelet transfusion. The patient is transferred to the neuro ICU and a month later, ambulates to your emergency department to thank you for their care.

Clinical Application Hemorrhagic stroke patients on antiplatelet drugs appear to have a risk of harm from platelet transfusion, so it should not be part of their care unless future studies show benefit.

WHAT DO I TELL MY PATIENT?

Although you are on medications that inhibit the function of your body's platelets, a cell that assists with clotting, giving fresh platelets would not be helpful, and based on recent evidence, might actually be harmful.

CONCLUSION VS COMMENTARY

COMPARISON

We generally support the authors' conclusion and do not recommend platelet transfusion for reversal of antiplatelet drugs in spontaneous intracereberal hemorrhage.

Other FOAMed:

- REBEL EM:The PATCH Trial: Hold the Platelets in Spontaneous Intracerebral Hemorrhage?
- EM Literature of Note: Put the Platelets Away in ICH
- CORE EM: Platelet Transfusion in Intracerebral Hemorrhage
- St. Emlyn's JC: Platelets for Intracranial Haemorrhage
- The Bottom Line: PATCH

RCT Quality Checklist

The study population included or focused on those in the ED	?
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	?
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	☑

Guest Skeptic: Dr. Robert Edmonds
Emergency Medicine Physician, Newport News Virginia

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Dont RINSE, Dont Repeat

Case Scenario:

68-year-old with sudden onset right sided hemiparesis and facial droop. Non-contrast head CT shows a hemorrhagic stroke. On review of the patient's medications you notice the patient is taking daily aspirin. You wonder if they would benefit from a platelet transfusion.

Q:

Does platelet transfusion reduce death or dependency in acute hemorrhagic stroke for patients on antiplatelet agents?

BOTTOM LINE

There appears to be evidence of harm if platelet transfusion is given to reverse antiplatelet agents in patients with atraumatic intracerebral hemorrhage, so this practice cannot be recommended.

Induction of Therapeutic Hypothermia During Out-of-Hospital Cardiac Arrest Using a Rapid Infusion of Cold Saline: The RINSE Trial

Bernard et al. Circulation. 2016

P Adults with OHCA that resuscitation was started, had IV access, still in cardiac arrest after resuscitation efforts

I Rapid infusion of 30ml/kg IV cold saline (2L max), stopped if pulmonary edema or T=33'C

C Standard Care for OHCA

O Primary: Survival to hospital discharge
Secondary: Patients with shockable and non-shockable rhythm's with ROSC, temperature in ROSC patients when arrived at hospital, and place of discharge

Exclusion criteria:

OCHA due to trauma, suspected intracranial bleed, known or suspected pregnancy, already cool (<34.5C) or patients with DNR.

Author's Conclusion:

"In adults with out-of-hospital cardiac arrest, induction of mild therapeutic hypothermia using a rapid infusion of large-volume, intravenous cold saline during CPR may decrease the rate of return of a spontaneous circulation in patients with an initial shockable rhythm and produced no trend toward improved outcomes at hospital discharge."

Background

Therapeutic hypothermia post cardiac arrest has received a great deal of attention since 2002. Two relatively small randomized control trials published in the NEJM showed that hypothermia post cardiac arrest resuscitation was neuroprotective (Bernard et al and The Hypothermia After Cardiac Arrest Study Group).

The Cochrane Collaboration updated their review on hypothermia for neuroprotection in adults after CPR in 2012. They concluded:

- *"Conventional cooling methods to induce mild therapeutic hypothermia seem to improve survival and neurologic outcome after cardiac arrest. Our review supports the current best medical practice as recommended by the International Resuscitation Guidelines."*

The SGEM was skeptical of prehospital cooling for OHCA after reviewing two studies on the subject (SGEM#21 and SGEM#54). Both papers showed no patient oriented benefit to pre-hospital cooling in patients with OHCA and return of spontaneous circulation (ROSC).

Then came the Targeted Temperature Management (TTM) Trial (Nielsen et al NEJM 2013). The bottom line was the TTM trial did not demonstrate a benefit of a targeted temperature of 33C vs. 36C for survival of OHCA (SGEM#83).

Results

A CONSORT (Consolidated Standards of Reporting Trials) flow diagram shows that 22,775 patients in cardiac arrest seen by EMS were screened. About half of those patients (11,476) in cardiac arrest had resuscitation commenced. Just over 10% (1,324) were enrolled in the study. A few more were excluded (122) and four withdrew leaving a final number for analysis of 1,198 patients (618 allocated to cooling and 580 allocated to standard care).
The included population had a mean age of about 65 years, almost ¾ being male, about 60% were witnessed bystander arrest, close to ½ were found in a ventricular fibrillation/tachycardia rhythm, 1/3 were asystole and 20% were pulseless electric activity.

Primary Outcome

Survival to hospital discharge – 10.2% cooling vs. 11.4% standard care (p=0.51)

Place of Discharge	Cooling	Standard Care	P Value
Home	54 (8.7%)	49 (8.4%)	0.125
Rehabilitation	9 (1.5%)	14 (2.4%)	
Nursing Home	0 (0.0%)	3 (0.5%)	
Survive to Discharge in Patients Admitted to Hospital	63/304 (20.7%)	66/317 (20.8%)	0.98

Secondary Outcome

- Patients with shockable rhythm who got ROSC at scene – 2% cooling vs. 50.6% standard care (p=0.031)
- Non-shockable rhythm's with ROSC at scene – 6% cooling vs. 29.4% standard care (p=0.43)
- Temperature in ROSC patients when arrived at hospital 34.7C cooling vs. 35.4C standard care (p=<0.001)

TALK NERDY TO ME

1) Included Patients:

It is important to remember that only 5% of all cardiac arrest patient seen by EMS were included in this study. This is because ½ of patients did not have resuscitation commenced and only about 10% of those patients were ultimately enrolled in the study. Another issue is that they included patients with non-shockable rhythms, which traditionally have dismal outcomes (2%) anyways.

2) Lack of Blinding:

Not everyone was blinded in this study. The outcome assessors were blinded to treatment allocation. It is not mentioned if the patients who survived found out which group they were allocated. The paramedics and hospital staff were aware of treatment allocation. This lack of blinding for the providers may or may not have introduced some bias. However, based on the hypothesis the bias should have been in the direction of the intervention.

3) Temperature Decrease

The two groups started at a similar temperature (35.9C vs. 35.8C). However, the mean 1.2 litre of cold saline rapidly infused in the treatment group only decreased the temperature by 1.2C. When compared to the standard group there was only a 0.7C difference between the two groups (34.7C vs. 35.4C). While this was statistically significant it did not result in a change in the primary outcome (survival to hospital discharge). It could be that the decrease in temperature was not great enough or that decreasing the temperature does not make a patient oriented outcome difference.

TALK NERDY TO ME

4) Stopped Early:

The trial was designed for sample size of 2,512 patients. The study was stopped at approximately 50% of enrolment prior to the first planned interim analysis. This was due to the publication of the TTM trial. A number of the hospitals involved in the RINSE trial changed their target temperature as a result of that NEJM publication. Stopping trials early (usually for benefit) has a number of problems that have been discussed before on the SGEM. The problem of stopping this trial early is the precision of the results. This decrease in precision can be incorporated into any results from a systematic review and meta-analysis on therapeutic hypothermia. Ultimately, stopping the trial early biases the results and limits us from getting closer to the truth.

5)Patient Oriented Outcome:

The primary outcome in this study was survival to discharge. We are always saying a better patient oriented outcome would not just be survival but survival with good neurologic function. Their secondary outcome of place of discharge is a surrogate for good neurologic outcome. They found no statistical difference in what percentage of patients were discharged home (8.7% vs. 8.4% p=0.125). It would have been better if they had used a validated instrument for assessing neurologic outcome.

Case Resolution The 71-year-old woman with the out-of-hospital cardiac arrest is not cooled in the field. You get ROSC, transport her to hospital and hope she survives to hospital discharge neurologically intact.

Clinical Application This is another study reinforcing that cooling pre-hospital by EMS for OHCA should not be performed.

CONCLUSION VS COMMENTARY

COMPARISON

We agree with the authors' conclusion.

WHAT DO I TELL MY PATIENT?

I will tell the patient's partner that her wife had a cardiac arrest. We were able to bring her back but she is still unconscious. The prognosis is poor but the emergency department staff will do what they can.

RCT Quality Checklist

The study population included or focused on those in the ED	
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	?
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	☑
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Other FOAMed:

- St. Emlyn's JC – Pre-hospital therapeutic hypothermia: The RINSE trial.
- EM Literature of Note – Not Seeing Any Value in RINSE
- REBEM EM – Targeted Temperature Management in Out-of-Hospital Cardiac Arrest: 33°C or 36°C?

Guest Skeptic: Jay Loosley
Registered Nurse and Paramedic, London Ontario
Research Assistant, Ottawa Hospital Research Institute
Superintendent, Middlesex-London EMS

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We Weren't Born To Follow Up The PEITHO Long-Term Follow Up Study

Case Scenario:

22-year-old presents to the ED with sudden dyspnea. She takes oral contraceptive and was placed in a below-knee cast for a fibula fracture 2 wks ago. She is alert and talking, with a systolic BP of 110 mmHg, but CTPA demonstrates bilateral pulmonary artery thrombus with RV dilatation, and troponin is raised. She asks if there isn't something she could have to break up the clot.

Q:

Does systemic thrombolysis in patients with submassive PE improve long-term mortality or morbidity?

BOTTOM LINE

Systemic thrombolysis in submassive PE cannot be recommended to reduce long-term mortality or morbidity at this time.

Impact of Thrombolytic Therapy on the Long-Term Outcome of Intermediate-Risk Pulmonary Embolism

Konstantinides et al. JACC. 2017

P Adults with confirmed PE, within 15 days of symptom onset (RV dysfunction, echo or CT chest, myocardial injury with positive troponin)

I Single weight based IV bolus of tenecteplase (30-50 mg)

C Placebo: bolus matched for appearance and volume. All received unfractionated heparin.

O Primary: Long-term mortality
Secondary: Persistent symptoms of heart failure and echo findings

Exclusion criteria:

Haemodynamic decompensation at presentation (SBP<90 for 15 minutes or drop in SBP of 40mmHg for 15 minutes with evidence of end-organ hypo-perfusion, need for catecholamines), known significant bleeding risk (not including antiplatelet agents but including Vitamin K antagonist or platelets <100,000/mm3), thrombolysis in preceding 4 days, SBP>180 or DBP>110, pregnancy or childbirth in last 30 days or breastfeeding.

Author's Conclusion:

Approximately 33% of patients report some degree of persistent functional limitation after intermediate-risk PE, but CTEPH is infrequent. Thrombolytic treatment did not affect long-term mortality rates, and it did not appear to reduce residual dyspnea or RV dysfunction in these patients.

Background

We have discussed pulmonary embolism (PE) a number of times on the SGEM. In episode #51 and #126 we talked about managing some patients with PEs at home. Then in episode #163 we shuffled off to Buffalo and discussed ultrasound-facilitated, catheter directed, low-dose fibrinolysis for acute massive or submassive PEs.

The 2015 Chest Guidelines recommend systemically administered thrombolytic therapy in patients with acute PE associated with hypotension (systolic BP<90mmHg) who do not have a high risk of bleeding (Kearon et al 2016).

- *In patients with acute PE associated with hypotension (eg, systolic BP <90 mm Hg) who do not have a high bleeding risk, we suggest systemically administered thrombolytic therapy over no such therapy (Grade 2B).*

In addition, this guideline still suggests systemic thrombolytic therapy using a peripheral vein over catheter directed thrombolysis (CDT) in patients with acute PE who are treated with thrombolytic agents. They do note that patients with a higher risk of bleeding and have access to CDT are likely to choose CDT over systemic thrombolytic therapy.

- *n patients with acute PE who are treated with a thrombolytic agent, we suggest systemic thrombolytic therapy using a peripheral vein over catheter directed thrombolysis (CDT) (Grade 2C).*
    - ***Remarks:*** *Patients who have a higher risk of bleeding with systemic thrombolytic therapy and who have access to the expertise and resources required to do CDT are likely to choose CDT over systemic thrombolytic therapy.*

However, we've been left not sure what to do about submassive PE – hence the highly memorable Swami vs. Breadsell cage match at SMACCDub.

Previous trials have suggested a reduction in clinical decompensation (MAPPET-3) and long-term pulmonary hypertension (MOPETT) in patients who are given systemic thrombolytics. The largest trial to date was the Pulmonary Embolism Thrombolysis (PEITHO) trial published in the NEJM 2014. It showed an number needed to treat (NNT) of 33 to prevent death or haemodynamic decompensation in the first 7 days but an number needed to harm (NNH) of 11 for major bleeding. The authors of the PEITHO trial conclude:

- *In patients with intermediate-risk pulmonary embolism, fibrinolytic therapy prevented hemodynamic decompensation but increased the risk of major hemorrhage and stroke.*

Results

As stated previously they were only able to get about 71% (709/1,005) of the entire study population consented to obtain two-year survival data and prospectively conduct long-term clinical and ECHO follow-up of their patients. The mean age was about 67 years with just over 50% being female.

Primary Outcome

Long-term mortality

- 20.3% (73/359) tenecteplase vs. 18.0% (63/350) placebo (p = 0.43)
- Median follow-up 37.8 months (interquartile range: 24.6 to 54.8 months)

Secondary Outcome

No statistical difference.

Secondary Outcomes	Tenecteplase	Placebo	P Value
Persistent Clinical Symptoms	63/175 (36%)	55/183 (30.1%)	0.23
NYHA Class III/IV	21/175 (12.0%)	20/183 (10.9%)	
CTEPH	4/190 (2.1%)	6/186 (3.2%)	0.79
Mean Systolic PA Pressure	31.6mmHg	30.7mmHg	0.57

TALK NERDY TO ME

1) Were these Emergency Department Patients:

From the paper this was not clear, but we reached out to Professor Konstantinides, who confirmed this:

- *"The vast majority of the PEITHO patients were recruited in Emergency Departments. Although this type of information was not explicitly requested in the eCRF and thus not directly obtained, we showed in the original NEJM paper back in 2014 that only 6% of the patients had surgery in the previous month, and of those only a small minority were actually still hospitalized in the same hospital in which surgery was performed. Clearly, most surgical patients were excluded because they had (or at least considered to have) contraindications to thrombolysis. We also had no medically ill patients who suffered acute PE in the same hospital in which they were admitted for an acute disease."*

2) Consecutive Recruitment:

This is often a problem in emergency medicine research. If you only recruit at convenient times, like daylight hours, it is possible that you get a different patient group. This could introduce bias and limit external validity. Patients who get out of bed to see us at 4am might be sicker than those who wait till morning. It isn't explicitly stated in either PEITHO papers or the methodology paper but there isn't any mention of convenience sampling or restricted researcher hours.

3) Allocation Blinding:

This was well done in the initial paper, with placebo that matched tenecteplase and blinding throughout the research team. However, they broke the allocation code to write up the original paper in 2014, so it's possible that the researchers at the centres who did long term clinical and echocardiographic assessment knew which group the patient was in. This would tend to inflate any benefit of the treatment, though, which makes it less of an issue given their results.

TALK NERDY TO ME

4) Completeness of Follow-Up:

This is a mixed bag. Initially 1,006 patients were randomised. The 28 sites which planned to do long-term follow-up randomised 709 patients (71%). They got good follow-up on mortality (696/709, 98.1%). However, clinical assessment was only done in 358 of the 578 long-term survivors (62%) and echo in 290 (50%). This could seriously affect the validity of the results.

At worst case, all the missing patients in the intervention group could have done really well (maybe they didn't attend because they were busy skiing across Antarctica?), while all those in the placebo group were so breathless they couldn't get to clinic. This would leave you with much different results:

Group	Symptoms	No Symptoms	% with Symptoms
Tenecteplase	63	112+119 missing = **231**	**21%** (62/294)
Placebo	55+114 missing = **169**	**128**	**57%** (169/297)

5) A Priori:

This is another threat to the study validity and is often a problem with outcomes that weren't considered before the study was started. Ideally, we like to see a preplanned study, powered for long-term outcomes, which is resourced to carry out long-term assessment on all the patients who are randomised. Fortunately the UK national funding network, the NIHR, has recognised this and just issued a call for projects.

Case Resolution

The patient was treated with low molecular weight heparin, and admitted to a high care area so that thrombolysis could be reconsidered if she deteriorated.

Clinical Application

In patients with submassive PE, treat with low molecular weight heparin, unless you can recruit them to a well-designed trial of thrombolysis.

CONCLUSION VS COMMENTARY

COMPARISON

We generally agree with the authors' conclusion.

WHAT DO I TELL MY PATIENT?

Although it sounds sensible to give you a drug to break up the clot, the evidence we have at the moment is that it will not improve your survival or how well you are in the long term. We may need to reconsider that if your blood pressure drops.

RCT Quality Checklist

The study population included or focused on those in the ED	?
The patients were adequately randomized	☑
The randomization process was concealed	☑
The patients were analyzed in the groups to which they were randomized	☑
The study patients were recruited consecutively (i.e. no selection bias)	?
The patients in both groups were similar with respect to prognostic factors	☑
All participants (patients, clinicians, outcome assessors) were unaware of group allocation	
All groups were treated equally except for the intervention	☑
Follow-up was complete (i.e. at least 80% for both groups)	?
All patient-important outcomes were considered	☑
The treatment effect was large enough and precise enough to be clinically significant	

Other FOAMed Resources:

- REBEL EM: Do All Submassive PE's Require Treatment with Thrombolysis?
- EM Lit of Note: A "Positive" Primary Outcome for PEITHO
- LITFL: Thrombolysis for submassive pulmonary embolus
- CORE EM: Long-Term Outcomes in Submassive PE After Thrombolytics

Guest Skeptic: Dr. Kirsty Challen
Consultant in Emergency Medicine, Lancashire Teaching Hospitals Trust
Creator, #PaperinaPic

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SGEM HOP

Every EHR Wants to "Rule" The World

Case Scenario:
Your patient was involved in an motor vehicle collision, and you pull up an app to review the Canadian CT Head Injury Rule. Second patient is an elderly woman presenting via EMS after a ground level fall in c-spine precautions. Now you review the NEXUS Criteria for c-spine imaging. Third patient just took a long flight and is now short of breath Once again, you use MDCalc to review Well's Criteria for pulmonary embolism and the PERC Rule.

Q:

Does deploying a novel, evidence-based, electronic health record (EHR) integrated clinical decision support (CDS) tool influence overall utilization of three specific high cost CT imaging studies: head, c-spine and PE?

BOTTOM LINE

Embedding CDS tools into EHRs is associated with an impact on CT utilization but we need to know if it improves patient oriented outcomes.

Embedded Clinical Decision Support in Electric Health Record Decreases Use of High-cost Imaging in the Emergency Department: EmbED study

Bookman et al. AEM. 2017

P 163 ED attending physicians at 5 ED sites (1 academic and 4 community – both urban and rural

I A new clinical decision support (CDS) tool integrated into electronic health record (EHR). The tool integrated the Canadian CT Injury Head Rule, the NEXUS c-spine rule, Well's Criteria and PERC rule

C Baseline level of CT usage during a 6 months period before integration of CDS tool

O The impact of the overall ordering on Non-contrast CT head, CT spine and CT pulmonary angiogram (CTPA)

Exclusion criteria:

Community sites in which both an attending and advanced practice provider both saw the patient

Author's Conclusion:

"*Embedded clinical decision support is associated with decreased overall utilization of high cost imaging, especially among higher utilizers. It also affected low utilizers, increasing their usage consistent with improved adherence to guidelines, but this effect did not offset the overall decreased utilization for CT brain or CT c-spine. Thus, integrating CDS into the provider workflow promotes usage of validated tools across providers, which can standardize the delivery of care and improve compliance with evidence-based guidelines.*"

Background

Use of CT scanning has increased more than 20-fold since 1980[1],[2]. Although the CT is certainly a valuable tool, it is likely overused in emergency medicine.[3] CT has downstream harms, including radiation, incidental findings, over-diagnosis, financial costs, and negative impacts on emergency department throughput.[4][5]

Numerous clinical decision rules, such as the Canadian CT Head Rule[6], the NEXUS c-spine tool[7], the PERC Rule[8], and the Well's Criteria[9], have been developed to help guide appropriate imagining.

However, uptake and appropriate use of these tools is not universal.[10] These authors question whether integration of a clinical decision support tool into the ordering system of the EHR would influence CT usage rates.

Results

There was a total of 235,858 patient visits during the study period. There was approximately a 6% decrease in targeted CTs (non-contrast head, c-spine, and CTPA) ordered during period after the intervention.

Primary Outcome

CT head and c-spine went down but CTPA was unchanged.

- CT head corrected relative risk usage decreased by 10% (from 7.3% before to 6.6% after); 95% CI 7-13%, p<0.001,
- CT c-spine corrected relative risk usage decreased by 6% (from 2.1% before to 2.0% after); 95% CI 1-11%, p=0.03
- CTPA corrected relative risk usage was unchanged (1.5% in both time periods) (relative decrease of 2%; 95% CI -9% to +5%, p=0.42)

Secondary Outcome

In a post-hoc subgroup analysis, change in CT usage as compared to baseline utilization:

- Baseline high users decreased CT use (18% decrease in CT brain, 14% decrease in CT c-spine, and 23% decrease in CT).
- Baseline lowest third of users, there was no statistical difference noted in CT head, but both CT c-spine (29%) and CTPA (46%) studies were increased.

TALK NERDY TO ME

Listen to the SGEM Podcast on iTunes to hear Dr. Brookman's answers to our nerdy questions.

1) Observational Study:

This was a before and after observational study. Two out of three CT modalities had a statistically significant decrease over the study period. You correctly stated in the paper that this was an association only. Could there not be other confounding factors beside the embedded CDS tools responsible for the changes observed. In addition, the lack of control group to compare the intervention to makes this study more difficult to interpret.

2) Appropriateness of Scans:

What is the right number of scans? Without clinical information, how can we know if the scans were appropriate or not? Was the increase in scans among low users a good thing or a bad thing? Were there more misses associated with the decreased CT rate?

3) Absolute versus Relative Numbers:

Your results are presented as relative changes. The absolute changes are less than 1%. Why did you decide to use relative rather than absolute numbers? Do you think these changes regardless of whether they were absolute or relative translate into clinically important patient oriented outcomes?

4) Qualitative Methodology:

As we were preparing for this podcast, my 18-year-old son Ethan shared a great article with us bemoaning the dominance of quantitative methodology at the expense of all other study types[12]. I noticed your study was originally mixed methods, with an incorporated qualitative analysis. Can you tell us about that?

5) Hypothesis Generating:

You reported some post hoc subgroup analysis that showed different effects of the intervention depending on the baseline usage levels of the physicians. High users of CT seemed to lower their CT ordering, but lower users seem to order more CTs. Do you have plans to explore this finding further?

Case Resolution

You discuss this fascinating study with your resident, and your department chief who happened to be walking by, and you agree that although EHR embedded CDS tools are probably not ready for generalized use, it would make a fantastic resident research project

Clinical Application

This was an interesting study in an area we are sure to see a lot more research. EHRs are here to stay, and it would be great if we could harness their power to help make better decisions for our patients. However, for a variety of reasons, such tools are not ready for general use yet.

WHAT DO I TELL MY PATIENT?

There has been an interesting new study on integrating clinical decision support tools into the computer to help doctors make the best decisions about CT usage. Although we don't have an electronic health record system like that here, let me pull up one of these tools on an app on my smart phone so that we can review your risk together and make a shared decision about the most appropriate care for you.

Observational Trials Checklist

Did the study address a clearly focused issue?	☑
Did the authors use an appropriate method to answer their question?	?
Was the cohort recruited in an acceptable way?	☑
Was the exposure measured to minimize bias	☑
Was the outcome accurately measured to minimize bias?	☑
Have the authors identified all important confounding factors?	
Was the follow up of subjects complete enough?	☑
How precise are the results/?	
Do you believe the results?	☑
Can the results be applied to the local population?	?
Do the results of this study fit with other available evidence?	?

CONCLUSION VS COMMENTARY

COMPARISON

We agree that CDS tools embedded into an EHR is associated with a decrease in CT utilization in this study, but the generalizability of these results remains to be seen.

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Director of Simulation Education, Markham Stouffville Hospital
Author, First10EM.com

EBM is EASY!

Evidence Based Medicine is Easy

I know that evidence based medicine scares people. That stats seem complicated. Papers are often full of obtuse language. People are constantly debating small details at journal clubs, which can leave many physicians feeling inadequate.

But I can assure you, evidence based medicine is easy. If I can do it, anyone can. The only difficult part is getting into the habit of actually picking up a paper and starting to read.

I am a community emergency doctor with no special training in quantitative research methodology or epidemiology. Everything I learned about evidence based medicine I learned by picking up papers and reading them for myself (with some important insights from people like Jerry Hoffman and Rick Bukata on the Emergency Medical Abstracts). This post runs through the simplified approach I take when reading the medical literature, with the hope that I can convince you that you are also capable of taking an active role in critiquing the medical literature.

Step 1: How do I find a paper to read?

When you are just starting out, I would suggest picking a paper that other people are also reviewing. This could be a paper that was chosen for your group's journal club, that was featured on a program like the Skeptics' Guide to Emergency Medicine, or one that you found in my Articles of the Month. Read the paper yourself, write down your conclusions, and then compare your thoughts to the conclusions of other experts who have read the same paper.

Eventually, you will probably find it limiting to only read papers chosen by others. Having access to a list of newly published research allows you to pick the topics that are most interesting to you. I currently get all of the abstracts from 47 different journals, but that is simply way too much for most people. Just pick one or two high impact journals in your field to scan each month. You can opt to receive notifications of new publications by e-mail, or you can subscribe to the journal's RSS feed.

If you are interested in a specific topic, another great option is to set up a pubmed email alert. It does require that you create a (free) NCBI account, but is easy and ensures that you will never miss an important paper on a topic that interests you (such as "sexual intercourse for the treatment of nephrolithiasis").

Step 2: Is this paper worth reading?

I use the title and abstract to decide whether a paper is worth reading. However, to save time, I don't read the entire abstract. First, I skip directly to the conclusions. If a paper's conclusions are not interesting, or don't seem relevant to my practice or my patients, I can throw the paper away and not waste any more time. If the conclusions seem interesting, I will look at the methods described in the abstract. If the methods are clearly poor or irrelevant to my current clinical practice (such as animal studies), I will not read the paper. If the conclusions are interesting and the methods seem reasonable I will download the paper to read.

Step 3: Read the paper

At first glance, papers seem long and dense. They are intimidating. simply scanning through a 16-page pdf is often enough to kill one's desire to read. Luckily, many of those pages are superfluous. Most of the time, we can be much more efficient in our reading if we understand the structure of a paper:

Title: Helpful (sometimes) for finding the paper in your original search, but basically useless after that.

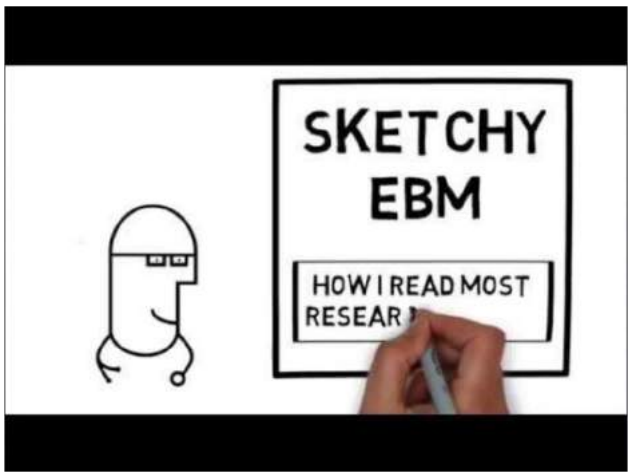
Abstract: This quick summary of the paper helps you decide if a paper is worth your while. However, the details are far too scant to help us make clinical decisions, so we can skip the abstract when we actually sit down to read a paper.
Introduction: This section provides background information on the topic. However, the data presented is not the result of a systematic review. There is a lot of room for bias in the introduction section. In a lot of ways, the introduction section is just a summary of the authors' opinions on the topic. If the topic is completely new to you, you might find this background information helpful. Most of the time, though, I just skip the introduction section.

Methods: This is the most important part of any research paper. Good results are meaningless without high quality research methods. Expect to spend most of your time here. The methods section is often the most confusing section, with esoteric language or jargon, but a simplified approach is possible. I will get back to that in a minute. If the methods are very poor, you can save yourself time by stopping now, because with poor methodology you are unlikely to be convinced to change your practice, no matter what you find in the following results section.
Results: This is the real reason you picked up the paper in the first place. You want to know what the study showed, so you are going to have to read through the results section. There are often many different results presented. If you are feeling overwhelmed, focus on the primary outcome of the study (which should have been clearly stated in the methods section).

Discussion: This is another non-systematic review the literature. The authors compare their results to prior studies. Like this introduction, this section represents the opinions of the authors'. Usually, I skip the discussion section.

Conclusion: This is the author's opinion of what their results show. At this point you have already read the methods and results and so should have already drawn your own conclusions about the paper. You don't need to read the authors' conclusions unless you want a taste of the subjectivity present in scientific publication. Therefore, although papers often seem overwhelming long, we can cut down on the amount of time we spend reading by sticking to the most important sections. All of the study's objective science is found in the methods and results sections. The remaining sections add the authors' subjective interpretations, which can be safely skipped most of the time.

Apparently I am not the only one who skips large chunks of research papers. A very similar approach to reading papers is outlined on Sketchy EBM:



Step 4: Interpret the paper (stats are less important than you think)

Medical research can certainly get very complex. Papers often include language understandable only if you have a PhD in statistics. However, the vast majority of the time a quality critical appraisal is possible by simply asking a few common sense questions as you read.

You can think of a trial like a race. We want the race to be fair. In order to be fair, the race has to have a fair start (all patients start the trial at the same spot), everyone needs to run the same course (all trial participants are treated similarly except for the intervention), and there needs to be a fair finish (the outcome is measured the same for everyone, without bias).

One framework I keep in mind when reading papers is the RAMMBO approach:

- **R**ecruitment
- **A**llocation
- **M**aintenance
- **M**easurement: Blind or Objective

Recruitment

- Who was included in this study? Do the study patients look like my patients?
- Is the study size appropriate? (Ideally, this should be easy to tell, because the researchers will describe their sample size calculation).
- Were there important exclusions that could affect the results?

Allocation

- Were the groups similar at the beginning of the trial?
- Was assignment to treatment groups randomized? If assignment wasn't randomized, it is worth considering what factors might have made the groups systematically different (confounders), but keep in mind that it is not possible to identify all confounders.

Maintenance

● Were the groups treated similarly throughout the trial (aside from the intervention of interest)?
● Were the outcomes of interest measured for all (or at least most) of the patients in the trial? (In other words, were patients lost to follow up, which could affect the reliability of the results?)

Measurement

● Were patients, clinicians and researchers all blinded to the treatment? (Bias is much more likely when
people are aware of the groups patients were assigned to).
● Or, were the outcomes objective and standardized? (In an unblinded trial, bias is less likely with an objective outcome like mortality than it is with a subjective outcome like satisfaction with treatment).
● Were harms adequately measured?

These simplified RAMMBO questions help me distill the methods section down into common sense questions that I can understand. They are primarily aimed at assessing the validity of the trial's results. After I finish reading a paper, I like to pause and ask myself a few other questions to help place the trial in its appropriate context:

1. Why was the study done?
    a. Is the question important?
    b. Does anyone have a vested interest in the outcome?
2. Is the benefit big enough?
    a. To answer this question, you have to consider both how the benefits weighs against harms, but also the cost that any new intervention might have.
3. How does this study fit with previous research?

In my opinion, the answers to these questions are far more important than any of the statistics or p values you might struggle with while reading. I always consider these questions before I even look at the statistics presented. Although comfort with critical appraisal does require some practice, these questions are relatively straightforward and, I think, make basic critical appraisal easy for any practicing clinician.

Step 4: Use a checklist

Most of the time, the basic questions above are all you need when appraising an article. However, sometimes if a paper is more complex or if I am tackling a more important question, I want to be more thorough with my critical appraisal. In those situations, I recommend using a checklist to help assess all the possible sources of bias in a paper. There are many checklists available. I generally use the Best Evidence in Emergency Medicine (BEEM) checklists:

1. Randomized Clinical Trials
2. Systematic Reviews
3. Diagnostic Studies
4. Clinical Practice Guidelines
5. Clinical Decision Instruments
6. Prognostic Studies

Checklists and EBM tools can be found here.

Step 5: Ask for help

Although I think evidence based medicine is easy, I will admit that there are some aspects that can get very complex. As practicing physicians, it doesn't make a lot of sense for us to learn everything about epidemiology. We need to be expert clinicians, not statisticians. The solution is simple: know when to ask for help. Start by reading the paper, but when you come across topics that you don't fully understand, reach out for some help. There are many incredible resources when it comes to evidence based medicine. Obviously, we have the #FOAMed community, with many excellent podcasts and blogs that can help with critical appraisal. I plan on updating this blog with a number of EBM resources in the coming year, so keep an eye on https://first10em.com/EBM for added resources. Reaching out to experts directly can also be helpful. As I struggled to learn critical appraisal, I have emailed experts like Jerry Hoffman, Ken Milne, and Andrew Worster on multiple occasions, and each time have been rewarded with friendly and brilliant responses. Local experts like medical librarians and university research methodologists are also excellent resources. Finally, don't underestimate the value of a simple search on Google or YouTube.

Step 6: Apply the research

This is where evidence based medicine can get complex. Reading and appraising papers is easy, but real evidence based medicine requires that clinicians interpret the evidence through a lens of clinical expertise and with patient values in mind. Evidence based medicine is not just about the literature. "Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values." (Sackett 2000)

This is why you are already an evidence based medicine expert. This is why it is better for practicing clinicians to read the literature than expert methodologists. Although a statistician will have incredible insight into the mathematics of the paper, it is only the practicing clinician who can adequately filter the information through their clinical expertise, explain it in simple terms to their patients, and make decisions that mesh the best available evidence with the values of the patient. That is evidence based medicine. These discussions (which we all have every shift) are complex. In comparison, reading the literature is simple, so why not give it a try?

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Cite this article as: Justin Morgenstern, "Evidence Based Medicine is Easy", First10EM blog, January 8, 2018. Available at: https://first10em.com/ebmiseasy/.

Thank you to Dr. Ken Milne and Dr. Andrew Worster for providing feedback on this blog post.

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Do you find EBM and clinical epidemiology:

a) Annoying
b) Boring
c) Complicated
d) Useless
e) All of the above

Then Sketchy EBM is for YOU!

Sketchy EBM has distilled some important EBM and clinical epidemiology topics down to bite-sized, completely digestible, short videos.

Do you like treats? You'll learn all about NUMBER NEEDED TO TREAT and INTENTION TO TREAT. Treats are great!

Are you odd? You'll learn just how ODD you might be! Knowing about odds can make you a better gambler!

Are you biased against EBM? You'll learn all about why BIAS is so bad for you!

If EBM videos are not your thing - Sketchy EBM also has a few helpful clinical and quality of care videos. And if that's still not your thing, but you like watching angry people rant, then have a look at the fine collection of RANThonys! Uncorked rage can be fun and educational!

No matter what you do, remember to always draw your own conclusions!

SKETCHY EBM

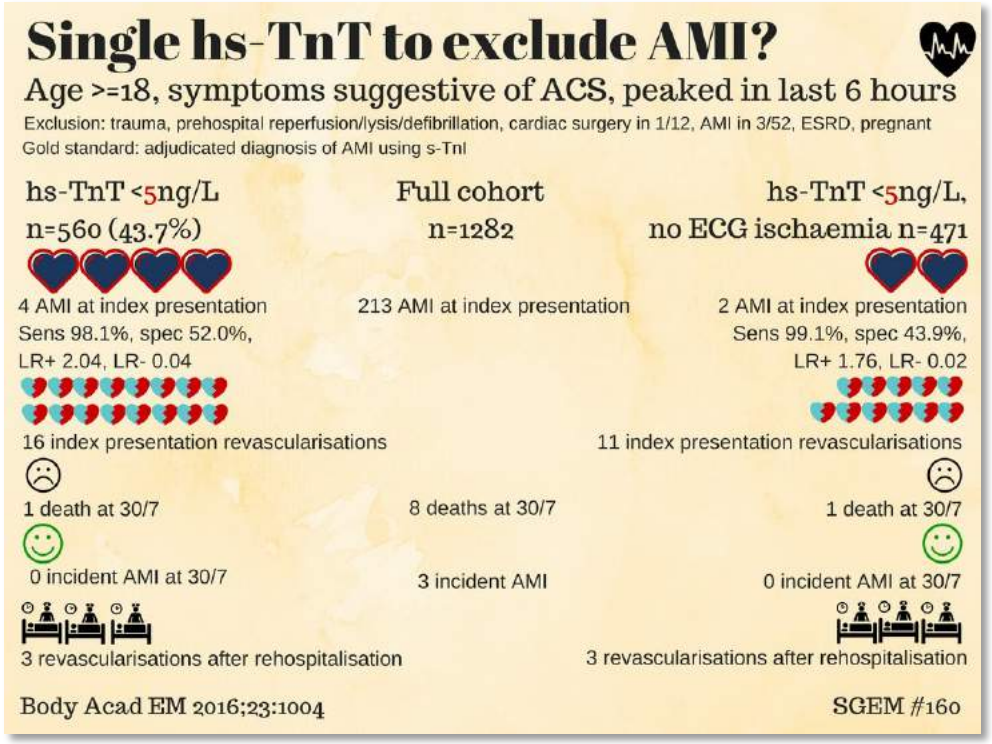
Paper In A Pic With Dr. Kirsty Challen

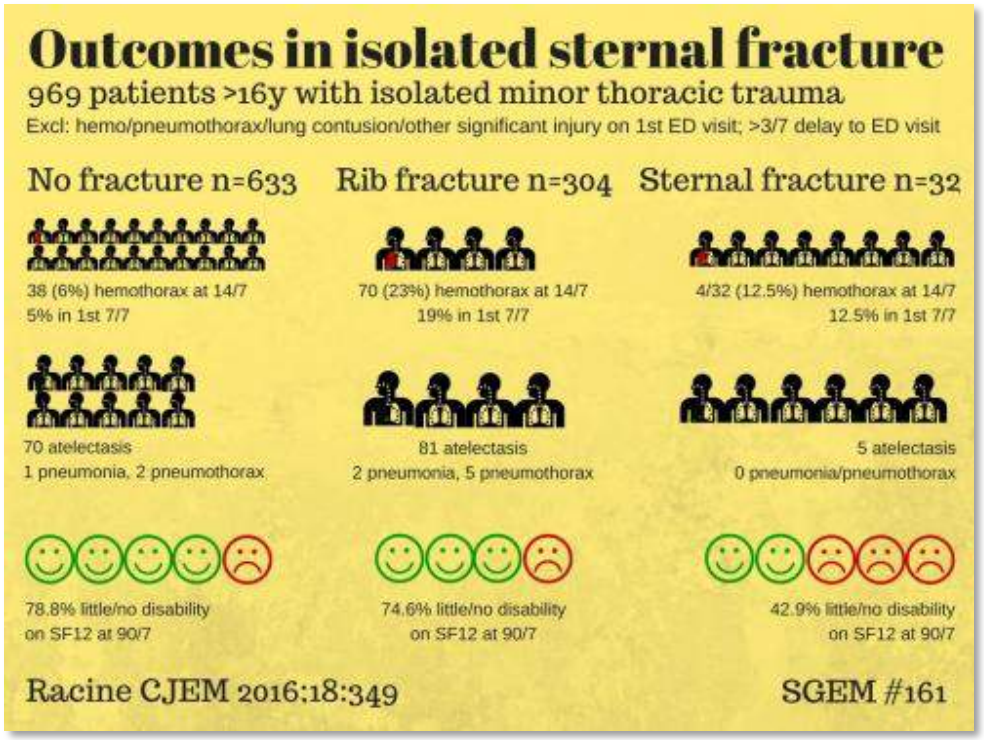
Dr. Kirsty Challen (@KirstyChallen) is a Consultant in Emergency Medicine at Lancashire Teaching Hospitals Trust (North West England). She did Medical School at Manchester, with a History of Medicine BSc at the same time. Kirsty did her residency in North West England and has a PhD in Health Services Research from Sheffield.

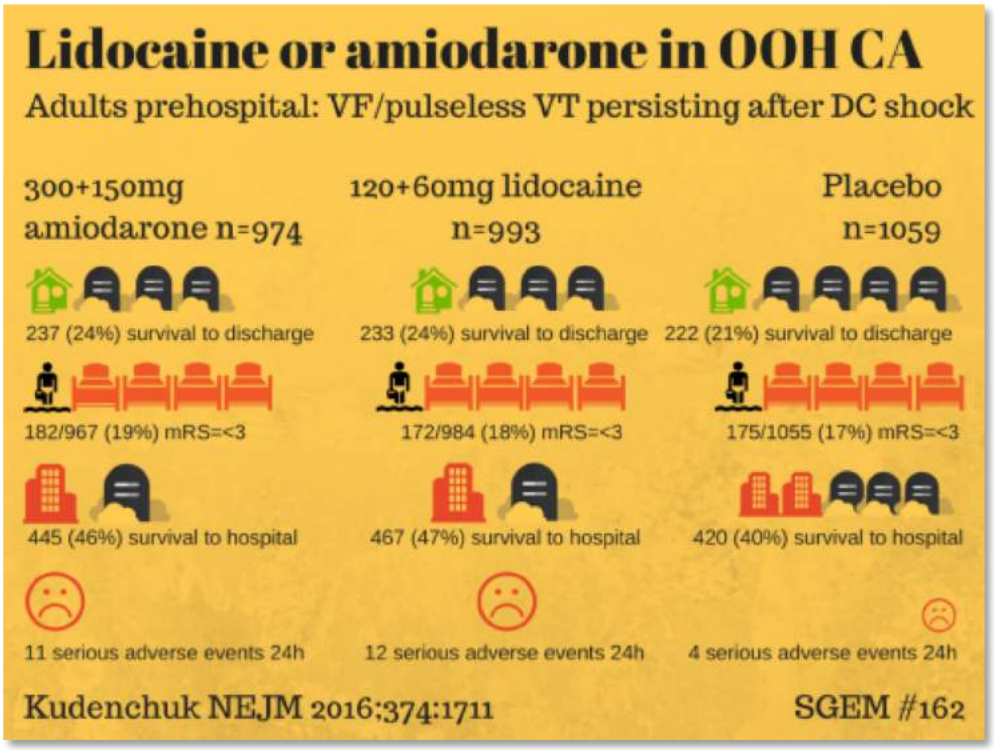
Kirsty has a knowledge translation project called Paper In A Pic (#PaperinaPic). She takes a paper we have critically reviewed on the SGEM and summarizes it into an infographic.

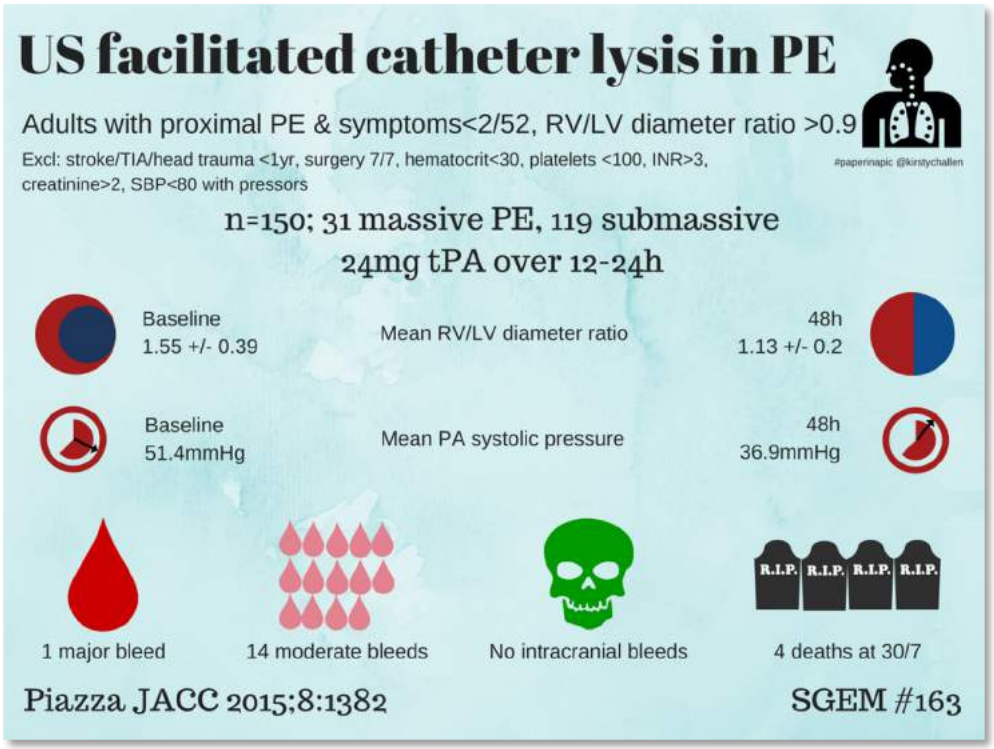
Below is a list of papers, SGEM critical reviews and Kirsty's #PaperinaPic.

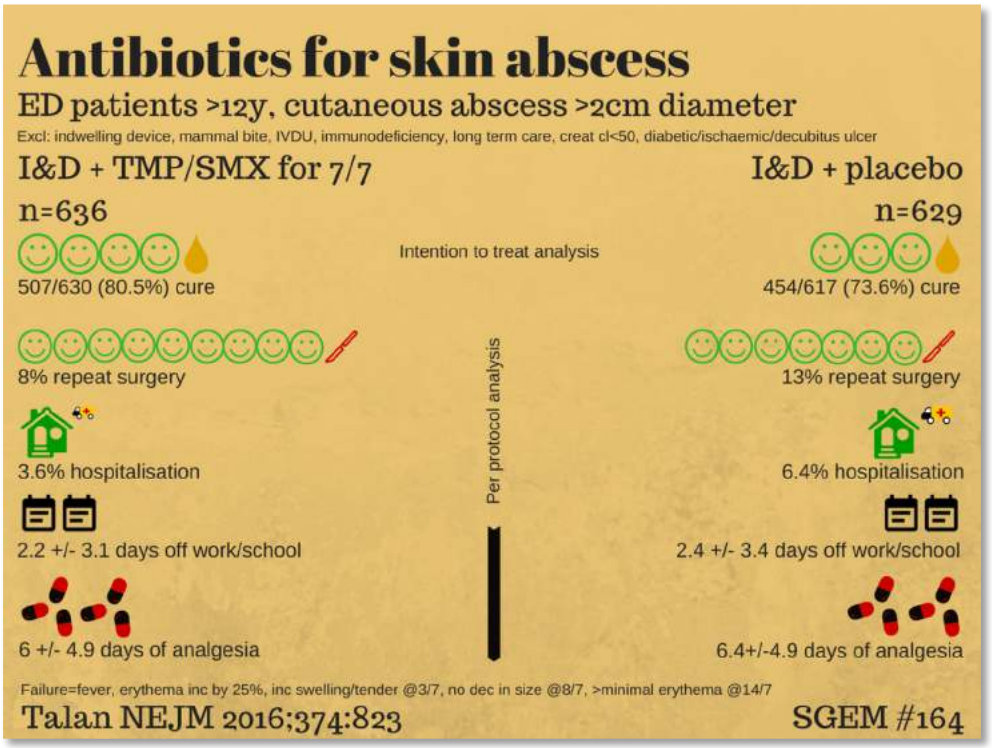
This chapter will focus on the season 5 infographics.

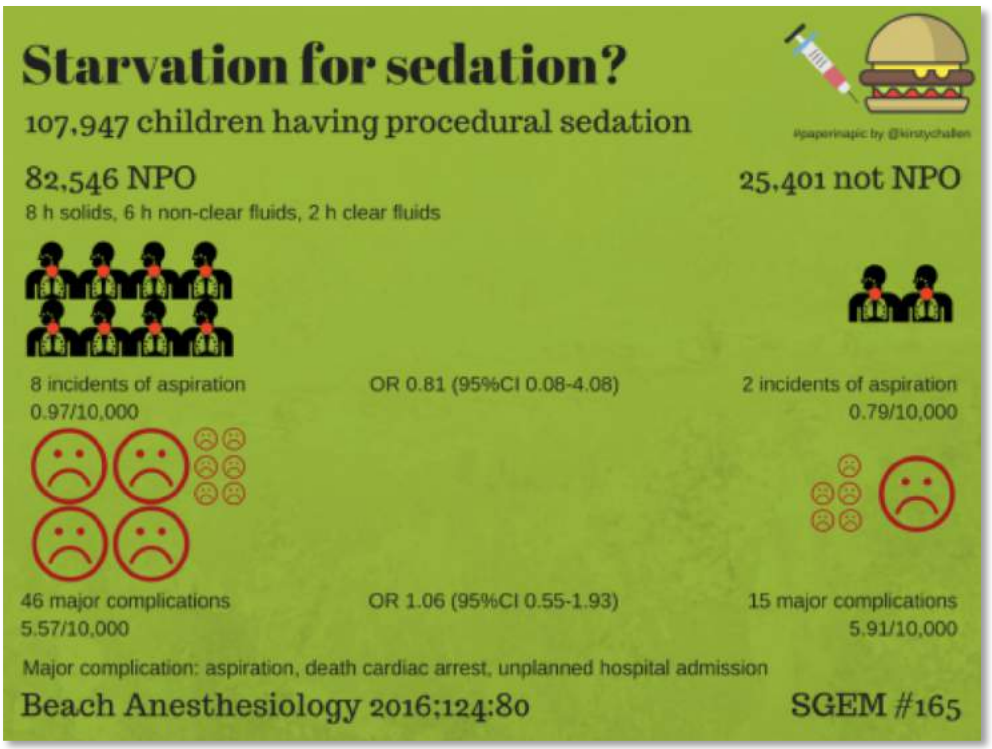

Single hs-TnT to exclude AMI?
Age >=18, symptoms suggestive of ACS, peaked in last 6 hours
Exclusion: trauma, prehospital reperfusion/lysis/defibrillation, cardiac surgery in 1/12, AMI in 3/52, ESRD, pregnant
Gold standard: adjudicated diagnosis of AMI using s-TnI
hs-TnT <5ng/L
n=560 (43.7%)
4 AMI at index presentation
Sens 98.1%, spec 52.0%,
LR+ 2.04, LR- 0.04
16 index presentation revascularisations
1 death at 30/7
0 incident AMI at 30/7
3 revascularisations after rehospitalisation
Full cohort
n=1282
213 AMI at index presentation
8 deaths at 30/7
3 incident AMI
hs-TnT <5ng/L,
no ECG ischaemia n=471
2 AMI at index presentation
Sens 99.1%, spec 43.9%,
LR+ 1.76, LR- 0.02
11 index presentation revascularisations
1 death at 30/7
0 incident AMI at 30/7
3 revascularisations after rehospitalisation
Body Acad EM 2016;23:1004
SGEM #160

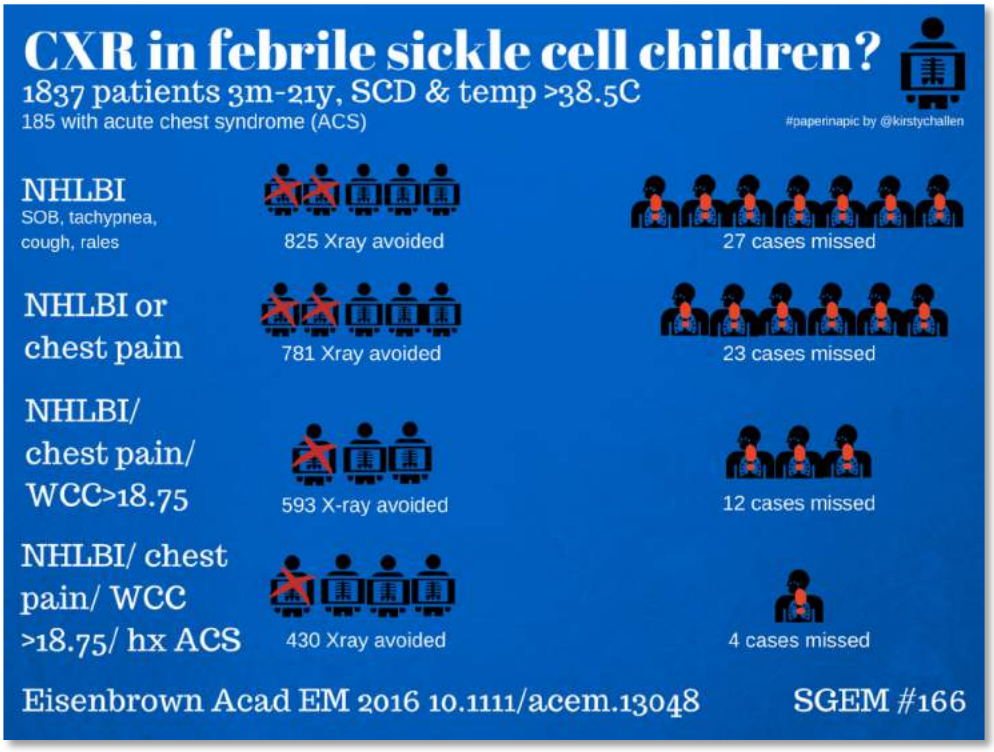

Outcomes in isolated sternal fracture
969 patients >16y with isolated minor thoracic trauma
Excl: hemo/pneumothorax/lung contusion/other significant injury on 1st ED visit; >3/7 delay to ED visit
No fracture n=633
38 (6%) hemothorax at 14/7
5% in 1st 7/7
70 atelectasis
1 pneumonia, 2 pneumothorax
78.8% little/no disability
on SF12 at 90/7
Rib fracture n=304
70 (23%) hemothorax at 14/7
19% in 1st 7/7
81 atelectasis
2 pneumonia, 5 pneumothorax
74.6% little/no disability
on SF12 at 90/7
Sternal fracture n=32
4/32 (12.5%) hemothorax at 14/7
12.5% in 1st 7/7
5 atelectasis
0 pneumonia/pneumothorax
42.9% little/no disability
on SF12 at 90/7
Racine CJEM 2016;18:349
SGEM #161

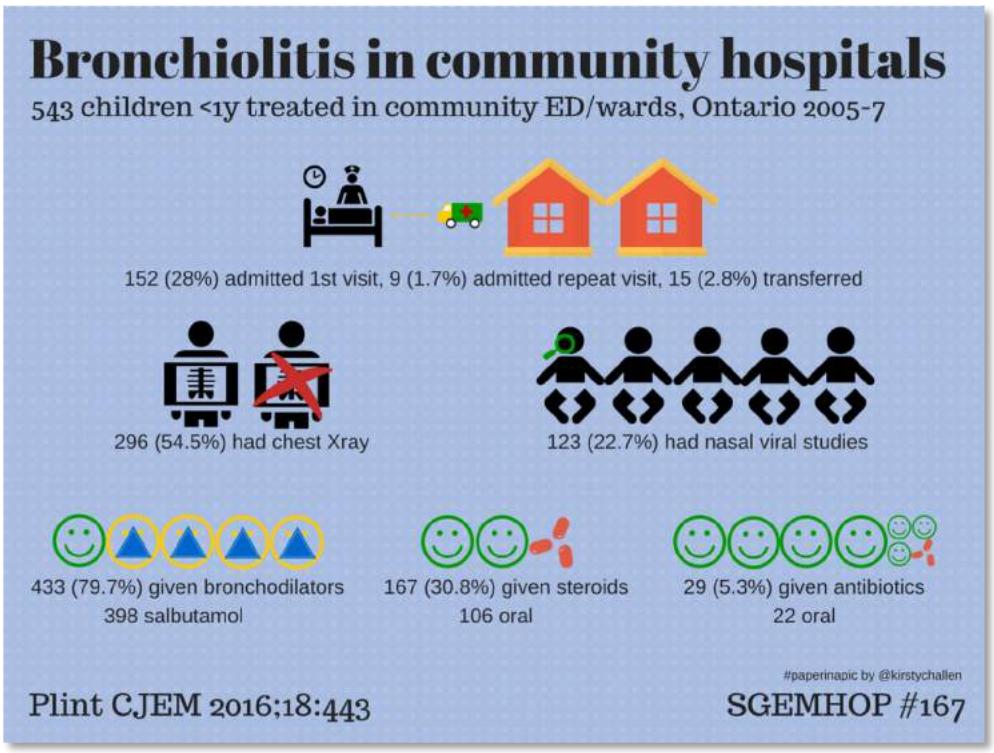

Lidocaine or amiodarone in OOH CA
Adults prehospital: VF/pulseless VT persisting after DC shock
300+150mg amiodarone n=974
120+60mg lidocaine n=993
Placebo n=1059
237 (24%) survival to discharge
233 (24%) survival to discharge
222 (21%) survival to discharge
182/967 (19%) mRS=<3
172/984 (18%) mRS=<3
175/1055 (17%) mRS=<3
445 (46%) survival to hospital
467 (47%) survival to hospital
420 (40%) survival to hospital
11 serious adverse events 24h
12 serious adverse events 24h
4 serious adverse events 24h
Kudenchuk NEJM 2016;374:1711
SGEM #162

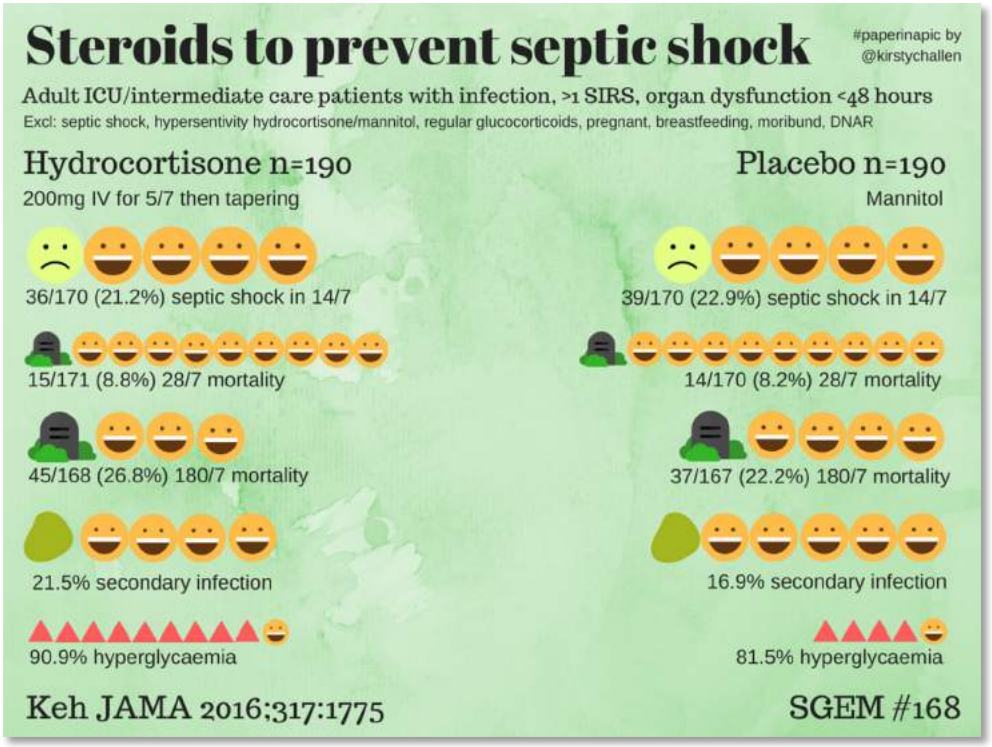

US facilitated catheter lysis in PE
Adults with proximal PE & symptoms<2/52, RV/LV diameter ratio >0.9
Excl: stroke/TIA/head trauma <1yr, surgery 7/7, hematocrit<30, platelets <100, INR>3, creatinine>2, SBP<80 with pressors
#paperinapic @kirstychallen
n=150; 31 massive PE, 119 submassive
24mg tPA over 12-24h
Baseline 1.55 +/- 0.39
Mean RV/LV diameter ratio
48h 1.13 +/- 0.2
Baseline 51.4mmHg
Mean PA systolic pressure
48h 36.9mmHg
1 major bleed
14 moderate bleeds
No intracranial bleeds
R.I.P. R.I.P. R.I.P. R.I.P.
4 deaths at 30/7
Piazza JACC 2015;8:1382
SGEM #163

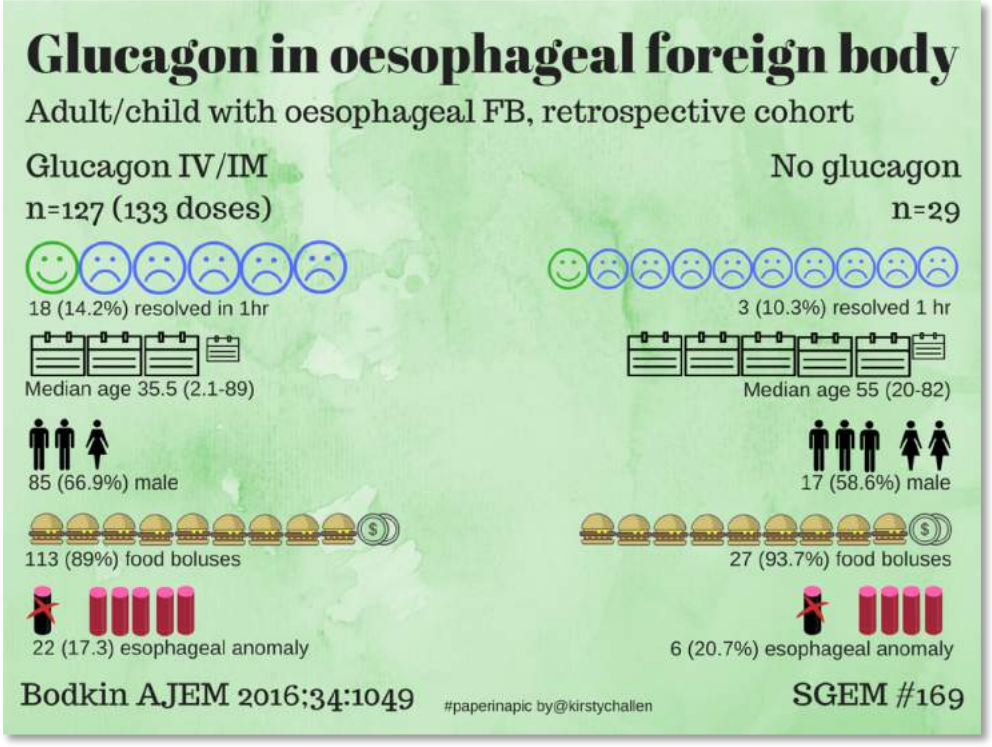

Antibiotics for skin abscess
ED patients >12y, cutaneous abscess >2cm diameter
Excl: indwelling device, mammal bite, IVDU, immunodeficiency, long term care, creat cl<50, diabetic/ischaemic/decubitus ulcer
I&D + TMP/SMX for 7/7
n=636
507/630 (80.5%) cure
8% repeat surgery
3.6% hospitalisation
2.2 +/- 3.1 days off work/school
6 +/- 4.9 days of analgesia
Intention to treat analysis
Per protocol analysis
I&D + placebo
n=629
454/617 (73.6%) cure
13% repeat surgery
6.4% hospitalisation
2.4 +/- 3.4 days off work/school
6.4+/-4.9 days of analgesia
Failure=fever, erythema inc by 25%, inc swelling/tender @3/7, no dec in size @8/7, >minimal erythema @14/7
Talan NEJM 2016;374:823
SGEM #164

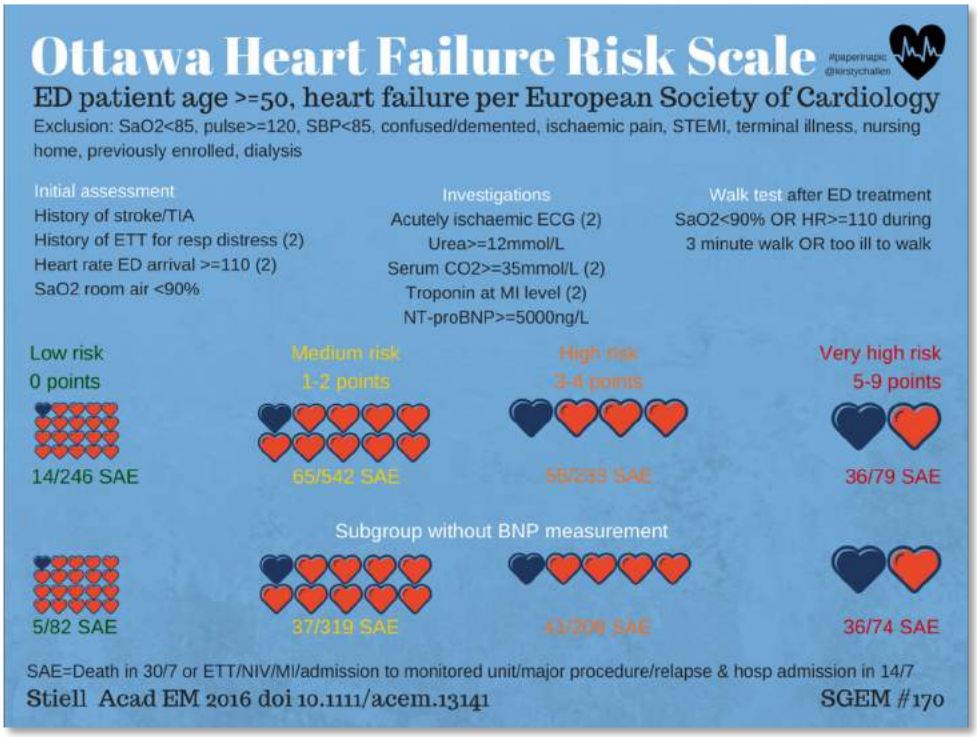

Starvation for sedation?
107,947 children having procedural sedation
#paperinapic by @kirstychallen
82,546 NPO
8 h solids, 6 h non-clear fluids, 2 h clear fluids
25,401 not NPO
8 incidents of aspiration
0.97/10,000
OR 0.81 (95%CI 0.08-4.08)
2 incidents of aspiration
0.79/10,000
46 major complications
5.57/10,000
OR 1.06 (95%CI 0.55-1.93)
15 major complications
5.91/10,000
Major complication: aspiration, death cardiac arrest, unplanned hospital admission
Beach Anesthesiology 2016;124:80
SGEM #165

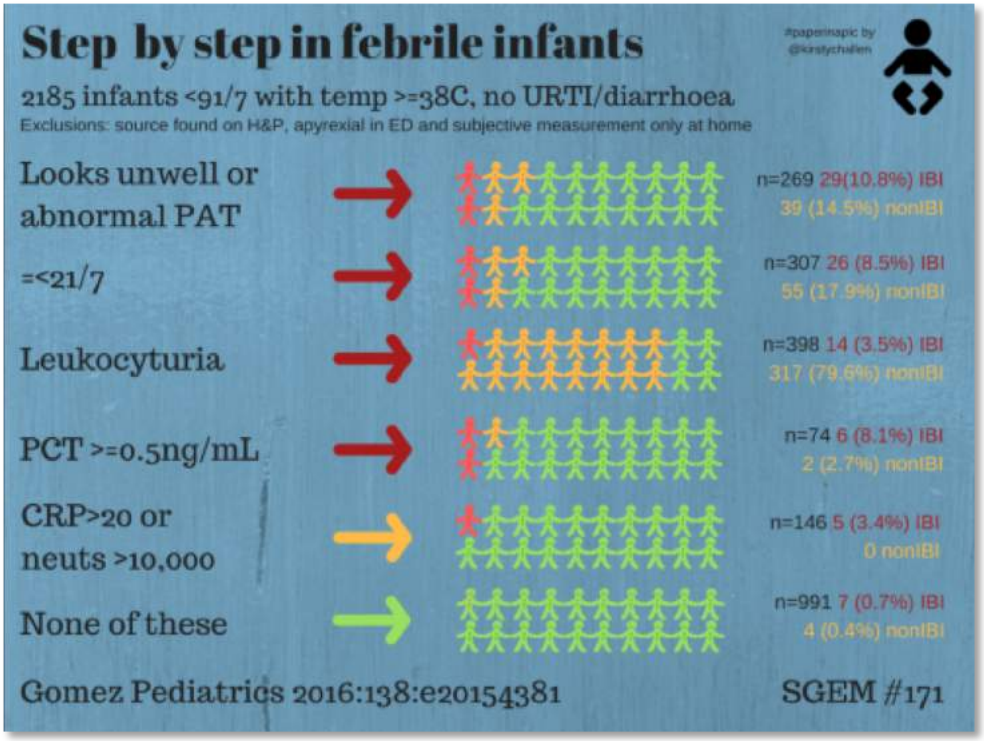

CXR in febrile sickle cell children?
1837 patients 3m-21y, SCD & temp >38.5C
185 with acute chest syndrome (ACS)
#paperinapic by @kirstychallen
NHLBI
SOB, tachypnea, cough, rales
825 Xray avoided
27 cases missed
NHLBI or chest pain
781 Xray avoided
23 cases missed
NHLBI/ chest pain/ WCC>18.75
593 X-ray avoided
12 cases missed
NHLBI/ chest pain/ WCC >18.75/ hx ACS
430 Xray avoided
4 cases missed
Eisenbrown Acad EM 2016 10.1111/acem.13048
SGEM #166

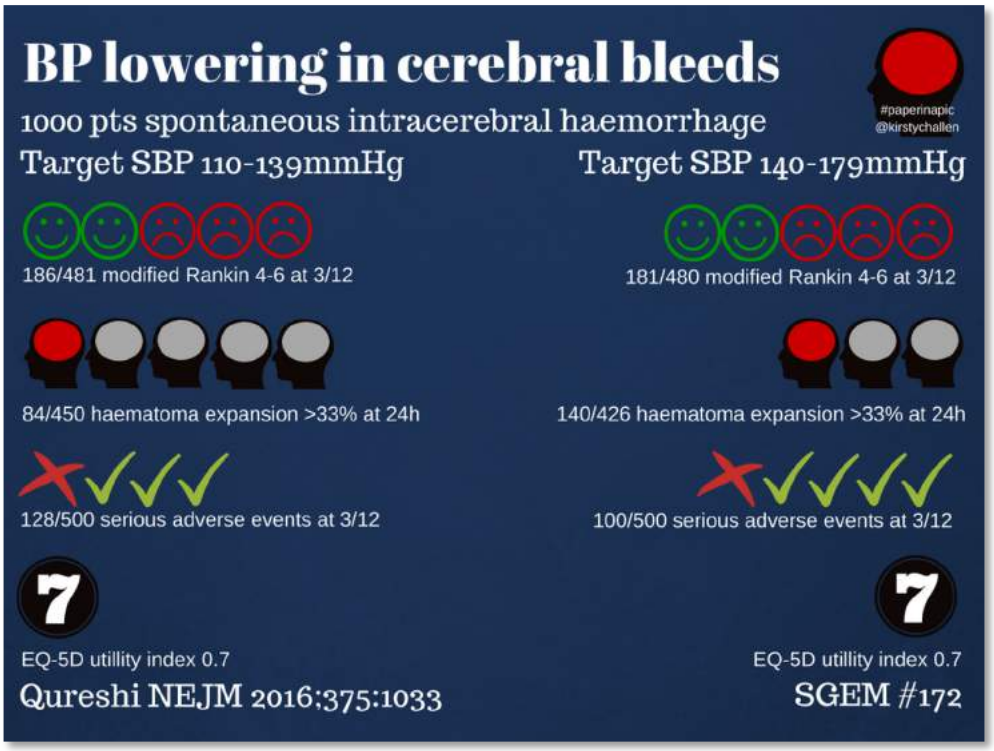

Bronchiolitis in community hospitals
543 children <1y treated in community ED/wards, Ontario 2005-7
152 (28%) admitted 1st visit, 9 (1.7%) admitted repeat visit, 15 (2.8%) transferred
296 (54.5%) had chest Xray
123 (22.7%) had nasal viral studies
433 (79.7%) given bronchodilators
398 salbutamol
167 (30.8%) given steroids
106 oral
29 (5.3%) given antibiotics
22 oral
#paperinapic by @kirstychallen
Plint CJEM 2016;18:443
SGEMHOP #167

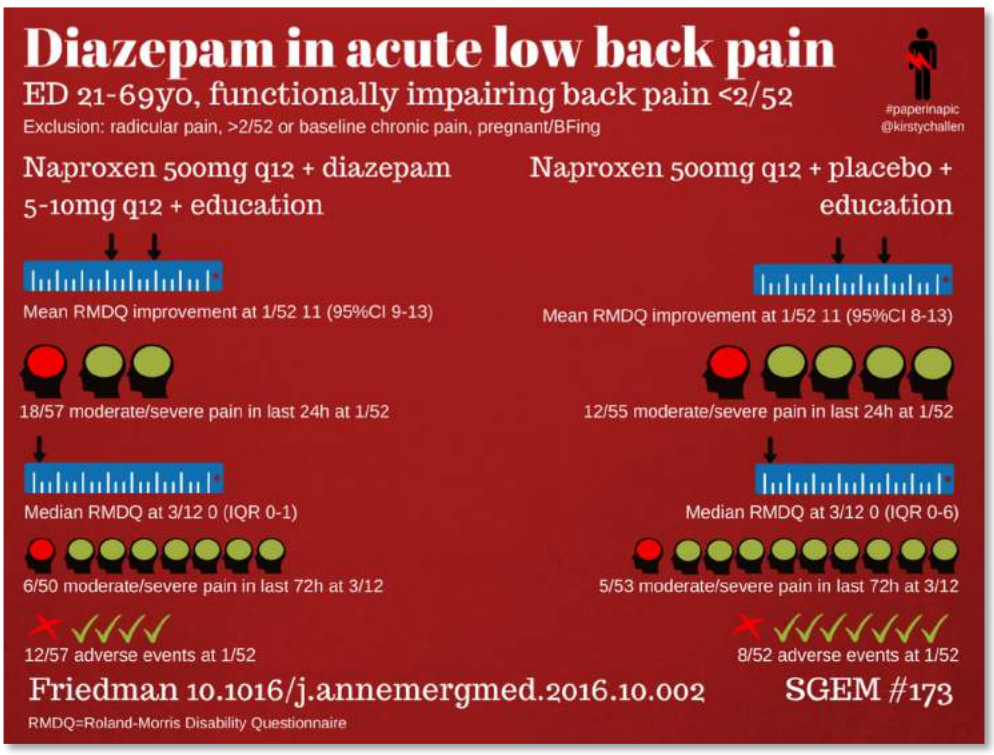

Steroids to prevent septic shock
#paperinapic by @kirstychallen
Adult ICU/intermediate care patients with infection, >1 SIRS, organ dysfunction <48 hours
Excl: septic shock, hypersentivity hydrocortisone/mannitol, regular glucocorticoids, pregnant, breastfeeding, moribund, DNAR
Hydrocortisone n=190
200mg IV for 5/7 then tapering
36/170 (21.2%) septic shock in 14/7
15/171 (8.8%) 28/7 mortality
45/168 (26.8%) 180/7 mortality
21.5% secondary infection
90.9% hyperglycaemia
Placebo n=190
Mannitol
39/170 (22.9%) septic shock in 14/7
14/170 (8.2%) 28/7 mortality
37/167 (22.2%) 180/7 mortality
16.9% secondary infection
81.5% hyperglycaemia
Keh JAMA 2016;317:1775
SGEM #168

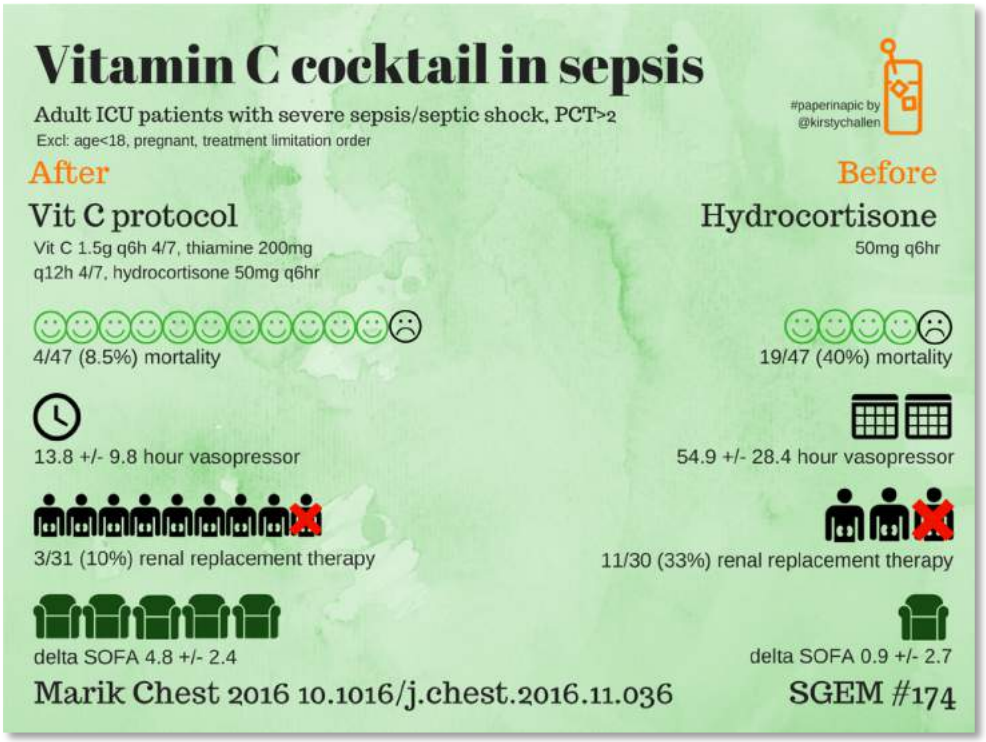

Glucagon in oesophageal foreign body
Adult/child with oesophageal FB, retrospective cohort
Glucagon IV/IM
n=127 (133 doses)
18 (14.2%) resolved in 1hr
Median age 35.5 (2.1-89)
85 (66.9%) male
113 (89%) food boluses
22 (17.3) esophageal anomaly
No glucagon
n=29
3 (10.3%) resolved 1 hr
Median age 55 (20-82)
17 (58.6%) male
27 (93.7%) food boluses
6 (20.7%) esophageal anomaly
Bodkin AJEM 2016;34:1049
#paperinapic by@kirstychallen
SGEM #169

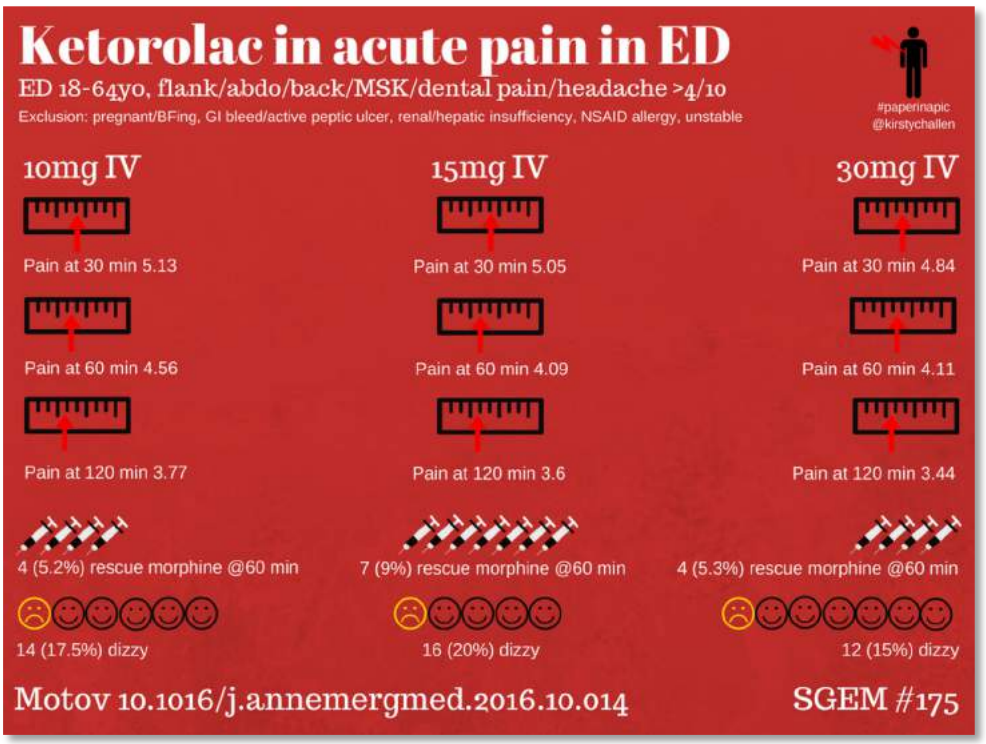

Ottawa Heart Failure Risk Scale
#paperinapic @kirstychallen
ED patient age >=50, heart failure per European Society of Cardiology
Exclusion: SaO2<85, pulse>=120, SBP<85, confused/demented, ischaemic pain, STEMI, terminal illness, nursing home, previously enrolled, dialysis
Initial assessment
History of stroke/TIA
History of ETT for resp distress (2)
Heart rate ED arrival >=110 (2)
SaO2 room air <90%
Investigations
Acutely ischaemic ECG (2)
Urea>=12mmol/L
Serum CO2>=35mmol/L (2)
Troponin at MI level (2)
NT-proBNP>=5000ng/L
Walk test after ED treatment
SaO2<90% OR HR>=110 during 3 minute walk OR too ill to walk
Low risk
0 points
14/246 SAE
Medium risk
1-2 points
65/542 SAE
High risk
3-4 points
95/239 SAE
Very high risk
5-9 points
36/79 SAE
Subgroup without BNP measurement
5/82 SAE
37/319 SAE
41/309 SAE
36/74 SAE
SAE=Death in 30/7 or ETT/NIV/MI/admission to monitored unit/major procedure/relapse & hosp admission in 14/7
Stiell Acad EM 2016 doi 10.1111/acem.13141
SGEM #170

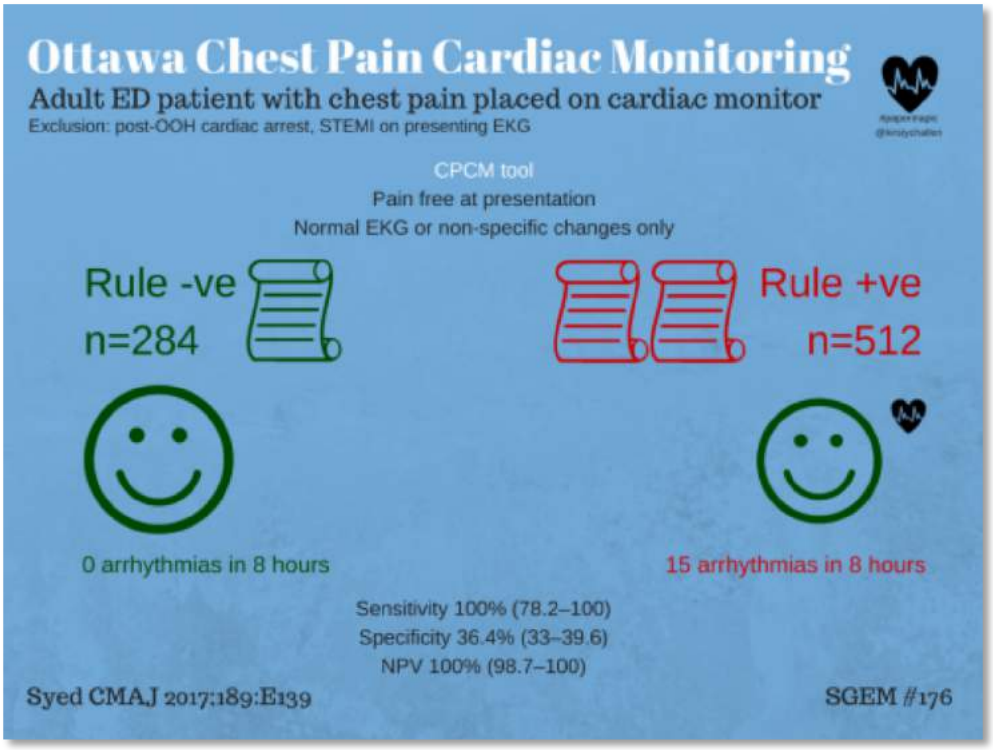

Step by step in febrile infants
#paperinapic by @kirstychallen
2185 infants <91/7 with temp >=38C, no URTI/diarrhoea
Exclusions: source found on H&P, apyrexial in ED and subjective measurement only at home
Looks unwell or abnormal PAT
n=269 29(10.8%) IBI
39 (14.5%) nonIBI
=<21/7
n=307 26 (8.5%) IBI
55 (17.9%) nonIBI
Leukocyturia
n=398 14 (3.5%) IBI
317 (79.6%) nonIBI
PCT >=0.5ng/mL
n=74 6 (8.1%) IBI
2 (2.7%) nonIBI
CRP>20 or neuts >10,000
n=146 5 (3.4%) IBI
0 nonIBI
None of these
n=991 7 (0.7%) IBI
4 (0.4%) nonIBI
Gomez Pediatrics 2016:138:e20154381
SGEM #171

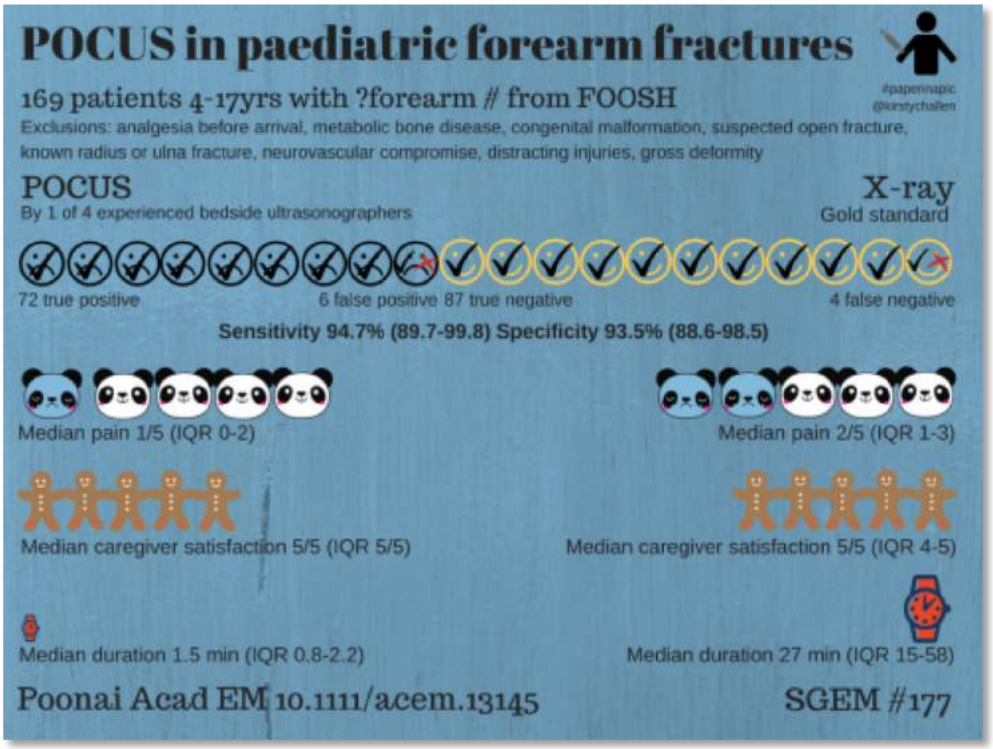

BP lowering in cerebral bleeds
#paperinapic
@kirstychallen
1000 pts spontaneous intracerebral haemorrhage
Target SBP 110-139mmHg
Target SBP 140-179mmHg
186/481 modified Rankin 4-6 at 3/12
181/480 modified Rankin 4-6 at 3/12
84/450 haematoma expansion >33% at 24h
140/426 haematoma expansion >33% at 24h
128/500 serious adverse events at 3/12
100/500 serious adverse events at 3/12
7
7
EQ-5D utillity index 0.7
EQ-5D utillity index 0.7
Qureshi NEJM 2016;375:1033
SGEM #172

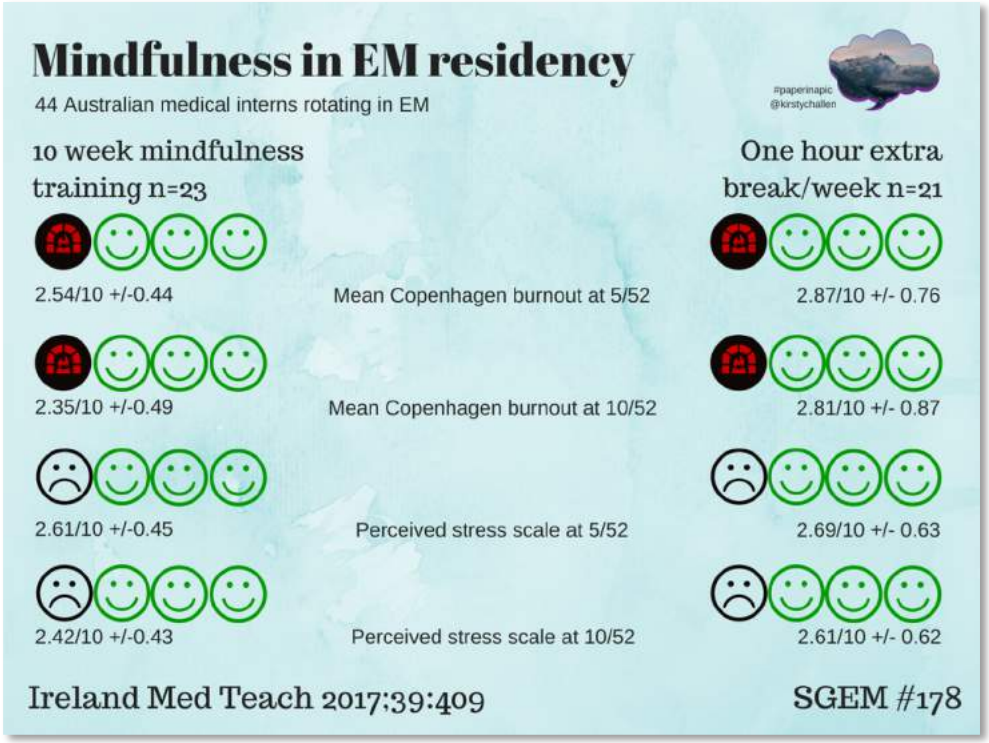

Diazepam in acute low back pain
ED 21-69yo, functionally impairing back pain <2/52
Exclusion: radicular pain, >2/52 or baseline chronic pain, pregnant/BFing
#paperinapic
@kirstychallen
Naproxen 500mg q12 + diazepam 5-10mg q12 + education
Naproxen 500mg q12 + placebo + education
Mean RMDQ improvement at 1/52 11 (95%CI 9-13)
Mean RMDQ improvement at 1/52 11 (95%CI 8-13)
18/57 moderate/severe pain in last 24h at 1/52
12/55 moderate/severe pain in last 24h at 1/52
Median RMDQ at 3/12 0 (IQR 0-1)
Median RMDQ at 3/12 0 (IQR 0-6)
6/50 moderate/severe pain in last 72h at 3/12
5/53 moderate/severe pain in last 72h at 3/12
12/57 adverse events at 1/52
8/52 adverse events at 1/52
Friedman 10.1016/j.annemergmed.2016.10.002
SGEM #173
RMDQ=Roland-Morris Disability Questionnaire

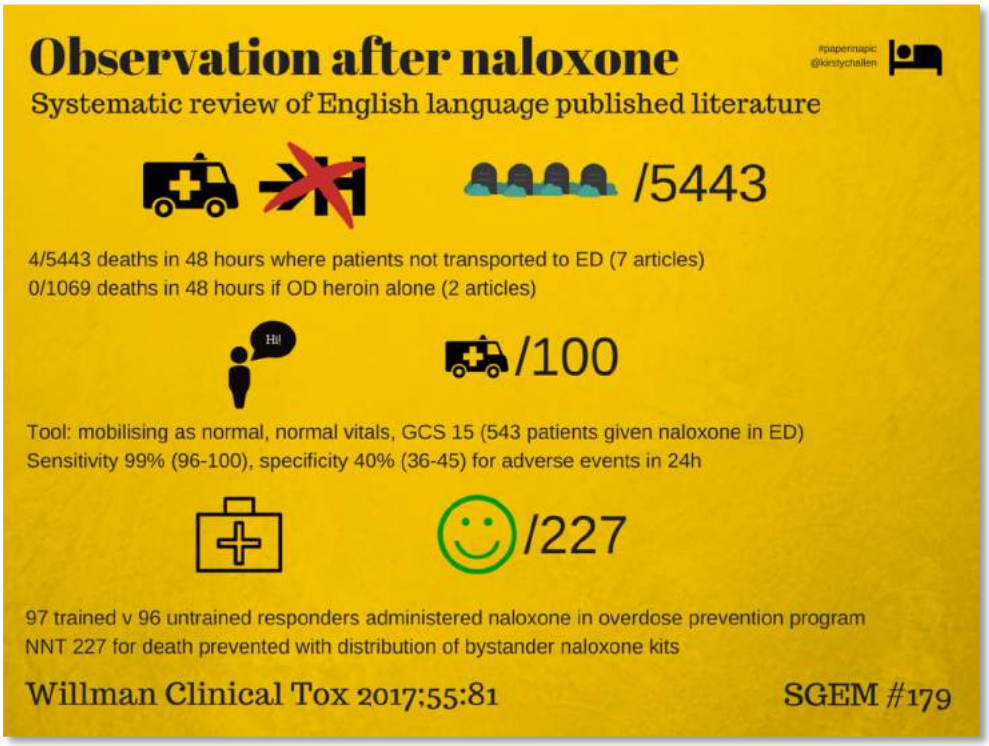

Vitamin C cocktail in sepsis
Adult ICU patients with severe sepsis/septic shock, PCT>2
Excl: age<18, pregnant, treatment limitation order
#paperinapic by @kirstychallen
After
Vit C protocol
Vit C 1.5g q6h 4/7, thiamine 200mg q12h 4/7, hydrocortisone 50mg q6hr
4/47 (8.5%) mortality
13.8 +/- 9.8 hour vasopressor
3/31 (10%) renal replacement therapy
delta SOFA 4.8 +/- 2.4
Before
Hydrocortisone
50mg q6hr
19/47 (40%) mortality
54.9 +/- 28.4 hour vasopressor
11/30 (33%) renal replacement therapy
delta SOFA 0.9 +/- 2.7
Marik Chest 2016 10.1016/j.chest.2016.11.036
SGEM #174

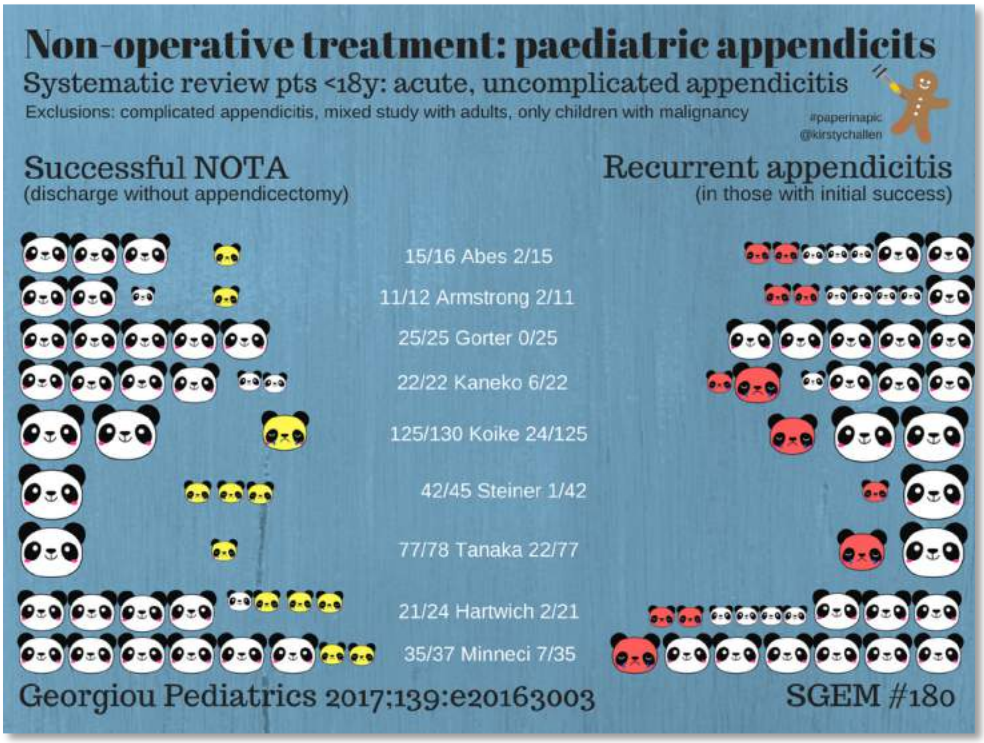

Ketorolac in acute pain in ED
ED 18-64yo, flank/abdo/back/MSK/dental pain/headache >4/10
Exclusion: pregnant/BFing, GI bleed/active peptic ulcer, renal/hepatic insufficiency, NSAID allergy, unstable
#paperinapic @kirstychallen
10mg IV
Pain at 30 min 5.13
Pain at 60 min 4.56
Pain at 120 min 3.77
4 (5.2%) rescue morphine @60 min
14 (17.5%) dizzy
15mg IV
Pain at 30 min 5.05
Pain at 60 min 4.09
Pain at 120 min 3.6
7 (9%) rescue morphine @60 min
16 (20%) dizzy
30mg IV
Pain at 30 min 4.84
Pain at 60 min 4.11
Pain at 120 min 3.44
4 (5.3%) rescue morphine @60 min
12 (15%) dizzy
Motov 10.1016/j.annemergmed.2016.10.014
SGEM #175

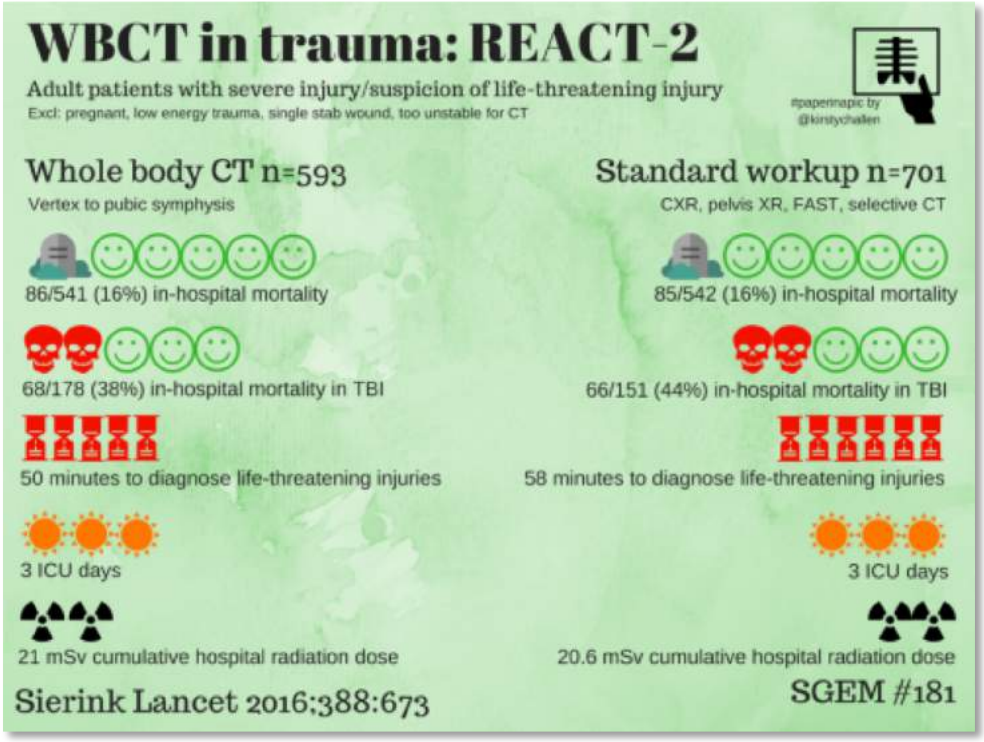

Ottawa Chest Pain Cardiac Monitoring
Adult ED patient with chest pain placed on cardiac monitor
Exclusion: post-OOH cardiac arrest, STEMI on presenting EKG
CPCM tool
Pain free at presentation
Normal EKG or non-specific changes only
Rule -ve
n=284
Rule +ve
n=512
0 arrhythmias in 8 hours
15 arrhythmias in 8 hours
Sensitivity 100% (78.2–100)
Specificity 36.4% (33–39.6)
NPV 100% (98.7–100)
Syed CMAJ 2017;189:E139
SGEM #176

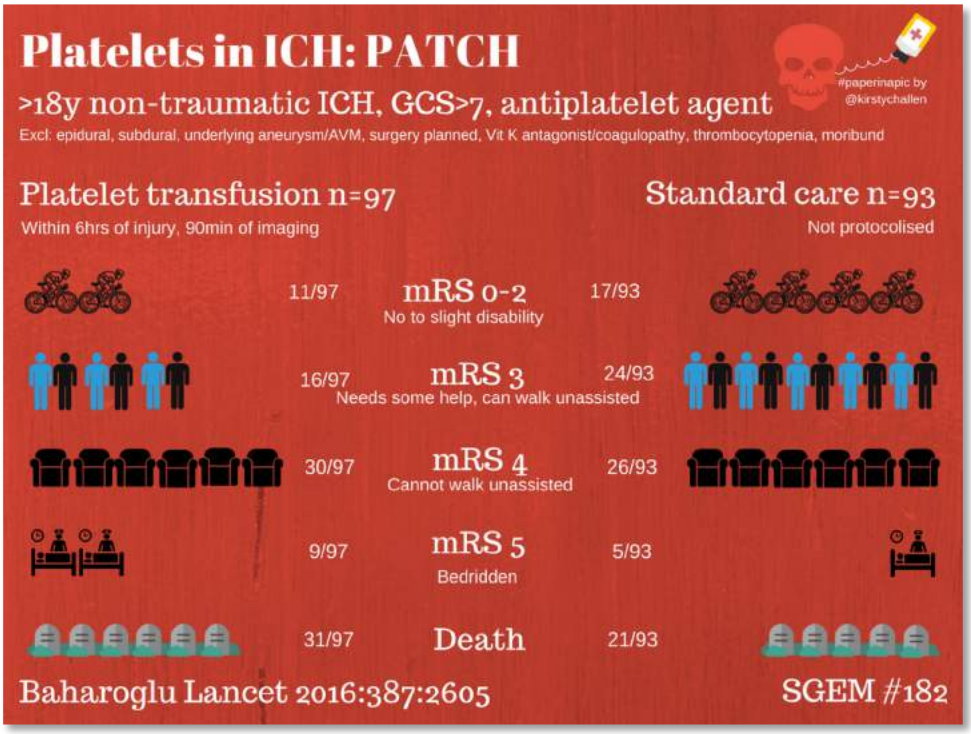

POCUS in paediatric forearm fractures
169 patients 4-17yrs with ?forearm # from FOOSH
Exclusions: analgesia before arrival, metabolic bone disease, congenital malformation, suspected open fracture, known radius or ulna fracture, neurovascular compromise, distracting injuries, gross deformity
POCUS
By 1 of 4 experienced bedside ultrasonographers
X-ray
Gold standard
72 true positive
6 false positive
87 true negative
4 false negative
Sensitivity 94.7% (89.7-99.8) Specificity 93.5% (88.6-98.5)
Median pain 1/5 (IQR 0-2)
Median pain 2/5 (IQR 1-3)
Median caregiver satisfaction 5/5 (IQR 5/5)
Median caregiver satisfaction 5/5 (IQR 4-5)
Median duration 1.5 min (IQR 0.8-2.2)
Median duration 27 min (IQR 15-58)
Poonai Acad EM 10.1111/acem.13145
SGEM #177

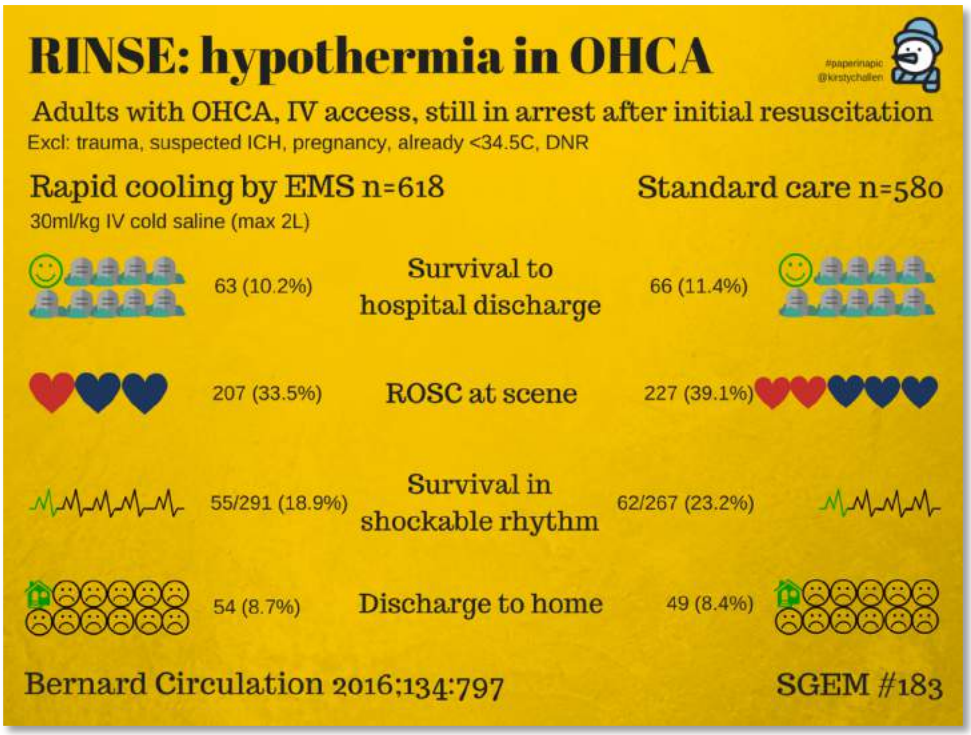

Mindfulness in EM residency
44 Australian medical interns rotating in EM
#paperinapic
@kirstychallen
10 week mindfulness training n=23
One hour extra break/week n=21
2.54/10 +/-0.44
Mean Copenhagen burnout at 5/52
2.87/10 +/- 0.76
2.35/10 +/-0.49
Mean Copenhagen burnout at 10/52
2.81/10 +/- 0.87
2.61/10 +/-0.45
Perceived stress scale at 5/52
2.69/10 +/- 0.63
2.42/10 +/-0.43
Perceived stress scale at 10/52
2.61/10 +/- 0.62
Ireland Med Teach 2017;39:409
SGEM #178

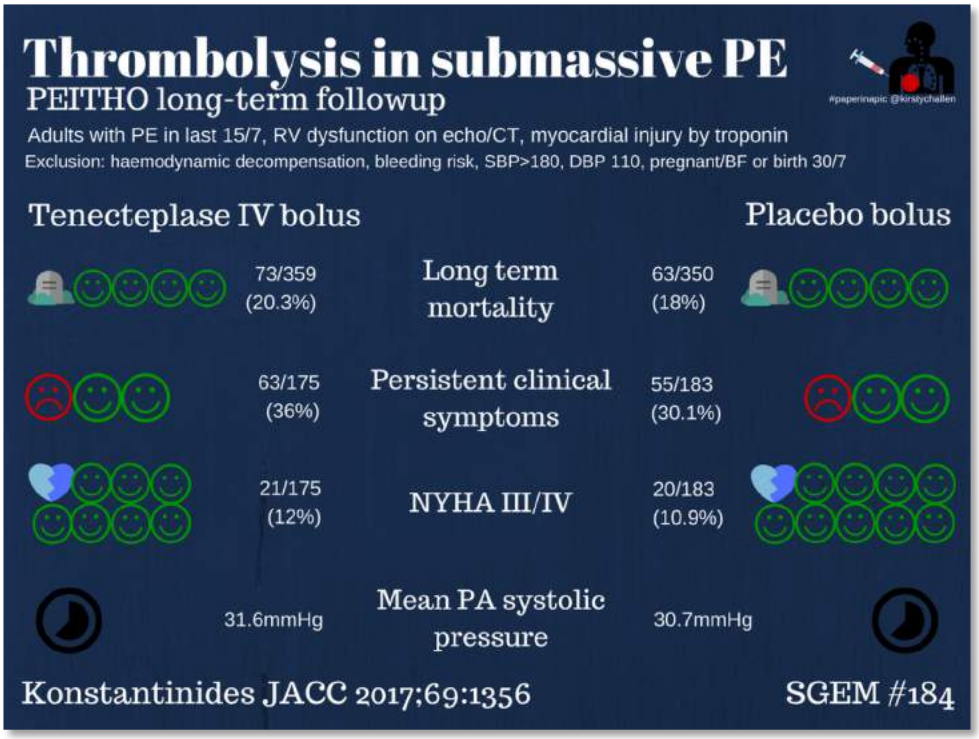

Observation after naloxone
#paperinapic
@kirstychallen
Systematic review of English language published literature
/5443
4/5443 deaths in 48 hours where patients not transported to ED (7 articles)
0/1069 deaths in 48 hours if OD heroin alone (2 articles)
Hi!
/100
Tool: mobilising as normal, normal vitals, GCS 15 (543 patients given naloxone in ED)
Sensitivity 99% (96-100), specificity 40% (36-45) for adverse events in 24h
/227
97 trained v 96 untrained responders administered naloxone in overdose prevention program
NNT 227 for death prevented with distribution of bystander naloxone kits
Willman Clinical Tox 2017;55:81
SGEM #179

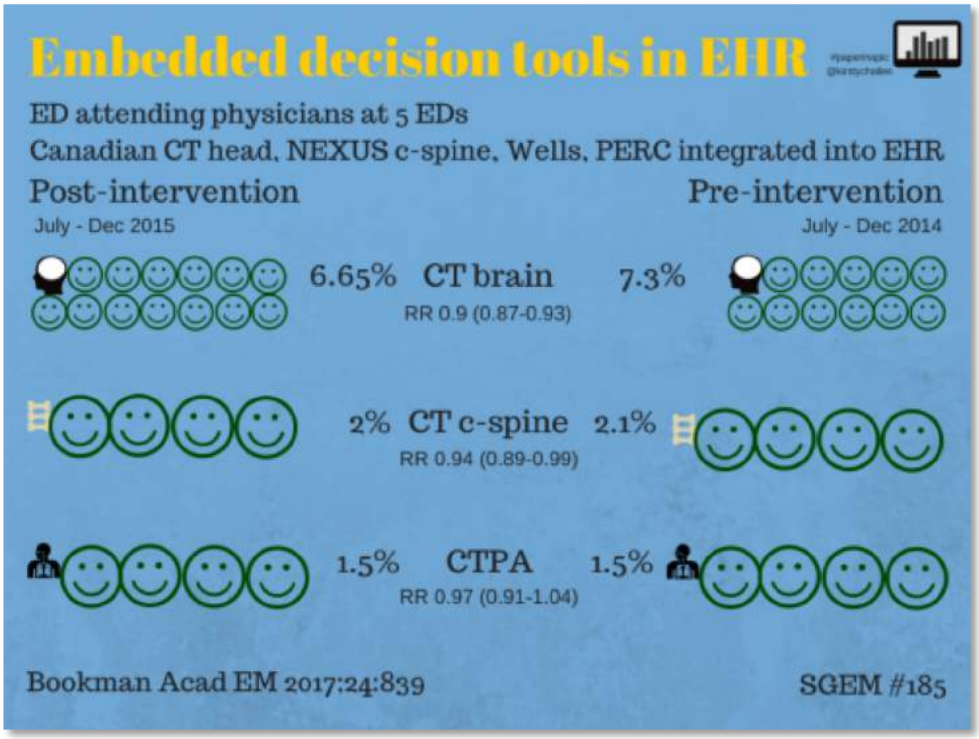

Non-operative treatment: paediatric appendicits
Systematic review pts <18y: acute, uncomplicated appendicitis
Exclusions: complicated appendicitis, mixed study with adults, only children with malignancy
#paperinapic
@kirstychallen
Successful NOTA
(discharge without appendicectomy)
Recurrent appendicitis
(in those with initial success)
15/16 Abes 2/15
11/12 Armstrong 2/11
25/25 Gorter 0/25
22/22 Kaneko 6/22
125/130 Koike 24/125
42/45 Steiner 1/42
77/78 Tanaka 22/77
21/24 Hartwich 2/21
35/37 Minneci 7/35
Georgiou Pediatrics 2017;139:e20163003
SGEM #180


WBCT in trauma: REACT-2
Adult patients with severe injury/suspicion of life-threatening injury
Excl: pregnant, low energy trauma, single stab wound, too unstable for CT
#paperinapic by
@kirstychallen
Whole body CT n=593
Vertex to pubic symphysis
86/541 (16%) in-hospital mortality
68/178 (38%) in-hospital mortality in TBI
50 minutes to diagnose life-threatening injuries
3 ICU days
21 mSv cumulative hospital radiation dose
Standard workup n=701
CXR, pelvis XR, FAST, selective CT
85/542 (16%) in-hospital mortality
66/151 (44%) in-hospital mortality in TBI
58 minutes to diagnose life-threatening injuries
3 ICU days
20.6 mSv cumulative hospital radiation dose
Sierink Lancet 2016;388:673
SGEM #181


Platelets in ICH: PATCH
#paperinapic by @kirstychallen
>18y non-traumatic ICH, GCS>7, antiplatelet agent
Excl: epidural, subdural, underlying aneurysm/AVM, surgery planned, Vit K antagonist/coagulopathy, thrombocytopenia, moribund
Platelet transfusion n=97
Within 6hrs of injury, 90min of imaging
Standard care n=93
Not protocolised
11/97
mRS 0-2
No to slight disability
17/93
16/97
mRS 3
Needs some help, can walk unassisted
24/93
30/97
mRS 4
Cannot walk unassisted
26/93
9/97
mRS 5
Bedridden
5/93
31/97
Death
21/93
Baharoglu Lancet 2016:387:2605
SGEM #182


RINSE: hypothermia in OHCA
#paperinapic @kirstychallen
Adults with OHCA, IV access, still in arrest after initial resuscitation
Excl: trauma, suspected ICH, pregnancy, already <34.5C, DNR
Rapid cooling by EMS n=618
30ml/kg IV cold saline (max 2L)
Standard care n=580
63 (10.2%)
Survival to hospital discharge
66 (11.4%)
207 (33.5%)
ROSC at scene
227 (39.1%)
55/291 (18.9%)
Survival in shockable rhythm
62/267 (23.2%)
54 (8.7%)
Discharge to home
49 (8.4%)
Bernard Circulation 2016;134:797
SGEM #183


Thrombolysis in submassive PE
PEITHO long-term followup
#paperinapic @kirstychallen
Adults with PE in last 15/7, RV dysfunction on echo/CT, myocardial injury by troponin
Exclusion: haemodynamic decompensation, bleeding risk, SBP>180, DBP 110, pregnant/BF or birth 30/7
Tenecteplase IV bolus
Placebo bolus
73/359 (20.3%)
Long term mortality
63/350 (18%)
63/175 (36%)
Persistent clinical symptoms
55/183 (30.1%)
21/175 (12%)
NYHA III/IV
20/183 (10.9%)
31.6mmHg
Mean PA systolic pressure
30.7mmHg
Konstantinides JACC 2017;69:1356
SGEM #184

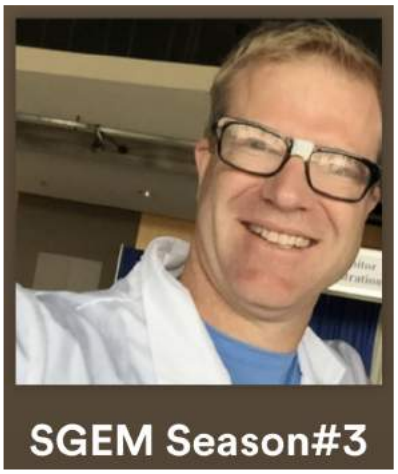

Embedded decision tools in EHR
ED attending physicians at 5 EDs
Canadian CT head, NEXUS c-spine, Wells, PERC integrated into EHR
Post-intervention
July - Dec 2015
Pre-intervention
July - Dec 2014
6.65% CT brain
RR 0.9 (0.87-0.93)
7.3%
2% CT c-spine
RR 0.94 (0.89-0.99)
2.1%
1.5% CTPA
RR 0.97 (0.91-1.04)
1.5%
Bookman Acad EM 2017:24:839
SGEM #185

Music of Season#5

If you are looking for the inspiring theme music from each of the SGEM episodes you can now find them on Spotify. Of course most of them come from the 1980's.

Season#1

Season#2



Season#3

Season#4

Season#5

Season#6

Music of Season#5

Episode	Song	Artist	Link
160	**Sensitive**	Robert Calvert	1
161	**Break on Through to the Other Side**	The Doors	2
162	**Staying Alive**	London Theater Orchestra	3
163	**Shuffle Off to Buffalo**	Joseph Bova, Carole Cook, Karen Prunczik, 42nd street ensemble	4
164	**Cuts Like a Knife**	Bryan Adams	5
165	**I Want to Be Sedated**	The Ramones	6
168	**The Power**	SNAP!	7
169	**Stuck in The Middle With You**	Stealers Wheel	8
170	**Don't Go Breaking My Heart**	Elton John and Kiki Dee	9
171	**Step By Step**	New Kids on The Block	10
172	**Don't Bring Me Down**	ELO	11
173	**I Won't Back Down**	Tom Petty	12
174	**Don't Believe The Hype**	Public Enemy	13
175	**Dancing on The Ceiling**	Lionel Richie	14
176	**Somebody's Watching Me**	Rockwell	15

Music of Season#5

Episode	Song	Artist	Link
177	**New Sensation**	INXS	15
178	**My My, Hey Hey (Out of the Blue)**	Neil Young and Crazy Horse	16
179	**Time Out Of Mind**	Steely Dan	17
180	**The First Cut is The Deepest**	Yusuf/Cat Stevens	18
181	**Did You Ever Have to Make Up Your Mind?**	The Lovin' Spoonful	19
182	**Don't Do it**	The Band	20
183	**Rinse and Repeat**	Riton, Kah-Lo	21
184	**We Weren't Born to Follow**	Bon Jovi	22
185	**Everybody Wants to Rule The World**	Tears for Fears	23
SGEM XTRA	**Sympathy for The Devil**	The Rolling Stones	24
SGEM XTRA	**Brick House**	Commodores	25
SGEM XTRA	**Done A lot of Wrong Things**	Paul Butterfield	26
SGEM XTRA	**Emergency**	Icona Pop	27
SGEM XTRA	**Dancing In The Streets**	Martha Reeves	28
SGEM XTRA	**Dancing In The Street**	David Bowie, Mick Jagger	29
SGEM XTRA	**Strange Fruit**	Sidney Bechet	30

About The Authors

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Dr. Milne is the Chief of Staff at South Huron Hospital in Exeter, Ontario, Canada. He has been doing research for over 30 years publishing on a variety of topics. He is passionate about skepticism, critical thinking and medical education. He is the creator of the knowledge translation project, The Skeptics' Guide to Emergency Medicine. When not working he is trying hard to be an endurance athlete. Dr. Milne is married to Barb and has three amazing children.

Christopher Carpenter, MD, MSc, FACEP, AGSF
Dr. Carpenter is Professor of Emergency Medicine at Washington University in St. Louis and is the former Chair of the SAEM EBM Interest Group and President of the ACEP Geriatric Section. He is Deputy Editor-in-Chief of Academic Emergency Medicine, as well as Associate Editor of the Journal of the American Geriatrics Society. He co-authored the textbook "Evidence-Based Emergency Care: Diagnostic Testing and Clinical Decision Rules, 2nd Edition". Dr. Carpenter lives in St. Louis, Missouri with his wife, two children, and wonder-dog and is an avid St. Louis Cardinals fan.

Etai Shachar, MSc, (M.D. in progress)
Etai is a 4th year medical student from St. George's University. He completed his clinical training in Detroit, MI where he cultivated a passion for urban emergency medicine (EM). His primary interests in EM include investigating how social determinants of health effect emergency health care outcomes. Etai spends his "free" time whipping around the streets of Toronto on his bicycle, training for triathlon races, and jumping between coffee shops taking part in creative writing projects.