The SGEM

The Skeptics' Guide to Emergency Medicine

Season 7

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Designed by: E. S. Milne

Introduction

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 augmenttraditional 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.

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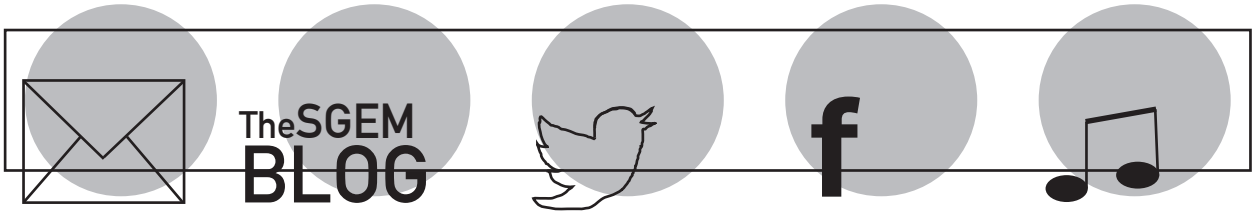

Disclaimer

The Skeptics' Guide to Emergency Medicine (SGEM) is produced in Canada and is intended for medical students, residents, physicians physician assistants, nurse practitioners, paramedics, pharmacists and anyone else caring for emergency patients. The goal of The Skeptics' Guide to Emergency Medicine (SGEM) program is to provide followers with the 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.

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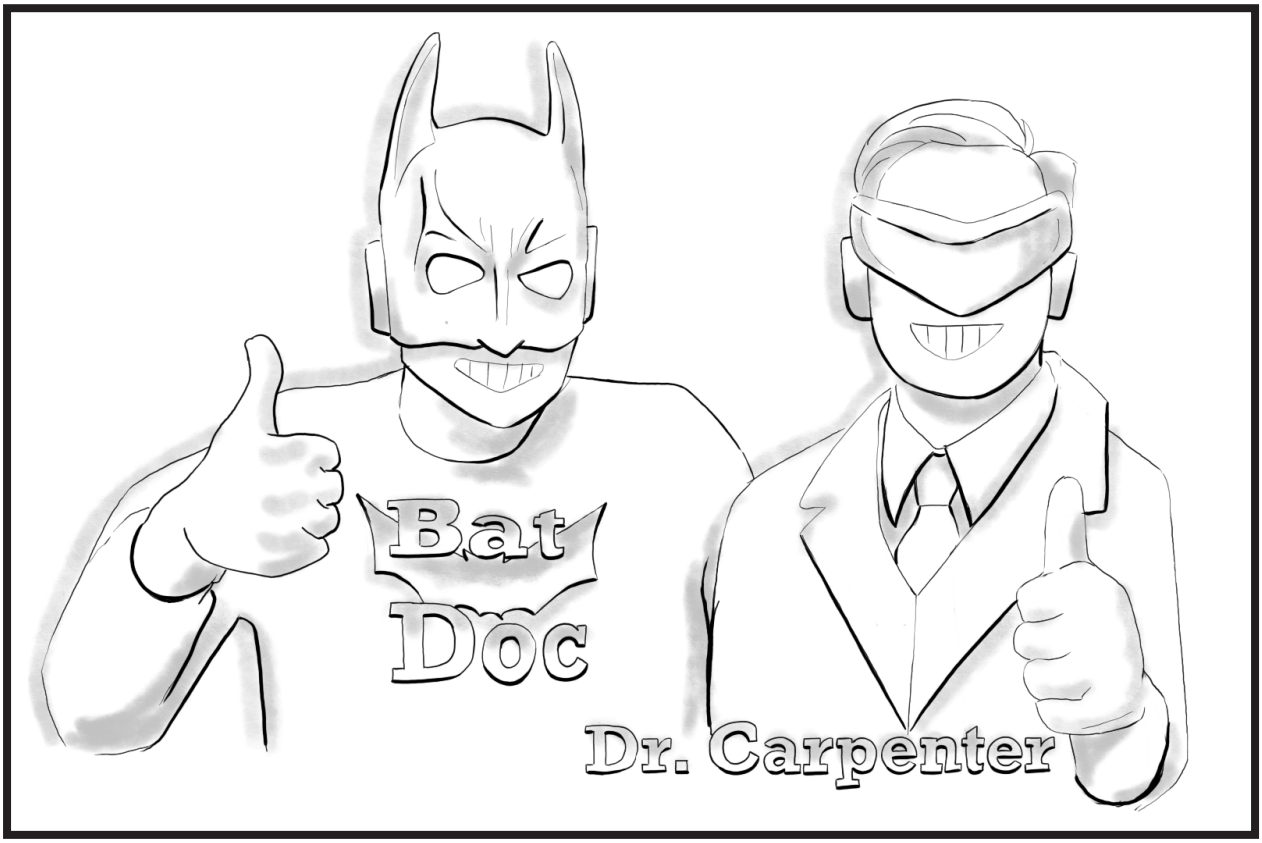
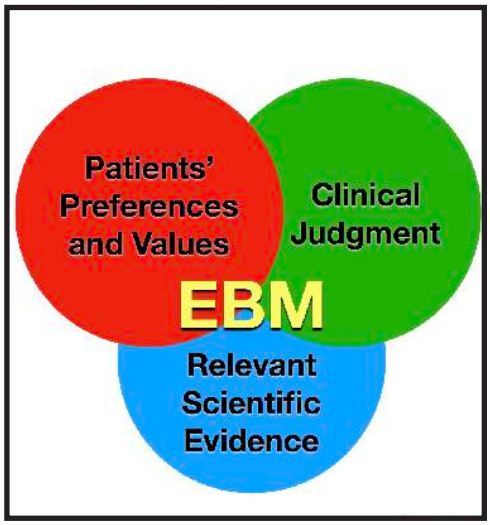
The SGEM makes a reasonable effort to supply accurate information but does not assume any liability for errors or omissions. Because of the nature of the program and its format, it is not recommendedthat they serve as the sole basis for patient evaluation and treatment.

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 tradtion.[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 seaof 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 approachto 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 fivesteps 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)

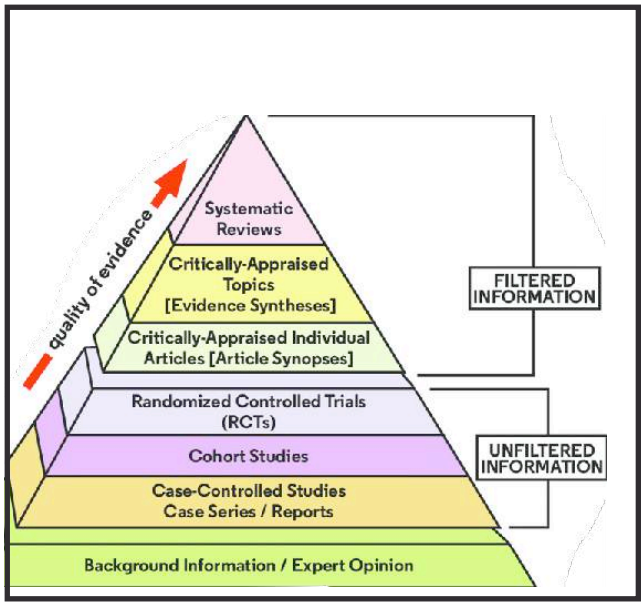
The PICOT question focuses subsequent steps to achieve the most pertinent results for the patients typically encountered.

Step 2: Devise a Search Strategy

Numerous open access electronic databases exist, including PubMed and Google Scholar. 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 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

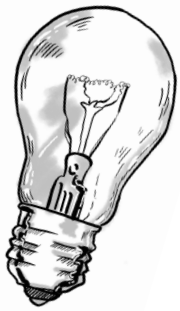
EBM describes a hierarchy of evidence depicting less biased research towards the top. Expert opinion and case reports site at the bottom of the hierarchy because they are more prone to spurious observations via unconscious interpretation, small sample sizes and statistical chance then are masked controlled 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, whilemeta-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 applicaions 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 #7 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.

Bibliography

1. Smith R, Rennie D. Evidence based medicine--an oral history. BMJ 2014;348:g371.
2. Tobin MJ. Counterpoint: evidence-based medicine lacks a sound scientific base. Chest 2008;133: 1071-4.
3. Holmes D, Murray SJ, Perron A, Rail G. Deconstructing the evidence-based discourse in health sciences: truth, power and facism. Int J Evid Based Healthc 2006;4:180-6.
4. Jenicek M. Evidence-based medicine: fifteen years later. Golem the good, the bad, and the ugly in need of a review? Med Sci Monit 2006;12:R241-R51.
5. Ioannidis DG. Evidence-based medicine has been hijacked: a report to David Sackett. J Clin Epidemiol 2016;73:82-6.
6. Guyatt GH, Rennie D, Meade MO, Cook DJ. Users' Guide to the Medical Literature: Essentials of Evidence-Based Clinical Practice. 3rd ed. New York: McGraw-Hill; 2015.
7. Ioannidis JP. Why most published research findings are false. PLoS Med 2005;2:e124.
8. Carpenter CR, Kane BG, Carter M, Lucas R, Wilbur LG, Graffeo CS. Incorporating evidence-based medicine into resident education: a CORD survey of faculty and resident expectations. Acad Emerg Med 2010;17:S54-S61.
9. Newman DH, Wyer PC. Evidence-based medicine: a primer for the emergency medicine resident. Ann Emerg Med 2002;39:77-80.
10. 10. Ioannidis DG. The Mass Production of Redundant, Misleading, and Conflicted Systematic Reviews and Meta-analyses.
    Milbank Q 2016;94:485-514.
11. Diner BM, Carpenter CR, O'Connell T, et al. Graduate medical education and Knowledge Translation: Role models, information pipelines, and practice change thresholds. Acad Emerg Med 2007;14:1008-14.
12. Hess EP, Grudzen CR, Thomsen R, Raja A, Carpenter CR. Shared Decision-making in the Emergency Department: Respecting Patient Autonomy When Seconds Count. Acad Emerg Med 2015;22:856-64.

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.

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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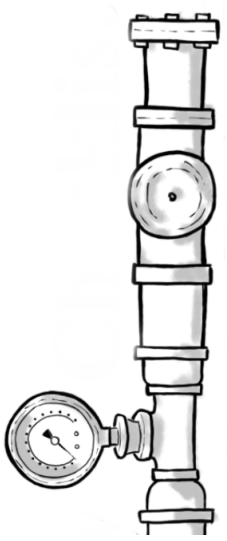

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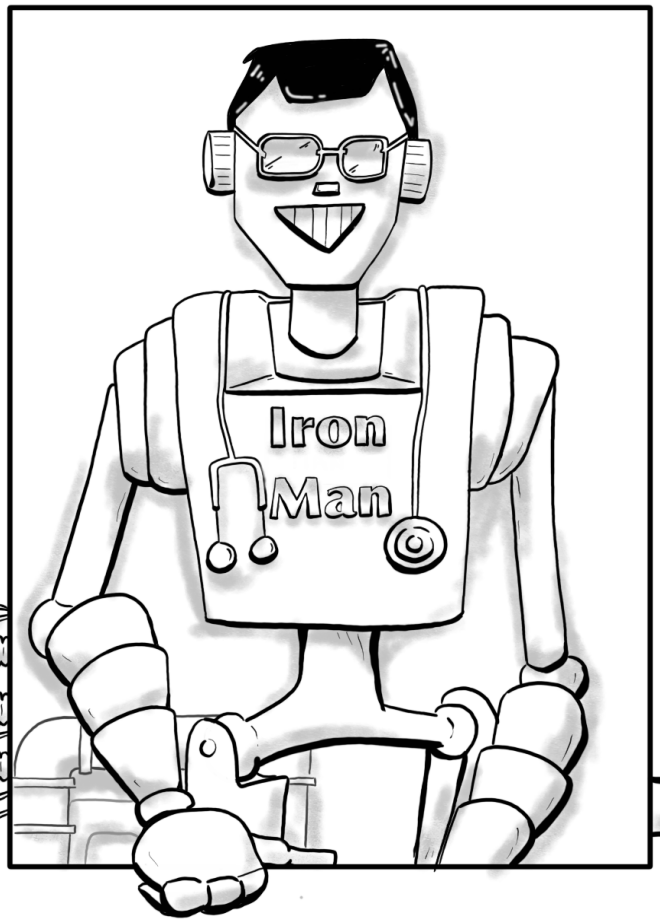
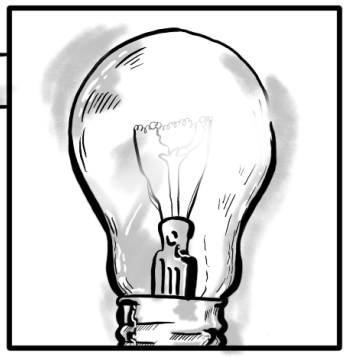
A Message to You Rudy: About Rudeness





Clinical Question:

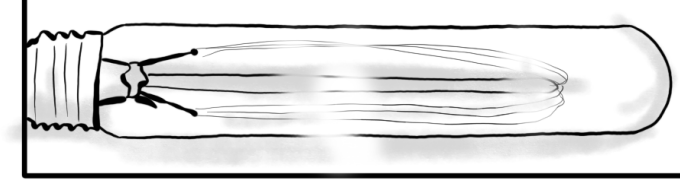
1) Does rudeness affect the performance of a clinical team?
2) If it does, can we mitigate the effects of rudeness?

Bottom Line:

Rudeness can have an impact upon how medical teams function and there may be a way to mitigate staff against this negative influence.

Guest:

Dr. Simon McCormick is an Emergency Medicine Consultant from Northern Ireland who works in Rotherham Hospital in Yorkshire, England. He is currently redeployed in Medical Education on *"Burnout Sabbatical"* but is hopeful of returning to the shop floor in the near future. He writes a blog called Broken Toy covering topics such as his experience with burnout, medical education and looking after each other.



Case Overview

Case:

You are working in the emergency department (ED) and have just been involved in a difficult case in the resuscitation room. During the resuscitation, a relative of the patient you have been treating named Rudy makes a derogatory/rude comment about Emergency Medicine (EM) staff.

Background:

Unfortunately, rudeness is a problem that is rife in medicine. It does not just come from patients and/or their relatives, as in this case, but can also come from the medical team. Specialties make fun of each other using unflattering stereotypes, seniors are unpleasant to juniors and physicians can say derogatory things to nurses.

This internal rudeness has traditionally been seen as just *"part of medicine"*, a way to *"build a tribe"* or just part of the black humour and banter needed to survive in a tough environment.

More recently, however, this has been questioned and people are now more inclined to think of the worst of this as a form of bullying and harassment and other, milder rudeness, as detrimental to the development of staff and harmful to a collaborative culture within medicine.

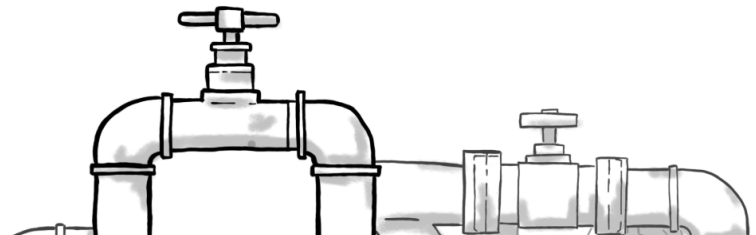
Perhaps even more worryingly, is the concern that rudeness has an impact on staff performance, actually putting patients at risk. That said, it is unlikely that we can eradicate rudeness completely from our working lives. However, is it perhaps possible to reduce the impact rudeness may haveon staff, either with some form of pre-emptive education or a post event debriefing whether the rudeness comes from the team or those patients and families we are trying to help.

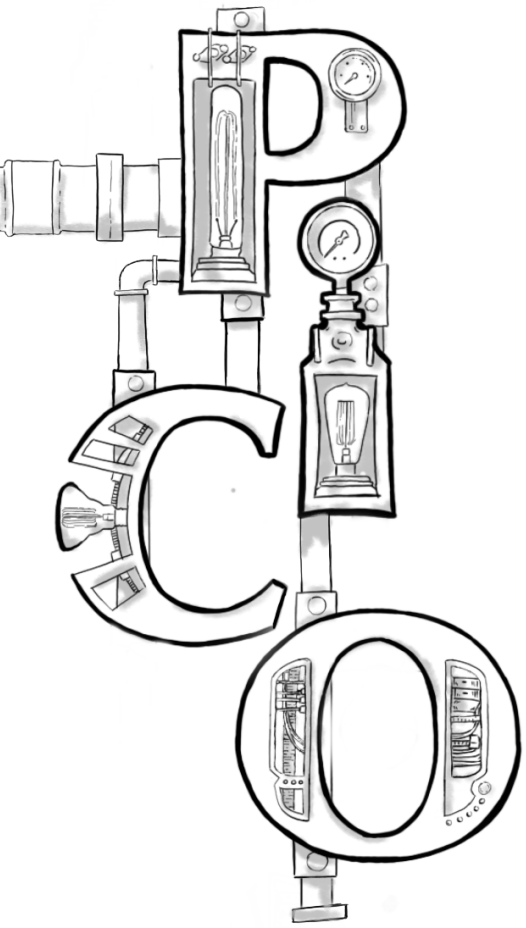
Rudeness does not need to be part of medicine. A better option is to try kindness as outlined in the excellent book by Dr. Brian Goldman. We discussed Brian's book on the SGEM Xtra called Don't Give Up – The Power of Kindness.

Being rude might make us feel better sometimes but that is always at the expense of who we are being rude to. Whilst it might take a little effort, taking the time to try to understand why someone is behaving as they are, showing some empathy, can have real benefits. As we start to understand the issues behind their actions and reactions, we are given the opportunity to reach out and show some kindness which not only helps them, it also helps us by reconnecting with that basic human desire to be helpful. Instead of the win/lose of rudeness we get a win/win with kindness!

Reference:

Riskin A, Erez A, Foulk TA, et al. Rudeness and Medical Team Performance. Pediatrics. February 2017





Population:
Neonatal Intensive Care Unit (NICU) staff, both physicians and nurses, working in a number of NICUs in Israel.

Intervention:
Staff were exposed to a controlled rude event by a relative during the first of a series of five resuscitation simulations. Staff were given either a pre-intervention Cognitive Bias Modification(CBM) or a post-intervention therapeutic narrative intervention.

- **CBM:** This is also known as cognitive behavior therapy or CBT is a therapy that tries to change behaviors by identifying maladaptive behaviors and finding ways, often using talk therapy, to change those behaviors.
    - *The CBM intervention involved brief, computerized cognitive training modules designed to alter threat-oriented biases in interpretation, by promoting a more positive or benign response rather than a threat-based interpretation of ambiguous information or stimuli.*
- **Narrative Intervention:** This was having the participants writing down the events post-experience to help process the event. This has been shown to improve health and general well-being. [i]

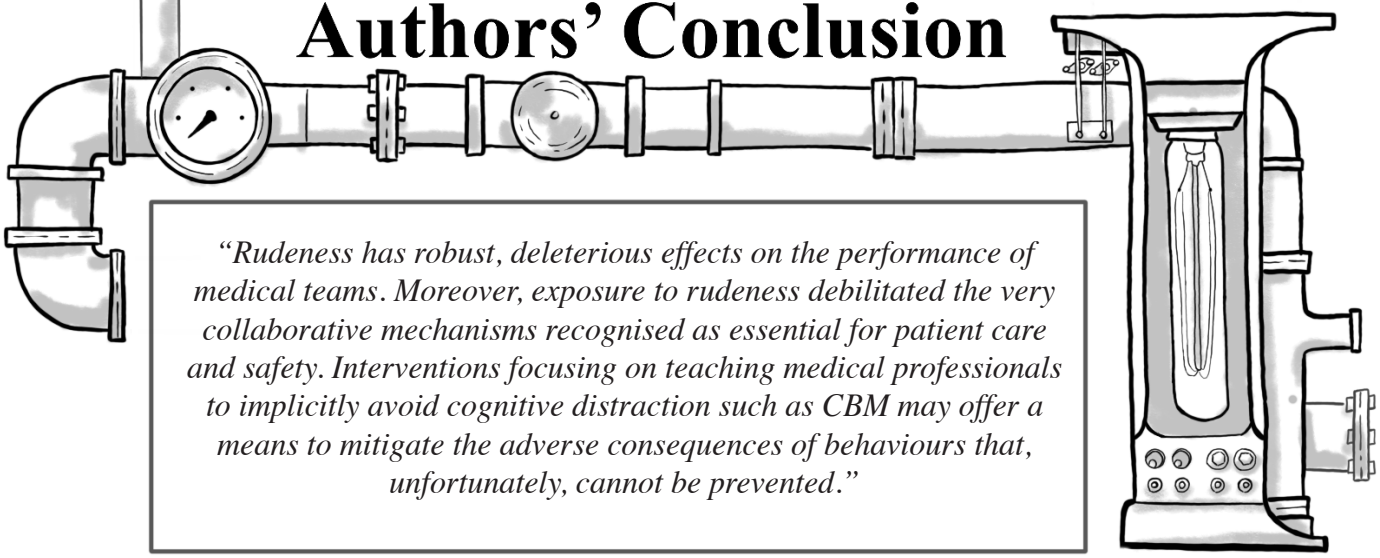
Comparison:
A neutral comment was made by the relative with no pre or post rudeness intervention given.

Outcomes:
Nine parameters separated into two broad aspects of team performance rated on a 5-point Likert scale (1 = failed; 5 = excellent) as well as a rudeness manipulation check (this was not listed or described in the methods section)

1. **Medical and Therapeutic Performance**
- Diagnostic performance
- Quality of therapy plan
- Intervention
- Overall general assessment of medical therapy

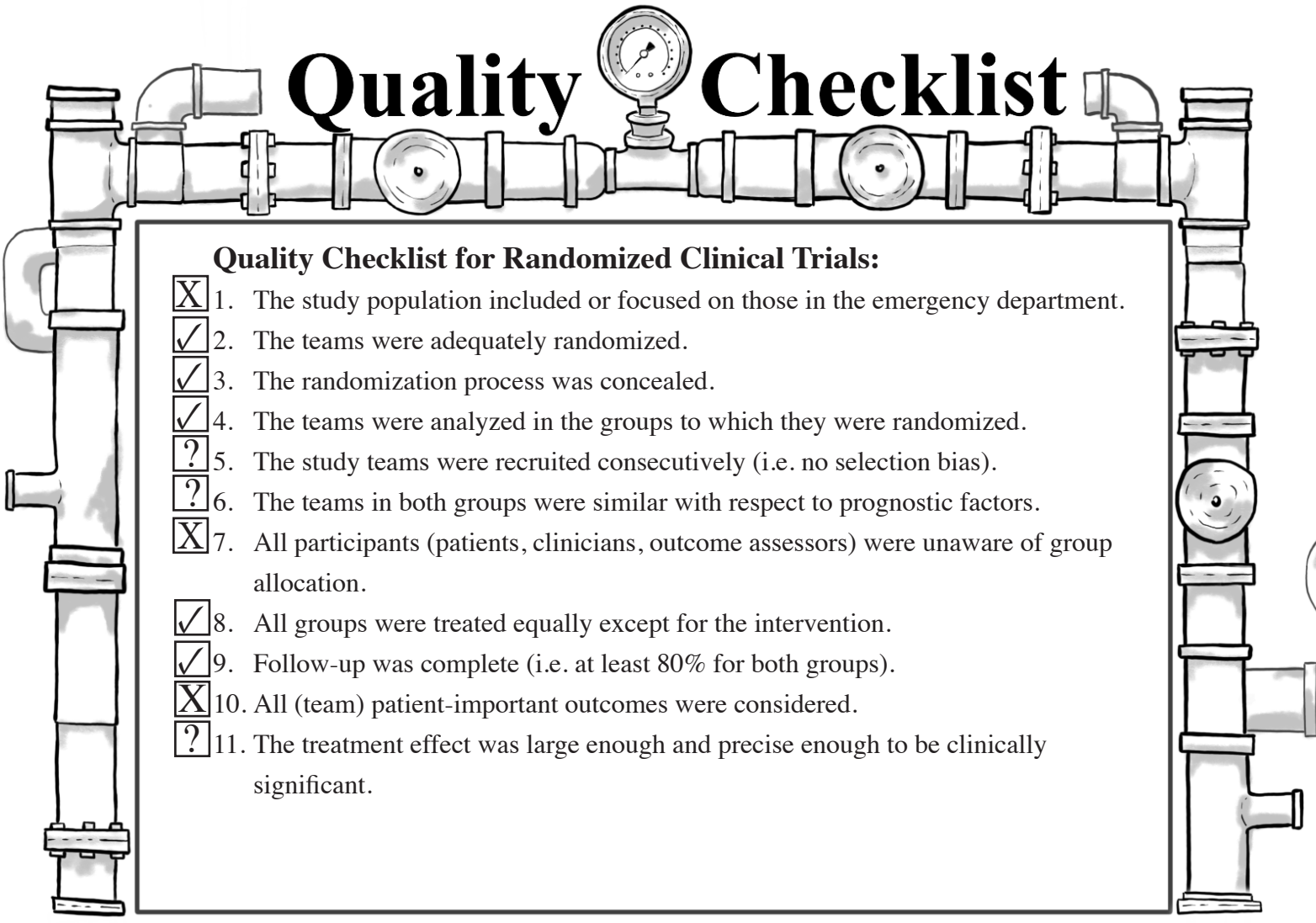
2. **Teamwork or Relational Cooperative Performance**
- Information sharing
- Workload sharing
- Helping among team members
- Communication between team members
- Overall general assessment of teamwork
- Rudeness Manipulation Check

Authors' Conclusion



"Rudeness has robust, deleterious effects on the performance of medical teams. Moreover, exposure to rudeness debilitated the very collaborative mechanisms recognised as essential for patient care and safety. Interventions focusing on teaching medical professionals to implicitly avoid cognitive distraction such as CBM may offer a means to mitigate the adverse consequences of behaviours that, unfortunately, cannot be prevented."

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

- [X] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [?] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [?] 6. The teams in both groups were similar with respect to prognostic factors.
- [X] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [X] 10. All (team) patient-important outcomes were considered.
- [?] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
They recruited 39 NICU teams consisting of two physicians and two nurses split across the four groups:

1. Neutral control group
2. Rudeness exposure with no intervention
3. Rudeness exposure with prior CBM
4. Rudeness exposure with post event narrative intervention

Rudeness negatively impacted medical and therapeutic performance as well as teamwork or relational cooperation. Pre-exposure CBM seemed to mitigate the impact of rudeness while post-exposure narrative intervention did not.

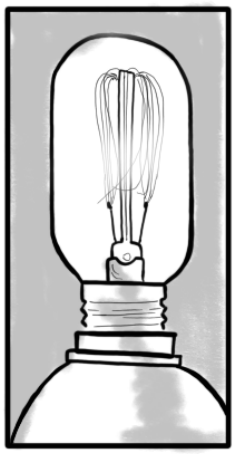
Compared to the control group, those exposed to the rudeness had statistically significant reduction in seven of the nine scores measured including the mean therapeutic and mean teamworking scores.

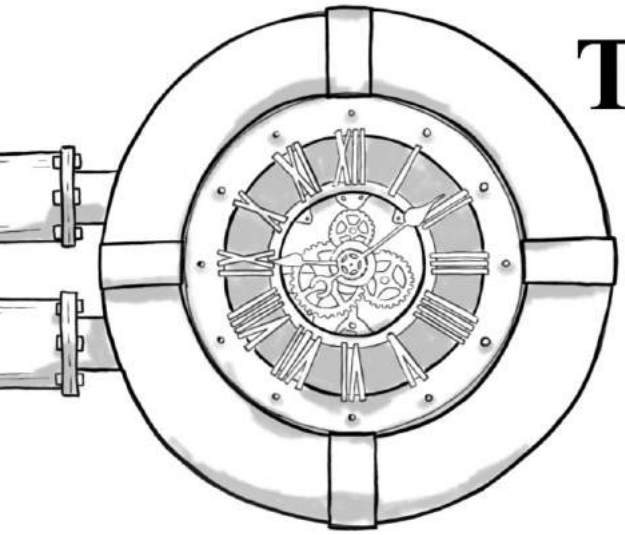
Those who were exposed to rudeness but had received pre-exposure CBM did not have a statistically significant drop in any scores compared to the controls. This suggests a degree of protection with CBM from the impact of rudeness.

Those who had the post-exposure narrative intervention showed a similar drop in medical and therapeutic performance as well as teamwork or relational cooperation scores compared to the controls. This suggests a lack of protection with post-exposure narrative intervention from the impact of rudeness.

☺ No statistical impact of rudeness (P<0.05)
☹ Statistical negative impact of rudeness (P<0.05)

Medical and Therapeutic	Control vs. Rude	Control vs. CBM	Control vs. Narrative
Diagnostic Performance	☺	☺	☺
Quality of Therapy Plan	☹	☺	☺
Intervention Score	☹	☺	☹
General Therapeutic Score	☹	☺	☹
Teamwork or Relational Cooperation	**Control vs. Rude**	**Control vs. CBM**	**Control vs. Narrative**
Information Sharing	☺	☺	☹
Workload Sharing	☹	☺	☹
Helping	☹	☺	☹
Communication	☹	☺	☹
General Teamwork Score	☹	☺	☹





Time to Talk Nerdy

1) External Validity:

The population in this study was not ED staff but rather NICU teams. The clinical scenarios they faced were pretty extreme, pushing their teamwork to the limit. It is reasonable to think rudeness would have a similar impact on the function of the ED staff and that CBM could mitigate the negative effect. However, the intellectually honest answer is we are unsure if these results can be generalised to ED until it is studied in that specific environment.

This is not because we in the ED are any better than those in the NICU, but because our working experiences are different. Whilst it is clear that staff on a NICU will experience rudeness at work, most people would agree that the ED is a place where tensions run high more often, and interpersonal conflict is unfortunately too frequent an occurrence. Having been in EM for nearly twenty years, I found the rude statement used in this study quite benign compared to what I've faced on a semi regular basis in the ED. It is therefore possible, given the successful intervention was a type of desensitisation therapy, that ED staff have already become immune to this level of rudeness.

And whilst talking about the level of rudeness, I wonder what the impact of the study's rude statement would have in different countries? How might the 'famously' or is it infamously polite British and Canadians react compared to our stereotypically more robust colleagues from the US, South Africa and Australia?

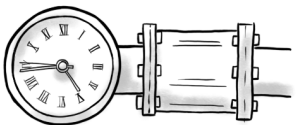
2) Recruitment and Prognostic Factors:

They do not specifically mention that teams were recruited consecutively. This could have introduced some selection bias. It is unclear if this would have impacted the results.

Another important issue is prognostic factors. The teams being studied were randomly assigned to each group but there is a very limited assessment of their baseline characteristics. The only characteristic recorded was of *"cumulative experience"* and this was found to be *"distributed equally"* across the groups.

While it may be impossible to control for all life experiences that might impact upon a psychological study such as this, it would have been good to know if the groups were matched for age, sex, individual clinical experience or seniority of position, to name a few.

In this study a team of four staff, each with five years of experience, is deemed equal to a team with three staff who have one year of experience and one who has seventeen. It might be argued that this was a study designed to look at teams not individuals, hence the use of cumulative experience, but we cannot ignore the fact that teams are composed of individuals, each of whom can have a huge impact upon how that team functions as a whole.



3) Interventions:

There are two intervention points described in this study. The rudeness intervention was delivered during the first simulation by the actor playing the mother and was the statement *"I know we should have gone to a better hospital where they don't practice Third world medicine!"* However, how do we know whether this was considered rude by the study participants? The investigators did do manipulation checks at two points later in the day to see if the team members had picked up on this rudeness, which they had.

The second intervention was the attempt to *"treat"* the rudeness, either proactively or retrospectively. The proactive treatment was a Cognitive Bias Modification (CBM) which is described in detail in the paper. In short it appeared to be a computer-based task where team members looked at faces in different stages of happiness or anger and rated what they thought the emotion displayed was. After establishing where their "threshold to threat" was, the computer program gave feedback to try to raise that threshold, effectively immunising against minor threats.

The retrospective treatment was a narrative intervention where, after the first simulation, team members were asked to write a couple of paragraphs about how the mother might have felt during the resuscitation. We are probably much more familiar with this approaches to rudeness with reflective practice an increasing part of our development as clinicians.

However, whilst this reflective process appeared to make team members feel the mother was less rude by the end of the day (from the previously mentioned manipulation checks), it didn't seem to help protect them from the effect of the rudeness. On the other hand, the CBM appeared to increase the perception of the mother's rudeness but did seem to prevent that rudeness adversely affecting performance.

While this CBM intervention looks like it might be useful we are unsure as to the duration of effect, as no measurements were carried out beyond the day of training. This means the practical application of such an intervention is currently pretty low as having all staff spend 20 minutes on a computer program pre-shift is unrealistic!

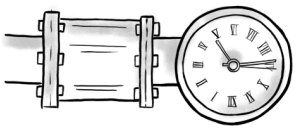
However, if it is consistently shown to make a significant, persistent difference one could easily imagine an app-based version being created that staff could access at an evidence-based interval to raise their threshold of threat.

4) Multiple Measurements and Comparisons:

This study had nine different outcomes measured on a five-point Likert scale. They never did identify what their primary outcome was and what the secondary outcomes would be.

They also compared CBM vs. control and narrative intervention vs. control. This lead to multiple measurements and multiple comparisons. The concern with this approach is that eventually one or two will have a statistically significant difference by chance.

However, given that all the measurements in this study seem to move in a similar direction for each group and consistent with the interventions, it is probably okay but we do need to watch out for this type of thing.



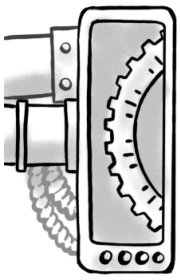
Whilst on this subject of measurements, the one they used in the trial does not appear to have been validated anywhere. They were similar to those used in the authors' previous paper on rudeness looking at individuals but tweaked slightly to reflect team skills rather than those of individuals. On a positive note, the two-person team doing the assessments were blinded, had good training and their inter-rater reliability was reported as moderate to high.

5) Outcomes:

The mean difference between the rudeness and control groups for general teamwork and general therapeutic performance were 0.37 and 0.57 respectively on a 5-point Likert scale. This was statistically significant difference, but we do not know if this would be clinically significant.

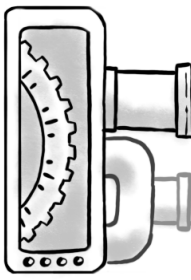
More importantly we have no knowledge on whether the rudeness negatively effecting the team work and therapeutic performance has any impact on any patient-oriented outcomes.

Even if CBM mitigates the negative impact of rudeness on those measurements does it result in a net patient-oriented benefit? These are important questions that still remain, and we would encourage the authors to consider exploring these additional important questions.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with their conclusions, although we might ask the authors nicely if they would tone the certainty in their language down a bit given the limitations of the study design and results that we have discussed.



Clinical Application:

We are unsure how to apply this information clinically. It does appear that rudeness can have an impact on team performance. What we do not know is if it has a negative impact on patient-oriented outcomes in the ED. In addition, would CBM mitigate the effect of rudeness in this clinical setting?

What Do I Tell the Team?

Sometimes patients and relatives can be rude to us, but we can also be very rude to each other. It is a practice of tribalism that has gone on for too long in medicine. This can have a negative influence on our team performance and could impact patient care and safety. Let's try to be kind to each other and always remember that we are all working for the best interest of the patients.

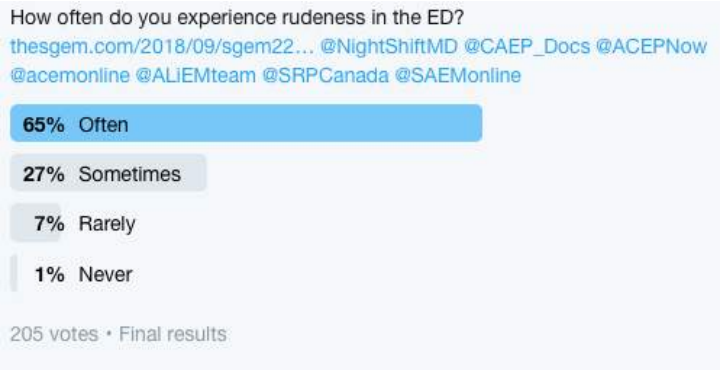
Case Resolution:

Whilst waiting for further information about practical use of CBM, you decide to try and reduce the amount of rudeness in your department by setting a good example to others. You also have a private conversation with Rudy later about his derogatory comment about the EM staff and politely discuss it could be perceived and negatively impact the team performance during resuscitations. In addition, you use this event as a teaching opportunity for your staff to explore the topic of rudeness, explain the impact it can have on team performance and encourage them to try and always be kind to patients and each other.

Episode End Notes

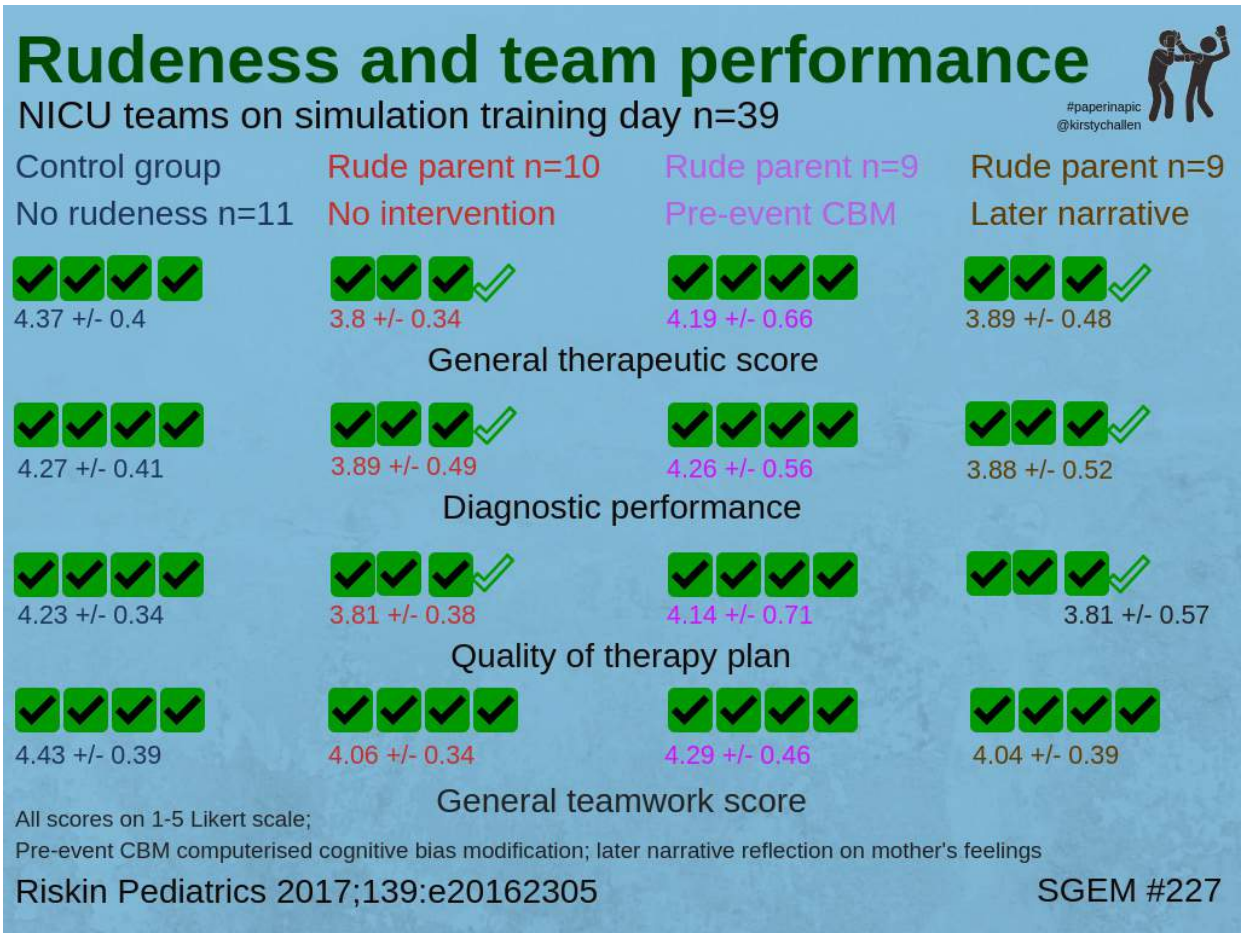
Other FOAMed:

- Civility Saves Lives
- St. Emlyns: The Impact of Rudeness on Medical Team Performance
- EMCrit: The Brindley Sessions – Rudeness
- EMCrit: The Brindley Sessions: – Part 2 Rudeness
- Don't Forget the Bubbles: Rudeness
- On the Wards: Professional socialization, tribalism, and career trajectories



References:

Pennebaker JW, Seagal JD. Forming a story: the health benefits of narrative. J Clin Psychol. 1999;55(10):1243–1254



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Winds of Change: High Flow Nasal Oxygen for Acute Bronchiolitis?

Clinical Question:

Will the patient benefit from the use of heated humidified high-flow oxygen via nasal prongs in preference to low flow oxygen via standard nasal cannula?

Bottom Line:

High-flow oxygen therapy is not required for every child in hospital with bronchiolitis. It will continue to have a role in supporting those with more severe disease, but the potential benefits and harms will need to be considered within the context of where it is being used.

Guest:

Dr. Ben Lawton is a paediatric emergency physician in Brisbane, Australia. He divides his time between a tertiary children's hospital and a community hospital that is busy enough to have its own paediatric emergency department. He is part of the Don't Forget the Bubbles team.

Case Overview

Case:

Elsie is five months old and presents on day two of a bronchiolitic illness. She has taken just under half of her usual feeds so far today and has a respiratory rate of 58 breaths per minute and oxygen saturation of 90% on room air with moderate work of breathing. She is not clinically dehydrated and has a temp of 38.2C with clear rhinorrhea, red ears, a red throat and equal air entry with widespread crackles and wheeze. She was born at term, is immunised and has no significant medical history. Her parents Dave and Tony have driven 20 minutes from home to bring her to the regional hospital where you work. Your hospital has an inpatient paediatric ward but is a 90-minute drive from the nearest children's hospital with PICU facilities.

Background:

We have covered bronchiolitis before on the SGEM#167 with expert Dr. Amy Plint. That episode looked at how bronchiolitis was managed in community hospitals. The bottom line was that there seemed to be a knowledge gap when it comes to managing bronchiolitis in the community setting (previous evidence as suggested a knowledge gap also exists in the academic pediatric hospitals).

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

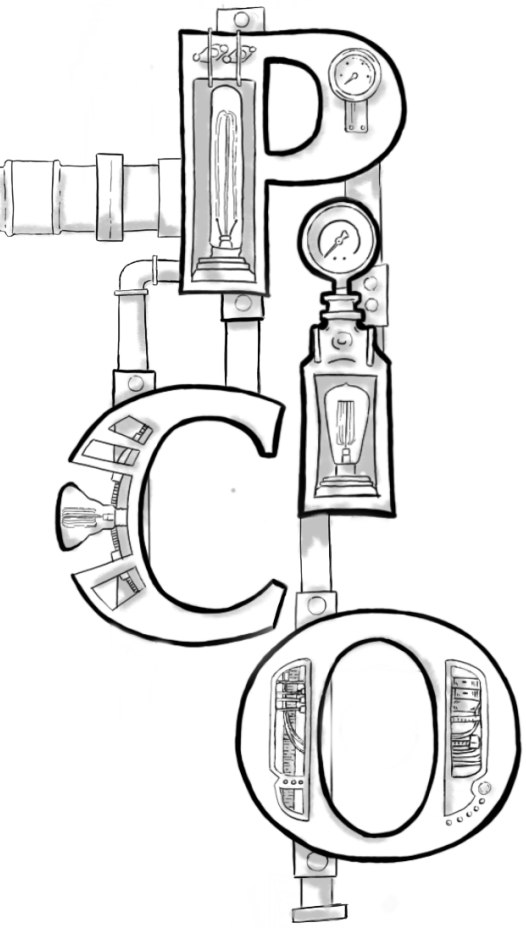
Hypertonic saline has been tried for acute bronchiolitis. A systematic review of this treatment modality was covered on SGEM#157. The bottom line at that time was that the data did not support the routine use of hypertonic saline for mild to moderate acute bronchiolitis.

The American Academy of Pediatrics guideline says that oxygen therapy in infants with saturation of 90% or greater may not be needed (Ralston et al Pediatrics 2014)

"Clinicians may choose not to administer supplemental oxygen if the oxyhemoglobin saturation exceeds 90% in infants and children with a diagnosis of bronchiolitis (Evidence Quality: D; Recommendation Strength: Weak Recommendation [based on low level evidence and reasoning from first principles])."

Reference:

Franklin et al. A Randomized Trial of High-Flow Oxygen Therapy in Infants with Bronchiolitis. NEJM March 2018.



Population:
Infants less than 12 months of age with bronchiolitis and needing supplemental oxygen based on their institutional practice.

- Bronchiolitis was defined using the American Academy of Pediatric criteria as symptoms of respiratory distress associated with symptoms of a viral respiratory tract infection.

- **Exclusions:** Critically ill infants who had an immediate need for respiratory support and ICU admission; infants with cyanotic heart disease, basal skull fracture, upper airway obstruction, or craniofacial malformation; and infants who were receiving oxygen therapy at home.

Intervention:
Heated humidified high-flow oxygen via nasal prongs (HFOT) at 2L/Kg/min with FiO2 titrated to maintain oxygen saturation of 92%-98% or 94%-98% depending on the institutional practice

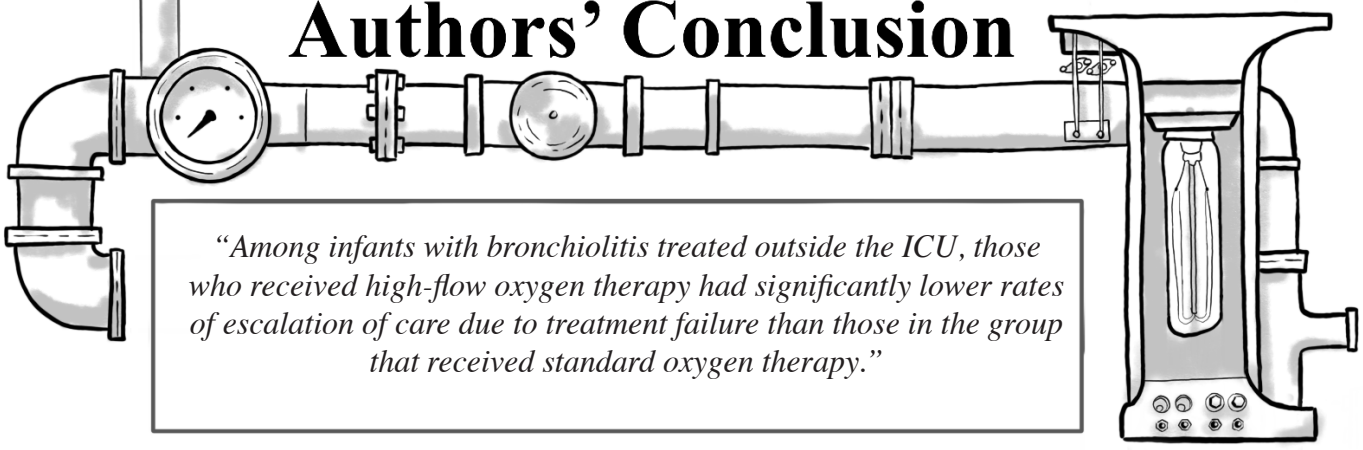
Comparison:
Oxygen via standard nasal low flow nasal prongs (LFOT) titrated to maintain oxygen saturation of 92%-98% or 94-98% depending on institutional practice with max of 2L/min

Outcomes:
Primary: Treatment failure resulting in escalation of care during hospital admission. Escalation of care was defined as needing increased respiratory support or transfer to an ICU. Treatment failure defined by meeting three of four clinical criteria. Clinicians were permitted to escalate therapy if they were worried for other clinical reasons not captured in the four clinical criteria:

- Heart rate unchanged or increased since admission
- Respiratory rate unchanged or increased since admission
- FiO2 requirement exceeding 0.4 on high-flow or 2L/min on low-flow to maintain oxygen saturation in target range
- Hospital Early-Warning Tool triggered

Secondary: The proportion of infants transferred to an ICU, duration of hospital stays, duration of ICU stays, duration of oxygen therapy, intubation rates, and adverse events (any event that was fatal, life threatening, permanently disabling or resulted in a prolonged hospital stay).

Authors' Conclusion



"Among infants with bronchiolitis treated outside the ICU, those who received high-flow oxygen therapy had significantly lower rates of escalation of care due to treatment failure than those in the group that received standard oxygen therapy."

Quality Checklist

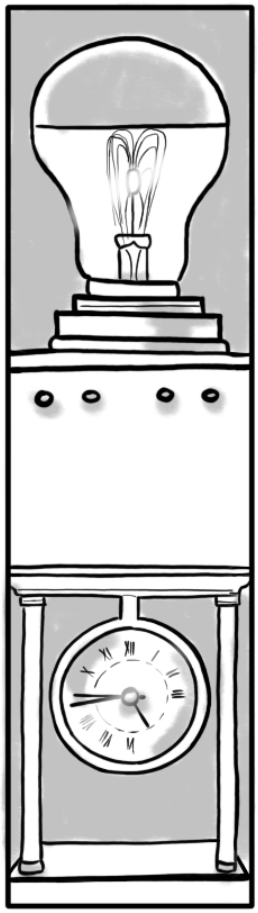
Quality Checklist for Randomized Clinical Trials:

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

Case Outcomes

Key Results:
They enrolled 1,472 infants with acute bronchiolitis with 733 assigned to receive standard oxygen therapy with nasal prongs (LFOT) and 739 assigned to receive high-flow oxygen therapy (FHOT). The mean age was six months and just over 1/3 were female.

Treatment failure was 12% in high-flow oxygen therapy group vs. 23% In the low-flow oxygen therapy comparison group.



Primary Outcomes:

- Treatment failure resulting in escalation of care
- HFOT 87/739 (12%) vs. LFOT 167/733 (23%)
- Risk difference -11% (95% CI -15% to -7%, P<0.001)
- NNT of 9 to prevent 1 episode of escalation of care

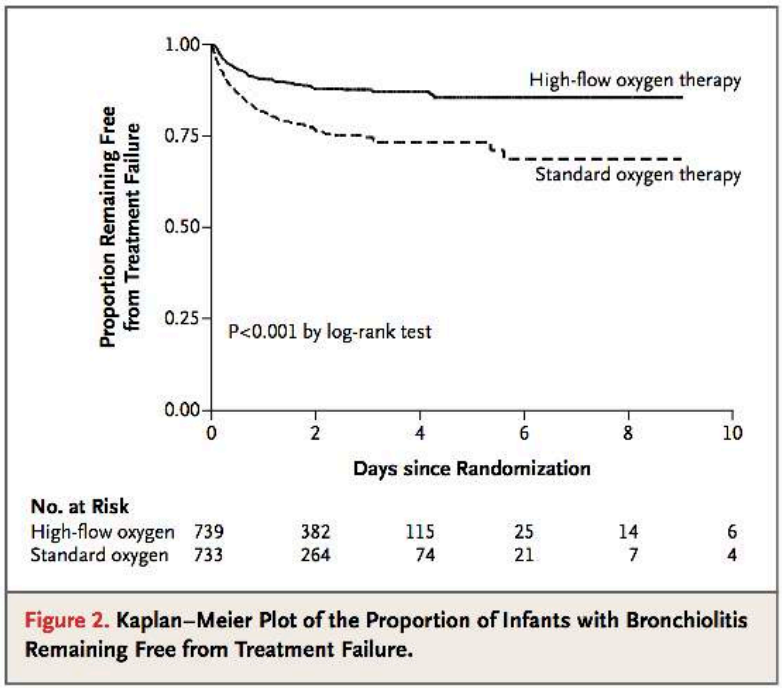
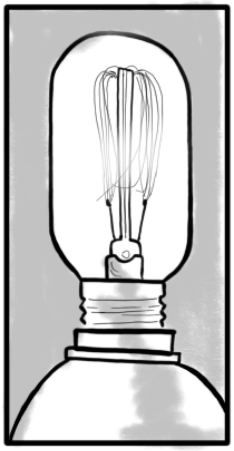
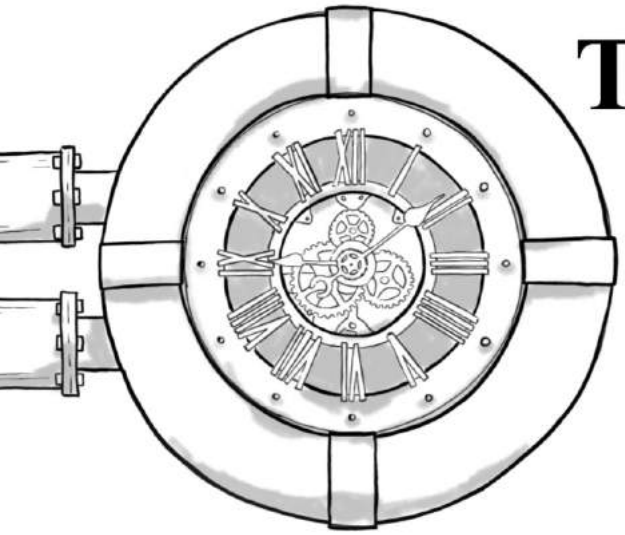


Figure 2. Kaplan–Meier Plot of the Proportion of Infants with Bronchiolitis Remaining Free from Treatment Failure.

Secondary Outcomes:

- There were no significant differences in duration of hospital stay, duration of ICU stays or duration of oxygen therapy.
- HFOT was used as a rescue therapy in all 167 infants in the standard care group who required escalation of care, 61% of these infants responded to HFOT as a rescue therapy.
- Twelve infants required intubation (eight from HFOT group and four from the LFOT group) so HFOT did not prevent intubation within the study cohort.
- There was no difference in adverse event rates with one pneumothorax in each group.





Time to Talk Nerdy

Thank you to our FOAMed friend in Australia, Jesse Spurr (Injectable Orange). He happened to be hanging out with the lead author on this paper and got us connected. We reached out to Dr. Donna Franklin and she was kind enough to include written responses to our nerdy questions.

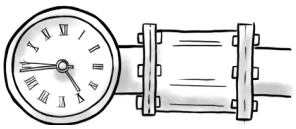
1) Objective vs. Subjective Clinical Criteria:

There were five clinical criteria to trigger an escalation of care. You needed three or more criteria to trigger the escalation. Three of the criteria were very objective (heart rate, respiratory rate and oxygen requirements). One was a fuzzy criterion, because different hospitals use different pediatric early warning (PEW) tools. These PEW tools could be triggered by a single or multi trigger meaning a rise in a single vital sign (e.g HR alone) would trigger escalation of care but not others thereby ticking two of the four boxes. The fifth clinical criterion was subjective, if the clinicians' spidey senses were tingling. I understand why they included clinical gestalt, but it would have made the study easier to interpret if they had just used objective criteria or been pragmatic and said if the clinician is worried that is enough to escalate care.

Agree that this was always going to be difficult in the subjective vs objective. Each of these early warning tools was comparable in scoring therefore when a child reached a certain HR, RR, SpO2 etc composite score and triggered a medical review, this occurred at the same level for all participating institutions.

What was interesting was that those patients who triggered the subjective 5th criteria we went back and checked all physiological criteria on these patients and they actually met the 3 of 4 criteria at that time of escalation. Thereby telling us that the Criteria 5 being the clinician's 'gut feel' is most of the time 'spot on'.

Agree it would have been best to use objective criteria however this was not always available



if poor documentation occurred and we would find that the medical notes provided more information and had to use what was available.

2) High-Flow Oxygen Therapy:

There has been some debate about what constitutes *"high-flow"* with some trials using 1L/kg or other flow rates. PARIS provides a dataset around a way of defining and using high-flow which is as defensible as any standard in this area. i.e. it is now a strong argument that we should accept "standard high-flow"as meaning flow of 2L/Kg/min with titrated FiO2 from 0.21 up, we know the adverse event rates do not increase up to an FiO2 of 0.4 so can argue that children being managed within these parameters should be cared for on standard wards with standard nursing ratios unless there are other contextual factors which make this problematic.

Agree with this – we are now performing a dose finding trial on the sicker cohort in PICU to see what the 'sweet spot' is for these children with flows delivered. However, this would be the more unwell Intensive Care patient rather than the PARIS patient who was mild to moderate in severity when randomised.

3) Composite Outcome:

The primary outcome of escalation of care was a composite outcome. It included either requiring more respiratory support or transfer to an ICU. For the standard oxygen therapy group, it meant being moved to HFOT. When you looked at the individual outcomes there was no difference in transfer to an ICU. Therefore, the difference in composite outcome was driven by moving LFOT patients to HFOT.

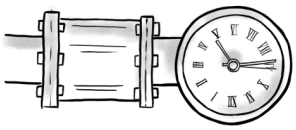
This one was difficult as hospitals were obviously already used to using high flow in the wards. We recognised that the study would have been better designed for both groups to immediately transfer to ICU if a child failed either treatment arm however this was not practical as all centres know how to care for high flow in the ward and it was not sensible to go directly to ICU from standard oxygen therapy. However, we recognised this was a flaw in the design but unfortunately not able to alter. For both common sense reasons and health care costs associated with ICU and transfers etc.

4) Escalation of Care:

Escalation of care was twice as likely to occur (7% vs 14%) in hospitals without an onsite PICU vs hospitals with a PICU. Not using a PICU bed has significant cost savings and is nicer for the family not to be in PICU but arguably not as disruptive for the family than being transferred to another hospital – though a study on family experience of care would be good and I think is coming. Transfers are both expensive and disruptive to families so on a system/economic level HFOT may be disproportionately useful in hospitals without PICU.

Yes, use of high flow in hospitals without onsite ICU is useful. They regional centres outperformed the tertiary centres and kept these children in their centre. The children who required escalating and transferred actually did transfer and they met 3 of the 4 criteria and were the more unwell cohort.

A HF paper has been submitted this week to the American Journal of Respiratory and Critical Care Medicine.



We will also be pulling together a paper looking at the regional vs tertiary centres in the near future.

5) Secondary Outcomes:

None of the secondary outcomes were statistically different (transferred to an ICU, duration of hospital stays, duration of ICU stays, duration of oxygen therapy and intubation rates). These seem very patient oriented compared to escalation of care.

6) Intubation Rate:

The lack of difference in intubation rates was odd on the face of it given that anecdotally we are intubating noticeably fewer kids with bronchiolitis than we did before the widespread use of HFOT. A difference may have been lost in the fact that all of the patients in the standard group who required escalation were put on HFOT so it is possible that without HFOT as a rescue therapy the intubation rate would have been much higher but there is no way to know this.

The ANZPIC database shows we still have up to 10% intubation rate for bronchiolitis, whereas PARIS showed a 0.8% intubation rater (12/1472) infants. Our unit we work in is around 3% but we have used high flow for >12years in PICU. The paper was alluding to the much lower than what was current in other centres around Australia and NZ specifically where it is higher. Schlapbach et al showed in his ERJ paper 'Burden of disease and change in practice in critically ill infants with bronchiolitis' a 'risk to be intubated' graph whereby there are some centres intubating up to 35% of these infants which is quite shocking to see in 2018.

7) Lack of Blinding:

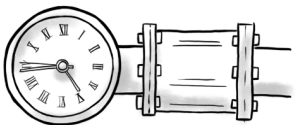
The two different oxygen supplementation setups were different and obvious. This means the study was unblinded. It could have introduced some bias. Especially given the subjective criteria that was part of the escalation of care. It is unclear which direction this potential bias due to lack of blinding would have influenced the results.

Agree that it could introduce some bias. All our centres were familiar with high flow however not all clinicians were believers. A difficult component of the design but could not change as you know what you are randomised to and it is therefore seen and managed as standard oxygen or high flow.

8) External Validity:

Within the parameters defined by the trial (flow of 2L/kg/min with FiO2 <0.4) there was no increase in adverse events with HFOT with a nursing ratio of 1:4. Nursing ratios of 1:2 (until recently required in many places) would prevent use of HFOT in many contexts as it would block too many beds leading to pressure for the child to be transferred anyway but these nursing ratios seem unnecessary based on PARIS. Important to note that PARIS came with paediatric nurse educator support provided by the trial team at no cost to the hospital. Many non-tertiary facilities do not have access to specialised paediatric nurse educator support and it would be important to observe for any increase in adverse events due to differences in nursing education capacity as HFOT is implemented outside of the trial.

As with any study protocol in place the performance of care and management was somewhat



improved during the course of the study as we were onsite at tertiary centres every day and visiting every1-2 weeks after initial set up at all regional centres for the course of the study. What was interesting was that prior to the study taking place all infants <12mths with bronchiolitis mild to moderate (PARIS patients description) would immediately go to resus bay. Within a few months of PARIS commencing and education in place the staff were more comfortable with these infants and they were cared for in the acute area and then randomised if meeting the inclusion criteria. We are performing a follow up study next year on translation of knowledge and using the Nurse Educators who work in these departments already as the people who will educate. We will screen these patients admitted and see how they are cared for and managed etc. Will be interesting to see – this will occur in six regional centres.

9) Oxygen Saturation:

This study had different oxygen saturation targets (92%-98% or 94%-98% depending on the institutional practice). Periods of hypoxia has been documented in health infants with saturation as low as 84% to 86% (Hunt et al J Peds 1999 and American Thoracic Society Am J Respir Crit Care Med 1999). Do these targets matter or should we allow lower oxygen saturations before providing supplemental oxygen?

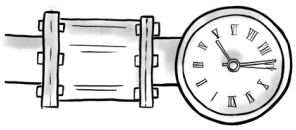
The AAP gives a weak recommendation based on low-level evidence that supplemental oxygen may not be administered if the level is >90%. The Bronchiolitis of Infancy Discharge Study (BIDS) demonstrated equivalence in their primary outcome (time to resolution of cough) between a minimum target oxygen saturation of at least 90% vs. >94%. Those in the modified group (minimum target of at least 90%) were fit for discharge sooner, off oxygen one day sooner and were actually discharged 10 hours earlier than the standard group.

Schuh et al published a RTC in JAMA 2014 on hospitalization of infants with bronchiolitis. The took patients with mild to moderate bronchiolitis and true oxygen saturations of >87%. They randomized them to have a true saturation reading or altered to read 3% higher than the true reading. The primary outcome was hospitalization within three days. Those with the artificially elevated pulse oximetry were less likely to be admitted to hospital within three days. This finding suggests the other factors besides oxygen saturation should be used in determining the management of infants with bronchiolitis.

There was also the Principi et al (JAMA 2016) that looked at desaturation of infants with bronchiolitis discharged home. It showed a majority of infants had hypoxic episodes (oxygen saturation of <90% for at least one minute). Of the infants who had desaturation events, the vast majority had oxygen levels <80% and more than a third <70% for at least one minute. However, there was no difference in unscheduled return medical visits and delayed hospitalizations between infants that had desaturations and those who did not.

Do these oxygen values really matter? What oxygen level should we use? Certainly, oxygen saturation should not be the only factor in making management decisions for patients with acute bronchiolitis.

We were governed by what was current standard practice in each facility with the thresholds. Agree that this is a difficult number to state which is correct. Then you also need to factor in altitude in various parts of the world too.



10) Failure?

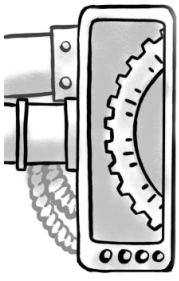
The primary outcome as mentioned was escalation of care or transfer to an ICU (failure of treatment). There was no difference in transfers to the ICU in this study.

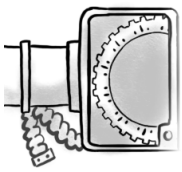
It would be totally reasonable based on the results of this trial to adopt a policy of putting infants on low flow oxygen initially with escalation to HFOT as the first thing to do once they have triggered those pre-determined clinical criteria, how you attach the low flow prongs to the infant is worth thinking about to avoid the need to pull tape off the child's faces in order to change the prongs should they need an escalation to HFOT.

To drill down on those numbers just a little more in order to make our point. Of the 167 patients who failed standard care with LFOT, 167 (100%) were put on HFOT. Of those, 102/167 (61%) improved representing 14% of the overall patients in the standard group. This means 65/167 (39%) did not improve and were transferred to the ICU. Therefore, 65/733 (9%) of patients that started on NP, were escalated to HFOT and ultimately ended up in the ICU. Remember that 12% (87/739) of the patients randomized to the HFOT group were admitted to the ICU. Now consider that the NNT of 9. The interpretation could be that 9 infants would need to be put on HFOT initially to prevent 1 from being put on HFOT later with no difference in ICU admissions. Does this actually represent a failure? How much equipment, time and staff would be needed for this intervention? Would it not be more practical just to put everyone on LFOT and only transition those to HFOT if needed?

The difficulty and acknowledgement in the design occurs here again, allowing escalation from standard oxygen to high flow in the ward and thus the patient could be managed in the ward and family and patient not transferred to ICU. The cleaner design would have been if failing either arm then both go to ICU. From a HF point of view this will soon be available for comment when published.

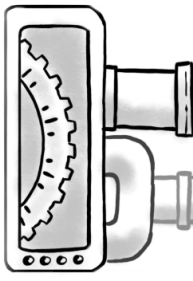
It can be definitely viewed as your 'bottom line' comment and indeed it has been interpreted this way in some of our institutions who participated. They continue to use HF as a rescue option only in the wards. This is some but not all hospitals who participated who now do this.

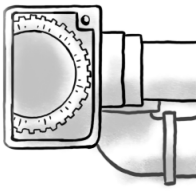




Comment on Authors' Conclusion Compared to SGEM Conclusion:

The authors conclusion that HFOT reduces need for escalation of care is reasonable and the parameters they have chosen as denoting a need for escalation in the trial reflect parameters around which clinical management and resource use would commonly be affected in clinical contexts where early warning tools are used (i.e would have triggered a Medical Emergency Team [MET] call). Within the system that I work this would reduce resource use, it is not clear that the escalation that this trial avoids actually benefits these patients i.e we may have just drawn an artificial line and then found a therapy that helps us stay the right side of that line forgetting that the line had no real meaning in the first place. The Authors have neither shown nor claimed that HFOT makes bronchiolitis better any quicker.





Case Resolution:

Elsie was commenced on low flow oxygen via nasal prongs at 1L/min, the flow was increased to 1.5L/min on day four and weaned over day five and she was discharged on day six. She started daycare three weeks later and currently has a runny nose, Dave and Tony are keeping a careful eye on her work of breathing.

What Do I Tell My Patient?:

I would tell Dave and Tony that Elsie needs some more help with her breathing. We will start with some oxygen through some nasal prongs, if she gets worse we can try her on high flow.

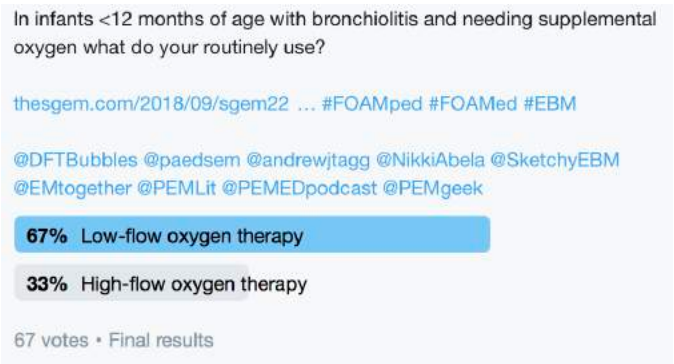
Clinical Application:

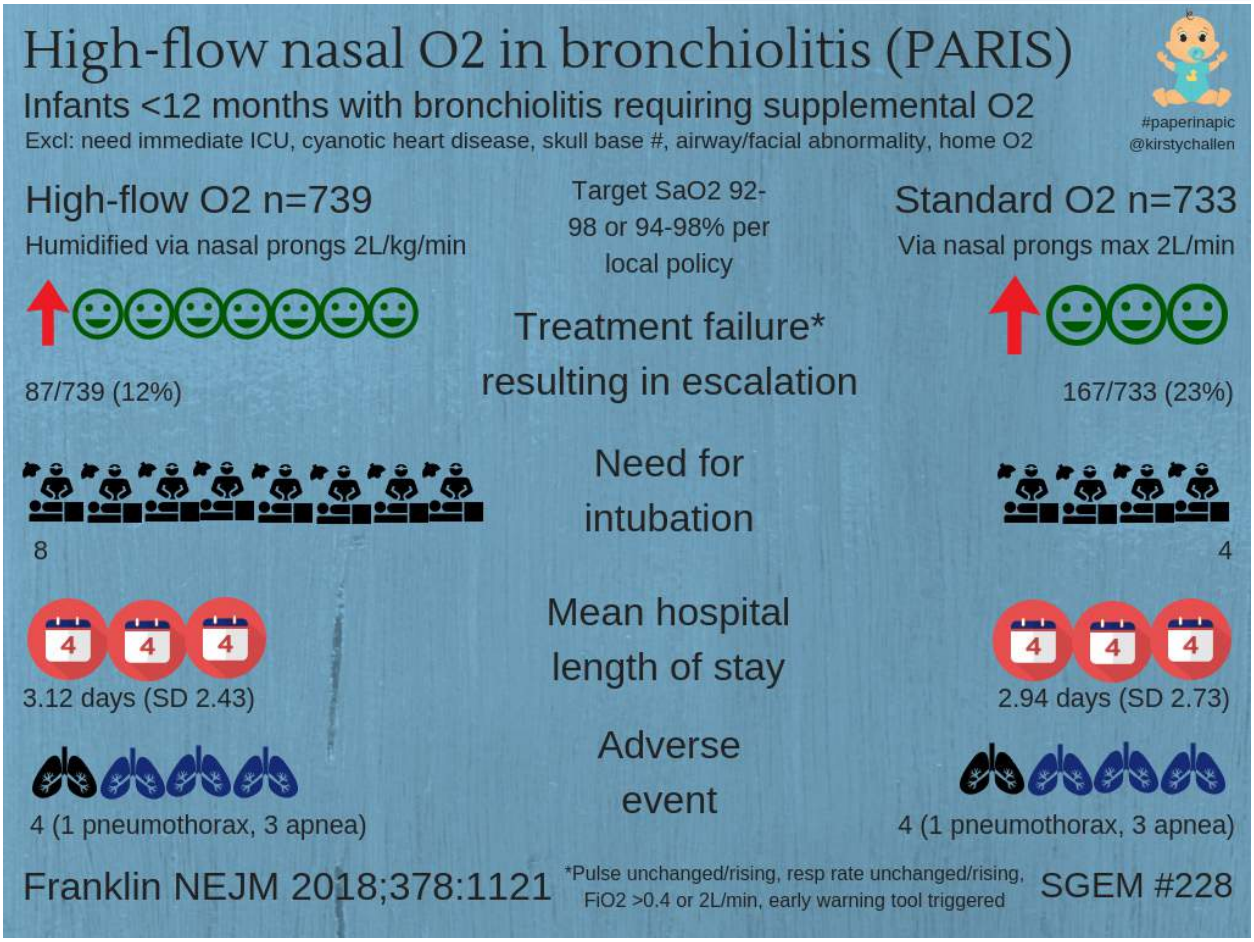
We have not found a magic bullet for bronchiolitis. HFOT oxygen for treating bronchiolitis in infants is associated with no increase in adverse events and is probably useful in enabling moderately unwell children with bronchiolitis be cared for outside of PICU in most developed healthcare systems where PEW scores are used. It does not make any difference to rate of recovery. There may well benefits in terms of cost and family experience in some contexts, but these have not been adequately explored yet.

Episode End Notes

Other FOAMed:

- Don't Forget the Bubbles: PARIS in the Autumn
- Frist10EM: Articles of the Month May 2018
- Triage Monkey: Wheezing in the City of Light
- REBEL EM: High-Flow Nasal Cannula Part 1: How it Works
- CanadiEM: TREKK series Bronchiolitis Guidelines
- EM Cases: Episode 59b Amy Plint Management of Bronchiolitis
- PEMPlaybook: Bronchiolitis
- PedEM Morsels: Bronchiolitis – Seriously, What Should I Do?
- RCEM Learning: NICE Bronchiolitis
- PEMGeek: Winter is Coming





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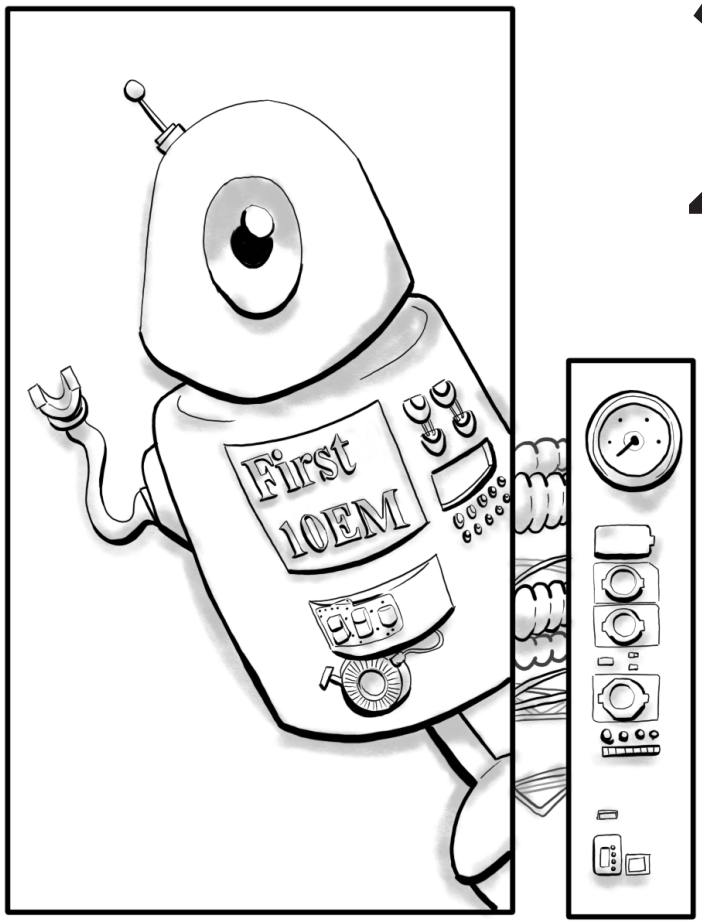


I Fought the Law and Won: But Would It Matter If I Had a Resident?

Clinical Question:

What are some of the key factors in malpractice claims against trainees, and how do those compare to malpractice cases that don't involve trainees?

Bottom Line:

You can make no mistakes and still be sued.

Guest:

Dr. Justin Morgenstern is an emergency physician and the Director of Simulation Education at Markham Stouffville Hospital in Ontario. He is the creator of the excellent #FOAMed project called First10EM.com

Case Overview

Case:

You are giving an introductory lecture on evidence-based medicine to the incoming class of residents, and after you finish you notice some excited chatter at the back of the room. Thinking that you have found some EBM keeners/gunners, you wander over to join the discussion, but find yourself in a heated discussion. One of the senior residents was recently named in a lawsuit, and the junior residents are worried. How likely are they to be sued? What can they do to prevent such a harrowing event? The residents turn to you, hoping that you can provide some insight on this topic.

Background:

Unfortunately, physicians are not perfect. Mistakes are made occasionally, and those mistakes can harm our patients.

Medical care provided by trainees involves some added risks. In an internal medicine setting, problems with handoffs, teamwork, and lack of supervision were identified as issues in trainee malpractice cases.

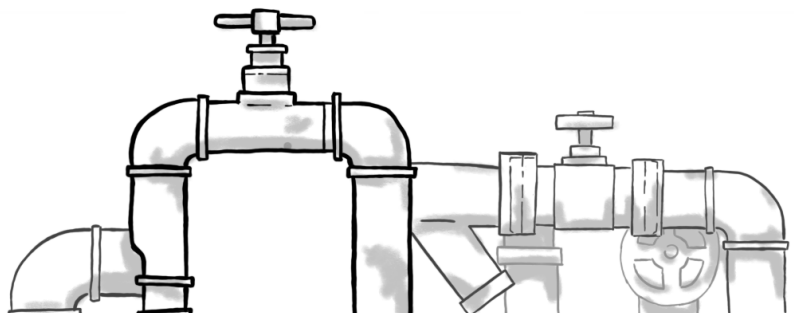
In Canada, we have a national organization called the Canadian Medical Protective Association (CMPA). The CMPA has approximately 97,000 members representing 95% of Canadian physicians.

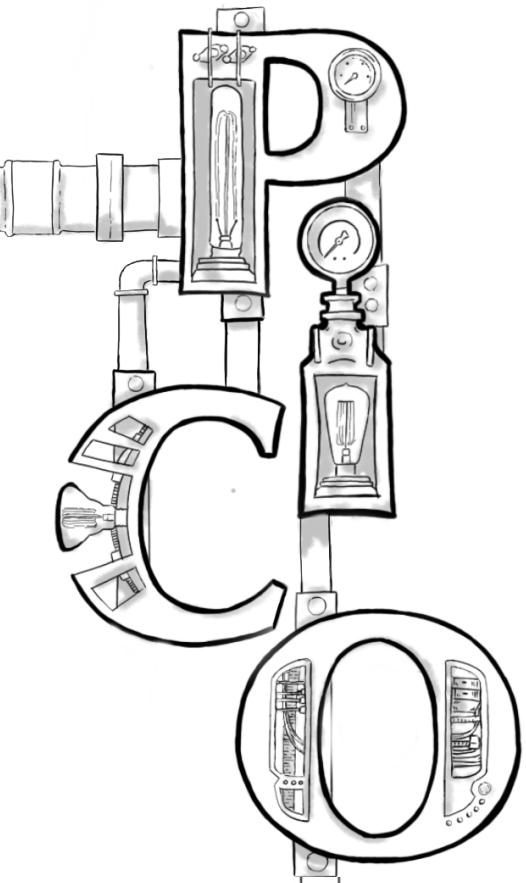
There are about 10,000 files opened every year with 38% involving payouts. Only 8% of cases end up in court. There has been a 5% decrease in cases over the last decade.

It is important to note that our medical-legal environment in Canada is much different than in the United States. It is a much more litigious system south of the border. The paper we will be talking about today come out of the US.

Reference:

Gurley et al. Comparison of Emergency Medicine Malpractice Cases Involving Residents to Non-Resident Cases. AEM September 2018





Population:
The Comparative Benchmarking System (CBS) database: a large database of malpractice claims covering more than 400 hospitals and more than 165,000 physicians.

Intervention:
Malpractice claims involving trainees (residents) in an emergency department setting over a three-year period from 2009-2012.

Comparison:
Malpractice claims not involving trainees in the same time period.

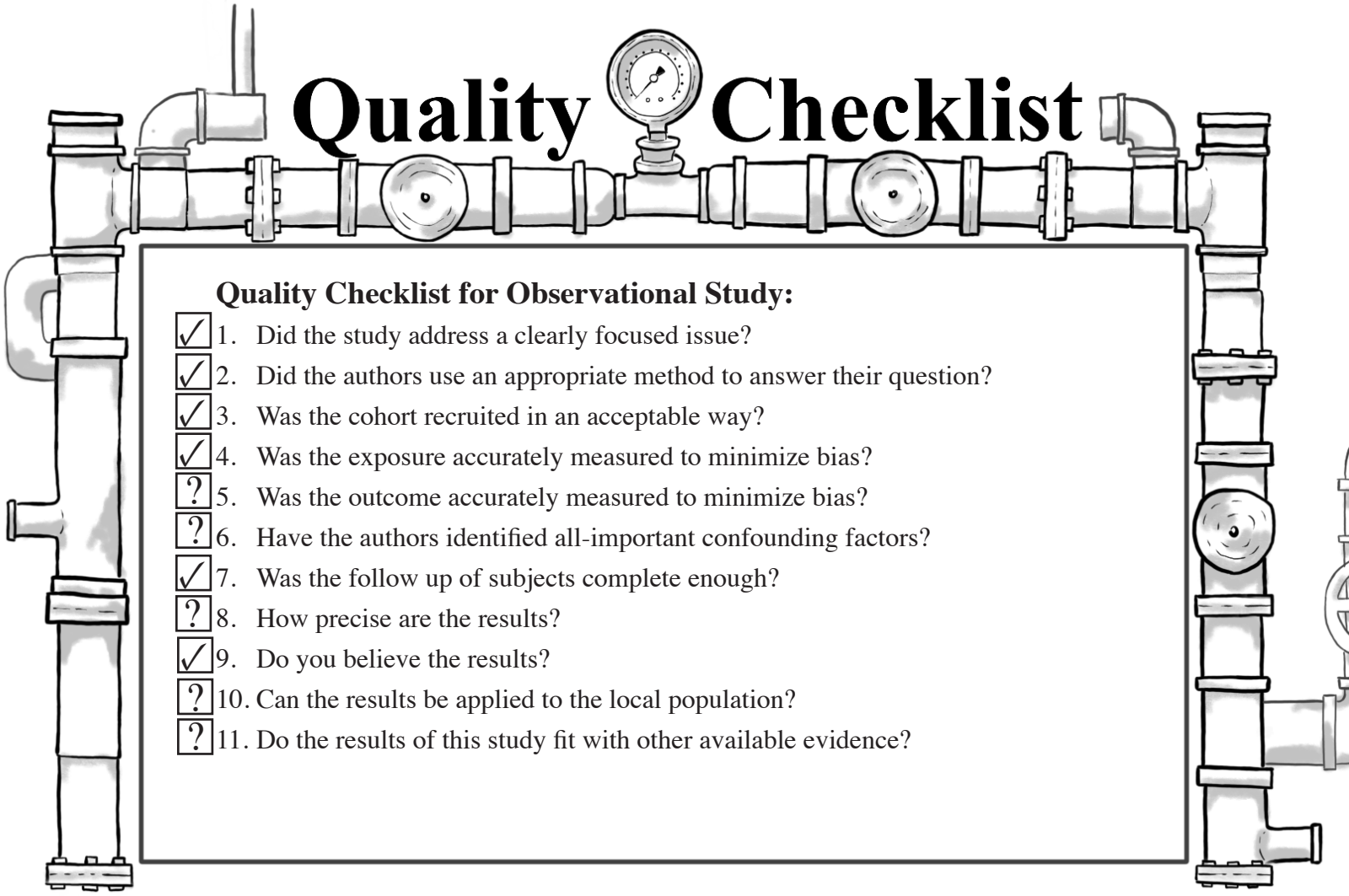
Outcomes:
Coded information covering a number of domains.

- Average Payment
- Case Severity (low, medium, high or death only)
- Allegation Category (Diagnosis Related, Medical Treatment, Surgical Treatment, Medication Related or other)
- Procedure Involved (yes/no and if yes what procedure)
- Final Diagnosis (ex: cardiac related, orthopedic related, etc)
- Contributing Factors (ex: communication, clinical judgement, documentation, etc)

Authors' Conclusion

"There are higher total incurred losses in non-resident cases. There are higher severity scores in resident cases. The overall case profiles, including allegation categories, final diagnoses and contributing factors between resident and non-resident cases are similar. Cases involving residents are more likely to involve certain technical skills, specifically vascular access and spinal procedures, which may have important implications regarding supervision. Clinical judgment, communication and documentation are the most prevalent contributing factors in all cases and should be targets for risk-reduction strategies."

Quality Checklist



Quality Checklist for Observational Study:

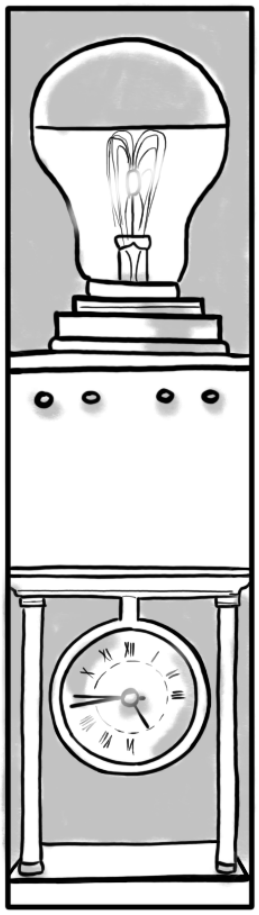
- ☑ 1. Did the study address a clearly focused issue?
- ☑ 2. Did the authors use an appropriate method to answer their question?
- ☑ 3. Was the cohort recruited in an acceptable way?
- ☑ 4. Was the exposure accurately measured to minimize bias?
- ? 5. Was the outcome accurately measured to minimize bias?
- ? 6. Have the authors identified all-important confounding factors?
- ☑ 7. Was the follow up of subjects complete enough?
- ? 8. How precise are the results?
- ☑ 9. Do you believe the results?
- ? 10. Can the results be applied to the local population?
- ? 11. Do the results of this study fit with other available evidence?

Case Outcomes

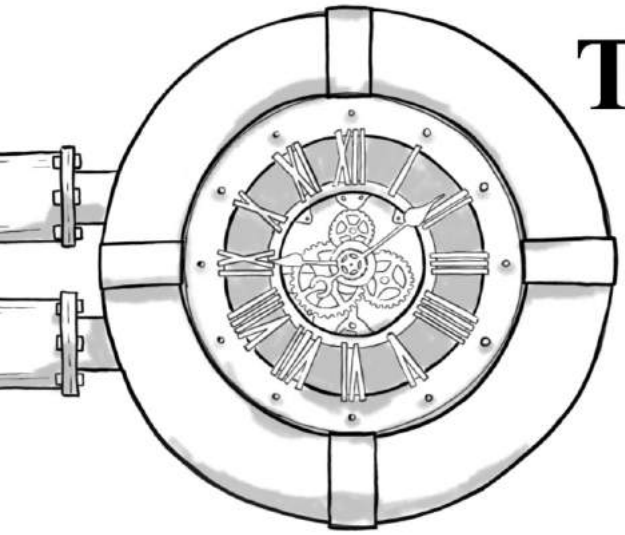
Key Results:

There were 845 malpractice cases identified, 113 (13%) of which included a resident. In 45 cases (40%) the resident was the only person named.

- The average incurred losses were $51,163 for resident cases and $156,212 for non-resident cases.
- Majority of cases were high injury severity which included death, permanent grave, permanent major or permanent significant injuries.
- The majority of cases were also a failure, delay or misdiagnosis.
- A procedure was involved in about 1/3 of cases.
- Residents had more cardiac diagnoses while non-resident cases had more orthopedic diagnoses.
- Clinical judgement was thought to be involved in about ¾ of the cases.



Case Severity	Resident	Non-Resident	P Value
Low	7/113 (6%)	49/732 (7%)	0.84
Medium	31/113 (27%)	268/732 (37%)	0.06
High (includes death)	75/113 (66%)	415/732 (57%)	0.05
Death Only	47/113 (42%)	249/732 (34%)	0.12
Allegation Category	**Resident**	**Non-Resident**	**P Value**
Diagnosis Related	64/113 (57%)	431/732 (59%)	0.65
Medical Treatment	28/113 (25%)	185/732 (25%)	0.91
Surgical Treatment	9/113 (8%)	34/732 (5%)	0.14
Medication Related	5/113 (4%)	47/732 (6%)	0.93
Other	5/113 (4%)	35/732 *5%)	
Procedure Involved	**Resident**	**Non-Resident**	**P Value**
Yes	36/113 (36%)	188/732 (26%)	0.17
Vascular	3/113 (3%)	1/732 (0%)	<0.008
Spinal	4/113 (4%)	8/732 (1%)	<0.04
Intubate/Ventilate	3/113 (3%)	14/732 (2%)	0.60
Final Diagnosis	**Resident**	**Non-Resident**	**P Value**
Cardiac Related Diagnosis	21/113 (19%)	71/732 (10%)	<0.005
Ortho Related Diagnosis	3/113 (3%)	72/732 (10%)	0.01
All other causes	---	---	No diff.
Top 3 Contributing Factors	**Resident**	**Non-Resident**	**P Value**
Clinical Judgement	80/133 (71%)	556 (76%)	0.24
Communication	30/113 (27%)	219/732 (30%)	0.46
Documentation	23/113 (20%)	151/732 (21%)	0.95



Time to Talk Nerdy

1) Observational Study:

This is a cohort study comparing cases that involve residents and cases that do not involve residents. No causation can be drawn in this type of study design. Residents were not randomly assigned to work or not work the shift and then look at whether there was a malpractice claim.

This is accurate, we cannot draw causation but can only report an association.

2) Other Confounders:

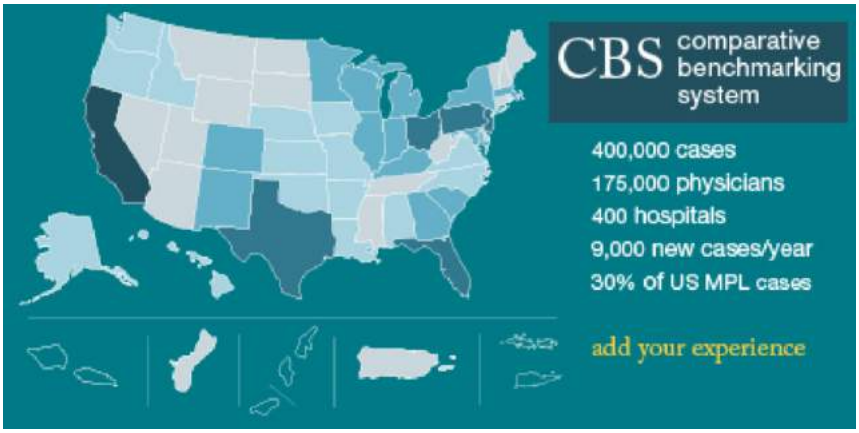
Residents tend to work in academic centers and might see a different type of case load than staff physicians. Might the type of patient seen, or hospital environment have acted as confounders to this research?

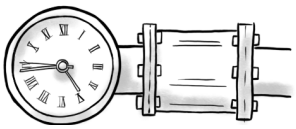
Yes, this is a potential confounder- residents could certainly see a potentially different case load. This is insurance company data. It is pre-codified data and as such we cannot look at the details of each specific case. For example, the overall milieu in the department at the time, the physician's case load and the overall acuity in the department are all unknown. These 'deep dives' we cannot take however, I think this limitation is partially offset by our ability to look at such a large HIPPA compliant data set in a unique way about a topic that I think most EM residents are not aware of.

3) CRICO:

You used the data from the Controlled Risk Insurance Company (CRICO) Strategies' division of Comparative Benchmarking System (CBS). While it is the largest database of this nature it only represents about 1/3 of all malpractice cases in the USA. Has the reliability of the data in this database ever been measured?

In the US with so many malpractice insurers and hospital/healthcare systems a study that captures 1/3 of cases is considered quite large and does extend from coast to coast. Aside from the fact that case data adheres to industry standards I am not aware of any formal reliability standard studies that have been performed.





4) External Validity:

Malpractice setting vary significantly between countries, and even between states. How generalizable do you think these results are and to what practice environments?

I suspect that about 10-15% of US cases will name a resident no matter where you are regionally that plays out in the dataset. Our data is from all over the country. Could there be variation from state to state and between countries based on malpractice law and precedent? Absolutely. The bottom line is the resident is at risk and that certain procedures need to be carefully supervised and may create a liability. High risk cases like the cardiac cases may be more common in places where residents are working at the big academic centers. In general, however the overarching message is that the resident risk profile is mirroring that of attendings.

5) NAIC Severity Scale:

Severity of outcomes was rated using something called the NAIC severity scale. What is the NAIC Severity Scale, and has it ever been validated?

The NAIC Severity Scale is an industry standard derived from the Severity Scale of the National Association of insurance commissioners. It is used across specialties in the malpractice/legal world to categorize injury severity for each case. All cases in the database are assigned a severity score which assess the severity of the outcome of the claimant's injuries allegedly caused by the event on a scale of 0-9. There are very specific definitions for each category however I do not know if this was validated prior to its widespread utilization in the insurance world.

6) Multiple Comparisons:

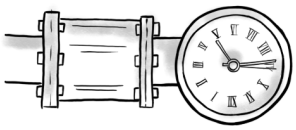
There are a large number of comparisons made in this study. I would expect some differences to be found by chance alone. Were any statistical adjustments made for multiple comparisons to investigate this possibility?

There were not statistical adjustments made between the comparisons as this was an observational study and beyond the scope of this project.

7) Fragility:

Some of the statistical differences could be due to the small number of observed events. An example of this would that vascular procedures were statistically more common in cases with residents (3%) compared to non-resident case (0.1%). However, these are small numbers – 3 total cases as compared to 1 – so it would only take a couple of extra cases to change the result. We should be cautious about over-interpreting these observations.

I agree with this conclusion. As mentioned in the limitations- the total number of malpractice cases related to specific procedures is small as was the number of cases overall that involved residents. I think the more robust conclusion that we can reach is that overall risk profiles are similar between residents and attending physicians and that both are at risk.



8) $100,000:

The average payment was $100,000 lower if a resident was named. That is a very interesting finding. Some might interpret that as residents being protective against larger payments. Other might say that residents are worth $100,000 (I think they are invaluable and prefer to have residents on shift). What hypothesis to you have to explain this observation and are there any plans to further investigate this finding?

I would like to think that having a resident is protective as I too find them invaluable, however we do not know the cause of the lower average incurred losses. We are unable to dive into case specifics and money allotments however we do plan on looking across specialties and should be able to see if this holds true in other high-risk specialties.

9) Law vs. Medicine:

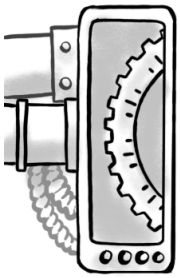
It is important to make a distinction between being sued, which is what was measured here, and an actual error occurring. It would be interesting to take these cases and have them reviewed by peers and told them some of the cases involved law suits and see how many they would identify as having fallen below the standard of care.

I totally agree and think this is an important distinction to make. We are working on several other QA projects looking at error in EM, however are unable to perform peer reviewed case analysis of EM malpractice cases at this time.

10) Anything Else:

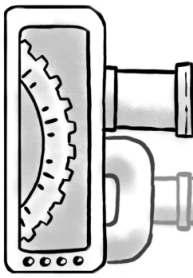
Is there anything else you would like to tell the SGEMers about your study or about being sued?

I think the most important thing to focus on is that there is a risk of being sued for both resident and attending physicians is real and that the overall case profiles are similar amongst both cohorts. Patients safety efforts should encompass the entire care team and focus on clinical judgement, communication and documentation. Increased supervision of residents during procedures has the potential to reduce risk and frankly cannot be a bad idea.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree that there are larger average losses when residents are not involved. While statistical differences were reported for some observations, we are skeptical and caution against over interpretation. This is due to the small numbers involved, multiple comparisons and fragility of some of the results. However, we do agree that clinical judgement, communication and documentation are the most prevalent factors contributing in all cases.



Clinical Application:
One of the limitations of evidence-based medicine is the lack of high-quality data. You encourage the residents to focus not on being sued but in providing great care in a kind and compassionate way.

Case Resolution:
One of the limitations of evidence-based medicine is the lack of high-quality data. You encourage the residents to focus not on being sued but in providing great care in a kind and compassionate way.

What Do I Tell the Resident?:
I would tell the residents that medical malpractice is very complicated. After reading this study, I am still not aware of any technique that is 100% protective from lawyers. I will continue do my best to be kind, curious, and understanding with my patients, and use resources like the Skeptics' Guide to Emergency Medicine to make sure I am constantly learning and improving in an admittedly difficult profession.

Episode End Notes

Having a resident named in a medical malpractice case has what association on incurred losses? #SGEMHOP

onlinelibrary.wiley.com/doi/abs/10.111... ...

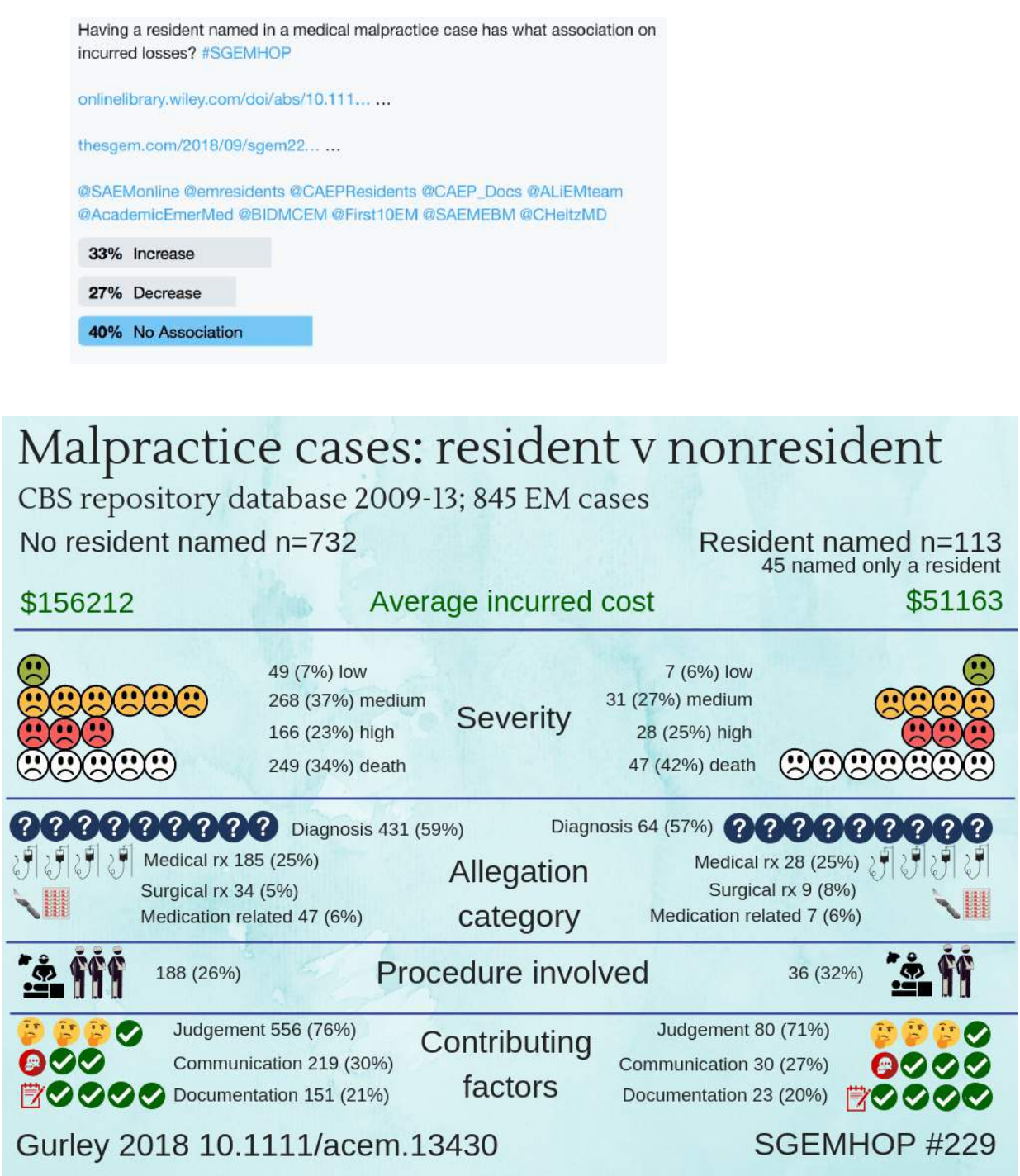
thesgem.com/2018/09/sgem22... ...

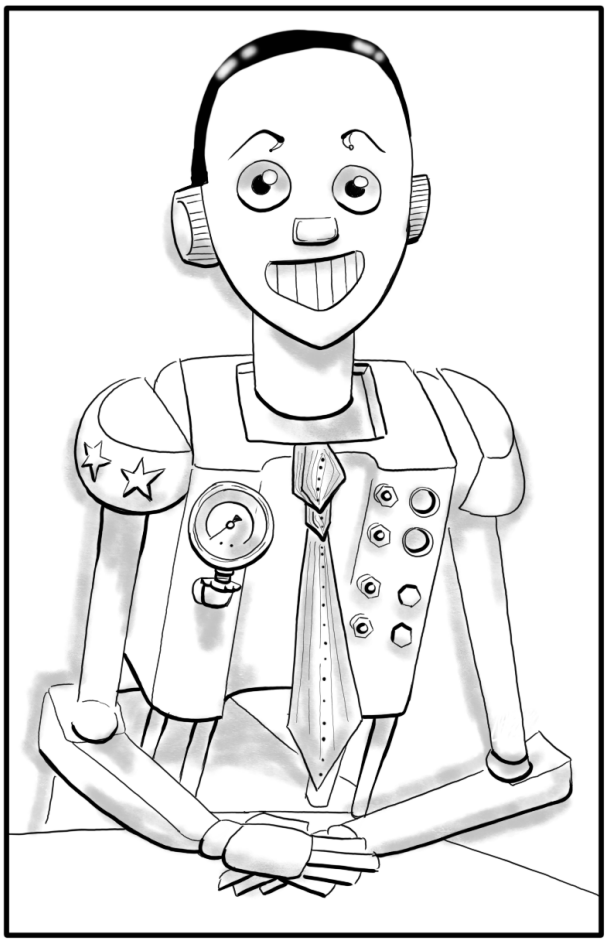
@SAEMonline @emresidents @CAEPResidents @CAEP_Docs @ALiEMteam @AcademicEmerMed @BIDMCEM @First10EM @SAEMEBM @CHeitzMD

33% Increase

27% Decrease

40% No Association





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Tamsulosin: You've Lost That Loving Feeling – For Renal Colic

Clinical Question:

Does initiation of tamsulosin at the time of diagnosis in ed patients with symptomatic ureteral stones less than 9mm increase the rates of stone passage in the following 28 days?

Bottom Line:

Medical expulsive therapy is not recommended for ureteral stones <9mm.

Guest:

Dr. Tony Seupaul, Professor and Chair, University of Arkansas for Medical Sciences Department of Emergency Medicine. Dr. Daniel Holleyman, Chief Resident at University of Arkansas for Medical Sciences Emergency Medicine Residency.

Case Overview

Case:

A 51-year-old man presents to the emergency department (ED) with five-hour history of acute onset left flank pain. The pain comes in waves, radiates into his left groin and is associated with nausea and vomiting. He noticed darkening of his urine, but does not have dysuria, fever, testicular pain, or penile discharge.

You work him up and the urine analysis shows large blood, negative nitrites, negative bacteria. CT abdomen/pelvis without contrast is done which identifies a 7mm radiopaque stone in the left distal ureter. The patient receives 15mg ketorolac IV (SGEM#175) because you know there is a ceiling to the analgesic effect of non-steroidal anti-inflammatory drugs (NSAIDs). His pain improves significantly, and he is ready for discharge. He is given a referral to Urology for follow up of his ureteral stone, a prescription for oral antiemetics, and advised to take over-the-counter (OTC) NSAIDs. He asks if there is anything he could do or take to help the stone pass faster?

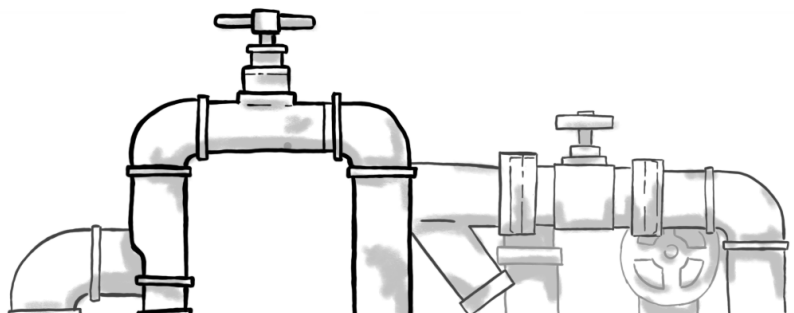
Background:

We have covered renal colic many times on the SGEM. This has included the medical expulsive therapy using alpha blockers, lidocaine for pain control, pushing IV fluids or diuretics to pass stones, ultrasound vs. CT scans for diagnosis, and even acupuncture vs. morphine for renal colic pain.

- SGEM#4: Getting Un-Stoned (Renal Colic and Alpha Blockers)
- SGEM#32: Stone Me (Fluids and Diuretics for Renal Colic)
- SGEM#71: Like a Rolling Kidney Stone
- SGEM#97: Hippy Hippy Shake – Ultrasound Vs. CT Scan for Diagnosing Renal Colic
- SGEM#154: Here I Go Again, Kidney Stone
- SGEM#202: Lidocaine for Renal Colic?
- SGEM#220: Acupuncture Morphine for Renal Colic

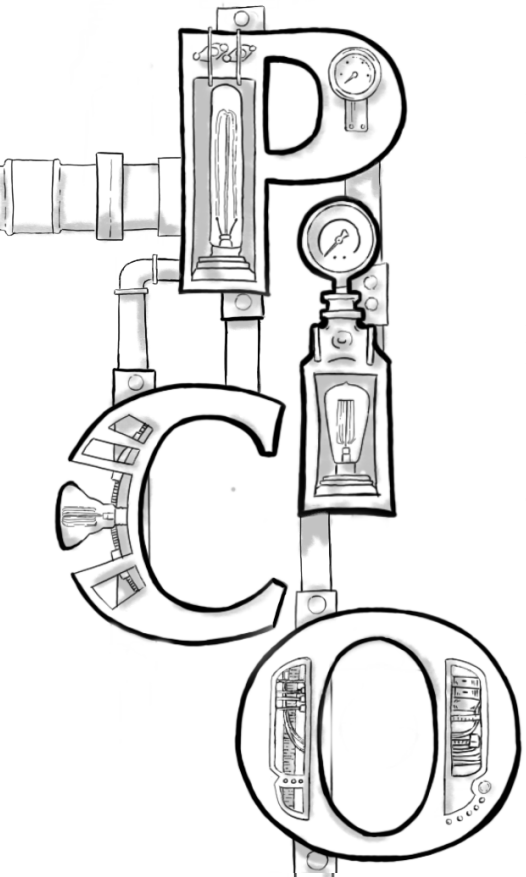
The SGEM bottom lines on the management of renal colic from those previous episodes were as follows:

- *Expulsive therapy is unnecessary for ureteric stones < 5mm.*
- *You don't need to push fluids (oral/IV) or use diuretics to pass kidney stones.*
- *There is some weak evidence that Tamsulosin MAY help passage of larger stones (5 to 10 mm).*
- *Bedside emergency department ultrasound is safe and has several advantages over CT for the diagnosis of kidney stones.*
- *Lidocaine cannot be recommended for the treatment of renal colic at this time.*
- *The evidence does not support the claim that acupuncture is superior to morphine for renal colic.*



Reference:

Meltzer, A. et al. Effect of Tamsulosin on Passage of Symptomatic Ureteral Stones: A Randomized Clinical Trial. JAMA Internal Med, 2018.



Population:
Emergency Department patients older than 17 years of age with symptomatic ureteral stone less than 9mm as determined by CT

- **Excluded:** There were 19 exclusions that can be found in the ClinicalTrial.gov website NCT00382265

Intervention:
Malpractice claims involving trainees (residents) in an emergency department setting over a three-year period from 2009-2012.

Comparison:
Tamsulosin 0.4mg daily for 28 days

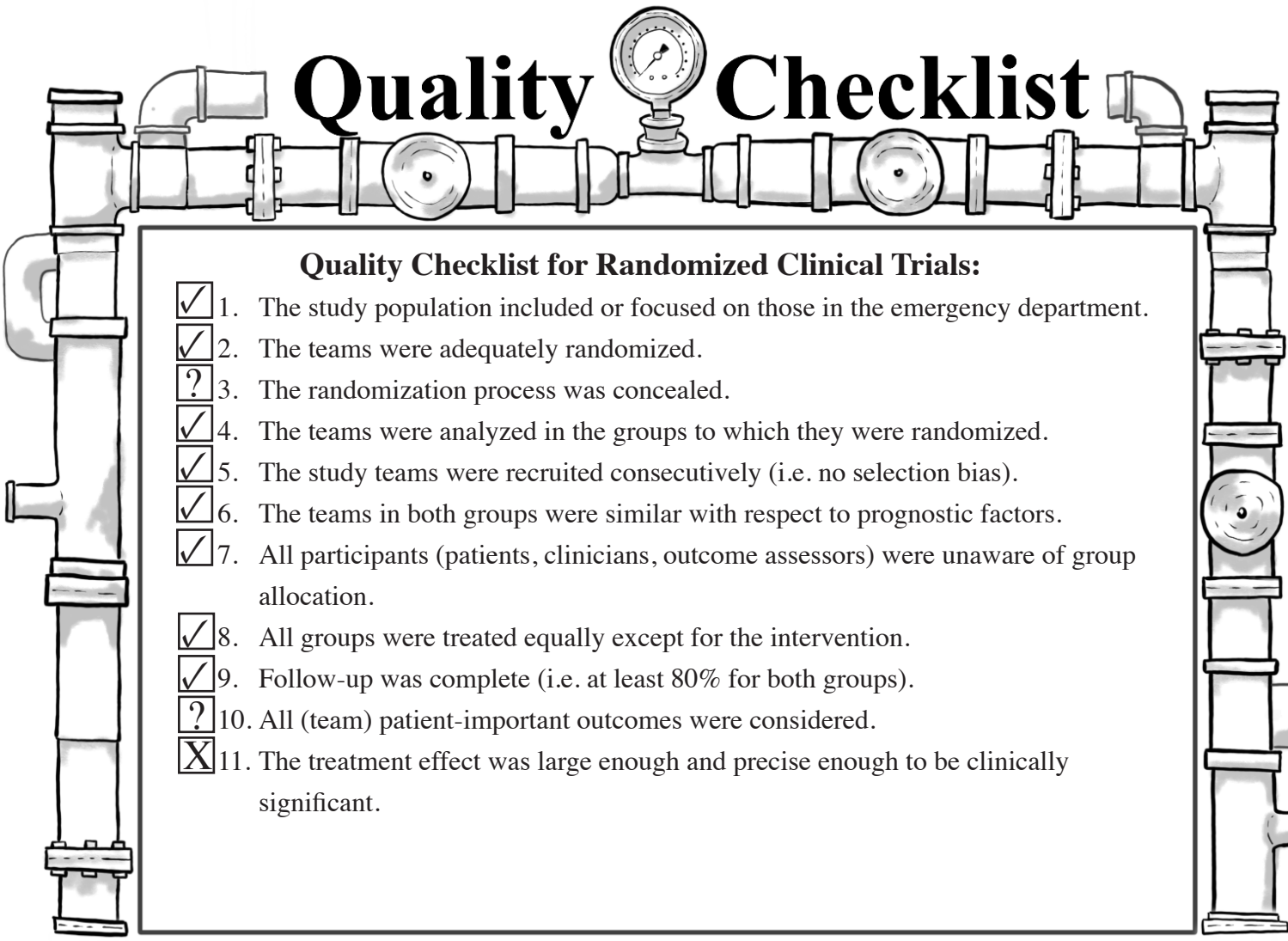
Outcomes:

- **Primary:** Passage of the stone within 28 days, determined by visualization or physical capture of the stone by patient
- **Secondary:** Assessment of stone passage by follow up CT; number who crossed-over to open-label Tamsulosin; proportion who returned to work; rate of surgical procedures; rate of hospitalization; percentage returning to the ED; duration of analgesic medication use; time to passage of stone.

Authors' Conclusion

"Tamsulosin did not significantly increase the stone passage rate compared with placebo. Our findings did not support the use of Tamsulosin for symptomatic urinary stones smaller than 9mm. Guidelines for medical expulsive therapy for urinary stones may need to be revised."

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

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

Case Outcomes

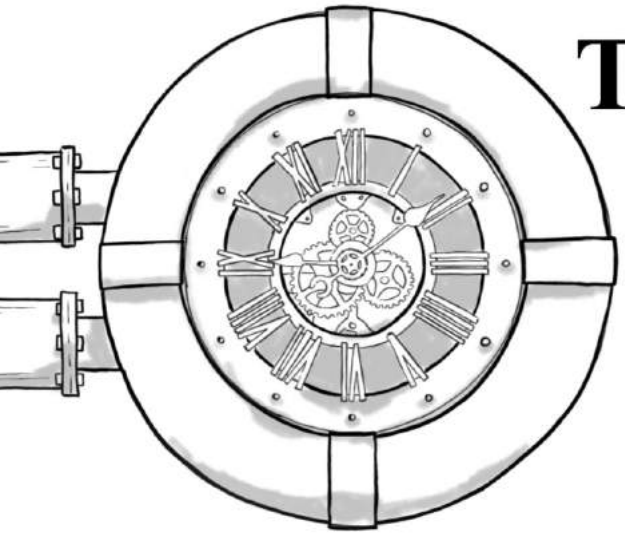
Key Results:
The study included 267 patients randomized to Tamsulosin and 245 patients randomize to placebo. The mean age was roughly 41 with just over ☐ being female. The mean diameter of urinary stones was 3.8mm (with a standard deviation of 1.4mm) with about ☐ being 5mm or greater. Just over 2/3 of stones were in the distal ureter, ureterovesicular junction (UVJ) or bladder.

No difference in stone passage at 28 days

Primary Outcome:
At 28 days, stone passage rate was 49.6% for Tamsulosin and 47.3% for placebo (RR 1.05 [95% CI 0.87 to 1.27] P= 0.60)

Secondary Outcomes:

- No difference between treatment groups for any of the secondary outcomes.
- Treatment adverse effects were also similar with the exception of ejaculatory dysfunction in men was more common in the Tamsulosin group (18.2% in Tamsulosin group vs. 7.4% in placebo group P=0.007).



Time to Talk Nerdy

We think this is a well-designed multi-center, randomized, double-blinded, placebo-controlled trial in ED patients at various different urban EDs, representing different (but not all) US geographic regions. This study has not differed from recent conclusions on Tamsulosin use in symptomatic ureteral stones. For stones <9mm, there just isn't convincing evidence that stones are passed any faster. This study represents a strong addition to the literature on the lack of benefit of medical expulsive therapy (MET).

1) Consistency with Prior Trials:

This trial cited a stone passage rate of only 50% at 28 days. The prior two trials we reviewed, Furyk and Pickard, the stone passage rate was >80% at 28 days. In the Meltzer trial, stone passage was primarily measured by patient report, either visualization or capture of the stone in 28d.

Compared to the Furyk and Pickard trials which used absence of stone on CT and absence of need for additional intervention, respectively.

So they weren't really comparing apples to apples. Additionally, in Phase 2 of the Meltzer trial, absence on CT was a secondary outcome, which had a smaller sample size, but had passage rates of 83.6% and 77.6% (tamsulosin v placebo).

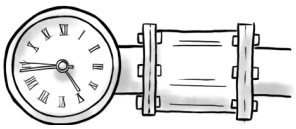
Other factors to consider are sampling bias due to history of stone, not getting a CT initially, location of stone, etc.

2) Systematic Review Meta-Analysis of Stones <5mm?

Why are we still talking about this? While it would be an error to make a logical leap based on this study alone, (after all, this study was powered for ALL stones <9mm), considering the theoretical benefit that Tamsulosin confers, one would think that the pooled evidence for its benefit in stones <5mm is pretty damning. Pooling of the subgroups from several trials would be interesting to see reported in a SRMA.

3) Subgroup Analysis of 5-9mm Stones:

Is the subgroup of stones 5-8mm worthy of studying on its own? The large majority of stones in this study were <5mm. If the goal of this study is to prove the inefficacy of Tamsulosin in stones <9mm, it would have been nice to see an even distribution of all stone sizes. Also considering that the urologic guidelines specifically delineate between <5mm and >5mm, it would make sense to focus on this group. Increasing the power to analyze this group would be beneficial. That being said, a four-year enrolment period at six different EDs yielded 512 patients. Of the total population, 133 had stones 5-8mm. Prevalence may be low enough for this subgroup that further studies would be difficult. Previous studies recommending Tamsulosin in the 5-10mm subgroup were underpowered and are discussed in SGEM#154.

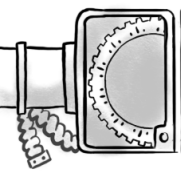


4) Urology Guidelines:

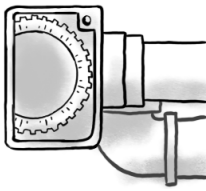
The discussion at hand is whether the urologic guidelines are based on the best evidence. This paper would suggest that they are not, and it recommends revision of said guidelines. As emergency medicine physicians we find ourselves in a position to advocate for our patients and do what is in their best interest. Many EM attendings I have spoken to state that they know what the evidence suggests, but they also know that many urologists will not consider further intervention until a course of MET has been done. EM physicians feel that their hands are tied, and they must prescribe Tamsulosin so that their patients do not have potential delays in care.

5) Consultant Relations:

We must have professional discussions with our all our colleagues. Maintaining trustworthy and respectful relationships is extremely important. This can pave the way for intelligent conversations about the latest scientific evidence on Tamsulosin. Try to avoid tribalism with the Urologists and do not be rude when discussing medical expulsive therapy. Consider inviting them to Grand Rounds to discuss how the literature can be applied so patients with renal colic get the best care possible based on the best evidence.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree with the authors' conclusions about avoiding the prescription of Tamsulosin for ureteral stones <9mm.



Case Resolution:

The patient is not prescribed Tamsulosin at discharge. He does follow-up with a Urologist three weeks after his ED visit. He continued to have pain for a week after his visit, which was partially controlled with NSAIDs. The patient believes he passed the stone but did not visualize the stone. A kidney-ureter-bladder (KUB) x-ray is performed in clinic, which does not identify a ureteral stone, and the patient is advised to follow up as needed.

What Do I Tell My Patient?:

The evidence supporting the use of Tamsulosin for kidney stones is very weak. In men, like you, there could be a risk of ejaculatory dysfunction while taking this medicine. Some urologists still like to have their patients try a course of this medicine. When you see the Urologist in follow-up they may still prescribe Tamsulosin, even though we do not recommend it at this time.

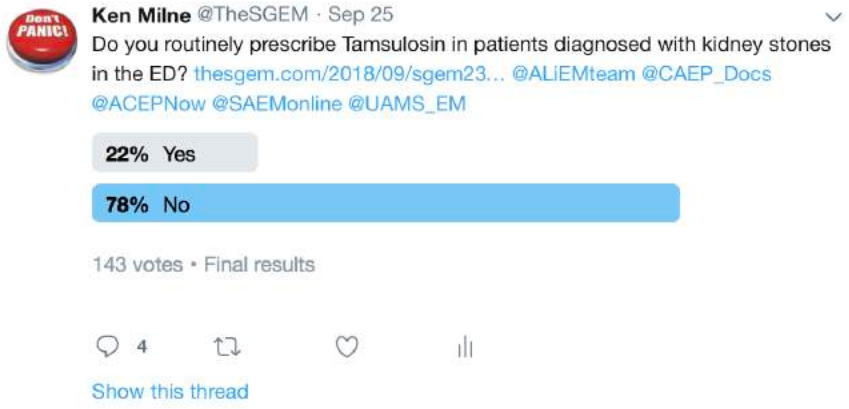
Clinical Application:

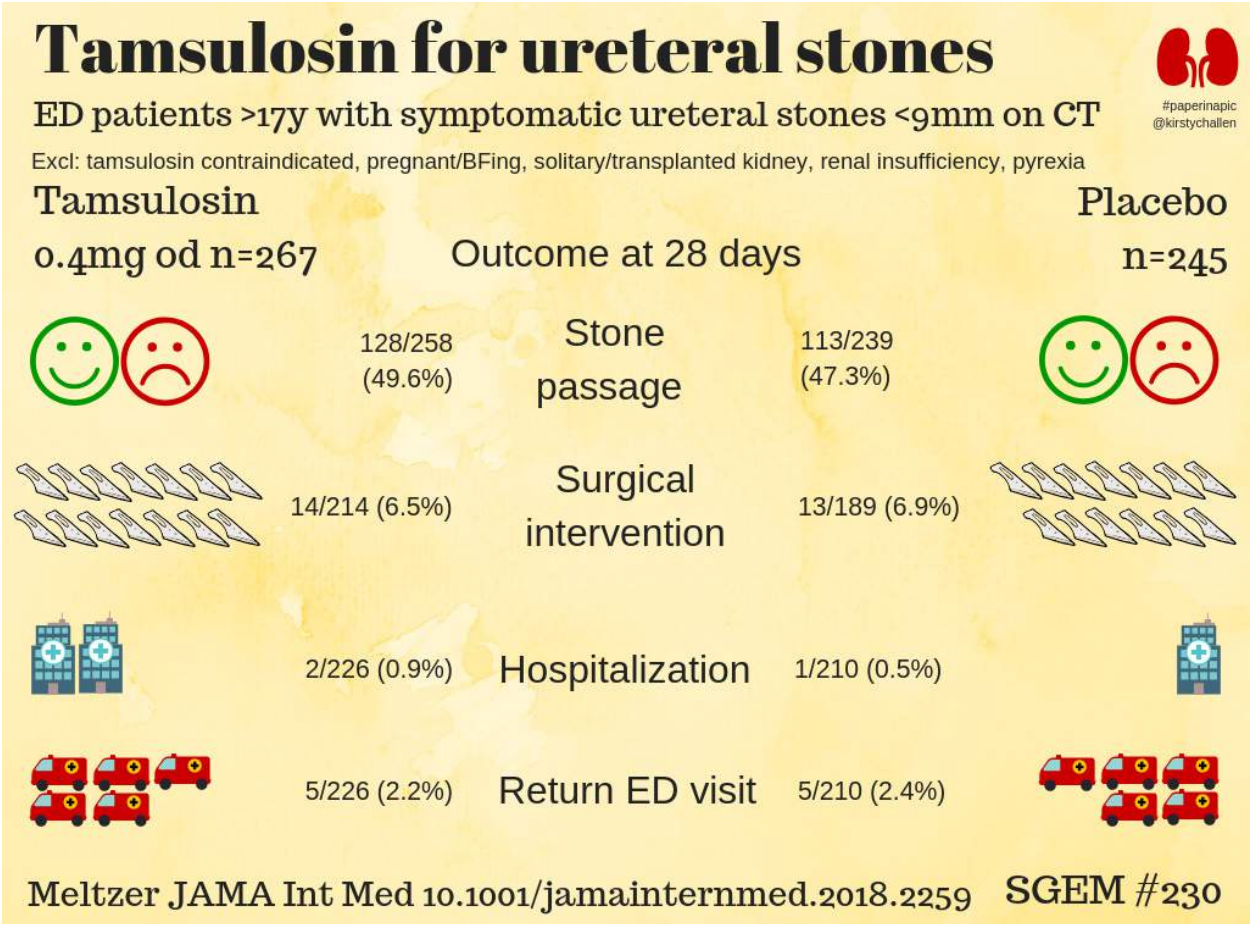
There are many discussions to be had with our Urology colleagues to determine the allocation of resources in the best interests of our patients. The guidelines published by the American Urological Association should also reflect the latest research. In female patients with stones 5-9mm, perhaps Tamsulosin could be used with less risk, but the current literature does not support its routine use. Otherwise, uncomplicated stones <9mm can be treated conservatively.

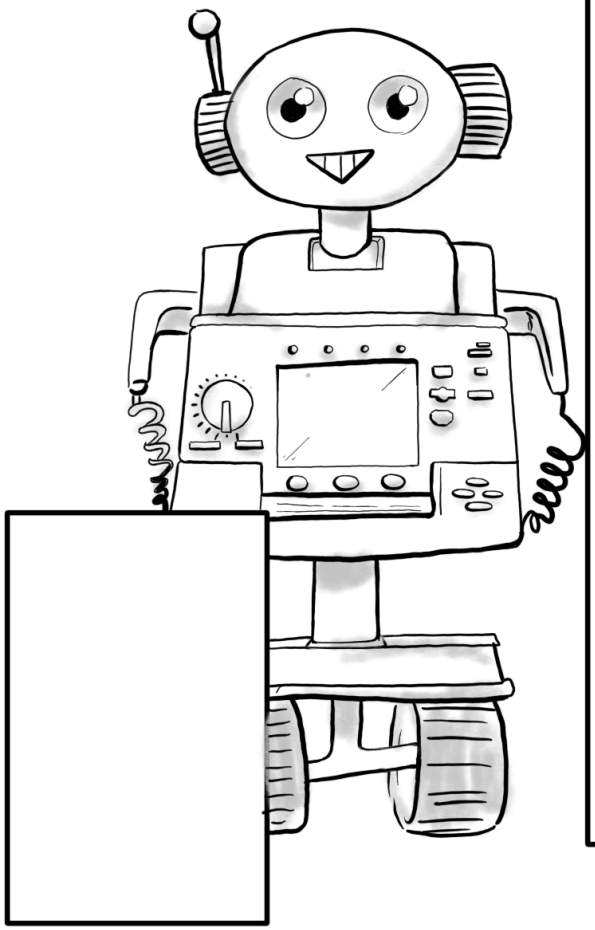
Episode End Notes

Other FOAMed:

- REBEL EM: Can Tamsulosin Get That STONE to Drop?
- EM Literature of Note: Another Failure for Tamsulosin
- Core EM: Medical Expulsive Therapy (MET) in Renal Colic
- First10EM: Tamsulosin for Kidney Stones – The STONE Trial
- St. Emlyn's: Tamsulosin and Renal Colic







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You're So Vein:
IO vs. IV Access for OHCA

Clinical Question:
Is intraosseous vascular access in the pre-hospital setting for OHCA associated with better neurologic outcomes compared to intravenous vascular access?

Bottom Line:
High-quality CPR and early defibrillation for shockable rhythms are more important in OHCA than obtaining vascular access.

Guest:
Andrew Merelman is a critical care paramedic and first year medical student at Rocky Vista University in Colorado. His primary interests are resuscitation, prehospital critical care, airway management, and point-of-care ultrasound.

Case Overview

Case:

A 46-year-old man has a cardiac arrest at home, witnessed by family. Bystander CPR is initiated prior to EMS arrival. EMS arrives on scene and initiates high quality basic life support (BLS). One defibrillation for ventricular fibrillation (VF) is provided but the patient remains in VF. As part of their protocol, they attempt vascular access to administer epinephrine and an antidysrhythmic. They wonder whether it would be better to attempt a peripheral intravenous (IV) line or intraosseous access first?

Background:

Cardiac arrest care has evolved drastically over the past couple of decades, but not in the way many may have expected. We now know that an emphasis on the basics (high quality chest compressions and defibrillation) are the most important aspects of resuscitation. More advanced skills such as airway management, vascular access, and cardiac medications are being de-emphasized.

It was the classic OPALS paper covered on SGEM#64 by the Legend of Emergency Medicine Dr. Ian Stiell that demonstrated no advantage to ACLS vs. BLS for out-of-hospital cardiac arrest (OHCA).

There have been other SGEM episodes that question the efficacy of various interventions:

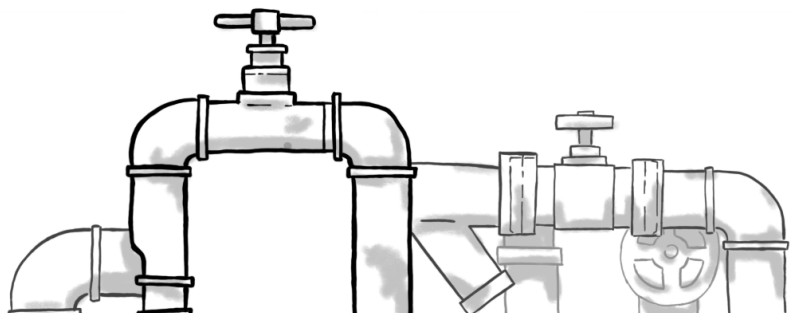
- Man vs. mechanical CPR for OHCA (SGEM#136)
- ACLS for OHCA (SGEM#189)
- Not Stayin' Alive More Often with Amiodarone or Lidocaine (SGEM#162)
- Remote ischemic conditioning for OHCA (SGEM#116)
- Pre-hospital therapeutic hypothermia (SGEM#21, SGEM#54, SGEM#82 and SGEM#183)

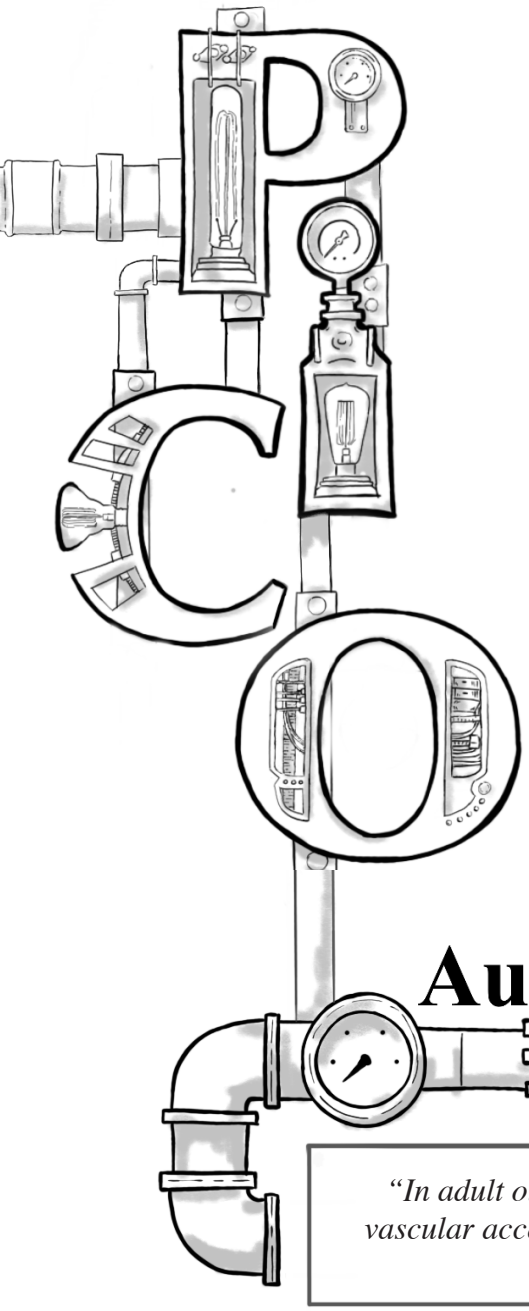
The resuscitation science community has been struggling to find advanced interventions that can show a benefit in mortality and, most importantly survival with good neurological outcome.

Intraosseous access has become a mainstay of cardiac arrest care due to its speed and reliability. However, no randomized trial has compared intravenous access to intraosseous access with a primary outcome of good neurologic function.

Reference:

Kawano et al. Intraosseous Vascular Access Is Associated With Lower Survival and Neurologic Recovery Among Patients With Out-of-Hospital Cardiac Arrest. Annals of EM May 2018





Population:
Out-of-hospital, non-traumatic, adult cardiac arrest patients

- **Excluded:** Unsuccessful attempt or more than one access site. Patients were also excluded if incarcerated or pregnant, those with DNR orders, and those with arrests presumed to be the result of exsanguination or severe burns.

Intervention:
Primary intraosseous vascular access

Comparison:
Primary intravenous vascular access

Outcomes:

- **Primary:** Favourable neurological outcome (modified Rankin Scale [mRS] score 3)
- **Secondary:** Return of spontaneous circulation (ROSC) and survival to hospital discharge.

Authors' Conclusion

"In adult out-of-hospital cardiac arrest patients, intraosseous vascular access was associated with poorer neurologic outcomes than intravenous access."

Quality Checklist

Quality Checklist for A Chart Review:

[?] 1. Were the abstractors trained before the data collection?
[✓] 2. Were the inclusion and exclusion criteria for case selection defined?
[✓] 3. Were the variables defined?
[?] 4. Did the abstractors use data abstraction forms?
[N/A] 5. Was the abstractors' performance monitored?
[X] 6. Were the abstractors aware of the hypothesis/study objectives?
[X] 7. Was the interobserver reliability discussed?
[X] 8. Was the interobserver reliability tested or measured?
[✓] 9. Was the medical record database identified or described?
[N/A] 10. Was the method of sampling described?
[✓] 11. Was the statistical management of missing data described?
[✓] 12. Was the study approved by the institutional or ethics review board?

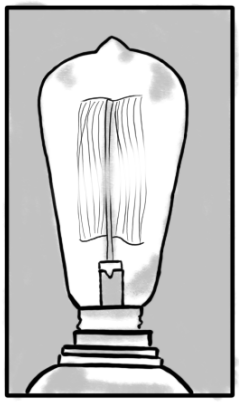
Quality Checklist for Observational Study:

[✓] 1. Did the study address a clearly focused issue?
[✓] 2. Did the authors use an appropriate method to answer their question?
[✓] 3. Was the cohort recruited in an acceptable way?
[✓] 4. Was the exposure accurately measured to minimize bias?
[?] 5. Was the outcome accurately measured to minimize bias?
[X] 6. Have the authors identified all-important confounding factors?
[✓] 7. Was the follow up of subjects complete enough?
[✓] 8. How precise are the results? The 95% CI around the point estimate for the primary and secondary outcomes was fairly wide.
[X] 9. Do you believe the results?
[X] 10. Can the results be applied to the local population?
[X] 11. Do the results of this study fit with other available evidence?

Case Outcomes

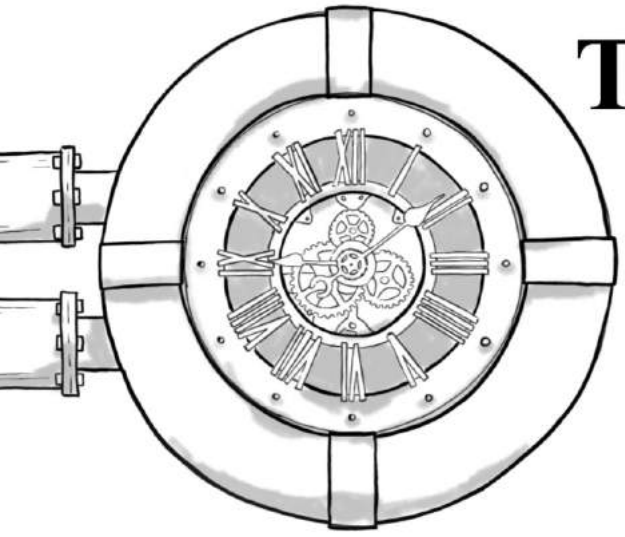
Key Results:
The study included 13,155 patients with OHCA. The vast majority (95%) had intravenous access with only 5% in theintraosseous group

Significantly fewer patients had a favourable neurologic outcome in the IO group compared to the IV group



Primary Outcome:
mRS score 3 was 10/660 (1.5%) IO group vs. 945/12,495 (7.6%) IV group

Secondary Outcomes:
- IO was associated with poorer survival to hospital discharge and ROSC.
- Sensitivity analyses revealed similar results.



Time to Talk Nerdy

This was a secondary analysis of the PRIME study NCT00394706

1) Association vs. Causation:
The most obvious limitation with this study design is it cannot conclude causation. The vast majority of patients had IVs placed with only 5% getting an IO. There may have been multiple unmeasured confounders responsible for the EMS crews deciding to use an IO. A randomized control trial would need to be conducted to answer whether or not IOs cause poorer neurological outcomes in these patients.

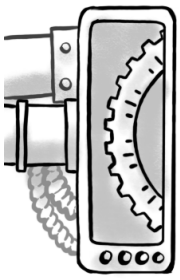
2) Reliability of the mRS:
The reliability of the mRS has been questioned (Quinn et al Stroke 2009). Inter-rater reliability was not discussed, tested or measured in the publication.

3) Differences at Baseline:
There were multiple differences in the population such as sex, witnessed or not, location, and defibrillation. There was a significant difference in initial rhythm between the two groups. In the IO group, 13.9% had a shockable rhythm while 26.2% in the IV group had a shockable rhythm. We know patients with shockable rhythms are more likely to do well. They attempted to mitigate these issues using various adjustments including propensity score matching.

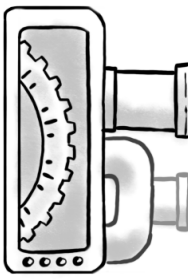
4) Differences in Treatment:
There were also differences in treatment between groups. One example is twice the number of patients in the IV group received interventional cardiac catheterization compared to the IO group. Techniques used to address these issues cannot remove all the potential biases in this type of study design.

5) So What?
At the end of the day does it really matter if you have vascular access in an adult patient with an OHCA? We do not have good evidence that the ACLS drugs provide a patient-oriented outcome.

The recent PARAMEDIC2 trial is another excellent example the failure of epinephrine to improve survival with favorable neurologic outcome. Stay tuned, because we will be covering this on future episode of the SGEM.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree with the authors that this data demonstrates an association of worse outcomes in patients with OHCA who had IOs placed compared to IVs.



Case Resolution:

The responding EMS providers choose to initiate IO access as the fastest, most reliable means. They are then able to administer ACLS medications as per their protocol knowing it's unlikely to make an important patient-oriented difference.

What Do I Tell My Patient?:

I would tell the family we are putting in tube directly into the bone. This is faster than starting an IV and we can give him medication quickly if needed. However, the most important things are good CPR and shocking the heart.

Clinical Application:

This secondary analysis should not deter paramedics from obtaining vascular access via IO. They should use the approach they think is best for each individual patient. In cardiac arrest, this is typically IO as it is faster and more reliable than intravenous. Using the fastest method allows more time to focus on the important interventions such as chest compressions and defibrillation.

Episode End Notes

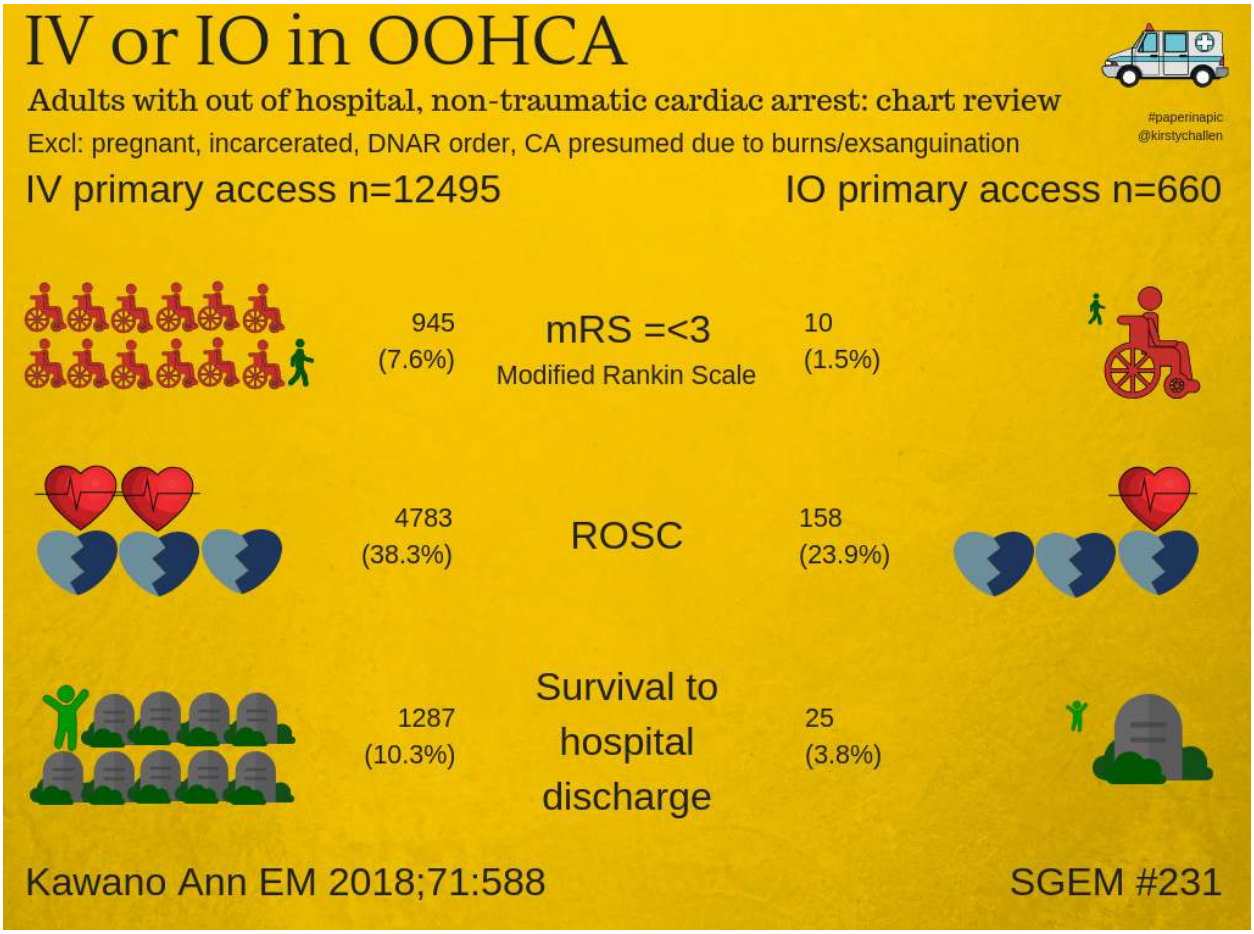
Other FOAMed:

- REBEL EM: IO vs. IV in Out of Hospital Cardiac Arrest (OHCA)

What is your go to for vascular access in adult OHCA?
thesgem.com/2018/09/sgem23...
@DrHowieMell @amerelman
@hp_ems @EMS1
@EMSWorldNews @jemsconnect
@EMSTODAY @MLPS911

Intravenous (IV)	50%
Intraosseous (IO)	41%
Don't need access	9%

150 votes · Final results
2018-10-02, 11:42 AM



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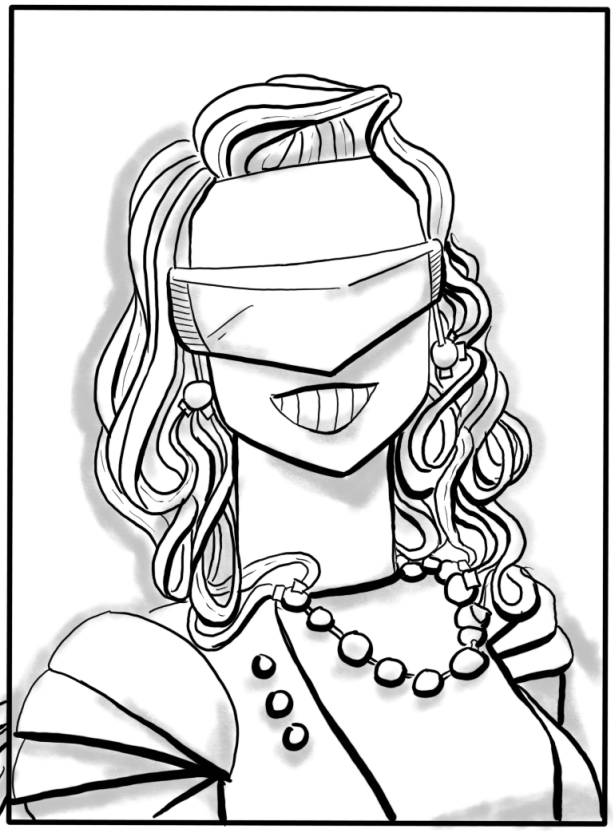


I Can See Clearly Now The Collar is Gone : Thanks to The Triage Nurse

Clinical Question:

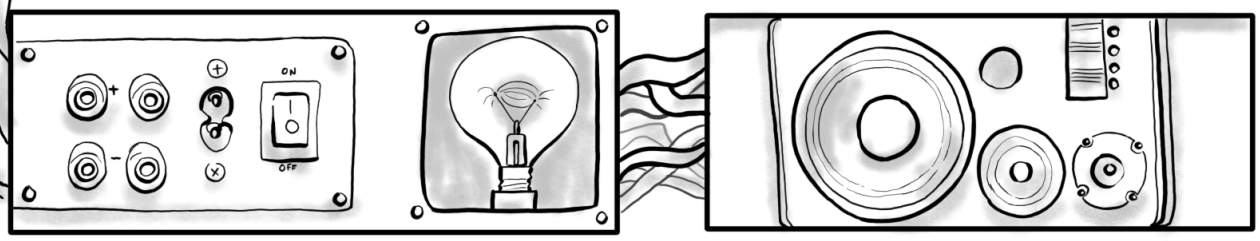
Can emergency department triage nurses apply the Canadian C-spine Rule to adult blunt trauma patients and safely clear the C-spine?

Bottom Line:

Properly educated emergency department triage nurses can apply the Canadian C-spine Rule to adult blunt trauma patients and safely clear the C-spine.

Guest:

Alison Armstrong is an Emergency Department Nurse, TNCC Course Director, Trauma Program Coordinator and Canadian C-Spine Rule Nurse Champion.



Case Overview

Case:

There are two case scenarios this week to try and capture the two common ways patients present to the triage nurse.

Case 1: A 51-year-old male patient presents to triage in a collar on a back-board via EMS following a rear-end motor vehicle collision (MVC) at a stop light. He was a belted driver with no past medical history and GCS 15. The driver of the car that hit him was texting and did not appear to slow before striking the rear of the patient's car at about 50 km/hr. The patient complains of left shoulder and neck pain.

Case 2: A 45-year-old female presents to triage at 20:30 walking stating that she fell from a chair this morning. She went to work all day as she thought she was unhurt initially, but pain has started to set in so she stopped by the emergency department on the way home complaining of right wrist and neck pain and stiffness all over. She is worried she may have a serious injury to her neck.

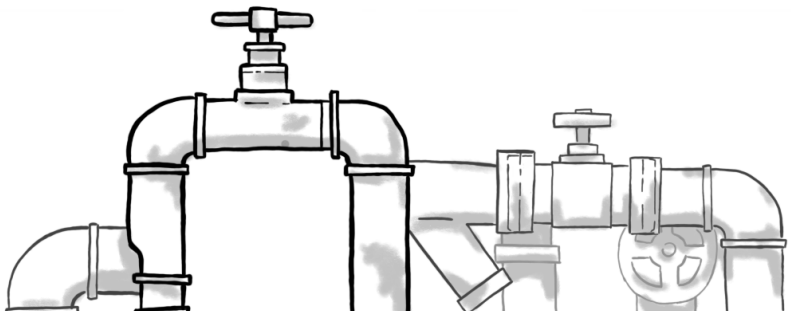
Background:

Clearing the c-spines is a regular activity in the emergency department (ED). This can be done clinically using the Canadian C-Spine Rules/Tools or with imaging. The vast majority of these patients (>99%) do not have a fractured cervical spine diagnosed.

Blunt trauma patients transported via EMS often arrive on a backboard, c-collar and head restraints. They remain this way often complaining to the nurse until they can be assessed by a physician and have their c-spine cleared.

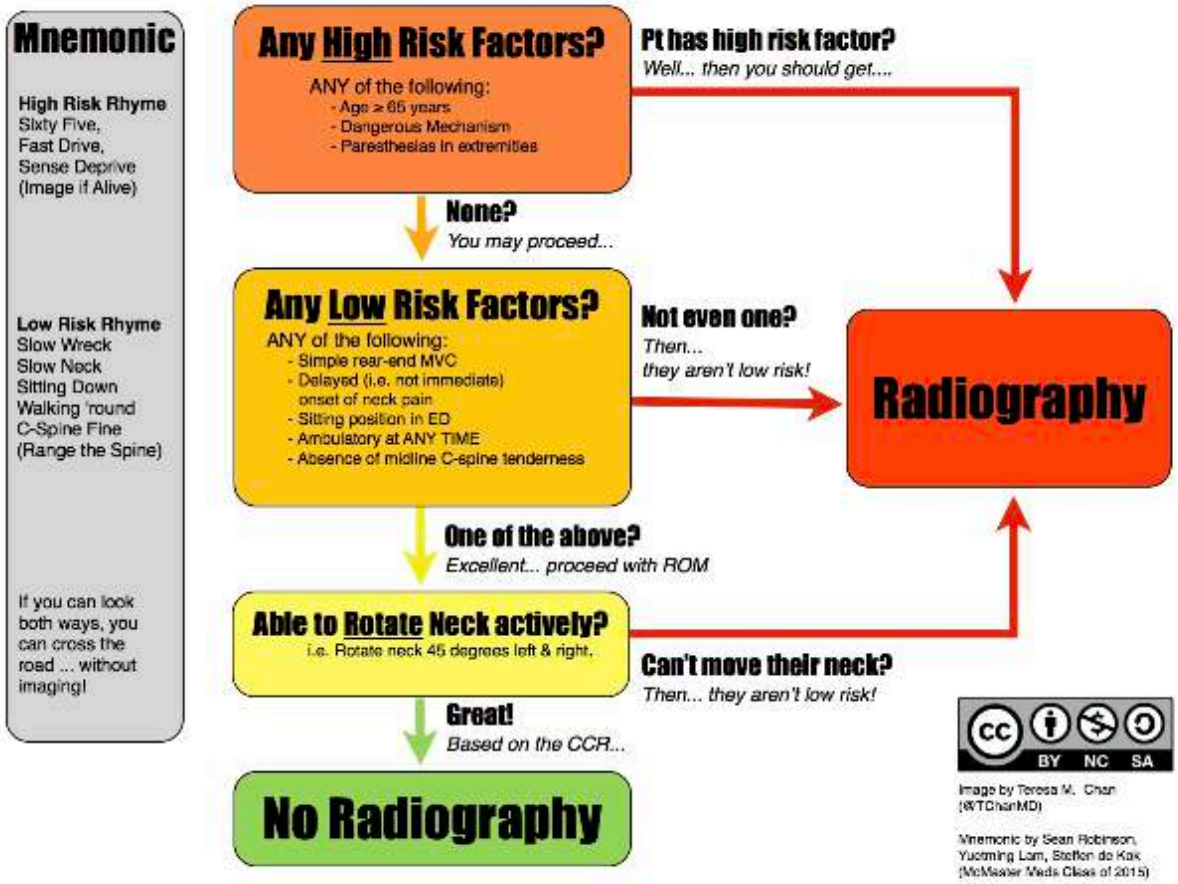
There are protocols to get blunt trauma patients off spine boards urgently. However, they still can remain in c-spine precautions for a long time waiting to be assessed. This adds to patient discomfort, occupies valuable acute ED space and can contribute to crowding.

The Canadian C-Spine Rule (CCR) is a clinical decision instrument developed to allow clinicians to clear the c-spine without imaging (1). This instrument has been validated to be safe and decrease use of diagnostic imaging (2,3).



CANADIAN C-SPINE RULE (CCR)

The CCR applies to alert (GCS=15) and stable trauma patients where cervical spine injury is a concern

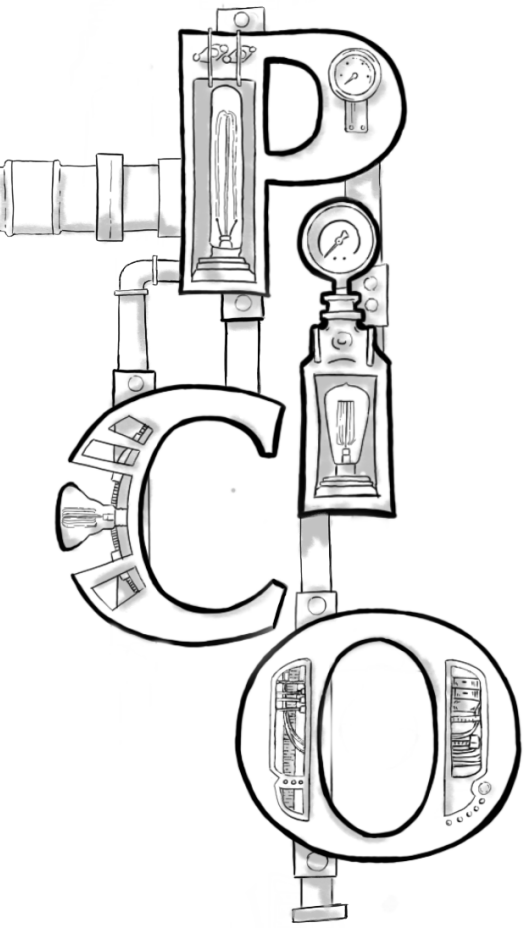


Dangerous Mechanism:

- Fall from elevation>=3 feet/ 5 stairs
- Axial load to head (diving)
- MVC high speed (>100km/hr), rollover, ejection
- Motorized recreational vehicle
- Bicycle collision

Reference

Stiell et al. A Multicenter Program to Implement the Canadian C-Spine Rule by Emergency Department Triage Nurses. Annals of EM Oct 2018



Population:
Alert adults presenting to the ED ambulatory or by EMS with acute blunt trauma occurring within the previous 48 hours with posterior neck pain and were in stable condition. Alert and stable was defined as a Glasgow Coma Scale (GSC) score of 15 with normal vital signs.

- **Exclusions:** Age less than 16 years, penetrating trauma, acute paralysis, or known vertebral disease

Intervention:

- **Phase 1 (Certification):** All ED nurses who performed triage activities had didactic training and then had to demonstrate competence by accurately assessing ten patients before being certified.
- **Phase 2 (Implementation):** All triage nurses who had become certified were empowered by a medical directive to *"clear"* the cervical spine of patients, allowing them to remove cervical spine immobilization of CCR–negative patients and triage them to a less acute area.

Comparison:
None

Outcomes:
Primary:

- **Clinical:** Proportion of eligible trauma patients who had their cervical spine cleared by nurses.
- **Safety:** Number of missed clinically important cervical spine injuries.

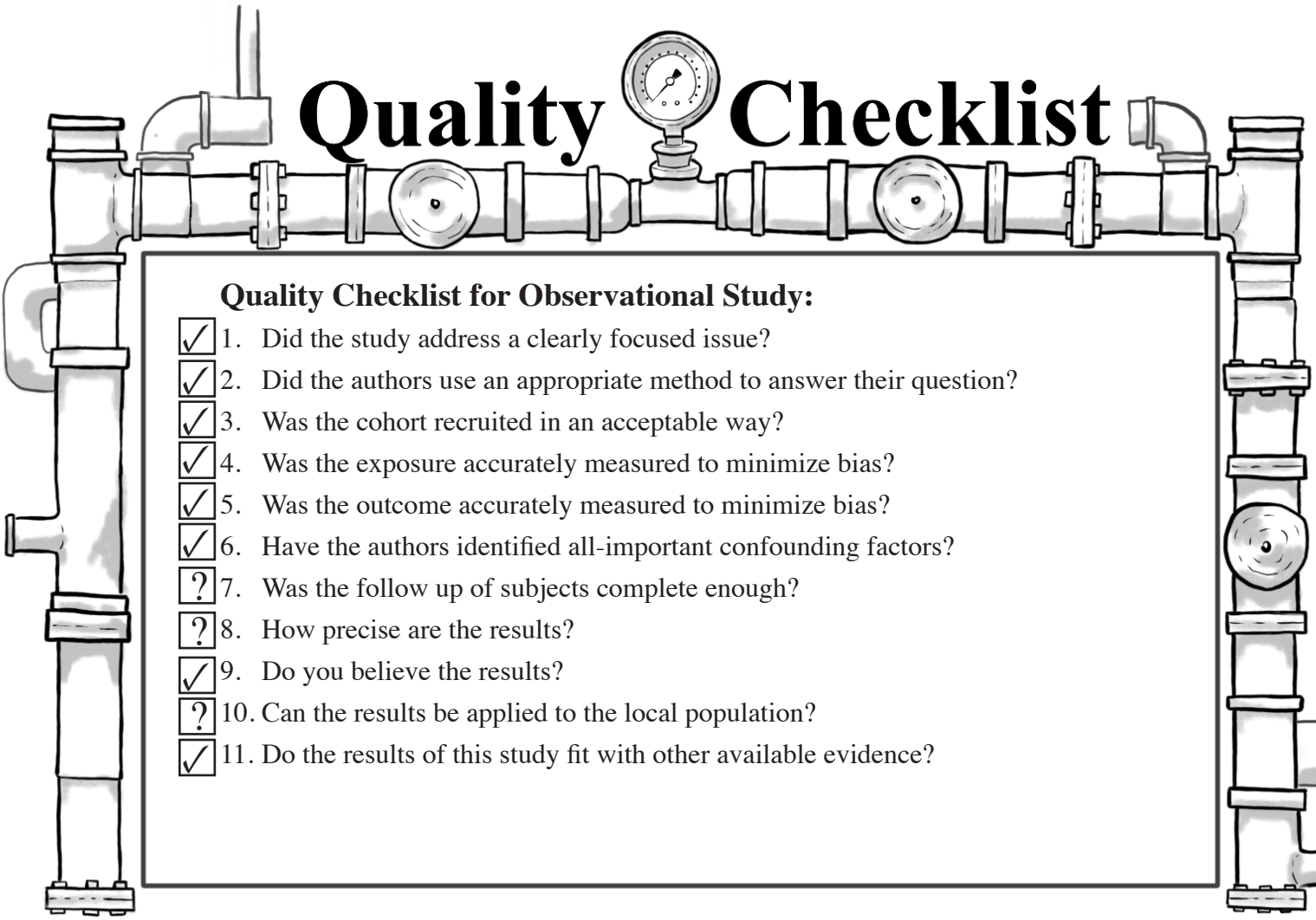
Secondary:

- **Clinical:** Length of time in the ED
- **Safety:** Number of serious adverse outcomes (neurologic deficit after clearance by the ED nurse)
- **Other:** Nurse accuracy in overall interpretation of the rule and nurse comfort with the rule.

Authors' Conclusion

"We clearly demonstrated that ED triage nurses can successfully implement the Canadian C-Spine Rule, leading to more rapid and comfortable management of patients without any threat to patient safety. Widespread adoption of this approach should improve care and comfort for trauma patients, and could decrease length of stay in our very crowded EDs."

Quality Checklist



Quality Checklist for Observational Study:

- ☑ 1. Did the study address a clearly focused issue?
- ☑ 2. Did the authors use an appropriate method to answer their question?
- ☑ 3. Was the cohort recruited in an acceptable way?
- ☑ 4. Was the exposure accurately measured to minimize bias?
- ☑ 5. Was the outcome accurately measured to minimize bias?
- ☑ 6. Have the authors identified all-important confounding factors?
- ? 7. Was the follow up of subjects complete enough?
- ? 8. How precise are the results?
- ☑ 9. Do you believe the results?
- ? 10. Can the results be applied to the local population?
- ☑ 11. Do the results of this study fit with other available evidence?

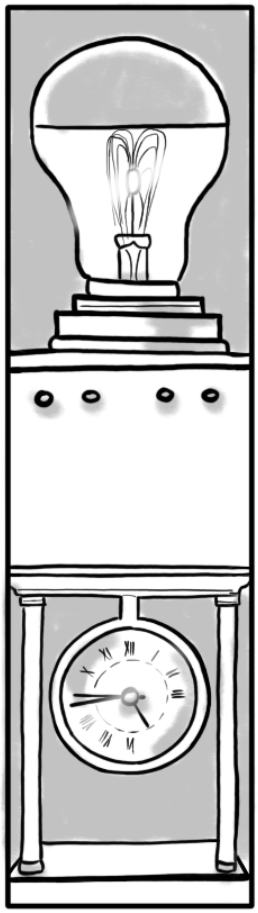
Case Outcomes

Key Results:

There were two phases to the study and authors focused on phase 2 (Implementation) part of the study which had a total of 1,408 patients. The mean age was 43 years, 52% were female, 64% (898) arrived via EMS and 1.1% (16) were found to have a c-spine injury (2 patients [0.1%] required internal fixation and 14 patients [1.0%] required rigid collars).

Of the 898 patients that arrived via EMS, 806 (90%) were immobilized. There were another 510 who walked into the ED with neck pain and triaged to either have immobilization applied (36%) or not (63%).

Triage nurses removed 41% of immobilized patients' collars and missed zero c-spine injuries.



Primary Outcomes:

- **Clinical:** Proportion of eligible trauma patients who had their cervical spine cleared by nurses was 41.1%. The number of c-spines cleared by nurses before the study was zero.
- **Safety:** Number of missed clinically important c-spine injuries was zero.

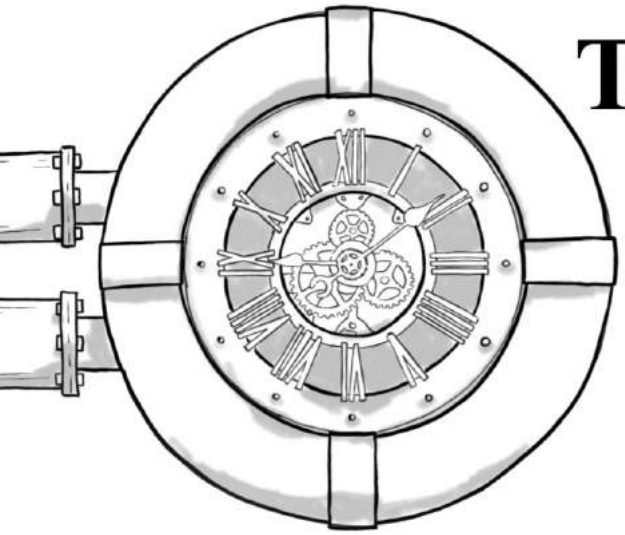
Secondary Outcomes:

- **Clinical:** Length of time in the ED was reduced by 26% (3.4 vs. 4.6 hours)
- **Safety:** Number of serious adverse outcomes (neurologic deficit after clearance by the ED nurse) was zero.
- **Other:** Nurse comfort and compliance with the rule was high. Only 1.3% of nurses indicated they were uncomfortable or very uncomfortable following the rule.

Table 3. Comfort and compliance with implementation of the Canadian C-Spine Rule as evaluated by the ED triage nurses.

Measurement	All Patients (N=1,408)	Ambulance Immobilized (N=806)	Ambulance Not Immobilized (N=92)	Ambulatory (N=510)
Comfort with using CCR (%)				
Very comfortable	618 (43.9)	345 (42.8)	40 (43.5)	233 (45.7)
Comfortable	347 (24.6)	192 (23.8)	30 (32.6)	125 (24.5)
Neutral	107 (7.6)	55 (6.8)	9 (9.8)	43 (8.4)
Uncomfortable	16 (1.1)	13 (1.6)	0	3 (0.6)
Very uncomfortable	3 (0.2)	3 (0.4)	0	0
Compliance with applying CCR (%)				
Rule=no immobilization	–*	385 (47.8)	–	–
Immobilization removed	–	331 (41.1)	–	–
Rule=immobilization	–	–	35 (38.0)	231 (45.3)
Immobilization applied	–	–	19 (20.7)	184 (36.1)

*Dashes indicate "not applicable."



Time to Talk Nerdy

Before we talk nerdy, we would just like to point out one thing. Medical research rarely focuses on recognizing that the nursing staff have a great capacity for critical thinking and application of many of the tools used by physicians.

1) Not Randomized Trial:

This was not an RCT and therefore there was no comparisons group. We do not know definitively if this would have decreased the length of stay compared the existing system. The LOS in the ED was shorter for those who had the collar removed compared to those who did not, which makes sense. Those without the collar being removed would have further evaluation and potentially imaging. How would this new protocol compare to physicians evaluating the patient? I suspect it would be faster with shorter LOS having the triage nurse apply the CCR but this study does not provide data to answer this question.

2) Compliance:

One hospital withdrew after phase 1 due to compliance issues. This suggests there may be difficulties implementing this in other sites. It would have been nice to have more information on why this happened. Was it compliance issues with the physicians, nurses, administration or a combination?

3) External Validity:

They mention small and rural hospitals. There may not be enough volume for triage nurses to feel comfortable using the CCR infrequently. The other issue is places like the US with a zero-miss culture. Would it be accepted in a much different medical-legal environment?

4) Precision:

It is hard to comment on the precision of the results with the event rate being so low. There were only 7/806 immobilized patients who arrived by ambulance who had clinically im portant c-spine injuries (0.7%). While no injuries were missed in this study it would only take one or two misses to call into question the validity of the results.

5) Follow-Up:

Was follow-up long enough and comprehensive enough? They monitored visit logs for 30 days, but some patients could have arrived with an injury past one month. It is also possible that patients went to another hospital rather than going back to the hospital they originally presented.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the authors' conclusions.

Clinical Application:

The triage nurses at Victoria Hospital at London Health Sciences Centere were the nerdiest of all nine sites in this study with over 90% of them volunteering to be a part of the implementation. Since the study completion, triage nurses at Victoria Hospital are using the CCR to clear c-spines and you know what, this Canadian C-Spine Rule is now being used in the pre-hospital environment all over Ontario now!

Case Resolution:

Case 1: The triage nurse could apply the CCR to the patient because he was involved in a simple rear-end MVC which is one of the low risk criteria. The triage nurse removed the front of his collar and palpated his c-spines. The patient reported pain all over. The triage nurse then asked the patient to look 45 degrees to the right, then the left. He was able to do the motion, so the triage nurse removed the collar and asked that the patient be offloaded to a regular stretcher.

Case 2: The female patient who fell from the chair also qualifies for the CCR to be used as it was not a dangerous mechanism and she had delayed onset of neck pain. The triage nurse palpated her c-spines and the patient complained of right lateral neck pain. The triage nurse then asked if she could rotate her head 45 degree to the right and then the left. The patient was able to do the motion, so the triage nurse knew that the patient did not need a c-spine collar and to be immobilized at triage.

What Do I Tell My Patient?

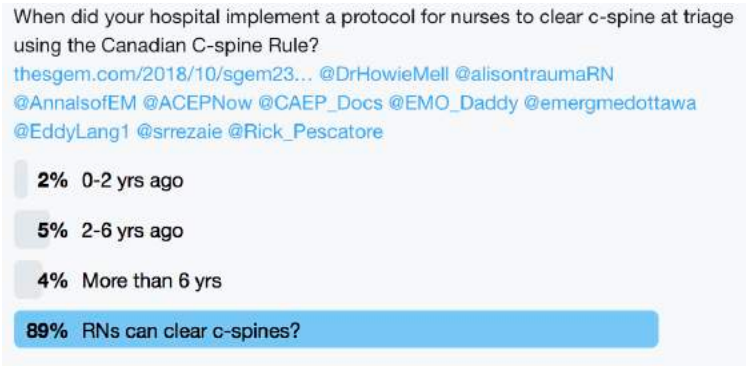
Patient 1: I know being in a collar and on a backboard can be very uncomfortable. The paramedics correctly put one on because of the pain you were having in your neck. We have a way to safely remove the collar and so a few little tests without missing any serious neck injuries. You don't need to be in that collar anymore so we can move you over to a regular stretcher or a chair if you like.

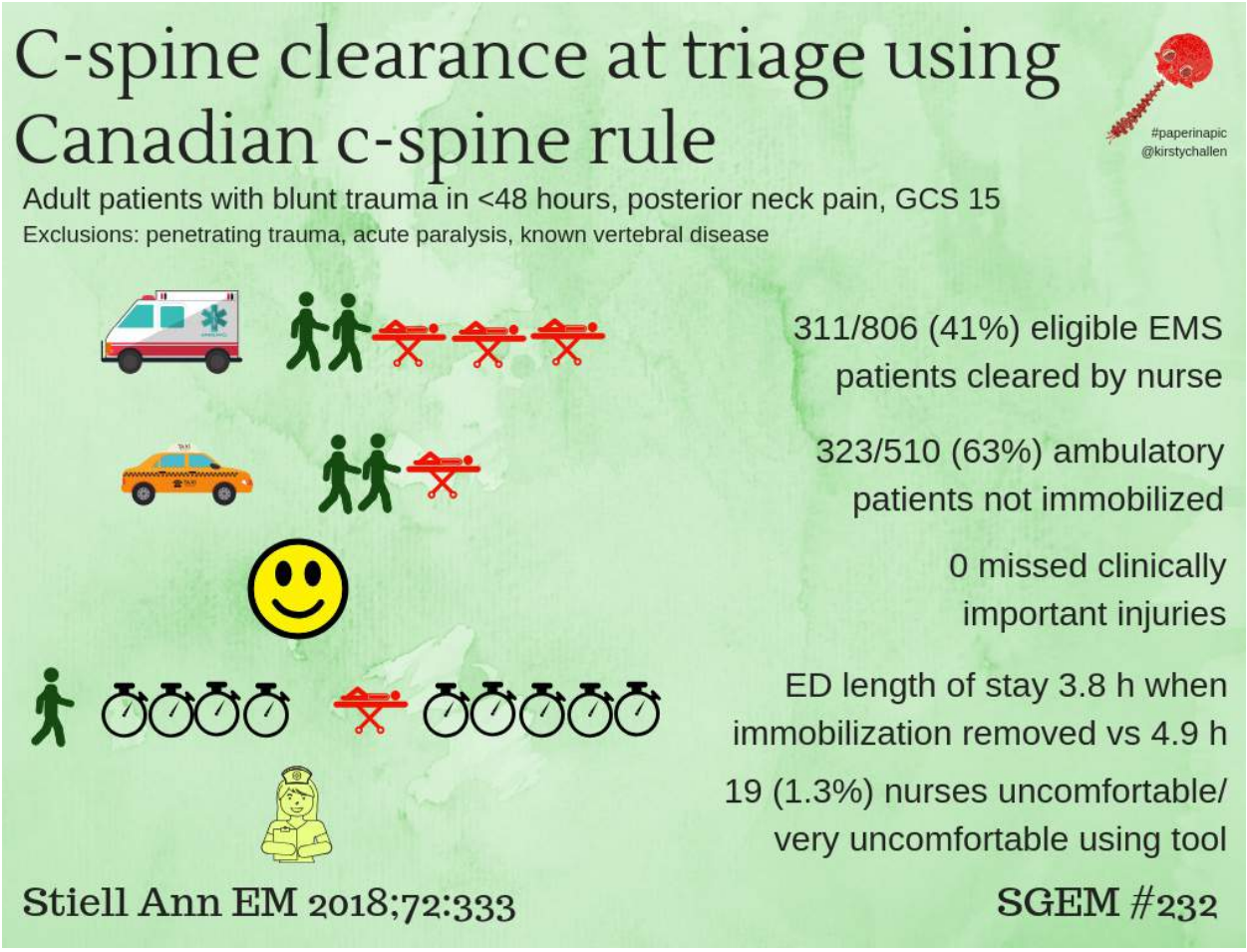
Patient 2: I know you are worried about your neck being injured but we have a tool that we use that can safely assure that you don't have a serious injury and won't need a c-spine collar. You can wait in the waiting room safely until the doctor is able to see you.

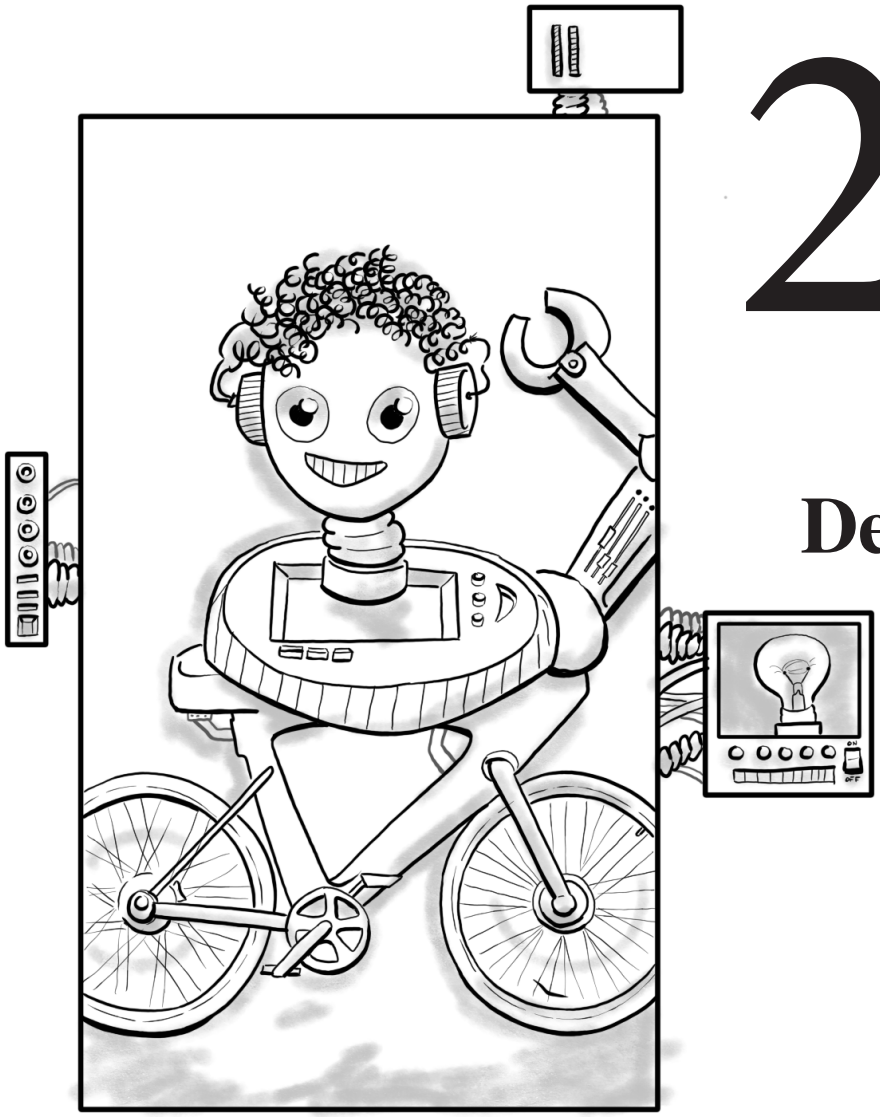
Episode End Notes

References:

1. Stiell IG, Wells GA, Vandemheen K, et al. The Canadian Cervical Spine Radiography Rule for alert and stable trauma patients. JAMA. 2001;286:1841-1848.
2. Stiell IG, Clement C, McKnight RD, et al. The Canadian C-Spine Rule versus the NEXUS low-risk criteria in patients with trauma. N Engl J Med. 2003;349:2510-2518.
3. Stiell IG, Clement CM, Grimshaw J, et al. Implementation of the Canadian C-Spine Rule: prospective 12-centre cluster randomised trial. BMJ. 2009;(339):B4146.







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Larry in the Den with Kiwis (LDK): Low Dose Ketamine vs. Opioids for Acute Pain

Clinical Question:

Is ketamine, at a dose of <0.5mg/kg, as effective as opiates for the treatment of acute pain in the emergency department?

Bottom Line:

Ketamine at a dose of <0.5mg/kg is non-inferior to opioid analgesics for acute pain in the ED. It is possible that over a longer time point, or with increased study of a greater number of patients, that one of the treatments would show benefit over the other.

Guest:

Dr. Corey Heitz is an emergency physician in Roanoke, Virginia. He is also the CME Editor for Academic Emergency Medicine.

Case Overview

Case:

You are caring for a 38-year-old male (Larry) who presented to the emergency department with lower back pain. During your evaluation, he tells you he doesn't want any narcotic pain medication. You wonder if there are alternative options, and a colleague reminds you that ketamine has recently gained a lot of exposure as a possible alternative.

Background:

The amelioration of pain and suffering should be one of the top priorities of emergency physicians. In 2001, JACHO made pain the 5th vital sign to address the issue of oligoanalgesia, which unfortunately created many problems.

Opiates became a very common treatment for acute pain in the ED setting after JACHO and the introduction of new and powerful opioids like oxycodone.

However, in recent years, an increased desire for alternatives has been prompted in an attempt to reduce opiate usage. The pendulum is swinging to opiophobia. This can leave the patient left in the middle with ineffective pain management.

One alternative or adjunct to limit the use of opioids in the ED is low dose ketamine (LDK). Several studies have been performed evaluating low dose ketamine (LDK) for acute pain, with a variety of methodological designs, time endpoints, and doses.

We have covered some of those papers and watched the literature develop over the years on the SGEM.

SGEM#111: Comfortably Numb – Low dose Ketamine as Adjunct for ED Pain Control

> **SGEM Bottom Line: High-quality published evidence to support the use of sub dissociative-dose ketamine to quickly reduce acute pain in emergency department settings is lacking, but lower quality studies inconsistently demonstrate effectiveness with uniformly low risk of adverse effects.**

SGEM#130: Low Dose Ketamine for Acute Pain Control in the Emergency Department (reviewed two ketamine papers)

> **SGEM Bottom Line: For patients who have a contraindication to opioids such as allergy or hypotension, sub dissociative ketamine would be a reasonable option to consider for treating acute pain.**

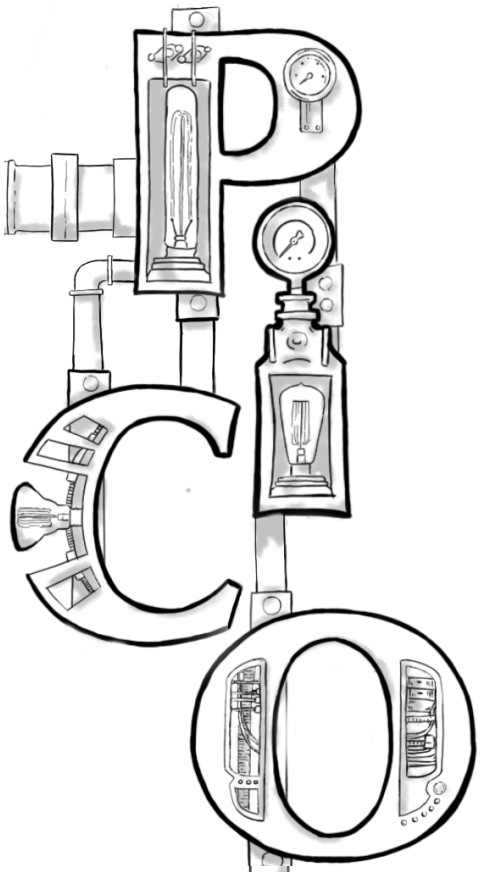
> **SGEM Bottom Line: While further validation in other settings is needed, this study suggests ketamine as a relatively safe option for patients who do not achieve analgesia with high doses of morphine or are unable to tolerate them.**

SGEM#198: Better Slow Down – Push vs. Short Infusion of Low Dose Ketamine for Pain in the Emergency Department

SGEM Bottom Line: Slowing down the rate of low-dose IV ketamine infusion to 15 minutes significantly reduces rates of the feeling of unreality and sedation with no difference in analgesic efficacy when compared to IV push over 3 – 5 minutes.

Reference:

Karlow et al. A Systematic Review And Meta-Analysis of Ketamine as an Alternative to Opioids for Acute Pain in the Emergency Department. AEM Oct 2018.



Population:
Randomized control trials (RCTs) with emergency department patients >18 years old receiving LDK for acute pain

- **Exclusions:** Did not report visual analog scale (VAS) score or numeric rating scale (NRS) pain scale measurement, co-administration of pharmacologically active substance less than 20 min after IV ketamine/opioid administration, included a placebo group

Intervention:
<5mg/kg ketamine IV (bolus, slow push or short infusion)

Comparison:
IV opioids converted to morphine equivalents

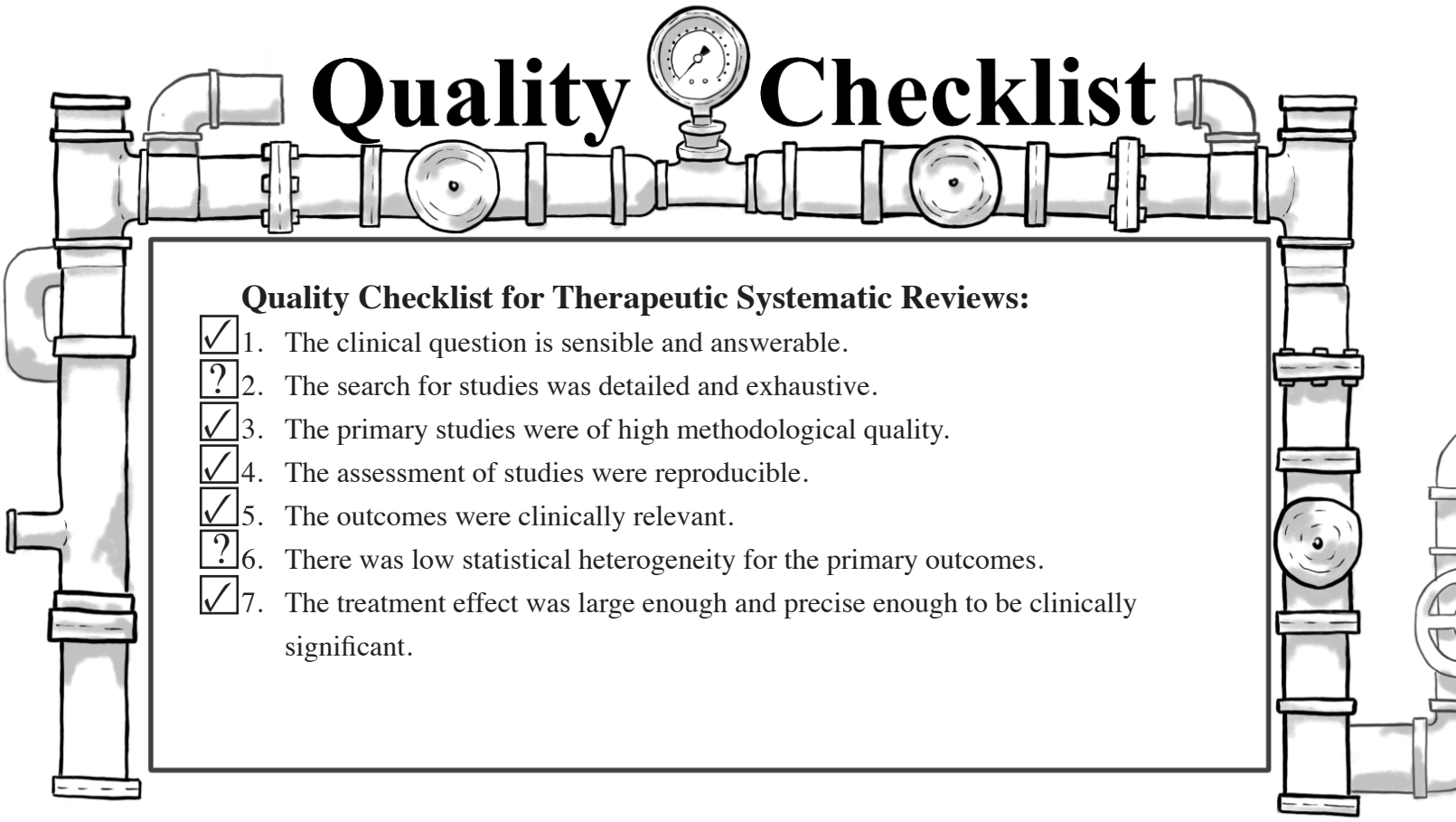
Outcomes:

- **Primary:** Numeric Rating Scale or Visual Analog Scale at ten minutes
- **Secondary:** Adverse events and the requirement of additional dosing or analgesics

Authors' Conclusion

Ketamine is non-inferior to morphine for the control of acute pain, indicating that ketamine can be considered as an alternative to opioids for ED short-term pain control.

Quality Checklist



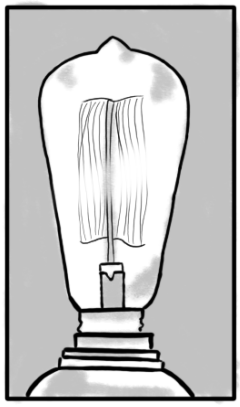
Quality Checklist for Therapeutic Systematic Reviews:

- ☑ 1. The clinical question is sensible and answerable.
- ? 2. The search for studies was detailed and exhaustive.
- ☑ 3. The primary studies were of high methodological quality.
- ☑ 4. The assessment of studies were reproducible.
- ☑ 5. The outcomes were clinically relevant.
- ? 6. There was low statistical heterogeneity for the primary outcomes.
- ☑ 7. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results
An extensive search of English language only publications found three RCTs for a total of 261 patients.

Low-dose ketamine was non-inferior to morphine as an analgesic.



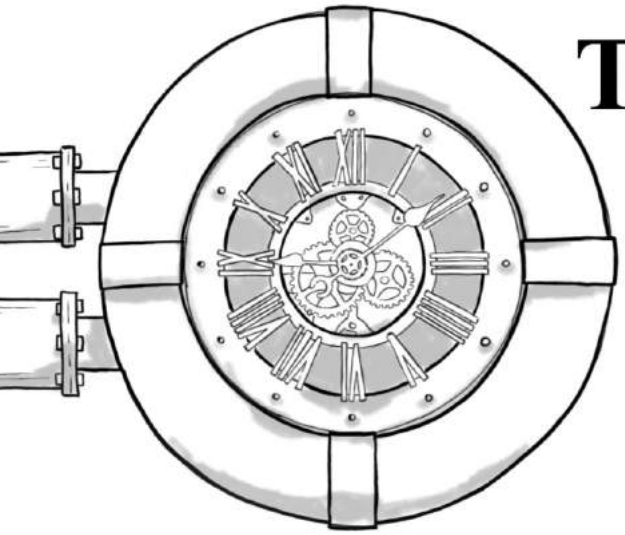
Primary Outcomes:

NRS or VAS at 10 minutes

- Pooled estimate of difference between ketamine and morphine equivalents was 0.42 (95% CI -0.70 to 1.54)
- That -0.70 is less than the lower end of inferiority established of -1.4

Secondary Outcomes:

- No severe adverse events were reported
- Higher rates of non-severe adverse events were seen with ketamine



Time to Talk Nerdy

Listen to the podcast on iTunes to hear Nick's and Evan's responses to our ten (two sets of five) nerdy questions.

1) Strict Inclusion Criteria:

Your inclusion criteria limited the studies to just three. Can you discuss your reasoning behind the strict selection of studies? Was there any search of unpublished abstracts or non-English language studies?

2) Heterogeneity:

The heterogeneity was fairly high with an I2 of 64.3%. How should we interpret the results given such differences between the three studies? Did you do anything to address the heterogeneity?

3) Small Sample Size:

The sample size of the included trials was fairly small, and the confidence interval of the primary outcome was wide. Do you think there is a possibility that with increased patient numbers, a benefit of one over the other could be uncovered?

4) Individual Patient Data:

You were able to get individual patient data from two of the three studies (Motov and Miller but not Majidinejad). Explain the advantage to having individual patient data when conducting a SRMA?

5) Ten Minutes:

You chose ten minutes as the primary outcome timeline. Is it possible that one of the treatments has a longer lasting effect, making it overall more effective? Can you discuss whether and how this was addressed?

6) Adverse Events:

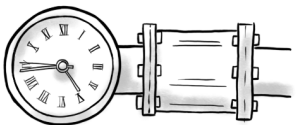
As you discussed, the numbers of adverse events were small and not able to be analyzed statistically. Most of the adverse events from ketamine are short lived. Is it possible the adverse events from morphine, while potentially less numerous and not able to be quantified, could be worse overall?

7) Additional Dosing or Analgesics:

The requirement for additional dosing or analgesics was another secondary outcome mentioned in the methods but not in the results. Why did you not report or discuss this secondary outcome?

8) Social Media:

It was interesting to note you cited FOAMed in the discussion as a reason ketamine has been adopted by the EM world as an alternative to opioids. A merging of traditional and non-traditional publications for knowledge translation.

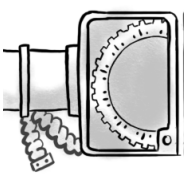


9) What to do at Discharge?

Can you comment on your thoughts about how to treat patients who improved with ketamine, after they are discharged?

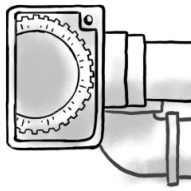
10) Anything Else:

Is there anything else you would like to say about your SRMA or ketamine in general?



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' conclusions.



Clinical Application:

In this time of transition between oligoanalgesia and opiophobia, IV ketamine offers a potential solution. It can minimize or avoid opioids while at the same time providing relief to ED patients with acute pain.

Case Resolution:

You discuss the possibility of using ketamine with your patient. He is interested in trying, and you give 0.3mg/kg intravenously with a decrease in the patient's pain level.

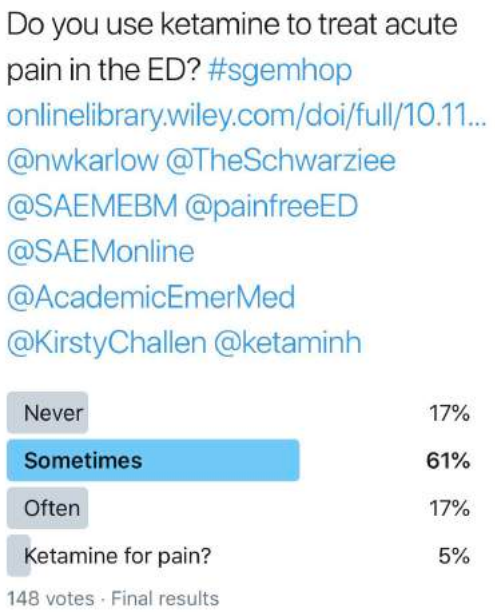
What Do I Tell My Patient?:

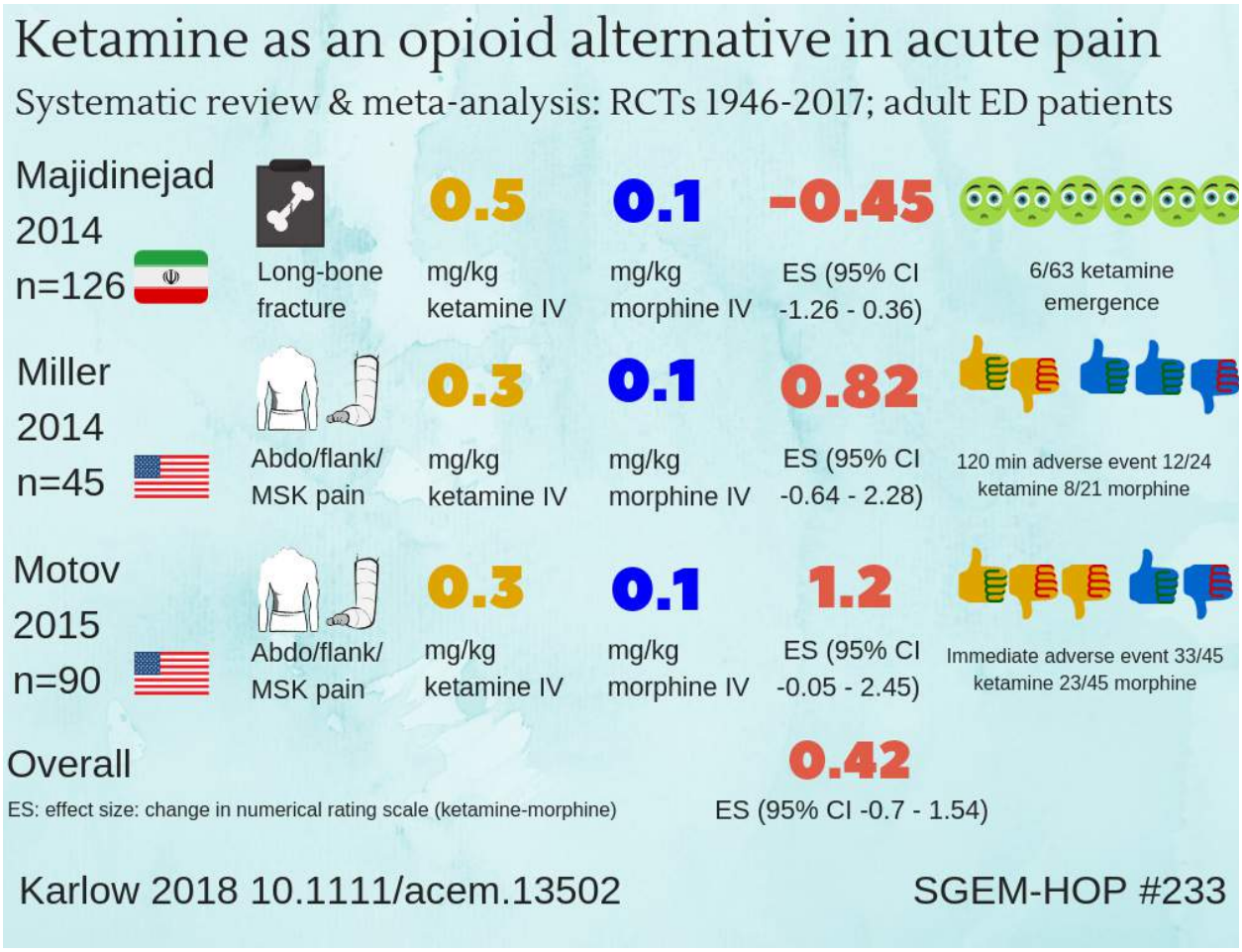
Ketamine is a non-opiate analgesic that has been shown to be similarly effective to opiates such as morphine for acute pain. There are some potential side effects, but these are not severe. Giving it to you as a slow infusion over 10 minutes should reduce the chances of you having a serious side effect.

Episode End Notes

Other FOAMed Resources:

- St. Emlyn's – Journal Club Ketamine
- EM Cases Journal Jam – Low Dose Ketamine Analgesia
- REBEL Cast Ep53 – GeriKet – Ketamine Analgesia in Older Adults
- REBEL EM – Low-Dose Ketamine for Acute Pain in the ED: IV Push vs Short Infusion?
- TOTAL EM#83 – Recent Literature Updates on Opiate Alternatives
- CORE EM – Infusion Versus IV Push Low-Dose Ketamine for Analgesia
- PharmERToxGuy – How to Administer Low-Dose IV Ketamine for Pain in the ED





SGEM#

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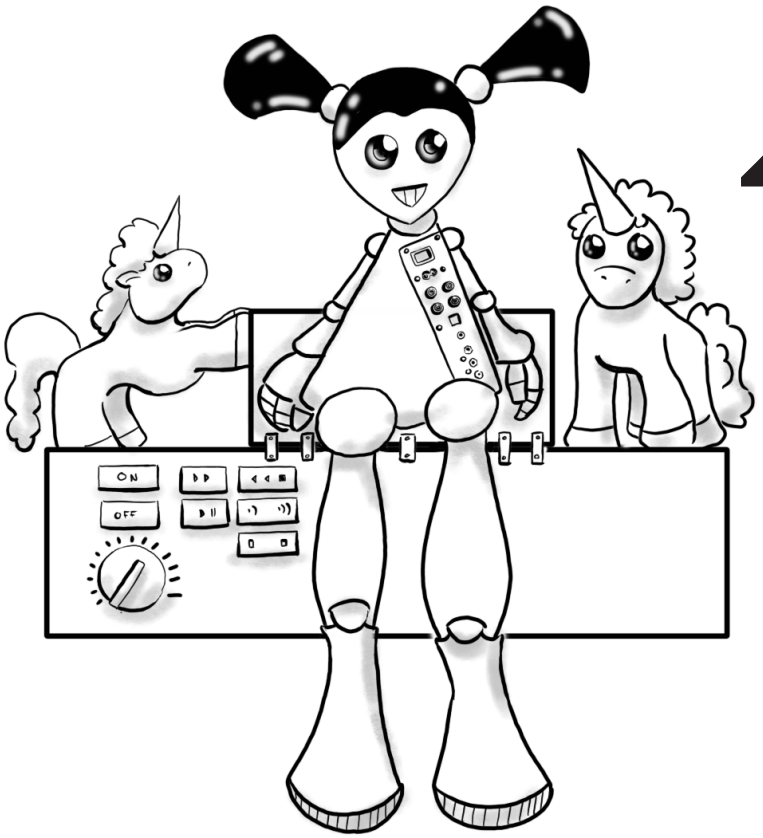


Contrast Induced Nephropathy: A Unicorn?

Clinical Question:

1. Is CT contrast associated with acute kidney injury?
2. Do intravenous sodium bicarbonate or sodium chloride with oral acetylcysteine or placebo prevent acute kidney injury and major adverse outcomes in high-risk patients undergoing angiography?

Bottom Line:

1. CT contrast is not associated with acute kidney injury?
2. The risk of AKI from CT contrast is not as great as it was thought to be, and it might not even exist. The risk of missed or delayed diagnosis likely outweighs any from the exposure in a patient who requires a contrast CT study.

Guest:

Dr. Lauren Westafer is a board certified emergency physician at Baystate Medical Center and instructor in the Department of Emergency Medicine at the University of Massachusetts Medical School. She is author of the blog, The Short Coat, and cofounder of the emergency medicine podcast, FOAMcast. Lauren is currently funded by an NHLBI K12 grant (1K12HL138049-01) studying the implementation of evidence-based diagnosis of pulmonary embolism in the emergency department.

Case Overview

Case:

A 64-year-old woman with type-2 diabetes. She presents to the emergency department with chest pain and some shortness of breath. The acute coronary syndrome work-up is negative but she is Well's high and needs a CTPA to rule-out a pulmonary embolism. Her GFR is 50 and you are wondering if the contrast needed for the CT will cause an acute kidney injury (AKI) and if so, can you do anything to mitigate causing an AKI?

Background:

There has been a huge increase in the number of CT scans performed with more than 75 million CT scans performed in the US in 2013. Some scans require intravenous contrast (CTPA and CTCA) while in other cases it may improve image quality.

There has been a lot of ink spilled over contrast-induced nephropathy (CIN). It came out of case reports and non-controlled studies. Historically the CTs were done with high osmolar contrast material and these non-controlled studies showed a rise in AKI. However, we now use iso-osmolar or low osmolar contrast and we are not seeing kidneys die as a result.

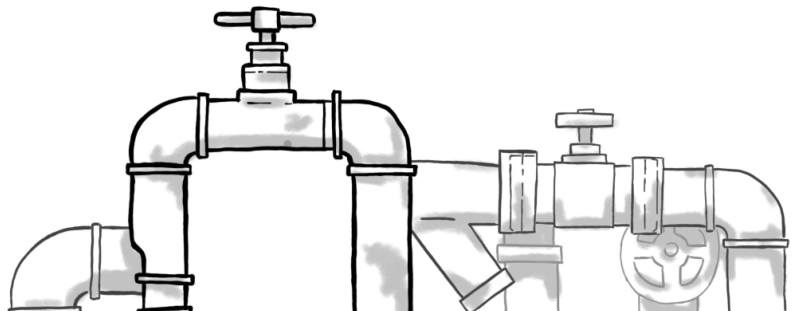
Multiple observational studies have been published demonstrating that AKI in the modern era does not exist. Part of the difficulty with this topic is the inconsistent definition of contrast-induced nephropathy. A common definition is an increase in creatinine level by 25% or an absolute increase of 0.3 to 0.5 mg/dL within 3 days.

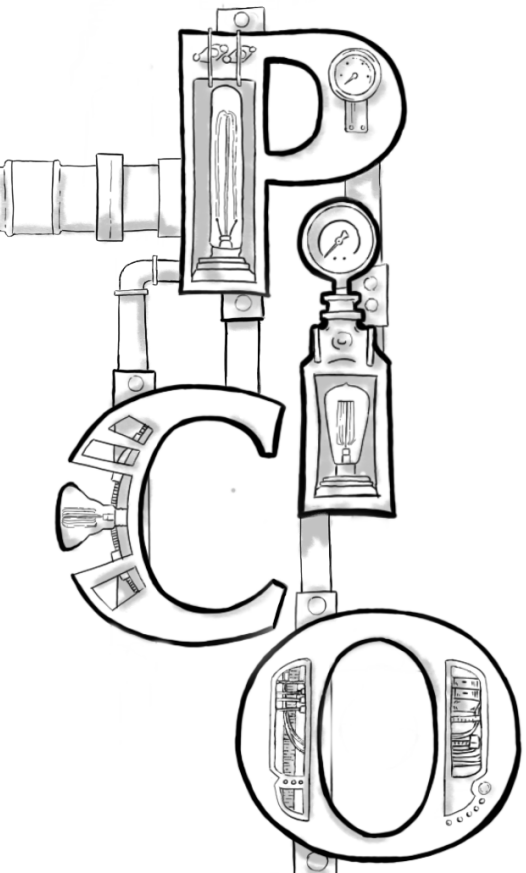
These are all disease-oriented outcomes (change in laboratory values) not patient-oriented outcomes like death or need for dialysis.

Reference:

Reference #1: Aycock, Westafer et al. Acute Kidney Injury After Computed Tomography: A Meta-analysis. Ann Emerg Med 2018 (CRD42017056195)

Reference #2: Weisbord SD, Gallagher M, Jneid H, et al; PRESERVE Trial Group. Outcomes after Angiography with Sodium Bicarbonate and Acetylcysteine. NEJM 2018 (ClinicalTrials.gov NCT01467466.)





Case #1

Population:
Adult humans

- **Exclusions:** Pediatrics, non-human studies, studies of contrast enhanced procedures (ex: coronary angiography), interventional studies, case reports, review articles, clinical guidelines, other meta-analyses

Intervention:
Contrast enhanced CT scans

Comparison:
Noncontrast CT scan

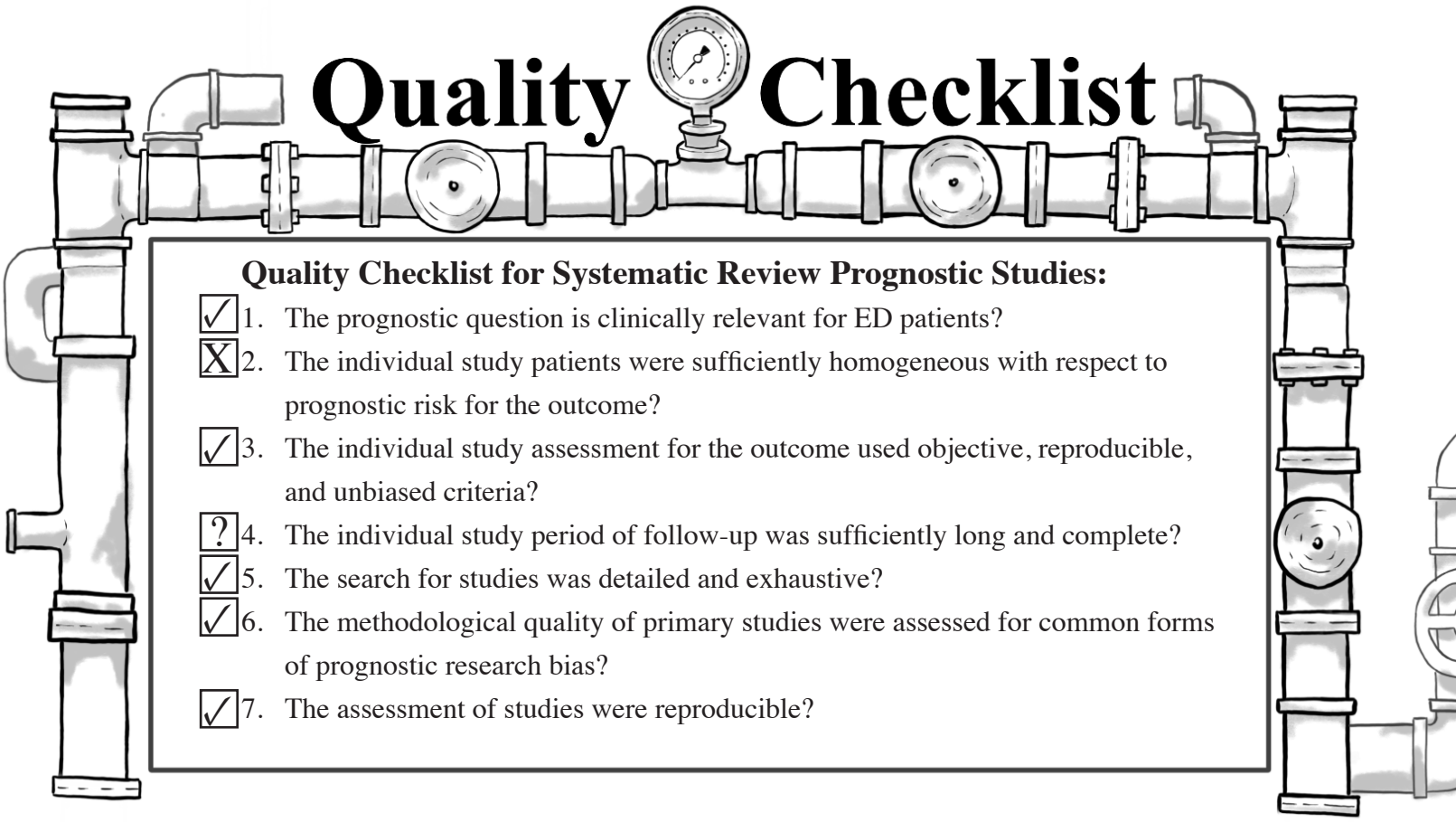
Outcomes:

- **Primary:** Incidence of acute kidney injury
- **Secondary:** Mortality or need for renal replacement therapy

Authors' Conclusion

"We found no significant differences in our principal study outcomes between patients receiving contrast-enhanced CT versus those receiving noncontrast CT. Given similar frequencies of acute kidney injury in patients receiving noncontrast CT, other patient- and illness-level factors, rather than the use of contrast material, likely contribute to the development of acute kidney injury."

Quality Checklist



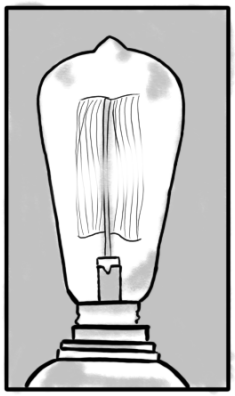
Quality Checklist for Systematic Review Prognostic Studies:

- ☑ 1. The prognostic question is clinically relevant for ED patients?
- ☒ 2. The individual study patients were sufficiently homogeneous with respect to prognostic risk for the outcome?
- ☑ 3. The individual study assessment for the outcome used objective, reproducible, and unbiased criteria?
- ? 4. The individual study period of follow-up was sufficiently long and complete?
- ☑ 5. The search for studies was detailed and exhaustive?
- ☑ 6. The methodological quality of primary studies were assessed for common forms of prognostic research bias?
- ☑ 7. The assessment of studies were reproducible?

Case Outcomes

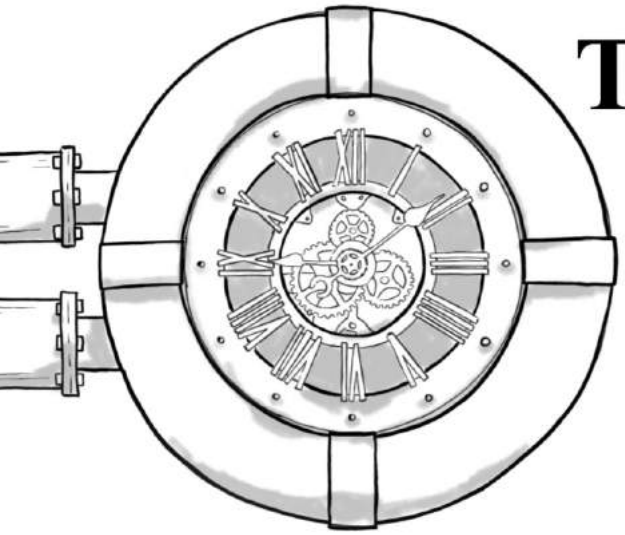
Key Results:
A total of 28 studies were included with over 100,000 patients. All of the studies were observational with the majority being retrospective chart reviews. Of the 28 studies, 26 evaluated and defined AKI, 13 measured the need for renal replacement therapy and 9 quantified all-cause mortality.

Contrast-enhanced CT was not significantly associated with acute kidney injury



Primary Outcome:
Incidence of acute kidney injury
- OR 0.94; 95% CI 0.83 to 1.07

Secondary Outcomes:
- Mortality OR 1.0; 95% CI 0.73 to 1.36
- Need for renal replacement therapy OR 0.83; 95% CI 0.59 to 1.16



Time to Talk Nerdy

Listen to the SGEM podcast on iTunes to hear Lauren's full response to my five nerdy questions.

1) Quality of Studies:

This SRMA only included observational studies, some retrospective and some prospective. I'm not saying garbage in, garbage out but it does limit the strength of conclusions that can be drawn.

Absolutely. We would have loved to have seen some RCTs but it's kinda hard to randomize someone who needs a scan for aortic dissection to a non-contrast scan – I think that might raise some flags with the IRB. On the other hand, I think it's important to take a gander at the evidence that was used to say PC-AKI was a thing to begin with – and that was case series and non-controlled studies…i.e. really subpar *"evidence".*

2) Publication Bias:

We know that publication bias can exist with positive studies being more likely to be published. Did you check for publication bias and if so, what did you find?

We did a funnel plot of publications, with an equal distribution of studies demonstrated visually. The Harbord-Egger test of bias was calculated to be –0.18 (P=0.70), indicating a low likelihood of publication bias.

3) Selection Bias:

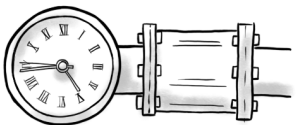
Because none of the studies were randomized, that can introduce selection bias. How could selection bias have been introduced into this SRMA and what impact do you think it would have on the results?

The type of CT scan being ordered would have been influenced by the baseline renal function. Also, could have resulted from the requirement for follow-up creatinine-level measurement, including a sicker cohort.

4) Measurement Bias:

There were differing definitions of AKI in the included studies and the timing of renal function measurements. Less than one in five studies reported renal function greater than 72 hours. How do you think that could impact the results?

We thought the differing definitions may affect the outcome because using the 25% rise in creatinine (Cr) definition, someone could go from a Cr of 0.7mg/dL (61.9 µmol/L) to 0.875 (84.4 µmol/L) and would meet the definition although these are both within normal limits – it's a super conservative definition. So we did a subgroup analysis – and no major differences except using 25% increase in creatine alone as a definition was associated with less AKI in the

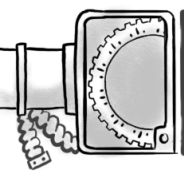


contrast arm…probably because it was just more sensitive in both arms. With the timing of follow-up this could overreport meaningful AKI if the Cr just goes back to normal. Again, we did a subgroup analysis and didn't find a difference in these groups either.

5) Heterogeneity:

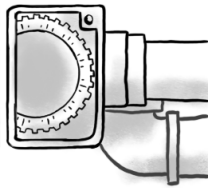
The heterogeneity for the primary outcome of AKI as measured by the I2 metric was fairly high (65.1%) indicating moderate heterogeneity. Some would suggest these studies should not be combined due to the differences between the studies.

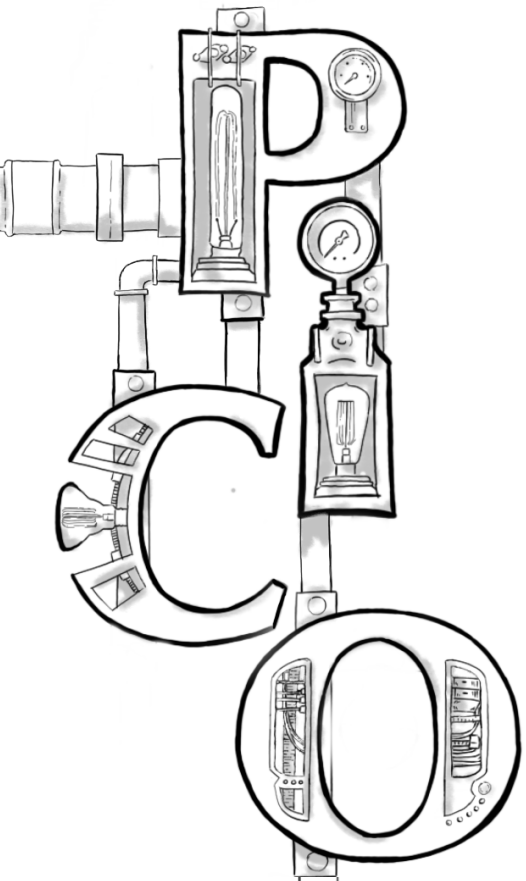
We saw the heterogeneity and it made sense given that a bunch of the studies weren't matched and were relatively small. Because of this we did, yes another subgroup analysis because we hypothesized that the higher quality or matched studies would be more homogenous and woila….when we examined those the I2 was 0% for matched studies and there was still no difference in odds of AKI. Also, the heterogeneity was low for the secondary outcomes…the patient oriented ones of mortality and need for dialysis.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' conclusions.





Case #2

Population:
Patients with compromised renal function (GFR 15-45 or 45-60 if diabetic)

- **Exclusions:** Patients who were undergoing emergency angiography and those with unstable baseline levels of blood creatinine. See list in Supplementary Appendix.

Intervention:
IV Sodium Bicarbonate or IV normal saline

Comparison:
Oral acetylcysteine (NAC) or Placebo

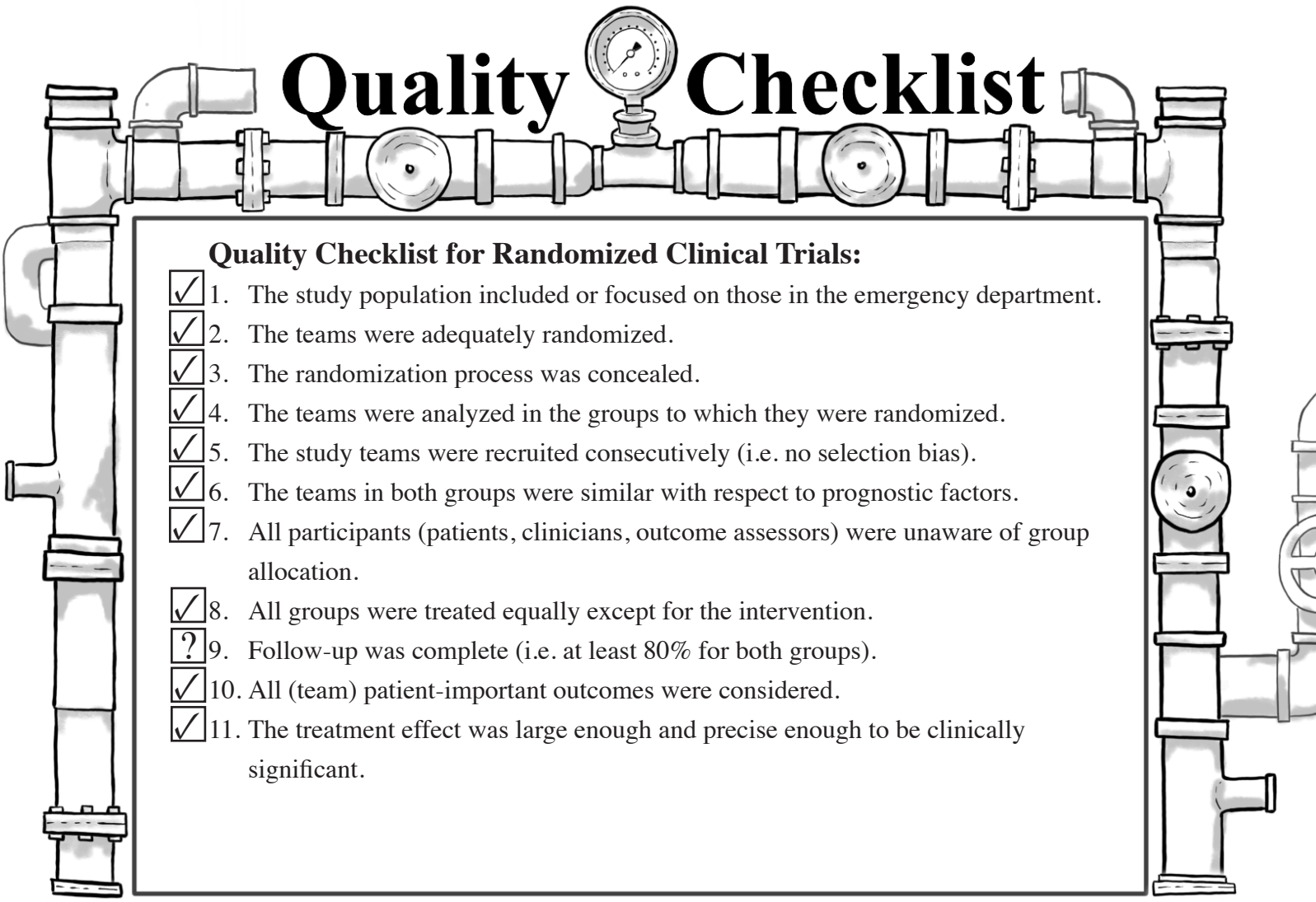
Outcomes:

- **Primary:** Composite of death, need for dialysis or >50% increase in creatinine 90-104 days post angiography (persistent impaired renal function)
- **Secondary:** Contrast-associated AKI (≥ 25% or 44 μmol/L) from baseline at 3–5 days after angiography; confirmed persistent kidney impairment; death; dialysis; hospitalization with acute coronary syndrome, heart failure or stroke by 90 days; or admission to hospital within 90 days.

Author's Conclusion

"Among patients at high risk for renal complications who were undergoing angiography, there was no benefit of intravenous sodium bicarbonate over intravenous sodium chloride or of oral acetylcysteine over placebo for the prevention of death, need for dialysis, or persistent decline in kidney function at 90 days or for the prevention of contrast-associated acute kidney injury."

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

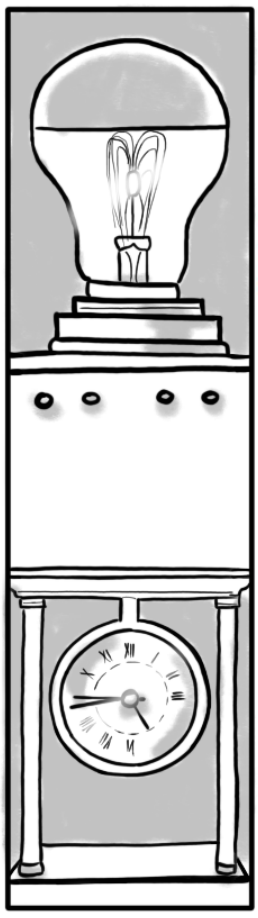
- ☑ 1. The study population included or focused on those in the emergency department.
- ☑ 2. The teams were adequately randomized.
- ☑ 3. The randomization process was concealed.
- ☑ 4. The teams were analyzed in the groups to which they were randomized.
- ☑ 5. The study teams were recruited consecutively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

Case Outcomes

Key Results:

There were 4,993 patients included in this trial randomized into 2-by-2 factorial design (2,511 sodium bicarb [NaHCO3], 2,482 sodium chloride [NaCl], 2,495 NAC and 2,498 placebo). The average age was 70 years, the vast majority (94%) were men, the median GFR was 50, 80% had diabetes and 90% of the procedures were coronary.

No difference in primary composite outcome or AKI between sodium bicarbonate and normal saline or between NAC and placebo.



Primary Outcomes:

Composite of death, the need for dialysis, or a persistent increase of at least 50% from baseline in the serum creatinine level at 90 days.

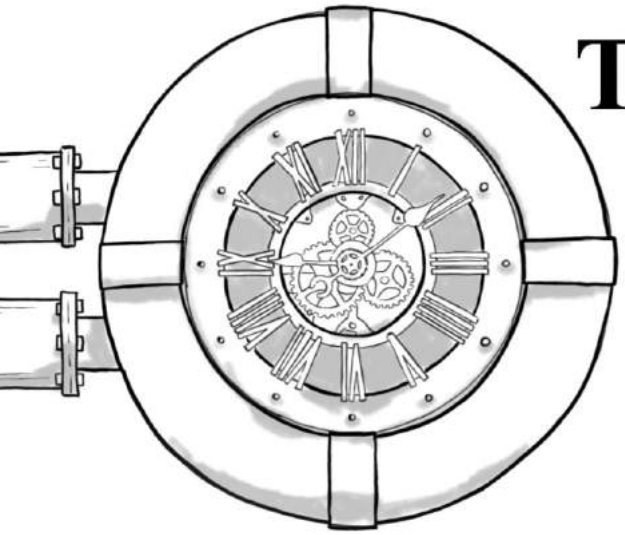
- No difference – around 4.5% for all four groups

Outcome	NaHCO3 vs. NaCl	OR (95% CI)	NAC vs. Placebo	OR (95% CI)
Composite	110 vs. 116	0.93 (0.72-1.22)	114 vs. 112	1.02 (0.78-1.33)
AKI	239 vs. 206	1.16 (0.96-1.41)	228 vs. 217	1.06 (0.87-1.28)

Secondary Outcomes:

No difference in any of the secondary outcomes

- Contrast-associated acute kidney injury (no difference)
- Death by 90 days (no difference)
- Need for dialysis by 90 days (no difference)
- Persistent kidney impairment by 90 days (no difference)
- Hospitalization with ACS, heart failure, or stroke by 90 days (no difference)
- All-cause hospitalization by 90 days (no difference)



Time to Talk Nerdy

1) Selection Bias/External Validity:

The population in this study was military veterans with stage 3 or 4 chronic kidney disease of whom 94% were male, 80% had diabetes and most (90%) were getting a contrast enhanced CT scan of their coronaries. This is a fairly select group and may limit the external validity to women, those without diabetes and those getting other forms of contrast enhances CTs.

2) Differences in Intervention:

The timing of initiation, duration, and rate of fluid administration varied between different sites.

3) Composite Outcome:

Having a composite outcome always makes the target bigger. They did not find a difference between the four groups. A concern always is that not all outcomes included in the composite are considered equal in importance. Persistent impairment in kidney function is not clinically equal to death or even the need for hemodialysis. However, they did report each component of the composite outcome and there were no differences between any of those outcomes either.

4) Stopped Early:

The trial was stopped early at the final interim analysis. They included only 5,177 (67.4%) of the patients minus those (4.1 to 9.2%) with missing creatinine levels. This is probably the biggest threat to the validity of this trial. The SGEM has talked about the problems of stopping trials early on previous episodes (SGEM#133, SGEM#137, and SGEM#183).

5) Confounders:

The primary endpoint was assessed at 90 days; therefore, the effect of the intervention may be confounded by other treatments in between the CT scan and the composite endpoint at three months.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' conclusions.

Clinical Application:
If a contrast enhanced CT study is needed for patient management you should get the scan even in high-risk patients.

Case Resolution:
The patient has the CTPA study done without receiving bicarb or NAC and no pulmonary embolism was identified. There was a small suspected pneumonia but requires clinical correlation.

What Do I Tell My Patient?:
There is no sign of heart attack or blood clot with the CT scan. However, we did pick up a possible early pneumonia on the CT scan. I have written a prescription for antibiotics. See your PCP next week and come back to the ED if you develop a rash, your shortness of breath gets worse or you are worried.

Episode End Notes

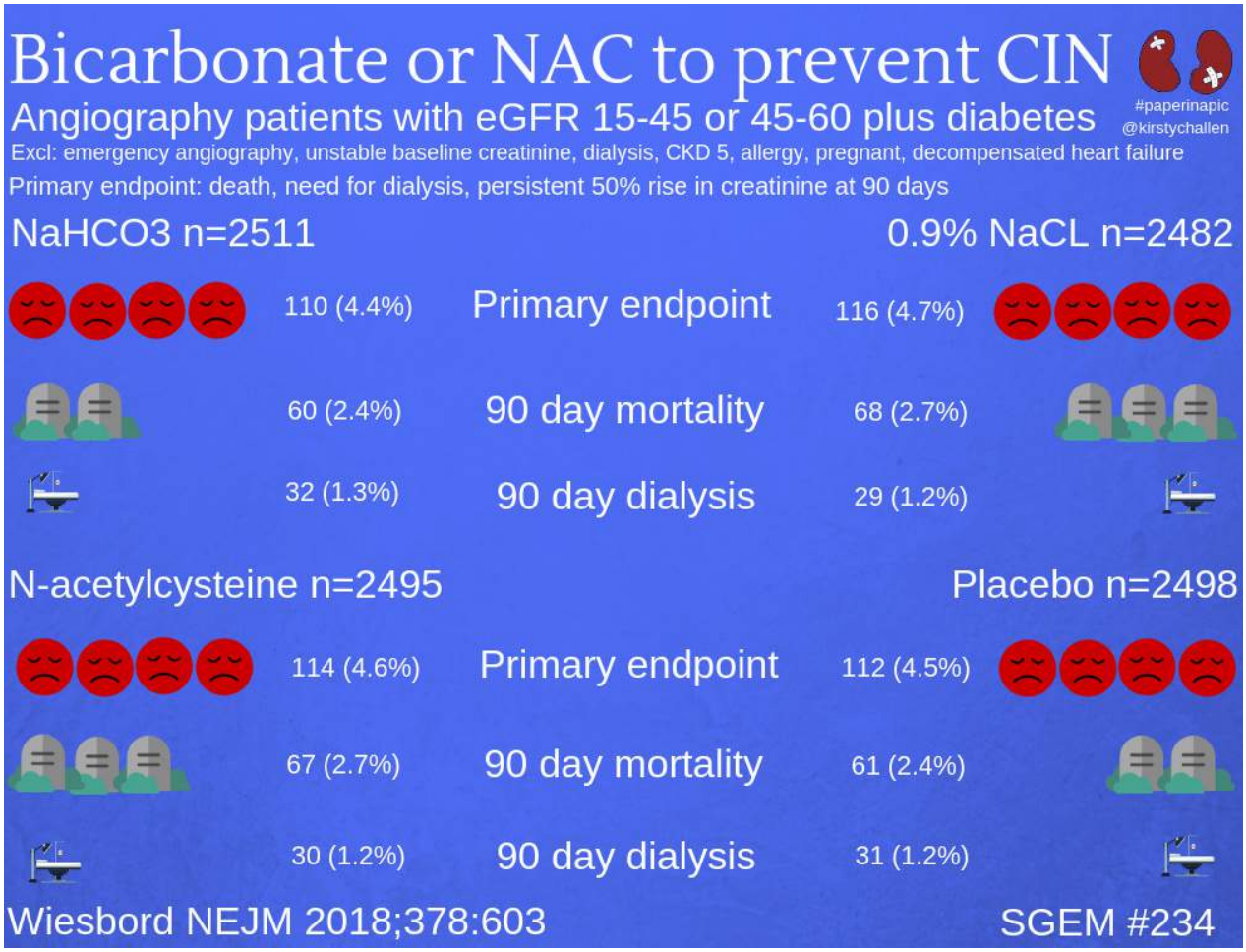
Do radiologists at your ED make it difficult to get a contrast enhanced CT scan due to the patients' renal function? #FOAMed #EBM

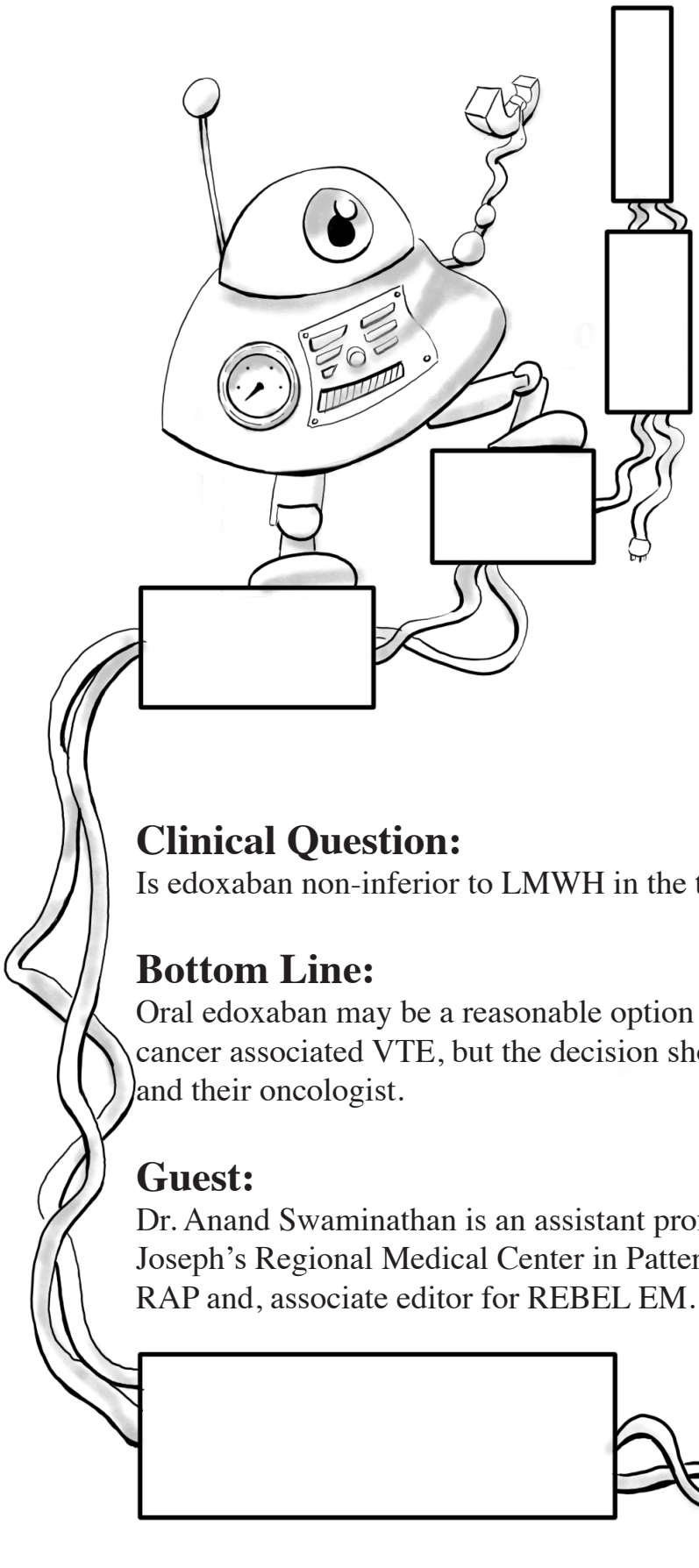
thesgem.com/2018/10/sgem23...

@LWestafer @CAEP_Docs @jeremyfaust @ACEPNow @srrezaie @BEEMcme @SAEMEBM @AnnalsofEM

- 49% All the time
- 36% Sometimes
- 9% Rarely
- 6% Never

179 votes • Final results





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Edoxaban for Cancer Associated VTE: Would the NEJM Lie to You?

Clinical Question:

Is edoxaban non-inferior to LMWH in the treatment of cancer-associated VTE?

Bottom Line:

Oral edoxaban may be a reasonable option to discuss with patients who have a cancer associated VTE, but the decision should probably be left up to the patient and their oncologist.

Guest:

Dr. Anand Swaminathan is an assistant professor of Emergency Medicine at the St. Joseph's Regional Medical Center in Patterson, NJ. He is a deputy editor for EM: RAP and, associate editor for REBEL EM.

Case Overview

Case:

A 43-year old woman with a history of breast cancer currently undergoing chemotherapy presents with mild chest pain. She is hemodynamically stable except for a heart rate of 105 and her pain is increased when she takes a deep breath. The chest x-ray is unremarkable, and you order a CT pulmonary angiogram (CTPA) which demonstrates a right segmental pulmonary embolism. You write a prescription for low molecular weight heparin (LMWH) and advise the patient that she will be taking shots for a couple of months. She tells you that a friend of hers had a clot in her leg and was given an oral blood thinner. She wants to know if you can prescribe that pill, so she doesn't have to take a shot.

Background:

Venous thromboembolism (VTE) occurs frequently in patient with cancer. Treatment in this group entails a number of challenges including a higher rate of thrombosis recurrence and a higher risk of bleeding. Standard therapy at this time for both symptomatic and asymptomatic VTE is with LMWH based on results from the CLOT trial (Lee 2003).

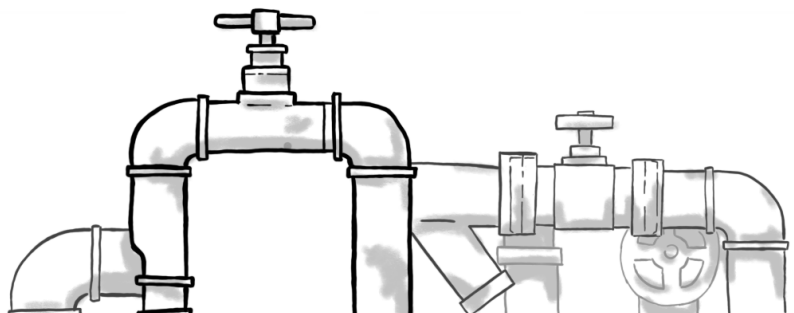
In non-cancer patients, new oral anticoagulants (NOACs) like rivaroxaban have been shown to be effective in treatment without increasing bleeding events. The NOACs also add ease of use for the patient.

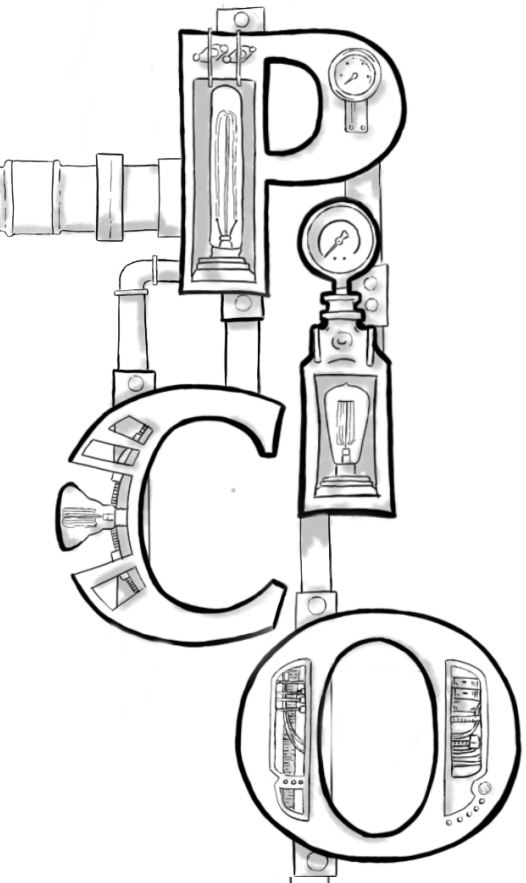
We covered using rivaroxaban on SGEM#126 with VTE guru Dr. Jeff Kline. This study suggested it was safe and effective to dry start (no LMWH needed) in certain patients with DVTs and PEs.

Though these agents are frequently used in the treatment of cancer-associated VTE, there is a dearth of evidence supporting this practice, in fact, none of the major agents – dabigitran, rivaroxaban, apixaban or edoxaban have undergone a well-done, randomized controlled trial.

Reference:

Raskob GE et al. Edoxaban for the Treatment of Cancer-Associated Venous Thromboembolism. NEJM 2018





Population:
Adult patients with active cancer or cancer diagnosed within the previous two years with acute symptomatic or asymptomatic deep-vein thrombosis (DVT) or pulmonary embolism (PE).

- **Exclusions:** See link to the list of exclusions in the Supplementary Appendix

Intervention:
LMWH for five days followed by oral edoxaban 60 mg daily for at least six months.

Comparison:
Subcutaneous (SQ) dalteparin 200 IU/kg daily (maximum dose 18,000IU) for one month followed by 150 IU/kg daily for at least five months.

Outcomes:

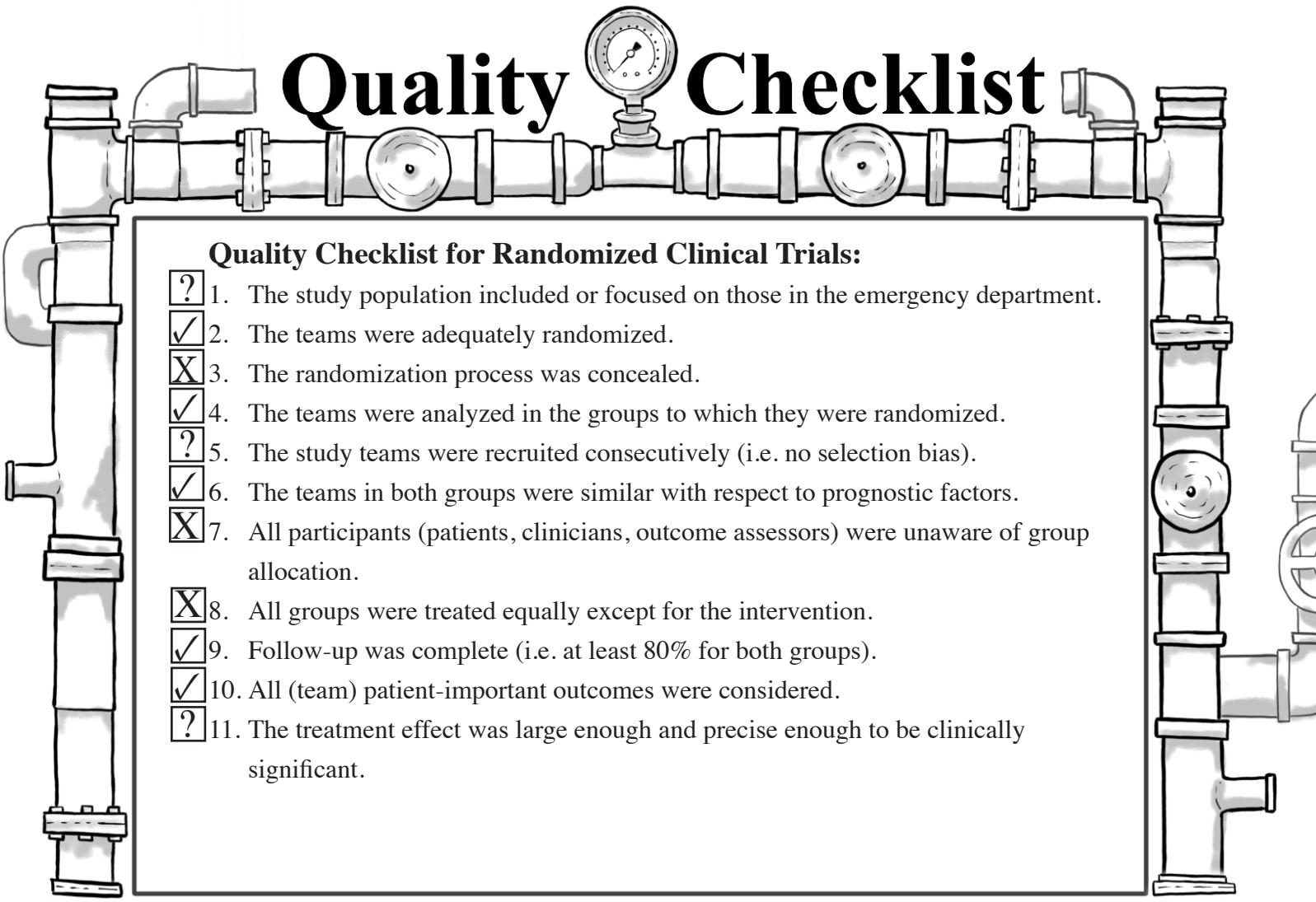
- **Primary:** Composite of recurrent VTE (DVT or segmental or more proximal PE) or major bleeding (overt bleeding associated with 2g/dL drop in hemoglobin or a transfusion of two or more units of blood during twelve-month follow up.

- **Secondary:** Clinically relevant non-major bleeding (CRNB), event-free survival, VTE-related death, all-cause mortality, recurrent DVT, recurrent PE. The complete list can also be found in the Supplementary Appendix.

Authors' Conclusion

"Oral edoxaban was noninferior to subcutaneous dalteparin with respect to the composite outcome of recurrent venous thromboembolism or major bleeding. The rate of recurrent venous thromboembolism was lower but the rate of major bleeding was higher with edoxaban than with dalteparin."

Quality Checklist



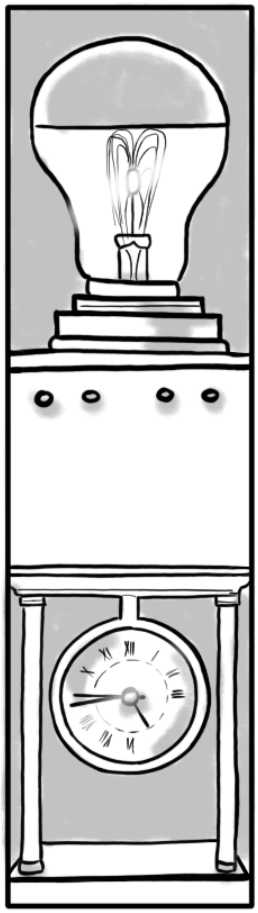
Quality Checklist for Randomized Clinical Trials:

- [?] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [X] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [?] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [✓] 6. The teams in both groups were similar with respect to prognostic factors.
- [X] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [X] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
- [?] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
This trial included 1,050 patients with the average age in the early 60's and close to a 50/50 male/female split. More than 50% had metastatic disease with almost 1/3 with recurrent disease.

Edoxaban was non-inferior to dalteparin for the primary outcome of recurrent VTE or major bleeding.



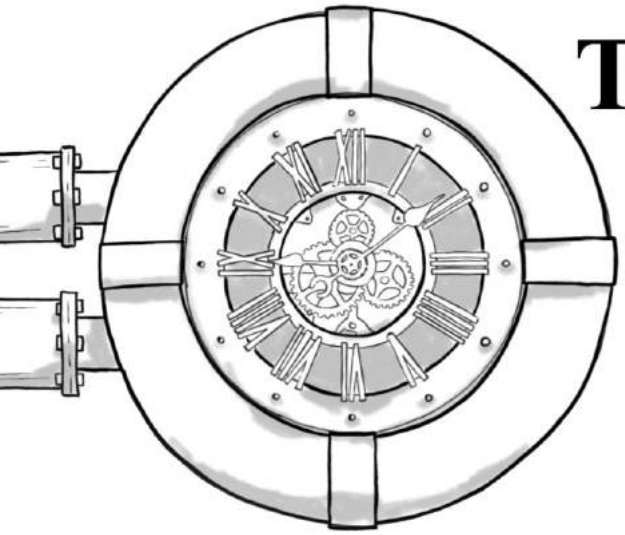
Primary Outcomes:

Recurrent VTE or major bleeding

- 12.8% vs 13.5 % HR 0.97 (95% CI 0.70 to 1.36 P=0.006 for non-inferiority)

Secondary Outcomes:

	Edoxaban	Dalteparin	Hazard Ratio (95% CI)
Recurrent VTE	41 (7.9%)	59 (11.3%)	0.71 (0.48 - 1.06) P=0.09
Recurrent DVT	19 (3.6%)	35 (6.7%)	0.56 (0.32-0.97)
Recurrent PE	27 (5.2%)	28 (5.3%)	1.00 (0.59 - 1.69)
Major Bleeding	36 (6.9%)	21 (4.0%)	1.77 (1.03 - 3.04) P=0.04
Clinically Relevant Non-Major Bleed	76 (14.6%)	58 (11.1%)	1.38 (0.98 - 1.94)
All-Cause Mortality	206 (39.5%)	192 (36.6%)	1.12 (0.92-1.37)
Event Free Survival	287 (55%)	296 (56.5%)	0.93 (0.77 - 1.11)



Time to Talk Nerdy

1) Consecutive Patients:

There is no mention in the manuscript if there were consecutive patients enrolled in the trial. Selection bias could have been introduced making the results harder to interpret. However, the Supplemental Appendix says: *"Adult subjects presenting with VTE associated with cancer (other than basal-cell or squamous-cell carcinoma of the skin) for whom long-term treatment with LMWH is intended are eligible to participate in the study."*It does not say *"all"* so we are unsure.

2) Emergency Patients:

It appears that these were patients recruited from outpatient clinics. Could the protocol be applied to emergency department patients being diagnosed with VTEs and would the outcomes be the same?

3) Lack of Blinding:

The patients were not blinded while the outcome assessors for major bleeding were unaware of group assignments. It is unsure if patients knowing what group they were assigned would have impacted the results. Why not just have placebo pills and SQ injections? This could have minimized this bias.

4) Combined Endpoint:

They made a composite outcome of efficacy (VTE recurrence) and safety (major bleed). Why not just have one primary outcome? They could have asked the patient what they thought the most important thing is from the list of all the secondary outcomes. Power the study to answer that question.

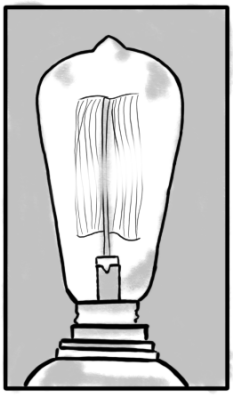
5) Patient Oriented Primary Outcome:

Let's drill down into the idea of a patient-oriented primary outcome. There was a lower recurrent VTE rate with edoxaban (7.9% vs. 11.3) but a higher major bleed rate (6.9% vs. 4.0%). This did not translate into a statistical difference in all-cause mortality or event free survival. So ultimately what is more important to patients?

6) Changed Primary Endpoint and Time Frame:

If you go to ClinicalTrials.gov you can see that they originally had a co-primary outcome. The primary efficacy outcome was incidence of recurrent VTE and the primary safety outcome was clinically relevant bleeding while on treatment. This was changed to *adjudicated* recurrent VTE or *major bleeding event*.

In addition, the original recurrent VTE time frame was six months. This was extended to twelve months. The original primary outcomes at six months can be found in the Supplementary Appendix. It showed non-inferiority of edoxaban compared to dalteparin for recurrent VTE but an increased HR for clinically relevant bleed (major or clinically relevant nonmajor bleeding). There was no difference in all-cause mortality or event-free survival.



Six Month Outcomes:	Edoxaban	Dalteparin	Hazard Ratio (95% CI)
Recurrent VTE	34 (6.5%)	46 (8.8%)	0.75 (0.48-1.17) P=0.2090
Clinically Relevant Bleed	83 (15.9%)	56 (10.7%)	1.54 (1.10-2.16)
All-Cause Mortality	140 (26.8%)	127 (24.2%)	1.14 (0.90-1.45)
Event-Free Survival	354 (67.8%)	360 (68.7%)	0.94 (0.76-1.17)

Searching through the changes on ClinicalTrials.gov site the it seems like the time frame change to 12 months for the outcome was only introduced September 28th, 2018. This is four years after the study began and on the day the results were 1st reported.

It's unusual to see a combination of the efficacy and safety as the primary outcome and given that we know the authors changed this, it almost seems like they were trying to hide the increased risk of bleeding.

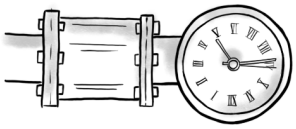
Personally, I'm more concerned about major bleeding in my patients than recurrent VTE which is common and expected in patients with cancer.

7) Cost:

There was no mention of the cost between oral edoxaban vs. SQ dalteparin? This was a multinational trial done in twelve different counties. Funding for medication is done differently from country-to-country. This issue may come into play when thinking about applying these results. A quick check of GoodRx.com showed edoxaban 60mg costs $4,200 for a one-year supply while Dalteparin costs SQ $36,800 (assume 80kg x 200IU/kg OD x 1 month + 150IU/kg OD x 11 months).

8) Non-Inferiority:

This was a non-inferiority trial design. They wanted to demonstrate that oral edoxaban was not worse than dalteparin in the parameters they measured. What about patient satisfaction? They did not ask the patient if they were happy with their care and if they would have liked to have been randomized into the other group. Was avoiding needles important to most of the patients? In the "real world" application would it mean more nursing visits for those getting SQ injections and less for those on oral medications? Would patients value the RN visit more than they disliked having a needle? These are all things to consider when contemplating how to apply these results. All that being said, compliance with the regimen suggests that patients preferred pills to shots.

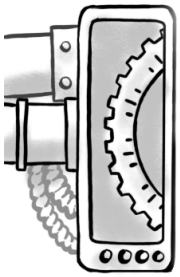


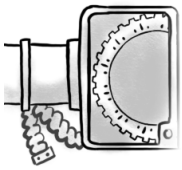
9) Conflicts of Interest:

The authors reported multiple conflicts of interest. The lead author and senior author both disclosed getting consultant fees and honoraria from Daiichi Sankyo during the conduct of the study. This does not make the data wrong but should make us more skeptical.

10) Sponsorship:

This trial was sponsored by Daiichi Sankyo the maker of edoxaban. This too does not make the data wrong. This pharmaceutical company, in collaboration with the coordinating committee, was responsible for the trial design, protocol and oversight. They were responsible for collection of the data and maintenance of the data. They also performed all the statistical analysis in collaboration with the writing committee. Daichi Sankyo would have a clear bias for demonstrating non-inferiority.

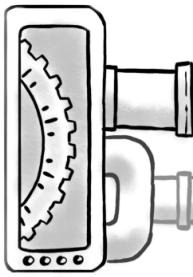


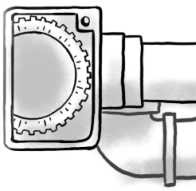


Comment on Authors' Conclusion Compared to SGEM Conclusion:

We would reversed the conclusions to emphasize the first to do no harm principle (primum non nocere). We also would have used the original co-primary outcome at six-months rather than the changed composite outcome at twelve months.

Our conclusion would have been: *"oral edoxaban had a higher rate of clinically relevant bleeding compared to dalteparin, was noninferior with respect to recurrent VTE and no statistically significant different was observed in all-cause mortality and event-free survival."*





Clinical Application:

The evidence for using edoxaban, or any other DOAC, in cancer-associated VTE is inconclusive. Though some of these agents are being preferentially used for treatment, we eagerly await future studies on the topic to determine if there is a most appropriate management. Consideration of DOACs on an individual patient basis is reasonable particularly if compliance and cost will be an issue but, should be done in concert with the patient's oncologist.

Case Resolution:

The patient is given LMWH as usual and referred back to her oncologist to discuss the possibility of going on an oral agent.

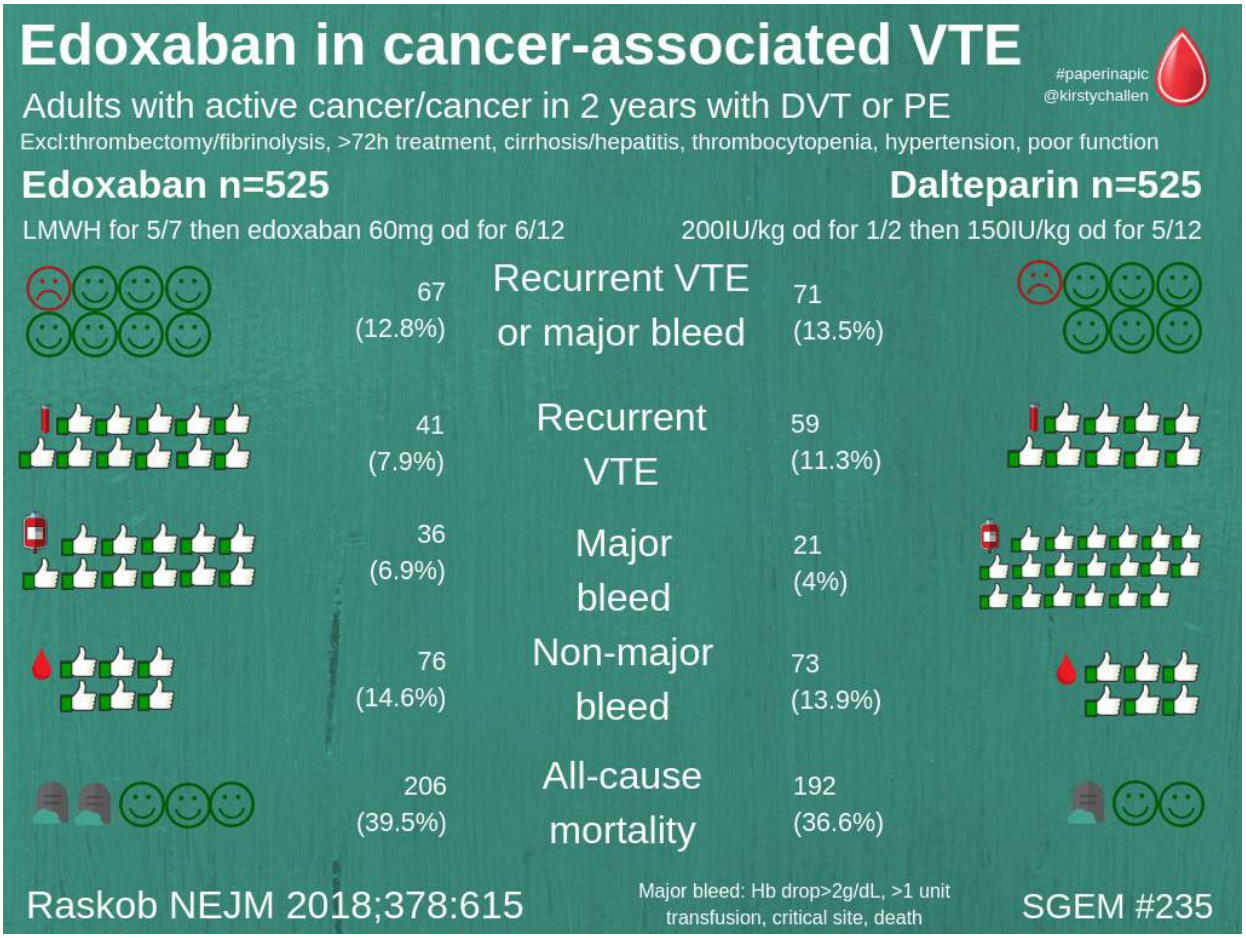
What Do I Tell My Patient:

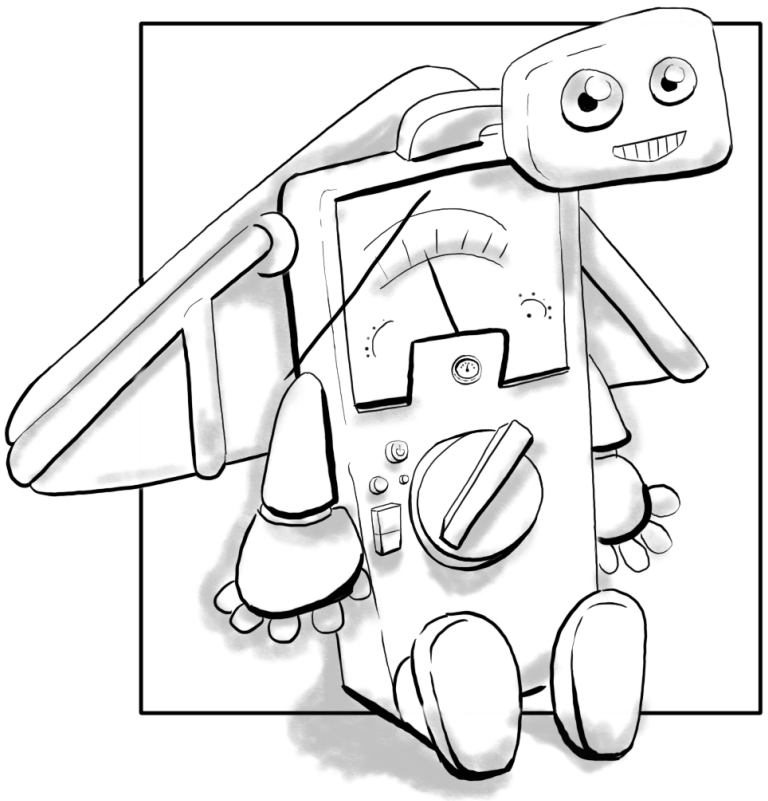
I understand why you might want a pill instead of a shot. A recent medical study shows that a pill was not inferior than a shot for preventing future blood clots. However, it did cause more bleeding. All the patients in the study got a shot once a day for at least the first five days before starting the pill. This option is something you can talk more about with your oncologist next week. I will send her a note saying you want to discuss taking a pill instead of a shot.

Episode End Notes

Other FOAMed:

- REBEL EM – Edoxaban in Cancer-Associated VTE
- PulmCrit – DVT-PE in cancer: Oral anticoagulant edoxaban non-inferior to enoxaparin





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TXA: Not for Brain Bleeds

Clinical Question:

Does administration of tranexamic acid reduce hematoma expansion and improve outcomes in adults with stroke due to intracerebral hemorrhage?

Bottom Line:

TXA does not currently have evidence of improving outcomes in hemorrhagic stroke and routine administration cannot be recommended at this time.

Guest:

Dr. Robert Edmonds is an emergency physician in the US Air Force in Virginia. This is Bob's eighth visit to the SGEM.

Disclaimer:

The views and opinions of this podcast do not represent the United States government or the US Air Force.

Case Overview

Case:

Your next patient is a stroke alert for a 67-year-old male living at a nursing home presents with severe right sided upper and lower extremity weakness noticed one hour ago while eating a meal. He obtains a stat head CT which shows an intracerebral hemorrhage. In addition to controlling his elevated blood pressure, you wonder if there is more you can offer this patient to improve his outcome and odds of survival. A resident points out that tranexamic acid (TXA) has been shown to decrease mortality for other hemorrhagic conditions, and questions if that could be helpful.

Background:

Stroke due to intracerebral hemorrhage (ICH) comprises approximately 20% of all strokes, but about half of all stroke deaths worldwide. Currently the only intervention known to adjust mortality in these cases is blood pressure management.

Lowering BP in ICH cases of was covered on SGEM#73: How Low Can You Go. The AHA Guidelines were updated since those episodes and recommend the following (Hemphill et al Stroke 2015):

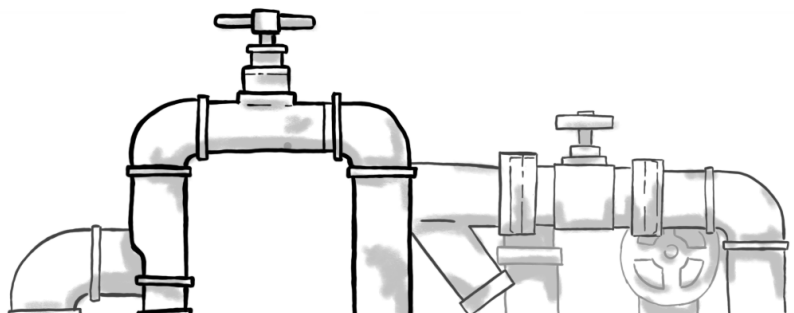
- *For ICH patients presenting with SBP between 150 and 220 mmHg and without contraindication to acute BP treatment, acute lowering of SBP to 140 mmHg is safe (Class I; Level of Evidence A) and can be effective for improving functional outcome (Class IIa; Level of Evidence B). (Revised from the previous guideline)*

- *For ICH patients presenting with SBP >220 mmHg, it may be reasonable to consider aggressive reduction of BP with a continuous intravenous infusion and frequent BP monitoring (Class IIb; Level of Evidence C). (New recommendation)*

SGEM#172: Don't Bring My Blood Pressure Down (Intensively) – The ATACH2 Trial did not support intensely lowing blood pressure. There was no statistical difference in death or disability between intensive blood pressure reduction (SBP 110-139 mm Hg) vs. standard blood pressure reduction (SBP 140-179 mm Hg) in patients with acute intracerebral hemorrhage.

TXA is a cheap drug that has been shown to improve mortality in trauma (CRASH-2), presumably due to its antifibrinolytic effect.

TXA has been discussed on the SGEM a number of times for epistaxis, trauma and post-partum hemorrhage:

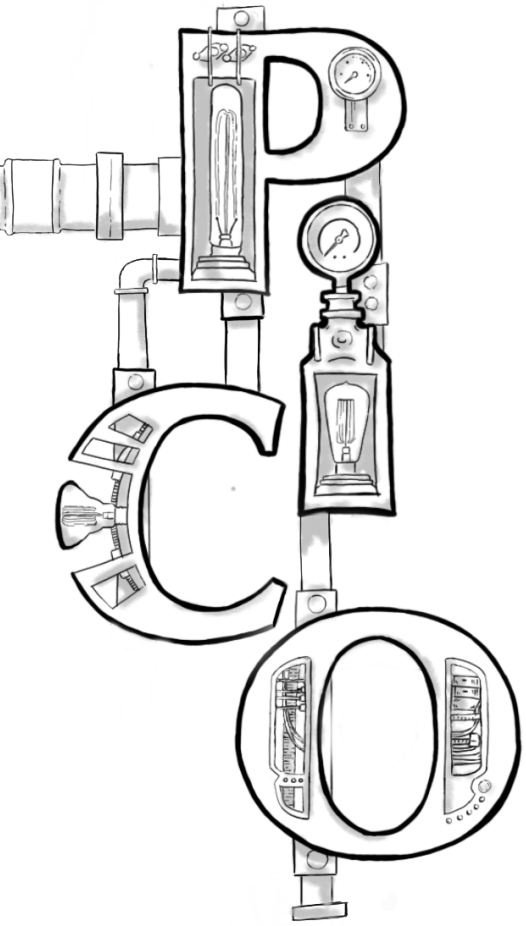


- SGEM#53: Sunday, Bloody Sunday (Epistaxis and Tranexamic Acid)
- SGEM#80: CRASH-2 (Classic Paper)
- SGEM#210: (Don't) Let it Bleed – TXA for Epistaxis in Patients on Anti-Platelet Drugs
- SGEM#214: Woman – The TXA Trial for Post-Partum Hemorrhage

Before this trial was started there were apparently only two small randomized control trials using TXA with a total of 54 patients. They provided no clear evidence for benefit or harm.

Reference:

Sprigg et al. Tranexamic acid for hyperacute primary IntraCerebral Haemorrhage (TICH-2): an international randomised, placebo-controlled, phase 3 superiority trial. Lancet. 2018



Population:
Adults with acute intracerebral hemorrhage admitted within eight hours of symptom onset.

- **Exclusion:** Intracerebral haemorrhage secondary to anticoagulation, thrombolysis, trauma, or a known underlying structural abnormality; patients for whom TXA was thought to be contra-indicated; pre-stroke dependence (mRS score >4); life expectancy less than three months; and GCS score less than five. A complete list of exclusion criteria is available in previous publication.

Intervention:
Administration of TXA, as a 1-gram loading dose in 100 ml normal saline (NS) over ten minutes, followed by another 1-gram in 250 ml NS over eight hours.over a three-year period from 2009-2012.

Comparison:
Placebo-normal saline administered with an identical regimen.

Outcomes:
Primary: Functional status at day 90 as assessed with the modified Rankin Scale (mRS).

Secondary:

- Neurological impairment at day seven or discharge (whichever came first).
- Radiological efficacy (change in hematoma volume from baseline to 24 hours and hematoma location).
- Health-related quality of life.
- Activities of daily living.
- Cognition and verbal fluency.
- Mood.
- Costs (length of hospital stay and discharge destination).

Authors' Conclusion

"Functional status 90 days after intracerebral haemorrhage did not differ significantly between patients who received tranexamic acid and those who received placebo, despite a reduction in early deaths and serious adverse events. Larger randomised trials are needed to confirm or refute a clinically significant treatment effect."

Quality Checklist

Quality Checklist for Randomized Clinical Trials:

- [?] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [?] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [✓] 6. The teams in both groups were similar with respect to prognostic factors.
- [✓] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
- [X] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

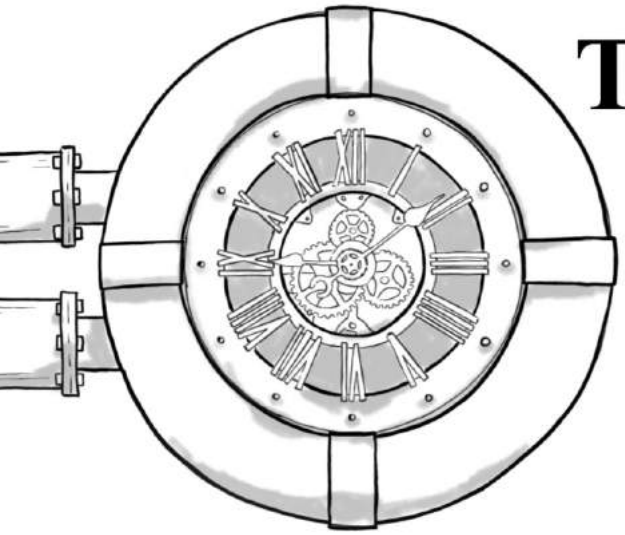
Key Results:
They enrolled 2,325 patients into the trial. The mean age was 69 years old with 56% being male. The median time from stroke onset to randomization was 3.6 hours.

No difference in mrs at 90 days between those who received tranexamic acid and placebo.

Primary Outcomes:
Adjusted odds ratio 0.88 (95% CI 0.76-1.03, p=0.11)

Secondary Outcomes:
There were no significant differences in any of the day 90 functional outcomes between treatment groups, including length of hospital stay and discharge disposition.

- By day seven, fewer patients had died in the TXA group (9%) than placebo (11%, p=0.04)
- Survival did not differ between groups over 90 days (adjusted hazard ratio 0.92, 95% CI 0.77-1.10, p=0.37)



Time to Talk Nerdy

1) Safety:

Although the trial failed to show a benefit for patients, it did show a decrease in serious adverse events (day two 33% vs. 36%, p=0.0272; day seven 39% vs. 43%, p=0.0200; day 90 45% vs. 48% p=0.0393), which notably included no increase in VTE (3% both groups, p=0.98). The authors point out how this study group was significantly older with more comorbidities than previous studies of TXA. This suggests that if there is another condition this patient with a hemorrhagic stroke has, such as a trauma resulting from an MVC, it does not appear less safe merely because of the presence of the hemorrhagic CVA.

2) Modified Rankin Scale (mRS) Score:

Previous study by Wilson et al 2005 has demonstrated substantial inter-rater reliability. In addition, these assessments were done by telephone interview and if could not be contacted were mailed a survey. This brings into question the accuracy of this primary outcome assessment.

3) Early Deaths:

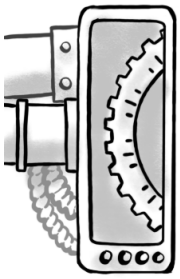
The study did show a reduction in early deaths by day seven. However, the difference disappeared by day 90. There was no difference in length of hospital stay or discharge disposition, so its hard to say what these patient's clinical course looked like. The participants' seven day NIHSS scores were the same between groups (10.13 vs. 10.29) so it suggests that administration of TXA did not result in a temporary improvement in functional status in the group of treatment patients that showed a delay in death, between day seven and 90.

4) Ordinal Analysis:

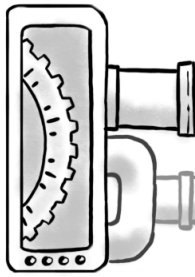
Stroke outcomes using the mRS had traditionally used a dichotomous outcome. It was usually divided into a good neurologic outcome (0-1 or 0-2) or a poor neurologic outcome (2-6 or 3-6). Proponents of using an ordinal analysis argue more granularity can be found using an ordinal shift approach rather than using a dichotomous approach. A problem with this is it assumes a uniformity of the treatment effect across the entirety of the scale. We have already mentioned the problem with inter-rater reliability. Expecting precision from the clinical uncertainty in stroke outcome measure is a problem. We can all agree on no disability (mRS 0) and death (mRS 6) but it becomes much more difficult to agree on the other ordinals. The way ordinal analysis can be used to manipulate conclusions can be seen in the IST-3 trial that was a negative trial for the primary outcome but was spun into a positive trial using a secondary ordinal analysis. We discussed this on SGEM#29. If you are interested in learning more about the issues with ordinal analysis check out Rory Spiegel's post on EMNerd.

5) Hypothesis Generating:

They discuss some of their subgroup analyses in the discussion. While these are interesting, they should not be overinterpreted. They also discuss that they may not have given TXA soon enough to show benefit. These should be viewed as hypothesis generating. If they want to answer these specific questions about certain subgroups and timing, they need to design a properly powered trial. Until that point all they can do is speculate.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree with the authors' conclusion, especially with their assertion that additional studies are needed to confirm or refute a clinically significant treatment effect. They did find a statistically significant reduction in early deaths by day seven, and larger trials could show this to be a true finding.



Clinical Application:
No change to my current management of a hemorrhagic stroke. However, if the stroke results in a significant trauma or other condition requiring TXA, this study may be used to justify giving TXA for the other condition, as there were no increased serious adverse events in this trial.

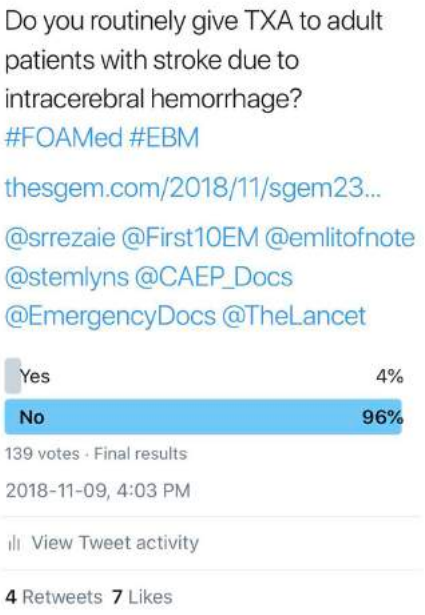
What Do I Tell My Patient?:
We are going to do everything we can to control your blood pressure to help increase your chances of doing well. We'll be talking with some other doctors that will be helping you while you stay in our hospital.

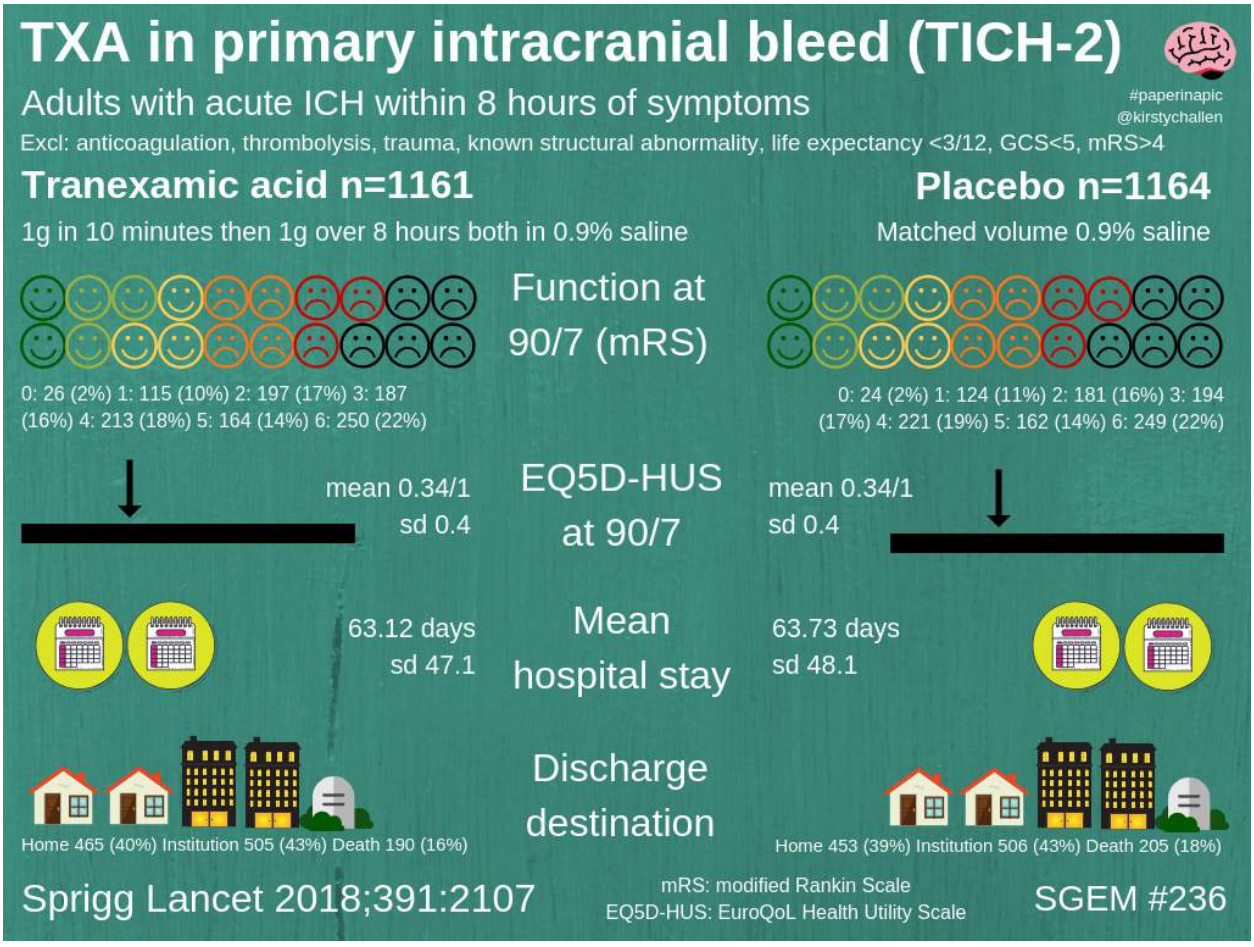
Case Resolution:
You manage the patient's blood pressure and contact the appropriate specialists for admission to the intensive care unit. You commend the resident for their thought process but inform them of this trial and that TXA did not show benefit, so you will not give it.

Episode End Notes

Other FOAMed:

- First10EM: TXA for ICH
- St. Emlyn's: TICH TICH BOOM? TXA in ICH
- REBEL EM: TXA for Spontaneous ICH?
- EM Literature of Note: If It Bleeds, It Can Get TXA?





237 Screening Tool for Child Sex Trafficking

Trigger Warning

As a warning to those listening to the podcast or reading the blog post, there may be some disturbing things discussed. The SGEM is free and open access trying to cut the knowledge translation down to less than one year. It is intended for clinicians providing care to emergency patients, so they get the best care, based on the best evidence. Some of the material could be considered explicit, graphic, offensive, and/or upsetting. As a trigger warning, if you are feeling upset by the content then please stop listening or reading. There will be resources listed at the end of the blog for those looking for assistance.

Clinical Question:

What is the utility of a CST screening tool in a high-risk patient population presenting to a large inner-city pediatric emergency department?

Bottom Line:

Child sex trafficking is a global problem and can be discovered in the emergency department through application of a simple screening tool.

Guest:

Dr. Chris Bond is an emergency medicine physician and clinical lecturer in Calgary. He is also an avid FOAM supporter/producer through various online outlets including TheSGEM.

You may have noticed there was no music for the introduction. Part of the SGEM brand is to have some fun and engaging theme music to help with knowledge translation. This topic of child sex trafficking is very serious and disturbing. I struggled with what would be an appropriate song choice. After thinking about it and not coming up with something acceptable I went to twitter to ask my #FOAMed friends.

It was Minh Le Cong (@Ketaminh) who suggested no music for this episode and perhaps a period of silence. Mitochondrial Eve (@BrowOfJustice) agreed and said that she uses silence to great effect frequently. I hold both of these wise people high regard and value their opinion. I listened, and I heard what they said and that is why there was silence rather than song to introduce this SGEMHOP episode on child sex trafficking.

Case Overview

Case

A 15-year-old girl presents to the emergency department with pelvic pain. She is with a parent and after the initial introductions and history, you have her parent leave the room to ask more sensitive questions. Upon further history, you discover that she has been having pelvic pain with genital discharge and has had more than ten sexual partners in their lifetime. Eventually, you discover that she has also been drinking alcohol and endorses that she has exchanged sex for drugs in the past.

Background

Child sex trafficking (CST) is a global human rights violation and occurs when a minor is engaged in any sex act which involves an exchange of something of perceived value, whether monetary or non-monetary (1,2).

Examples of CST include prostitution of children by others, *"survival sex"* (runaway/homeless children having sex in exchange for shelter or something else needed to survive), working in sex-oriented businesses, or production of child sexual abuse materials (3,4).

Statistics from the United States Human Trafficking Reporting System indicate that 85% of identified sex trafficking victims were US citizens/legal residents and 55% were minors (5).

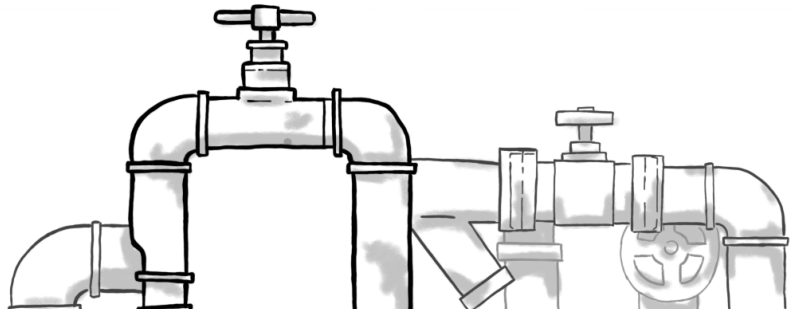
Statistics on trafficking in persons in Canada from 2016 reveal the following (Juristat Bulletin):

- Number of police-reported incidents of human trafficking on the rise and is at the highest level since data became available in 2009 (0.94/100,00 people)
- One in three police-reported human trafficking incidents is a cross-border offence
- More than half of human trafficking incidents involve another offence, usually prostitution
- The vast majority (95%) of the victims of human trafficking are women, 72% are under 25 years of age and most of the people accused of human trafficking are male (81%).

Risk factors associated with CST include a history of abuse, substance use, juvenile justice system involvement, a history of running away from home and LGBTQ status (6-12).

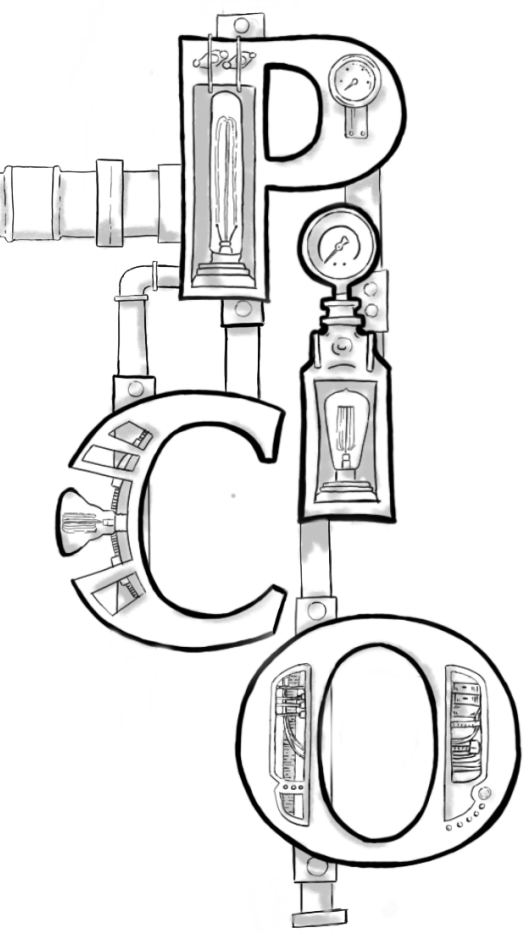
Victims of CST are at risk for a myriad of health-related consequences, including physical injury, chronic pain, STIs, substance use disorders and psychiatric disorders such as PTSD, depression and suicide (13-16).

Most of these victims seek medical attention at some point, with 88% having seen a physician during their exploitation (15).



Reference

Kaltiso et al. Evaluation of a Screening Tool for Child Sex Trafficking Among Patients with High-Risk Chief Complaints in a Pediatric Emergency Department. AEM October 2018.



Population:
Patients aged 10-18 years of age presenting with high-risk chief complaints or if the attending physician was concerned about high-risk sexual or social behaviour regardless of the chief complaint. (Chief complaints: vaginal/penile discharge, pelvic/genital pain, request for sexually transmitted infection testing, request for pregnancy testing, intoxication/ ingestion, suicide attempt, suicidal ideation, homicidal ideation, acute sexual assault, traumatic assault, clearance examination for social services, and behavioral complaints.)

- **Exclusions:** Non-English speakers, patients with intellectual disabilities, acute emergencies, severe pain, or need for stabilization and if the attending physician requested that the patient not be interviewed (typically if they felt that the patient was too young to be asked questions about sexual history or drug use).

Intervention:
Child sex trafficking (CST) screening tool

Comparison:
None. The screening tool was previously developed from a comparison of CST victims to patients presenting with complaints of acute sexual assault without a commercial component.

Outcome:
Diagnostic accuracy of the child sex trafficking screening tool (sensitivity, specificity, PPV and NPV).

Child Sex Trafficking Screening Tool:

Screening tool questions:
• Have you ever broken any bones, had any cuts that required stitches, or been knocked unconscious?
• Some kids have a hard time living at home and feel that they need to run away. Have you ever run away from home?
• Kids often use drugs or drink alcohol, and different kids use dif ferent drugs. Have you used drugs or alcohol in the past 12 months?
• Sometimes kids have been involved with the police. Maybe for running away, for breaking curfew, for shoplifting. There can be lots of different reasons. Have you ever had any problems with the police?
• *Added question for transition into sexual history:* Have you ever had sex of any type? (penis in vagina *or* penis/finger in "butt" *or* mouth on penis *or* mouth on vagina)
• How many sexual partners have you had?
• Have you ever had a STI, like herpes or gonorrhea or chlamydia or trichomonas?

Secondary questions:
• Has a boyfriend, a girlfriend or anyone else ever asked you, or forced you, to do something sexual with *another* person (including oral sex, vaginal sex, or anal sex with someone else)?
▪ Do you feel comfortable telling me about it?
• Has anyone ever asked or forced you to do some sexual act in public, like dance at a bar or a strip club?
▪ Do you feel comfortable telling me about it?
• Sometimes kids are in a position where they really need money, drugs, food, or a place to stay. Have you ever traded sex for money, drugs, a place to stay, a cell phone, or something else?
▪ Do you feel comfortable telling me about it?
• Has anyone ever asked you to pose in a sexy way for a photo or a video?
▪ Do you feel comfortable telling me about it?

Authors' Conclusion

"Applied to an inner-city PED population of 203 participants with high-risk chief complaints, the screening tool has high sensitivity and high negative predictive value. This makes it appropriate for an initial screening to rule out CST in this high-risk population. Applicability for broader use and additional practice settings are warranted given the significant positivity rate among those presenting with high-risk concerns."

Quality Checklist

Quality Checklist:

- ☑ 1. The clinical problem is well defined.
- ? 2. The study population represents the target population that would normally be tested for the condition (i.e. no spectrum bias).
- ☑ 3. The study population included or focused on those in the emergency department.
- ☒ 4. The study patients were recruited consecutively (i.e. no selection bias).
- ☑ 5. The diagnostic evaluation was sufficiently comprehensive and applied equally to all patients (i.e. no evidence of verification bias).
- ☑ 6. All diagnostic criteria were explicit, valid and reproducible (i.e. no incorporation bias).
- ? 7. The reference standard was appropriate (i.e. no imperfect gold-standard bias).
- ? 8. All undiagnosed patients underwent sufficiently long and comprehensive follow-up.

Case Outcomes

Key Results

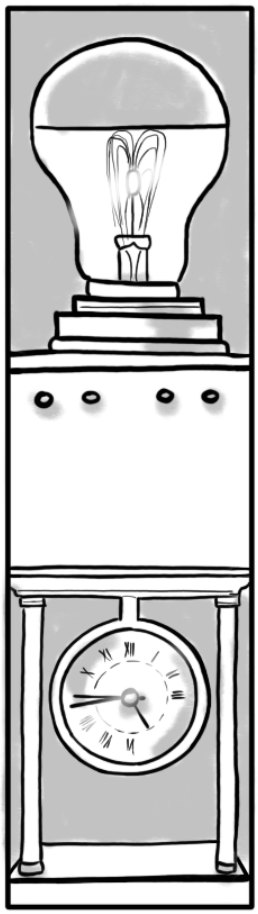
This trial involved 203 participants out of 254 eligible patients. Almost half, (100/203) screened positive with the tool. There were eleven CST victims identified, for a prevalence of 5.4%. Ten out of the eleven victims screened positive with the screening tool.

Using a cut off score of two positive answers out of six, the tool demonstrated sensitivity of 90.9% and NPV of 99.0%

Primary Outcomes:

Diagnostic accuracy of CST screening tool

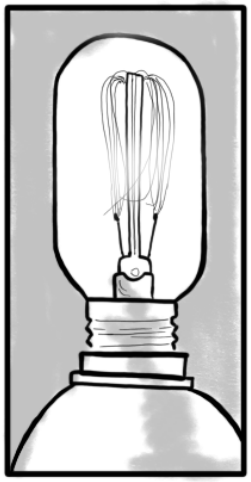
- Sensitivity 90.9% (95% CI 58.7%-99.8%)
- Specificity 53.1% (45.6-60.4%)
- PPV 10.0% (5.0-17.6%)
- NPV 99.0% (94.7-99.9)

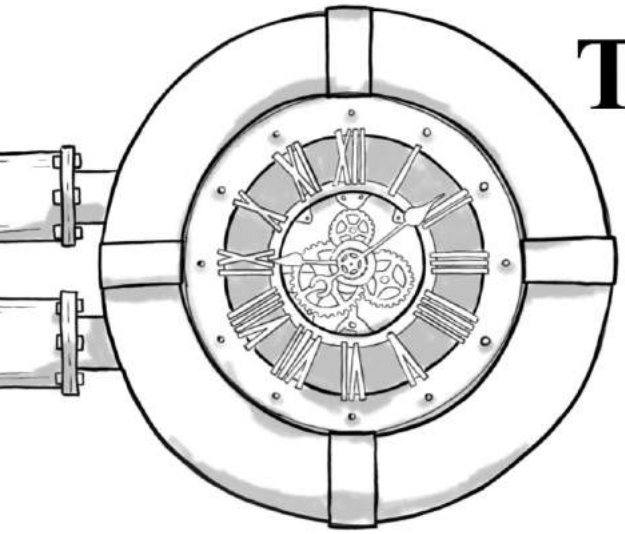


Statistic	Formula	Value	95% CI
Sensitivity	$\frac{a}{a+b}$	90.91%	58.72% to 99.77%
Specificity	$\frac{d}{c+d}$	53.12 %	45.81% to 60.35%
Positive Likelihood Ratio	$\frac{Sensitivity}{1-Specificity}$	1.94	1.53 to 2.47
Negative Likelihood Ratio	$\frac{1-Sensitivity}{Specificity}$	0.17	0.03 to 1.11
Disease prevalence	$\frac{a+b}{a+b+c+d}$	5.42% (*)	2.74% to 9.49%
Positive Predictive Value	$\frac{a}{a+c}$	10.00% (*)	8.04% to 12.38%
Negative Predictive Value	$\frac{d}{b+d}$	99.03 % (*)	94.00% to 99.85%
Accuracy	$\frac{a+d}{a+b+c+d}$	55.17% (*)	48.05% to 62.14%

Other Findings:

- Mean age of CST victims was 15.9 years (13-18), nine females and two males.
- Presentation of CST victims included alone, with a parent/guardian, with a friend, a police officer and a social services case manager.
- 55% of CST victims had seen a medical provider within the past six months.
- History items strongly associated with CST were: more likely to have run away from home, have used drugs/alcohol in the past twelve months, have had more than ten sexual partners and have had a prior sexually transmitted infection.
- There was no chief complaint among the inclusion criteria that correlated significantly with CST presentation.





Time to Talk Nerdy

Listen to the podcast on iTunes to hear Sheri-Ann's responses to our ten nerdy questions.

1) Selection Bias:

This was a convenience sample and could have introduced some selection bias into the study. You excluded non-English speaking patients. This would seem to be a high-risk group. You also excluded patients if the attending physician requested that the patient not be interviewed. This was typically if the clinician felt that the patient was too young to be asked questions about sexual history or drug use. Do you think that could have introduced some bias?

2) 18-Years-Old:

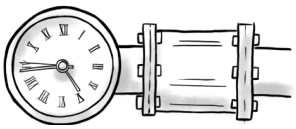
You included 18-year-olds in the study. This is a group that could be voluntarily participating in stripping/commercial sex work.

3) Gold Standard:

A patient was considered to be a *"true"* CST victim if the information obtained during the emergency department visit met with the US Department of State definition of CST. Do you think this represents a *"true"* gold standard?

4) Follow-Up:

Another concern we had was if the follow-up was long enough and comprehensive enough to identify any missed cases.



5) Prevalence:

The number of cases was small (11/203) and predictive value is based on prevalence. While the point estimate for NPV looked good (99%) because of so few cases and the 95% confidence interval was fairly wide (down to 94.7%). This means it would miss up to 1 in 20 case. Can you comment on this issue and if missing 5% of child sex trafficking cases would be acceptable?

6) Tip of the Iceberg:

How much is this a *"tip of the iceberg"* phenomenon in this study, and how many CST victims do you think we are missing?

7) Labor Trafficking:

This was not addressed and is more common than sex trafficking. Do you have any comments on this issue?

8) External Validity:

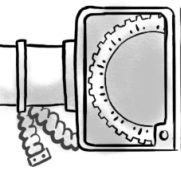
This was a single center study done in an urban pediatric emergency department. How do you think this would translate into a community emergency department?

9) Screening Tool:

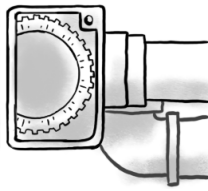
The CST screening tool was administered by an independent researcher. Do you envision the triage nurse adding this to their workload? If yes, will they be as good as a research assistant and how will this impact department flow?

10) Anything Else?

Is there anything else you would like to say about your screening tool or child sex trafficking in general?



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the authors' conclusions.



Clinical Application:

Use a CST screening tool in adolescents with high risk presenting complaints in the ED.

Case Resolution:

After discovering that your patient has traded sex for drugs, you have your social worker see the patient while you continue the work up for her acute medical illness.

What Do I Tell My Patient?:

I am very concerned about some of the things you are telling me, so I would like to have our social worker speak with you more about this concern.

Additional Information and Resources:

- National Human Trafficking Resource Center 24 hour Hotline 1-888-373-7888
- Department of Health & Human Services (Call when suspect unaccompanied foreign national child is victim of trafficking) 202-205-4582
- Resources for physicians HEAL Trafficking
- Victim Services Huron County (Ontario, Canada) – Sex Trafficking is not only an Urban Isssue
- Centre for Addiction Mental Health – Free online course helps service providers support survivors of human trafficking
- British Columbia (Canada) – Office to Combat Trafficking in Persons

References:

1. 2016 UNODC Global Report on Trafficking in Persons. United Nations Publication, Sales No E16IV6. Vienna: United Nations Office on Drugs and Crime, 2016. 2.
2. U.S. Department of State. Victims of Trafficking and Vio- lence Protection Act of 2000. Pub L No. 106-386 Division A. 2001 103(8); Available at: https://www.state.gov/j/tip/laws/61124.htm. Accessed May 7, 2018.
3. Greijer S, Doek J. Interagency Working Group on Sexual Exploitation of Children. Terminology Guidelines for the Pro- tection of Children From Sexual Exploitation and Abuse. Lux- embourg 2016. Available at: http://www.ilo.org/wc msp5/groups/public/—ed_norm/—ipec/documents/instruc- tionalmaterial/wcms_490167.pdf. accessed on 5/7/18
4. Institute of Medicine and National Research Council. Confronting Commercial Sexual Exploitation and Sex Trafficking of Minors in the United States. Washington, DC: The National Academies Press, 2013.
5. Banks D, Kyckelhahn T. Characteristics of Suspected Human Trafficking Incidents, 2008–2010. Washington, DC: U.S. Department of Justice, 2011.
6. Williamson C, Prior M. Domestic minor sex trafficking: a network of underground players in the midwest. J Child Adolesc Trauma 2009;2:1–16.
7. Reid JA. Risk and resiliency factors influencing onset and adolescence-limited commercial sexual exploitation of disadvantaged girls. Crim Behav Mental Health 2014;24:332–44.
8. Reid JA, Baglivio MT, Piquero AR, Greenwald MA, Epps N. Human trafficking of minors and childhood adversity in Florida. Am J Public Health 2017;107:306–11.
9. Bigelsen J, Vuotto S. Homelessness, Survival Sex and Human Trafficking: As Experienced by the Youth of Cove- nant House New York. 2013. Available at: https://humantraffickinghotline.org/sites/default/files/Homelessness% 2C%20Survival%20Sex%2C%20and%20Human%20Traff icking%20-%20Covenant%20House%20NY.pdf. Accessed Oct 29, 2017.
10. Chettiar J, Shannon K, Wood E, Zhang R, Kerr T. Survival sex work involvement among street-involved youth who use drugs in a Canadian setting. J Public Health 2010;32:322–7.
11. Cimino AN, Madden EE, Hohn K, et al. Childhood mal- treatment and child protective services involvement among the commercially exploited: a comparison of women who enter as juveniles or as adults. J Child Sexual Abuse 2017;36:352–71.
12. Dank M, Yahner J, Madden K, et al. Surviving the Streets of New York: Experiences of LGBTQ Youth, YMSM, YWSW Engaged in Survival Sex. Washington, DC: Urban Institute, 2015.
13. Goldberg AP, Moore JL, Houck C, Kaplan DM, Barron CE. Domestic minor sex trafficking patients: a retrospective analysis of medical presentation. J Pediatr Adolesc Gynecol 2017;30:109–15. 14.
14. Greenbaum VJ, Dodd M, McCracken C. A short screen- ing tool to identify victims of child sex trafficking in the health care setting. Pediatr Emerg Care 2018;34(1):33–7. 15.
15. Lederer L, Wetzel C. The health consequences of sex traf- ficking and their implications for identifying victims in healthcare facilities. Ann Health Law 2014;23:61–91. 16. Zimmerman C, Yun K, Shvab I, et al. The Health Risks and Consequences of Trafficking in Women and Adoles- cents: Findings from a European Study. London: London School of Hygiene and Tropical Medicine (LSHTM), 2003.

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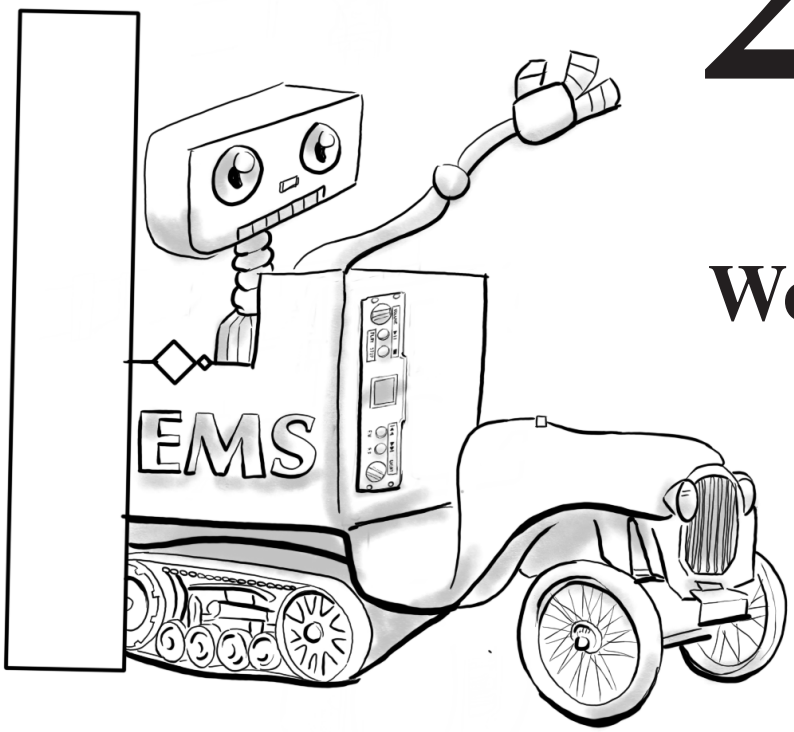
The Epi Don't Work for OHCA



Clinical Question:

Does the use of epinephrine in cardiac arrest improve survival rates with a favourable neurological outcome?

Bottom Line:

The use of epinephrine in adults with OHCA to improve survival with favorable neurologic outcome is not supported by the literature and protocols should be changed to reflect the data.

Guest:

Jay Loosley is the Superintendent of Education at Middlesex-London Paramedic Service. Jenn Doyle is a paramedic educator at Middlesex-London Paramedic Service.

Case Overview

Case

A 51-year-old man experiences a cardiac arrest on the street. You are the first provider on scene with Emergency Medical Services (EMS) and start high-quality Cardiopulmonary Resuscitation (CPR). A cardiac defibrillator is hooked up and the patient is in ventricular fibrillation. He is unsuccessfully shocked. An oral airway is placed, peripheral intravenous (IV) line started successfully and the paramedic asks her partner if you want to administer IV epinephrine?

Background

The AHA has five steps in the Chain-of-Survival for out-of-hospital cardiac arrest (OHCA).

Step One– Recognition and activation of 911
Step Two– Immediate high-quality CPR
Step Three– Rapid defibrillation
Step Four– Basic and advanced EMS
Step Five– Advanced life support & post arrest care

We are going to discuss Step Four that focuses on rapid access to advanced cardiac life support (ACLS) skills such as intubation and intravenous drug therapy.

This step is controversial, and we have covered it on the SGEM with the classic OPALS trial by Legend of Emergency Medicine Dr. Ian Stiell (SGEM#64). This was a before and after study to see if advanced cardiac life support (ACLS) techniques, including IV epinephrine, would improve survival to discharge.

While there was an improvement in return of spontaneous circulation (ROSC) and survival to hospital admission there was not an increased survival to hospital discharge. There was also no increase in survivors with good neurological outcomes with ACLS.

There have been a number of papers published since OPALS that support the findings of not using ACLS drugs like epinephrine for OHCA (Olavseengen et al. JAMA 2009, Hagihara et al. JAMA 2012 and Cournoyer et al. AEM 2017).

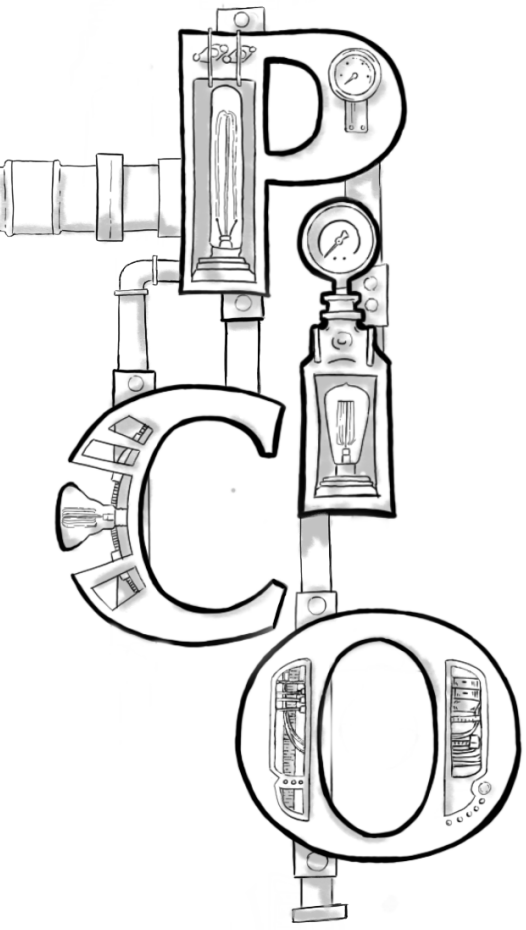
We reviewed the Cournoyer et al cohort study as part of the #SGEMHOP series with Academic Emergency Medicine (AEM). It demonstrated better ROSC with ACLS but not better survival to hospital discharge (SGEM#189).

A limitation of these studies is their observational nature. There is one randomized control trial on epinephrine for OHCA by Jacobs et al. published in Resuscitation 2011. This Australian trial showed better ROSC with epinephrine but not better survival to hospital discharge in 534 patients.

Unfortunately, the trial failed to achieve their sample size for a variety of reasons which left it underpowered. This means there is a lack of high-quality data to rely upon in deciding whether or not to use epinephrine in OHCA situations.

Reference

Perkins et al. A Randomized Trial of Epinephrine in Out-of-Hospital Cardiac Arrest. NEJM 2018.



Population:
Adult patients with OHCA that ACLS was started by paramedics

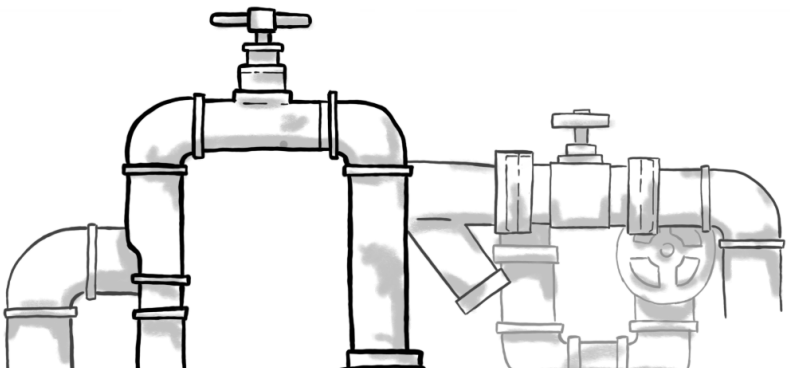
- **Excluded:** Pregnancy, age <16 years, cardiac arrest due to anaphylaxis or asthma or the administration of epinephrine before the arrival of the trial-trained paramedic

Intervention:
Epinephrine 1mg IV every 3 to 5 minutes

Comparison:
Placebo (0.9% saline) IV every 3 to 5 minutes

Outcomes:

- **Primary:** Survival at 30 days.
- **Secondary:** Survival to hospital admission, length of stay in the hospital and in the intensive care unit (ICU) , survival at hospital discharge and at three months, and neurological outcomes at hospital discharge and at three months.



Authors' Conclusion

"In adults with out-of-hospital cardiac arrest, the use of epinephrine resulted in a significantly higher rate of 30-day survival than the use of placebo, but there was no significant between-group difference in the rate of a favorable neurologic out come because more survivors had severe neurologic impairment in the epinephrine group."

Quality Checklist

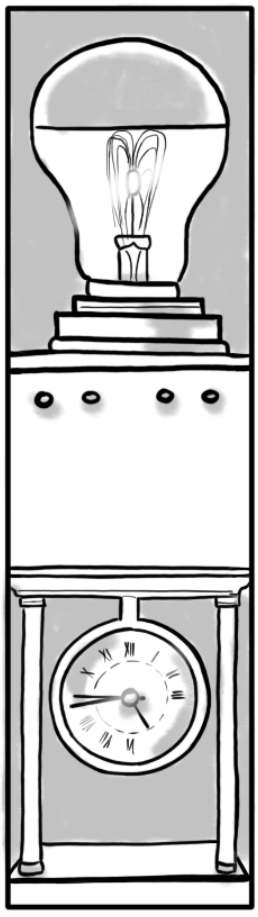
Quality Checklist for Randomized Clinical Trials:

- [X] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [✓] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [✓] 6. The teams in both groups were similar with respect to prognostic factors.
- [✓] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
- [?] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
There was a total of 8,007 patients include in the analysis. The mean age was 70 years with almost 2/3 being male and 2/3 witnessed arrests. CPR was performed in 70% of the cases and less than one in five had a shockable initial cardiac rhythm.

30-Day survival was statistically higher in the epinephrine group compared to placebo.



Primary Outcomes:

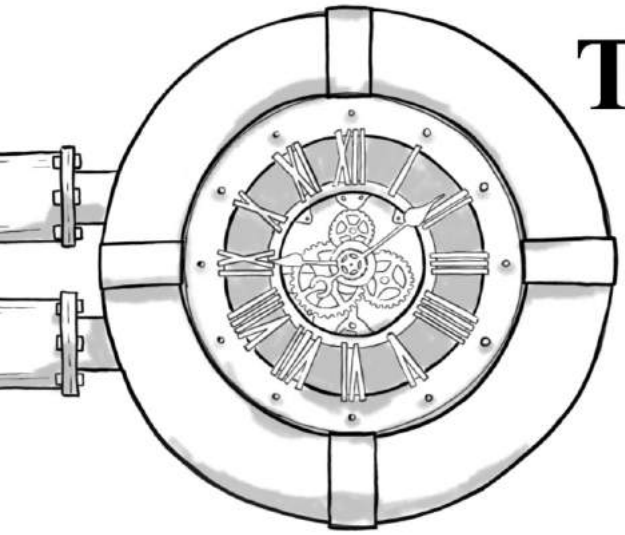
Survival at 30 days

- 3.2% (130/4,012) epinephrine vs. 2.4% (94/3995) placebo
- Unadjusted odds ratio 1.39 (95% CI 1.06 to 1.82; p=0.02)
- Adjusted odds ratio 1.47 (95% CI 1.09 to 1.97; p=0.02)
- NNT of 112 with a fragility index of 6

Secondary Outcomes:

There was greater survival to hospital admission, survival to hospital discharge and survival at three months in the epinephrine group. There was no difference in good neurological outcome at discharge or at three months. Severe neurologic impairment (mRS 4 or 5) was more common among survivors in the epinephrine groups compared to the placebo group (31.0% vs. 17.8%)

	Epinephrine	Placebo	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Survival to Hospital Admission	23.8%	8.0%	3.59 (3.14-4.12)	3.83 (3.30-4.43)
Survival to Hospital Discharge	3.2%	2.3%	1.41 (1.08-1.86)	1.48 (1.10-2.00)
Good Neurologic Outcome at Discharge	2.2%	1.9%	1.18 (0.86-1.61)	1.19 (0.85-1.68)
Survival at Three Months	3.0%	2.2%	1.41 (1.07-1.87)	1.47 (1.08-2.00)
Good Neurologic Outcome at 3 Months	2.1%	1.6%	1.31 (0.94-1.82)	1.39 (0.97-2.01)



Time to Talk Nerdy

The PARAMEDIC-2 trial has been covered by many other #FOAMed providers. We are just going to mention five things and then list the other critical appraisals in the show notes.

1) Survival Rate at 30 Days:

Survival was fairly low in this trial at about three percent. This could have been because of selection bias. Those patients with OHCA who got ROSC (n=615) or epinephrine (1,192) administered before paramedics arrived were excluded from the study.

2) Time of Epinephrine:

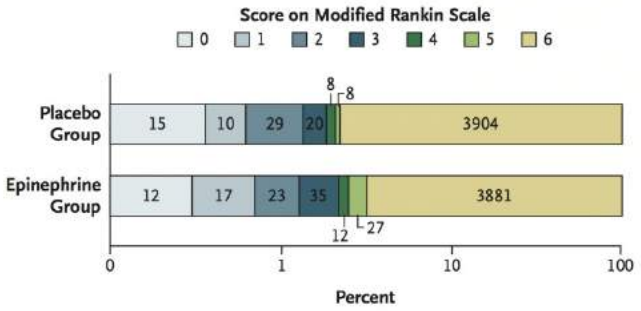
The median time to administration of epinephrine did not occur until 22 minutes post-arrest (6.6 minutes response time plus 13.8 minutes on scene time). Would there be different results if epinephrine administration occurred earlier in the management of the arrest? This is unknown and would need to be tested to see if earlier administration of epinephrine for adult OHCA would provide a benefit.

3) Amount of Epinephrine:

Paramedics administered 1mg epinephrine bolus every three to five minutes which is the standard directive. Would different results be seen if epinephrine was administered in different doses or dosing intervals (high vs. low dose, infusion vs. bolus)? Again, this is an interesting question that would need to be studied.

4) Modified Rankin Scale (mRS) Score:

Some of the problems with the mRS score have been discussed before on the SGEM. A study by Wilson et al 2005 has demonstrated substantial inter-rater reliability. In addition, they used a mRS score of 0 to 3 as being a favorable neurologic. Perhaps patients would consider a good outcome 0 to 2? The results are then 1.3% for the epinephrine group vs. 1.35% for the control group.



5) Evidence-Based Medicine (EBM):

The definition of EBM includes the literature, clinicians and patients. The literature informs our care but should not dictate our care. Clinical judgement must also be used when deciding upon management. Patient values also need be considered. This trial demonstrated increased ROSC, survival to hospital admission, ICU admission, survival to hospital discharge, 30 days and at three months. However, there was no improvement in favorable neurologic outcome with a significant increase in survivors with severe impairment at hospital discharge (epinephrine 31.0% vs. placebo 17.8%) and at three months (16.3% vs. 14.9%). When evaluating any therapy, we must always consider the harm. Increasing survival of severely damaged patients after OHCA cannot be viewed as a successful intervention.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions.

Clinical Application:

Resuscitation efforts should focus on things that have been demonstrated to improve patient-oriented outcomes like high-quality CPR and early defibrillation. In contrast, epinephrine should not be routinely given to adult patients with OHCA.

What Do I Tell the Team?

Nothing, they are in cardiac arrest.

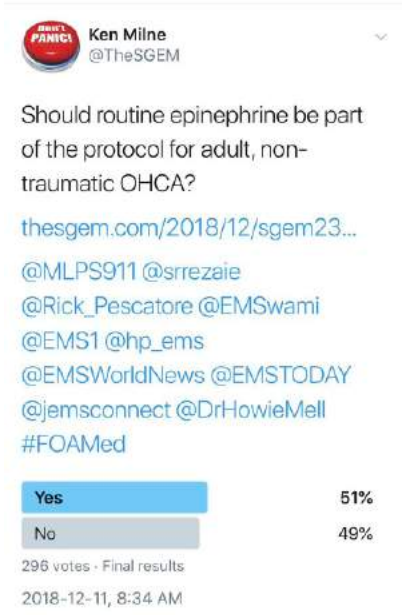
Case Resolution:

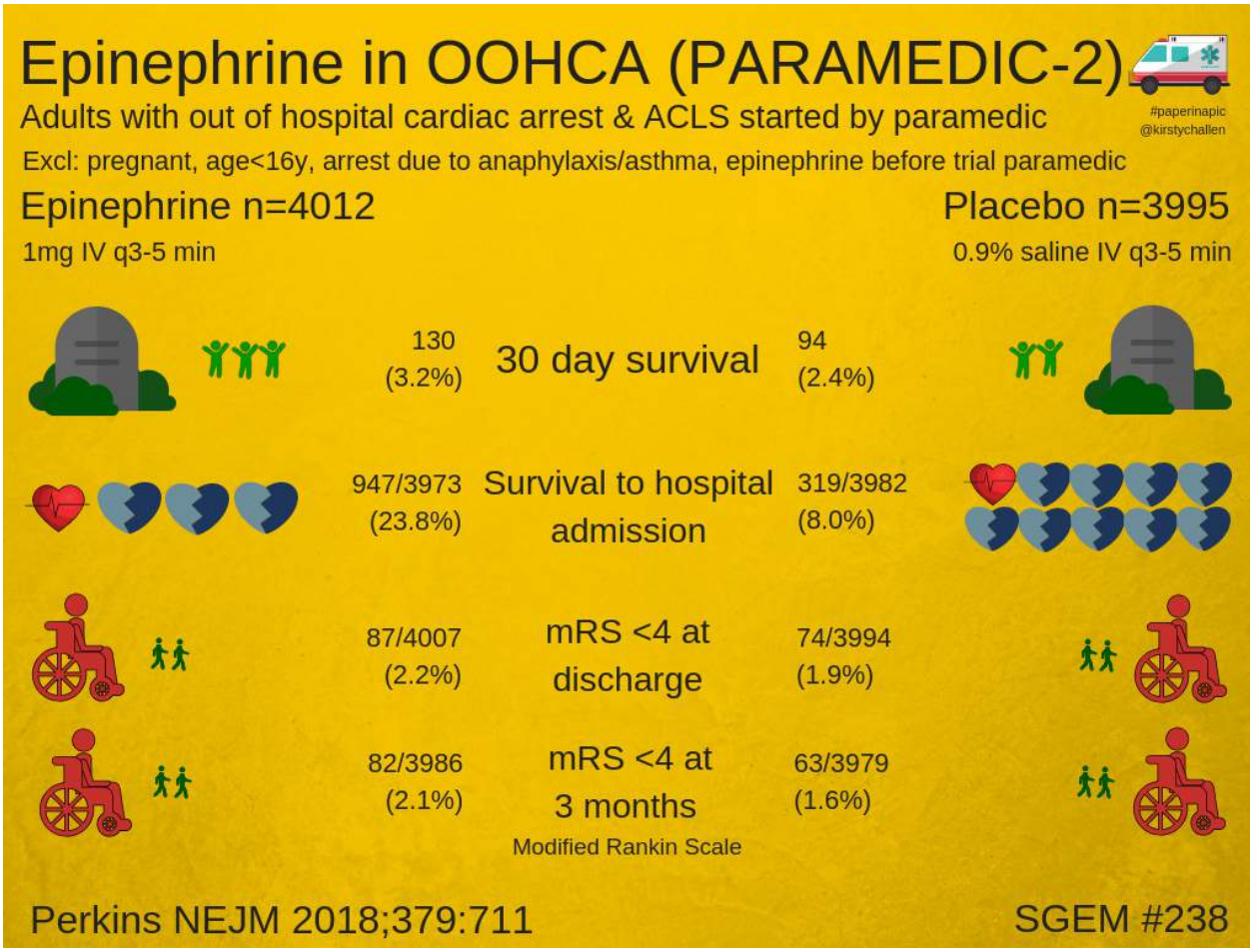
The patient is loaded into the ambulance with high-quality CPR being provided and epinephrine is given automatically as part of the existing protocol. The patient has ROSC and survives to hospital admission but dies soon after in the ICU.

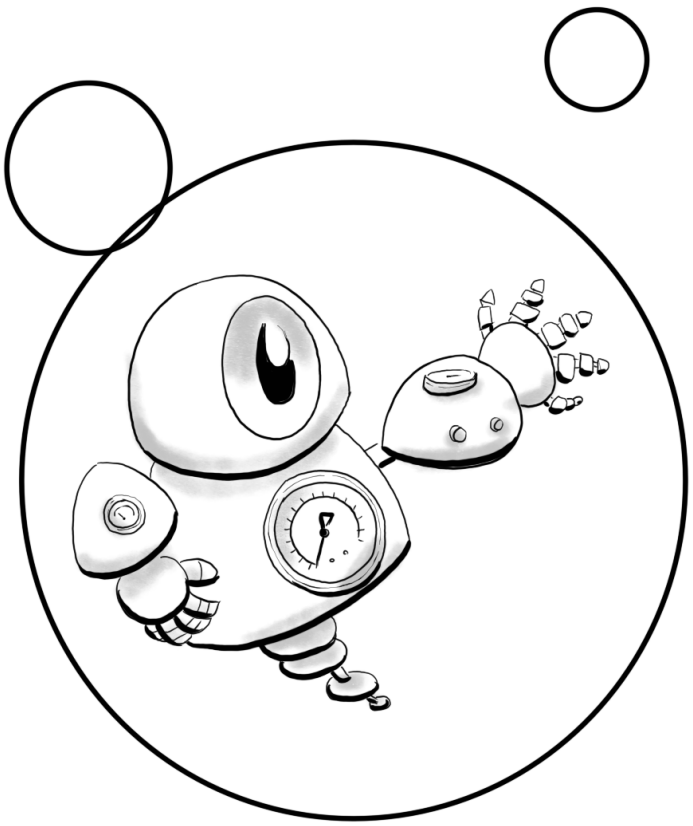
Episode End Notes

Other FOAMed:

- First10EM: PARAMEDIC-2 – Epinephrine Harms/Helps in OOHCA
- REBEL EM: PARAMEDIC-2: Time to Abandon Epinephrine in OHCA?
- EMNerd (EMCrit): The Case of the Costly Compound
- St. Emlyn's: JC – Does Epinephrine Work in Cardiac Arrest
- The Resus Room: PARAMEDIC2
- TOTAL EM: PARAMEDIC2 – It's Time to Call the Code on Epinephrine (Adrenaline)
- The Bottom Line: PARAMEDIC2 – Adrenaline vs Placebo







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Febrile Seizure Recurrence: With or Without You Acetaminophen?

Clinical Question:

Does the regular administration of acetaminophen reduce the risk of immediate recurrence of a febrile seizure in children?

Bottom Line:

Treat a febrile child with antipyretics for comfort not to normalize the temperature or prevent a recurrent febrile seizure.

Guest:

Dr. Damian Roland is a Consultant at the University of Leicester NHS Trust and Honorary Associate Professor for the University of Leicester's SAPPHIRE group. He specialises in Paediatric Emergency Medicine and is a passionate believer that education exists to be shared (#foamed).

Damian is part of the Don't Forget the Bubbles (DFTB) team. They published an epic paper to determine the transit time of a Lego head (Tagg et al). The primary outcome was the FART (Found and Retrieved Time) score. Bowel habit were standardized before the trial started using the SHAT (Stool Hardness and Transit) score. The story was picked up by the BBC, Forbes and even talked about by James Corden on the Late, Late Show.

Case Overview

Case:

An 18-month-old presents having had a febrile convulsion (febrile seizure) at home. The seizure lasted no more than a minute and now having been in the department for a couple of hours the infant is back to their normal selves. Observations are normal except a low-grade fever and there is a clear focus in a right otitis media for an infection. You start to counsel the parents with likely outcomes for the future and immediate safety netting advice. You tell the parents that regular antipyretics won't stop another febrile convulsion occurring and they should really only be used to help their child when they are distressed with a fever. After you leave the room a student who had witnessed the consultation asks you why you said you couldn't stop febrile convulsions when a recent publication from Japan has clearly shown that regular rectal acetaminophen significantly reduces the risk of recurrence?

Background:

Febrile seizures are very common and very, very scare for care-givers and parents. During winter periods a typical emergency department may well see a child a day presenting with a febrile seizure

There was a SRMA by Rosenbloom et al. (Eur J Paediatr Neurol 2013) that concluded antipyretics were ineffective in reducing the recurrence of febrile seizures in children.

SGEM#95 covered this paper with Pediatric Super Hero Anthony Crocco. Our bottom line was that antipyretics appear to offer no significant improvement in the recurrence rates of febrile seizures in children.

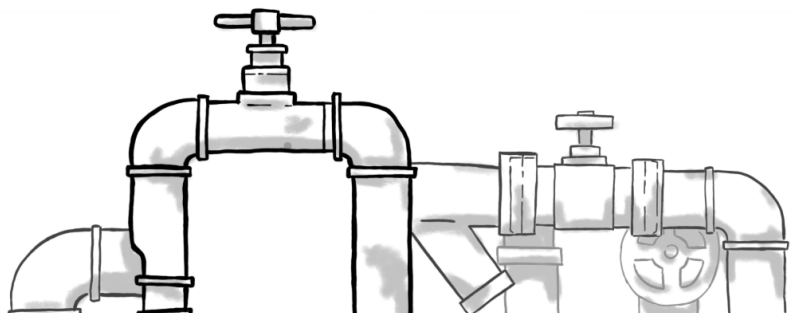
Fever fear is a real concern for parents and they often come to the emergency department for evaluation and reassurance.

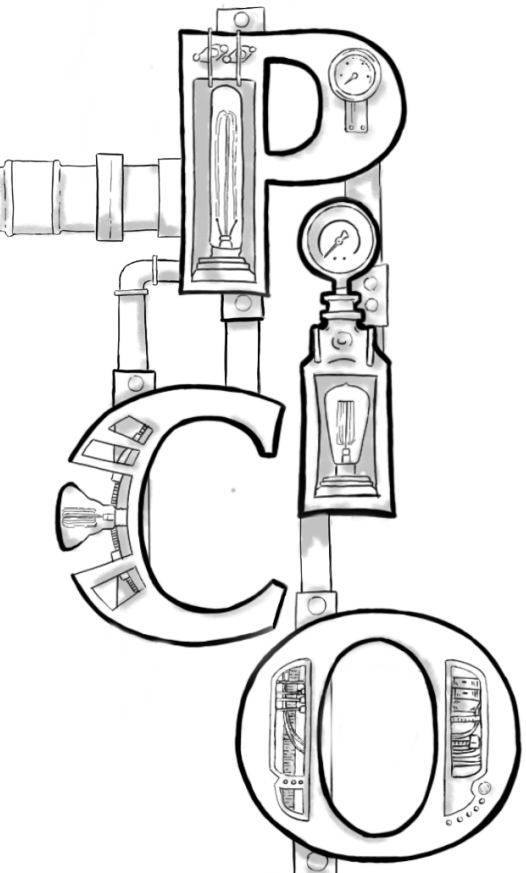
The American Academy of Pediatrics guidelines say *"fever, in and of itself, is not known to endanger a generally healthy child. In contrast, fever may actually be of benefit; thus, the real goal of antipyretic therapy is not simply to normalize body temperature but to improve the overall comfort and well-being of the child."*

Standard advice has always been that the regular administration of an antipyretic won't reduce the risk of recurrence but a recent publication in Pediatrics has challenged this position.

Reference

Murata et al. Acetaminophen and febrile seizure recurrences during the same fever episode. Pediatrics. 2018





Population:
Infants and Children 6 to 60 months old attending an Emergency Department at a single Japanese City Hospital

- **Exclusions:** Patients with 2 or more FSs during the current fever episode, seizures lasting >15 minutes, patients with epilepsy, chromosomal abnormalities, inborn errors of metabolism, brain tumor, intracranial hemorrhage, hydrocephalus, or a history of intracranial surgery, patients who had been administered diazepam suppository, patients whose parents requested the use of diazepam suppository, patients who had taken antihistamines or patients with diarrhea.

Intervention:
Rectal acetaminophen (10mg/kg) at presentation and every six hours until 24 hours after the onset of the febrile seizure

Comparison:
No treatment for 24 hours after the onset of the febrile seizure

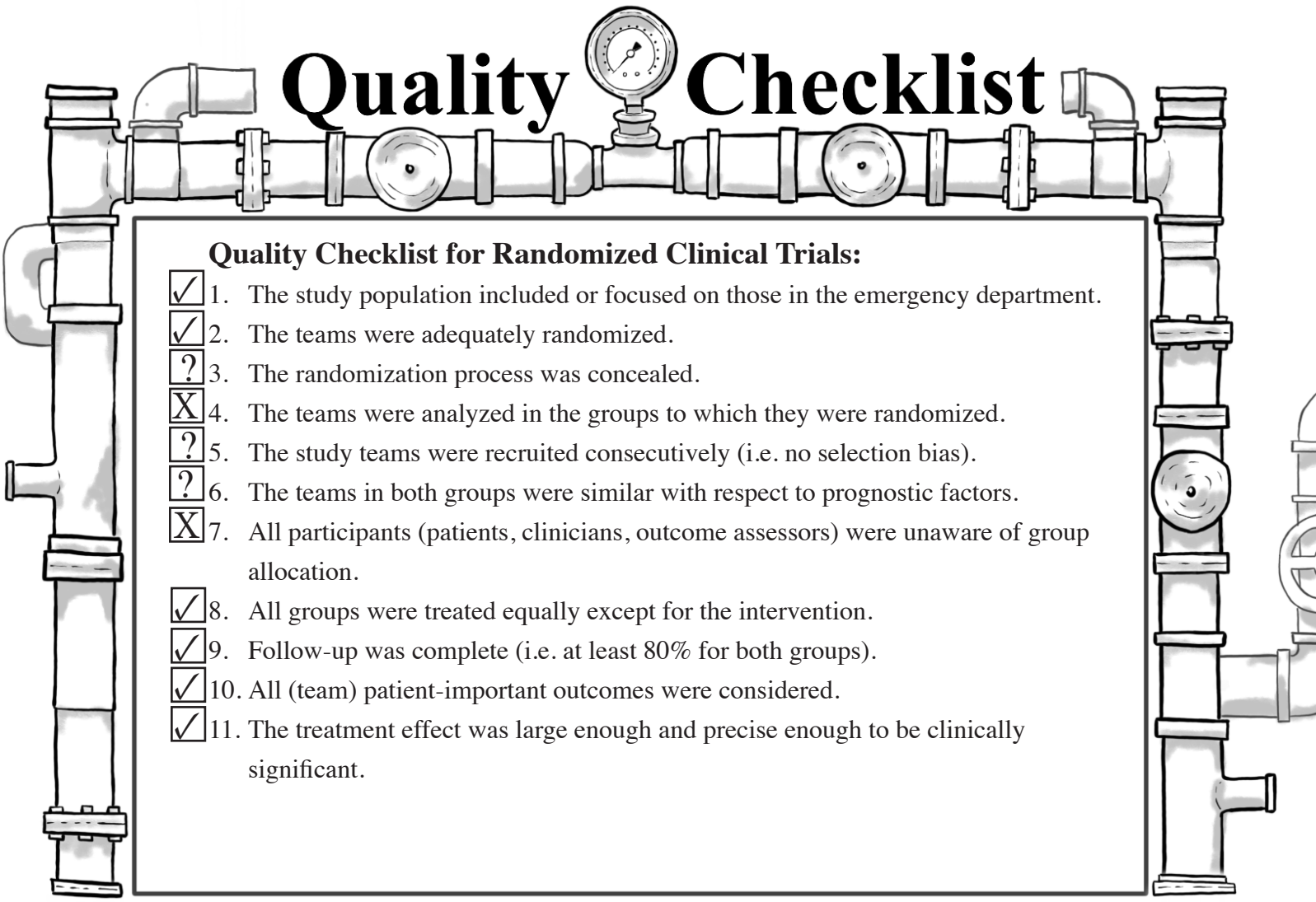
Outcomes:

- **Primary:** Seizure recurrence during the same fever episode
- **Secondary:** Variables associated with febrile seizures recurrence (acetaminophen use, age, and duration of seizure).

Authors' Conclusion

"Acetaminophen is a safe antipyretic against FSs (Febrile Seizures) and has the potential to prevent FS recurrence during the same fever episode"

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

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

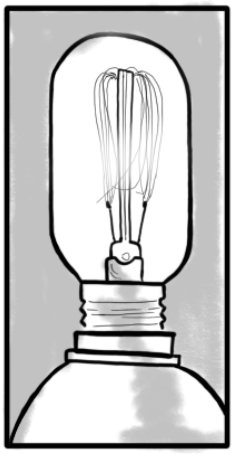
Case Outcomes

Key Results:
There were 438 children randomize in this trial to rectal acetaminophen or no antipyretics. The median age was about 20 months, a quarter had a history of a febrile seizure and 16% had a febrile seizure in this study.

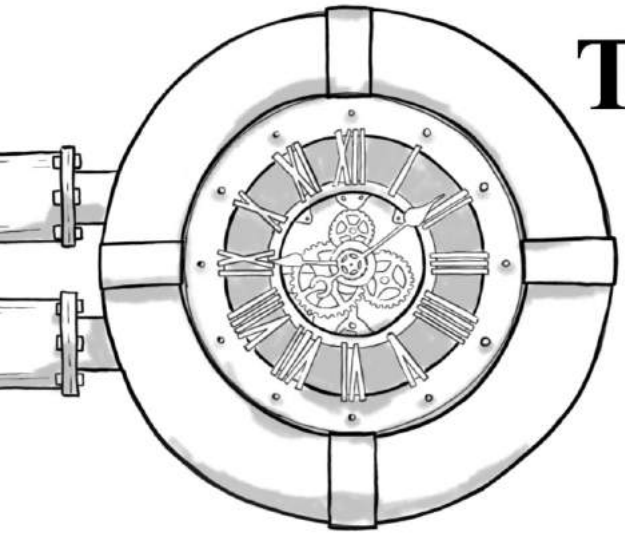
Febrile seizure recurrence rate was significantly lower with rectal acetaminophen compared to no antipyretic treatment.

Primary Outcome:
Febrile seizure recurrence

- 9.1% in the intervention group vs. 23.5% in the control group (p <0.001)
- Absolute difference of 14.4% and NNT 7 to prevent one recurrence



Secondary Outcomes:
Four variables (rectal acetaminophen use, age of patient, duration of seizure and rectal acetaminophen and age) were independently associated with FS recurrence.



Time to Talk Nerdy

1) Exclusions:

They excluded 1/3 of potential patients for a variety of reasons. The vast majority of the exclusions were because the patient had been given a diazepam suppository to prevent a febrile seizure or the parents requested the use of diazepam suppository. We always like to see consecutive inclusions and some of these exclusions could have introduced some selection bias into the trial.

2) Blinding, No Placebo Group and Prognostic Factors:

The trial was not blinded and there was no placebo group. This could have biased the self-reporting of parents to favor acetaminophen. We are also unsure if both groups were similar with regards to prognostic factors because no confidence intervals were provided around the point estimates.

3) Intention-to-Treat (ITT) Analysis:

It appeared they did not perform an intention-to-treat analysis which would again bias the results towards intervention/treatment group (rectal acetaminophen).

4) External Validity:

Another issue with this study is the external validity. Many patients were excluded from inclusion because they had already received a rectal suppository of diazepam. I do not use a rectal benzodiazepines to prophylactically prevent a febrile seizures. While it may be the standard to give acetaminophen rectally in Japan this has not been my experience. It is rare parents prefer the rectal route and most often give antipyretics orally. This means this Japanese population may not be the same as the patients we see in the UK or elsewhere.

5) Ethics:

One last point is the ethical consideration of withholding antipyretics from a febrile child. We have already discussed that the AAP recommends treating for comfort not to lower the temperature. Withholding antipyretic therapy in a sick febrile child could be considered unethical because it could withhold comfort for some children.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We disagree with the authors' conclusions given the methodologic limitations of the trial.

Clinical Application:

This is a chance to remind people again that fever is not the enemy but pain, distress and serious bacterial illness are the real concern. A chance to debate external validity and cultural validity. I think it would be possible to replicate this study elsewhere and possibly come up with similar results but culturally per rectum is considered unacceptable/inappropriate for this purpose. There is debate hear about the social context of care (as opposed to the evidence-based context of care)

However uncomfortable it may appear, while I would not change my practice based on this, I think it does hint that you can probably reduce the recurrence rate through this method. Whether you should is the key question.

What Do I Tell My Patient?

Your child had a febrile seizure and are common in children. They are at a low risk of developing epilepsy. The evidence is not clear on whether or not keeping the fever down will prevent another seizure. The best advice is to use acetaminophen to help keep your child comfortable and not focus as much on the temperature.

Case Resolution

The child is given acetaminophen orally not to bring down the fever or prevent a febrile seizure but to ameliorate the pain of acute otitis media.

Episode End Notes

Other FOAMed:

- DFTB: Hot and Shaking Truth
- EM Cases: Episode 73 Emergency Management of Pediatric Seizures
- DFTB: Febrile Seizures
- Broome Docs: Paracetamol PR for Febrile Seizures?

Will you recommend using RECTAL acetaminophen regularly to prevent recurrent febrile seizures?

thesgem.com/2018/12/sgem23...
#FOAMped #EBM

@Damian_Roland @DFTBubbles @KirstyChallen @AAPNews @EMtogether @AmerAcadPeds @PedEMMorsels @gracie_leo @NikkiAbela

Yes - Rectal	14%
No - Try Oral	21%
No - Treat for comfort	**65%**

109 votes · Final results

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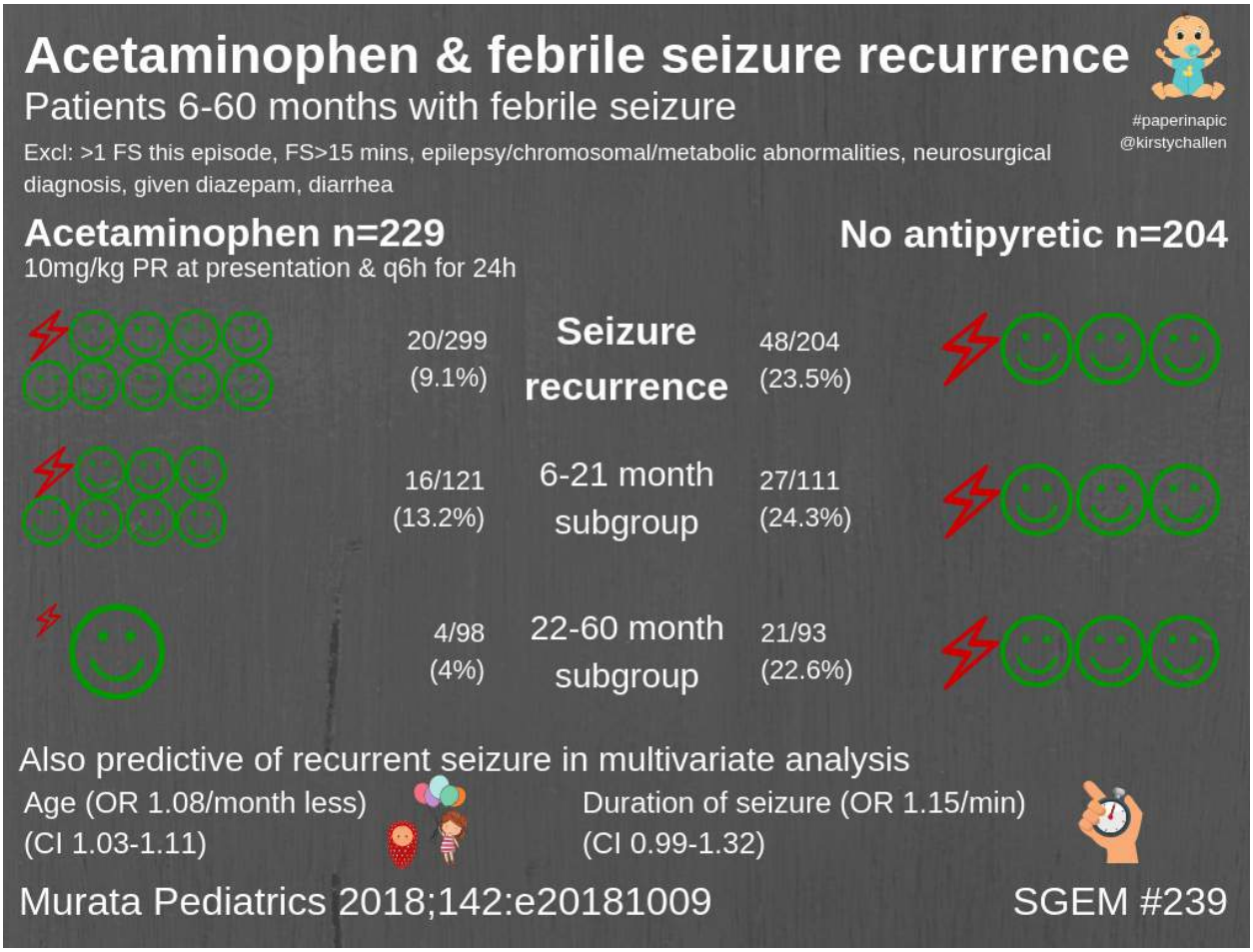

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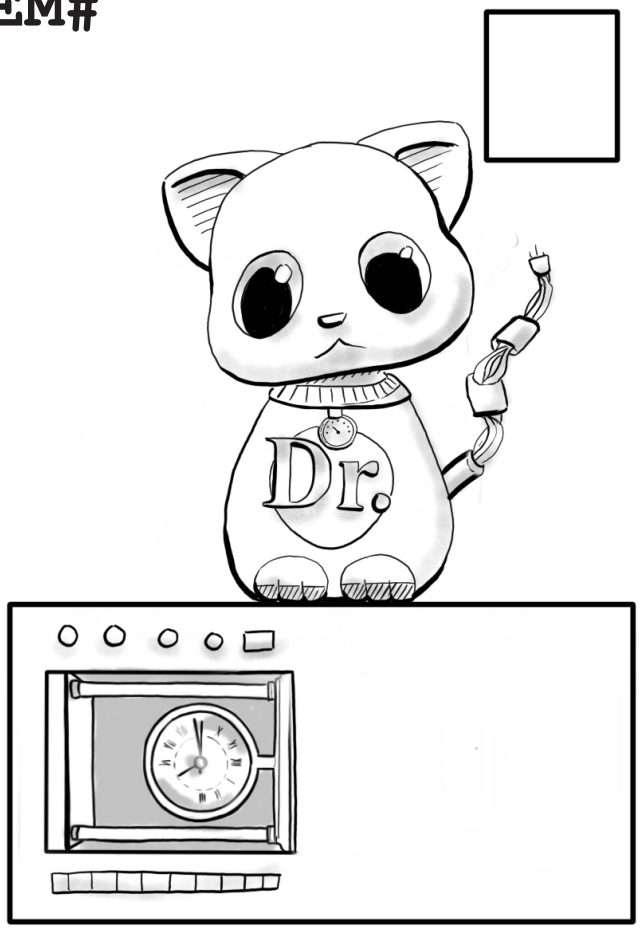

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I Can't Get No Satisfaction for My Chronic Non-Cancer Pain

Clinical Question:

Is the use of opioids to treat chronic non-cancer pain associated with greater benefits or harms compared with placebo and alternative analgesics?

Bottom Line:

There appears to be no long-term analgesics benefits from prescribing opioids for chronic non-cancer pain (nociceptive and neuropathic). However, their use is associated with increased adverse events.

Guest:

Dr. Sergey Motov is an Emergency Physician in the Department of Emergency Medicine, Maimonides Medical Center in New York City. He is also one of the world's leading researchers on pain management in the emergency department and specifically the use of ketamine. His twitter handle is @PainFreeED.

Case Overview

Case:

A 45-year-old woman with chronic low back pain due to L4/5 disk herniation for over one-month presents to the emergency department with chief complaint of worsening left sided back pain over past week after doing some heavy lifting at work. She denies bowel or bladder dysfunctions, weakness in her bilateral lower extremities or loss of sensation in her legs. On physical examination, the patient has no sensory deficits but does have pain upon straight left leg raise at L4-S1 distribution. While you are contemplating therapeutic modalities, the patient tells you that she has been taking oxycodone several times a day and occasionally gabapentin, but the pain does not seem to be getting better. She asks you how much longer she needs to continue taking oxycodone to see some improvement.

Background:

Opioids are frequently prescribed for patients with chronic non-cancer (nociceptive and neuropathic) pain, however, the prolonged use of these analgesics may not provide significant pain relief but instead may lead to development of significant adverse effects such as tolerance, dependence, misuse, and in some cases, a development of an opioid use disorder.

Therefore, there is a need for high quality research including systematic reviews that can either support or refute the analgesics efficacy and safety in patients suffering from CNCP.

We haver reviewed papers on pain management in the emergency department for many years on the SGEM. One of the first episodes to look at opioids for pain management was SGEM#55. Our bottom line from that episode was that opioid prescribing in the emergency department will continue to be a problem. The study reviewed does not provide enough high-quality information to implement this guideline at my hospital.

The case scenario for this episode is a woman with worsening low-back pain for a month. Many different pharmaceutical treatments have been tried for acute low back pain with limited success. These include acetaminophen, muscle relaxants, non-steroidal anti-inflammatories (NSAIDs), steroids and benzodiazepines.

- **Acetaminophen:** 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.

- **Muscle Relaxants:** 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.

- **NSAIDs:** 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.

- **Steroids:** Balakrishnamoorthy et al (Emerg Med J 2014) did a double-blind trial of adult patients in the emergency department with acute low back pain and radiculopathy. In this study, the patients received either a single dose of 8 mg of IV dexamethasone or normal saline in addition to oxycodone. While the steroid treatment was reported to shorten the emergency department length of stay and decrease pain up to six weeks after discharge the difference was only statistically significant not clinically significant and there was not difference in functional capacity.

- **Benzodiazepines**: Friedman et al (Ann Emerg Med 2017) showed that diazepam was no better than placebo when added to naproxen for acute low back pain (SGEM#173).

A number of non-pharmaceutical treatment modalities have also been tried to treat low back pain. These include cognitive behavioral therapy, mindfulness, chiropractic, physical therapy and acupuncture also with limited success.

- **CBT and Mindfulness:** Cherkin et al (JAMA 2016) did a randomized control trial in patients with back pain for greater than three months. They were randomized into CBT, mindfulness or usual care. The intervention groups had a greater clinically meaningful improvement (61% CBT, 58% mindfulness vs. 45% for usual care). However, we need to be cautious in interpreting these results because of the potential placebo effect.

- **Chiropractic:** Paige et al (JAMA 2017) did a SRMA of spinal manipulative therapy for acute pain. None of the 26 studies included for analysis blinded the providers and only four blinded the patients. The majority of the studies were classified as low quality. Only two studies had a sham comparison group. There was high heterogeneity (i2=67%). While the primary outcome was statistically significant it did not reach clinical significance.

- **Physical Therapy:** Paolucci et al (J Pain Research 2018) did a narrative review on different rehabilitative exercise techniques for management of chronic low back pain. All techniques were better than control but no clear superior method was identified. The authors called for more high-quality research on the topic.

- **Acupuncture:** Colquhoun and Novella (Anesthesia and Analgesia 2013) There is no high-quality evidence that acupuncture treats any condition and is just a theatrical placebo (SGEM#187 and SGEM#224).

This gets us back to the use of opioids. The American College of Emergency Physicians (ACEP) has a guideline on the use of opioids for adult patients presenting to the emergency department with acute non-cancer pain or an acute exacerbation of chronic non-cancer pain.

1. *In the adult ED patient with noncancer pain for whom opioid prescriptions are considered, what is the utility of state prescription drug monitoring programs in identifying patients who are at high risk for opioid abuse?*
    - **Level C Recommendation:** *The use of a state prescription monitoring program may help identify patients who are at high risk for prescription opioid diversion or doctor shopping.*

2. *In the adult ED patient with acute low back pain, are prescriptions for opioids more effective during the acute phase than other medications?*
    - **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.*

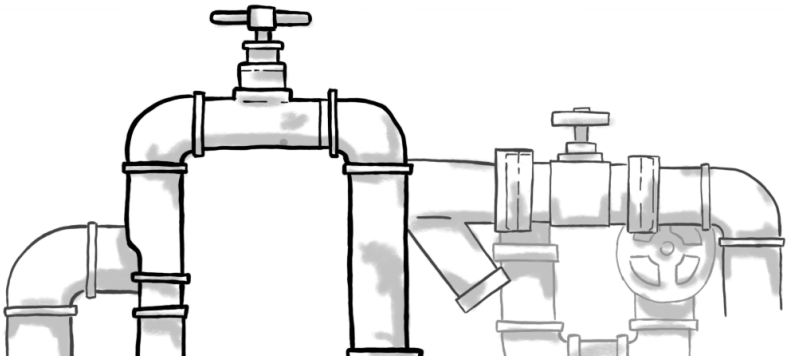
3. *In the adult ED patient for whom opioid prescription is considered appropriate for treatment of new-onset acute pain, are short-acting schedule II opioids more effective than short-acting schedule III opioids*
    - **Level B Recommendation:** *For the short-term relief of acute musculoskeletal pain, emergency physicians may prescribe short-acting opioids such as oxycodone or hydrocodone products while considering the benefits and risks for the individual patient.*
    - **Level C Recommendation:** *Research evidence to support superior pain relief for short-acting schedule II over schedule III opioids is inadequate.*

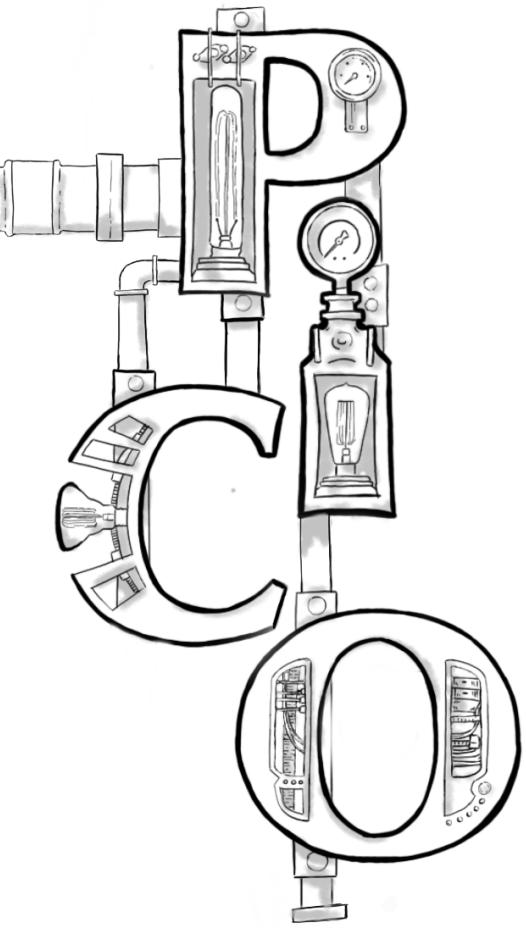
4. *In the adult ED patient with an acute exacerbation of noncancer chronic pain, do the benefits of prescribing opioids on discharge from the ED outweigh the potential harms?*
    - **Level C Recommendations:** *(1) Physicians should avoid the routine prescribing of outpatient opioids for a patient with an acute exacerbation of chronic noncancer pain seen in the ED. (2) If opioids are prescribed on discharge, 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. (3) the clinician should, if practicable, honor existing patient-physician pain contracts treatment agreements and consider past prescription patterns from information sources such as prescription drug monitoring programs.*

One final thing to remember in patients with chronic non-cancer pain is to manage their expectations. Do not set them up for failure. They need to know their pain might not resolve 100% in the emergency department and that most patients will have persistent symptoms with functional impairment for weeks to months (Itz et al 2013 , Donelson et al 2012 and Costa et al 2012).

Reference:

Busse JW et al. Opioids for Chronic Noncancer Pain A Systematic Review and Meta-analysis. JAMA December 2018





Population:
Adult patients with chronic non-cancer pain who were randomized to an oral or transdermal opioid (pure opioid or a combination product) vs. any non-opioid or placebo control and were enrolled in the studies with follow-up for at least four weeks.

- **Exclusions:** Studies in the form of abstract and rarely used interventions (such as oral ketamine, mexiletine, propoxyphene, dextropropoxyphene, fedotozine, and asimadoline) for chronic noncancer pain in North America

Intervention:
Administration of oral (pure or combination product) and/or transdermal opioids

Comparison:
Placebo or active non-opioid comparator

Outcomes:

- **Primary:**
  i. Pain difference in change of pain score between groups (via 10 cm VAS)
  ii. Physical functioning (via 100-point36-item Short Form Survey (SF-36) scale)
  iii. Incidence of vomiting

- **Secondary:**
  i. Emotional functioning (via emotional 100-point SF-36 mental component score)
  ii. Role functioning (via 100-pointSF-36 subscale for role limitations due to physical problems)
  iii. Social functioning (via 100-point SF-36 subscale for social functioning),
  iv. Sleep (via SF-36 sleep quality 100-mm VAS)
  v. Rates of adverse effects

Authors' Conclusion

"In this meta-analysis of RCTs of patients with chronic noncancer pain, evidence from high-quality studies showed that opioid use was associated with statistically significant but small improvements in pain and physical functioning, and increased risk of vomiting compared with placebo. Comparisons of opioids with nonopioid alternatives suggested that the benefit for pain and functioning may be similar, although the evidence was from studies of only low to moderate quality."

Quality Checklist

Quality Checklist for Therapeutic Systematic Reviews:

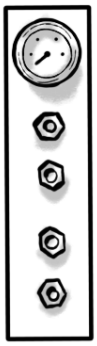
- [✓] 1. The clinical question is sensible and answerable.
- [✓] 2. The search for studies was detailed and exhaustive.
- [?] 3. The primary studies were of high methodological quality. Yes, for placebo arm. No for the non-opioid analgesics.
- [✓] 4. The assessment of studies were reproducible.
- [✓] 5. The outcomes were clinically relevant.
- [X] 6. There was low statistical heterogeneity for the primary outcomes. No. The I2 was 70.4% for pain and 65.7% for physical function.
- [X] 7. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
They identified 96 RCTs (n=26,169) with a median age of 58 years and 61% female.

No clinically significant difference in pain, physical functioning or emotional functioning but an increase in vomiting.

Outcome	Difference	Statistical	Clinical
Pain Relief	−0.79 cm (95% CI, −0.90 to −0.68)	Yes	No
Physical Function	2.04 points (95% CI, 1.41 to 2.68)	Yes	No
Emotional Function	0.14 points (95% CI, −0.58 to 0.86)	No	No
Role Function	2.80 points (95% CI, 0.99 to 4.61)	Yes	Yes
Social Function	1.58 points (95% CI, 0.45 to 2.70)	Yes	No
Sleep Quality	4.56 mm (95% CI, 2.88 to 6.24)	Yes	No
Vomiting	RR 2.50 (95% CI, 1.89 to 3.30)	Yes	Unsure

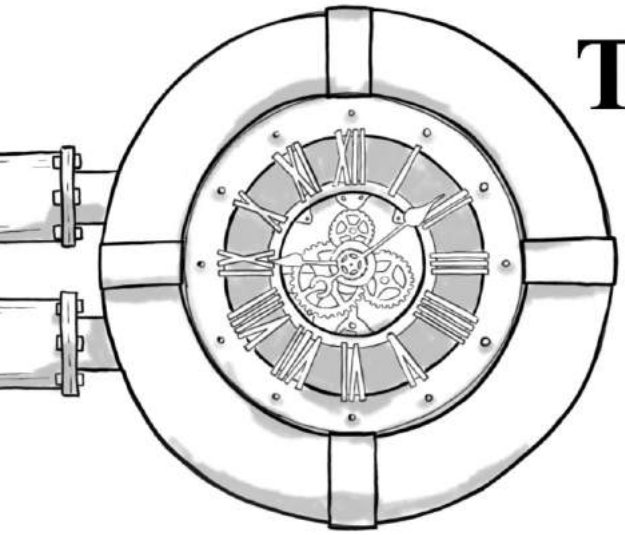


1) High quality randomized trials that compared opioids to placebo demonstrated that:

- Opioids were associated with pain relief compared with placebo (weighted mean difference, –0.79 cm [95% CI, –0.90 to –0.68 cm] that did not reach the minimally important difference of 1 cm.
- Opioids were associated with a small improvement in physical functioning compared with placebo, but did not meet the criterion for the minimally important difference (weighted mean difference, 2.04 points [95% CI, 1.41-2.68 points] on the 100-point SF-36 physical component score.
- Opioids were not significantly associated with emotional functioning compared with placebo (weighted mean difference, 0.14 points [95% CI, –0.58 to 0.86 points] on the 100-point SF-36 mental component score, P = .70).
- No association of opioids on role functioning compared with placebo (weighted mean difference, 0.87 points [95% CI, –0.54 to 2.28 points] on the 100-point SF-36 subscale for role limitations due to physical problems, P = .23).
- An association of opioids with improved social functioning compared with placebo but did not meet the minimally important difference criterion (weighted mean difference, 1.58 points [95%CI, 0.45-2.70 points] on the 100-point SF-36 subscale for social functioning).
- Opioids were associated with a small improvement in sleep quality compared with placebo but did not meet the criterion for the minimally important difference (weighted mean difference, 3.42 mm [95% CI, 1.58-5.26 mm] on the SF-36 sleep quality 100-mm VAS).
- Opioids were associated with an increased incidence of vomiting; however, this association was less in the 18 enrichment RCTs (5961 patients) compared with placebo (RR, 2.50 [95% CI, 1.89-3.30].

2) Low-to-moderate quality randomized trials that compared opioids to non-opioids demonstrated:

- No difference in the association of opioids vs. anti-inflammatory drugs for pain relief (weighted mean difference, –0.60 cm [95% CI, –1.54 to 0.34 cm] on the 10-cm VAS for pain, P = .21); and no difference in physical functioning between opioids and nonsteroidal anti-inflammatory drugs (weighted mean difference,–0.90points [95%CI,–2.69 to 0.89points] on the 100-point SF-36 physical component score).
- No difference in pain relief between opioids and nortriptyline (weighted mean difference, –0.13 cm [95% CI, –0.99 to 0.74 cm] on the 10-cm VAS for pain, P= .78); and no difference in physical functioning (weighted mean difference, –5.31 points [95% CI, –13.77 to 3.14 points] on the 100-point SF-36 physical component score).
- Opioids were associated with greater pain relief than anticonvulsants (weighted mean difference, –0.90 cm [95% CI, –1.65 to –0.14 cm] on the 10-cm VAS for pain) but did not reach minimally important difference of 1 cm; and no difference in physical functioning (weighted mean difference, 0.45 points [95% CI, –5.77 to 6.66 points] on the 100-point SF-36 scale.



Time to Talk Nerdy

This was a very impressive and meticulously executed systematic review and meta-analysis emphasizing the lack of analgesic and functional benefits of long-term opioids use for CNCP at the expense of increased risk of adverse effects. Considering the senior author was Dr. Gordon Guyatt and organized out of McMaster University, we would expect nothing less.

1) Five Strengths:

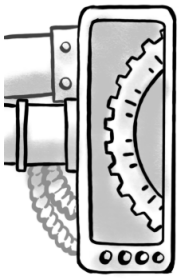
- A comprehensive search for eligible randomized control trials in any language.
- Data imputation for missing nonsignificant outcomes.
- Use of minimally important differences.
- Sensitivity analyses that addressed methodological differences, length of follow-up, and reported vs converted change scores.
- Large sample size.

2) Five Weaknesses:

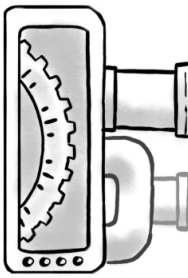
- Results of the low-to-moderate quality trials comparing opioids to non-opioid analgesics were restricted to treatment lasting one to six months and may not apply to individuals with substance use disorder or other mental illness, to those involved in litigation, or to those receiving disability benefits.
- Most eligible trials allowed for post-randomization titration of opioid dose, which precluded between-trial subgroup analyses of higher vs lower doses of opioids.
- There were 73 trials (76%) with frequent (≥20%) missing outcome data.
- Only 21 of 96 trials addressed mean or median morphine-equivalent doses per day of 90mg or greater.
- Only 48 out of 96 trials (50%) adequately concealed allocation.

3) Five Limitations:

- Impossible to assess the long-term associations of opioids with chronic non-cancer pain because no trial followed up patients for longer than six months.
- None of the included studies provided rates of developing opioid use disorder and only two reported rates of overdose.
- Subgroup effects could not be evaluated for opioids vs. active comparators as there were less than two trials in each subgroup.
- The modelling of risk difference for achieving the minimally important difference was based on assumptions that could not be directly assessed and might not have been met.
- Heterogeneity associated with pooled estimates for pain relief and functional improvement among trials of opioids vs placebo may have reduced evidence quality.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree with the authors' conclusion that the opioid use for managing chronic non-cancer is not clinically superior to placebo or non-opioid analgesics with respect to analgesic efficacy, functional restoration and does result in more side-effects.

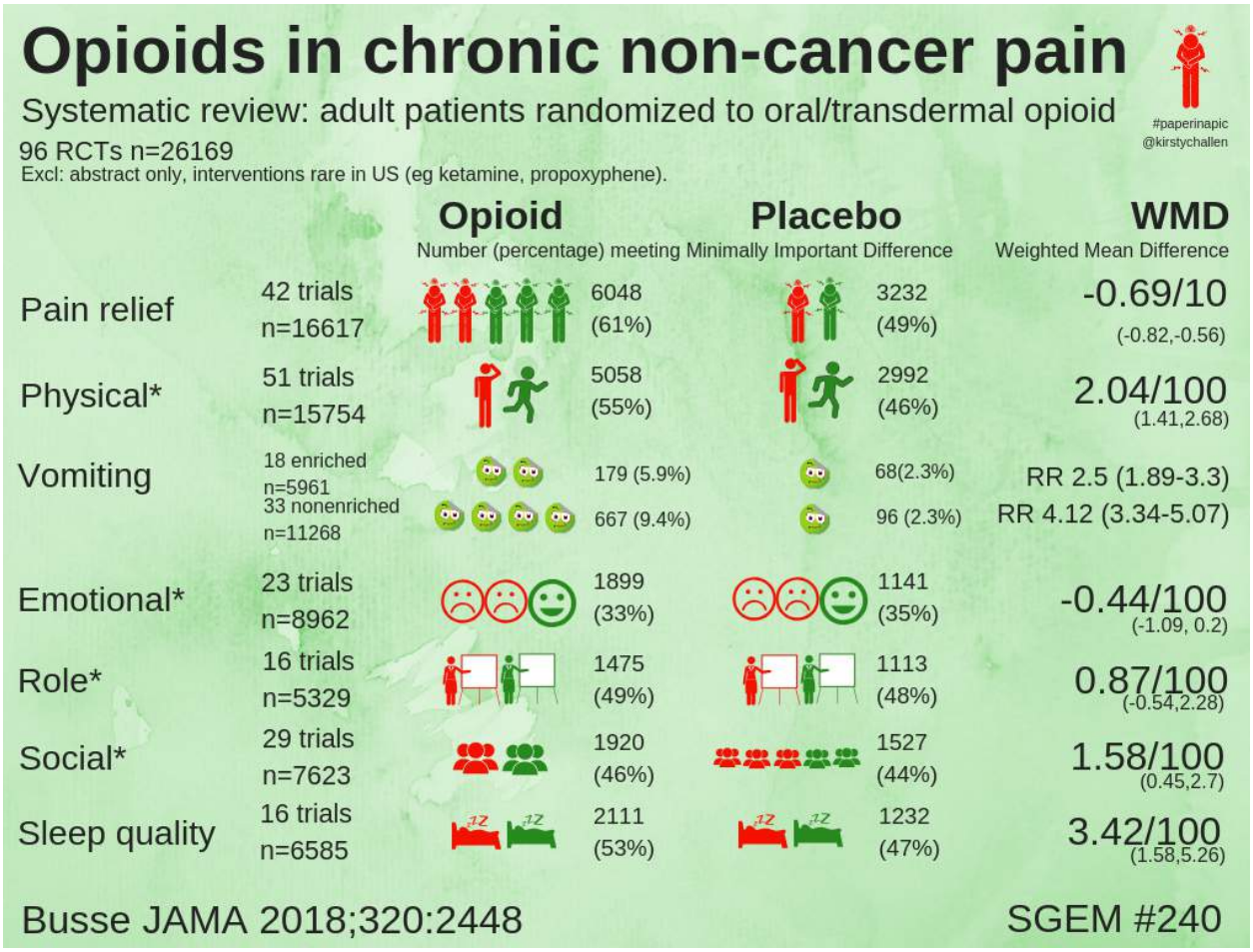


Clinical Application:
Long-term opioids (up to six months) use for chronic non-cancer pain is not associated with significant analgesic and functional benefits in comparison to placebo or non-opioid analgesics. Their use, however, is associated with higher rates of adverse effects. The routine prescribing of opioids in the emergency department for chronic non-cancer pain (nociceptive and neuropathic) should be discouraged.

What Do I Tell My Patient?
I am afraid that taking opioid analgesics (oxycodone, hydrocodone, hydromorphone, tramadol) for your chronic painful condition will result in more harm to you than in alleviating your pain and restrict your functional status. Therefore, I would recommend you not take this medication any longer and instead, consider using a combination of non-opioid analgesics and non-pharmacological treatments.

Case Resolution:
The patient was told that continuous use of oxycodone for her lumbar radiculopathy will not alleviate her pain and improve her functional status to the level she is willing to accept, and that she needs to use a combination of non-opioid analgesics and non-pharmacological treatments like physical therapy and graded exercise with a proper follow-up with a spine specialist or pain management specialist.

Episode End Notes



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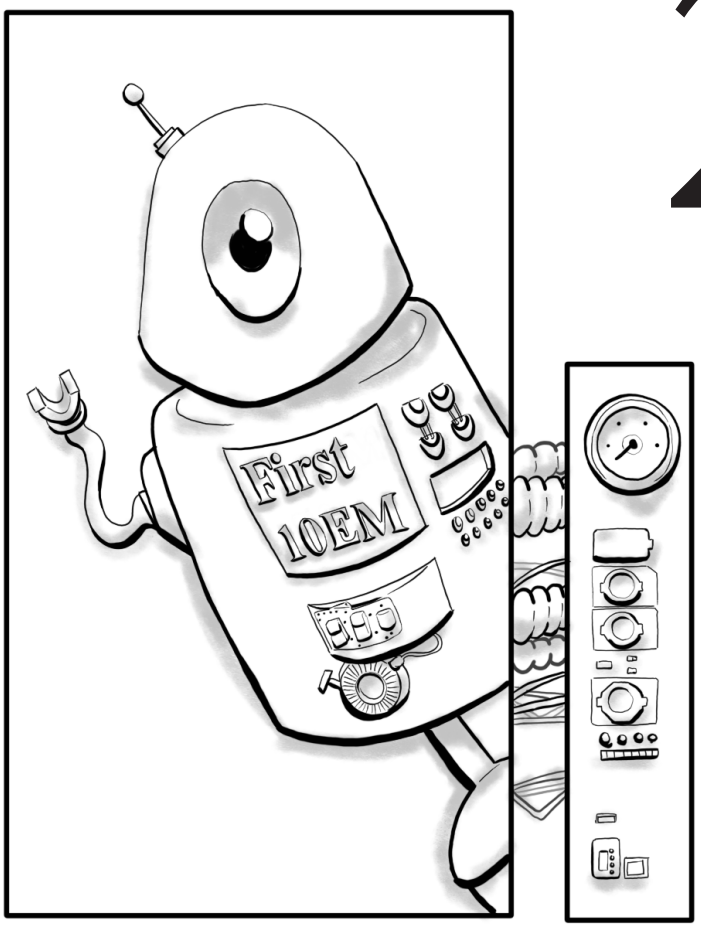


Wake Me Up Before You Go, Go: Using the Hour Rule

Clinical Question:

Can the hospital observation upon reversal (hour) rule be used to risk stratify patients for safe discharge from the emergency department after suspected opioid overdose?

Bottom Line:

Clinical judgement is important and should not be underrated. This study supports the use of clinical judgement in the decision to discharge suspected overdose patients, although caution is required, as there were a number of adverse events missed with both clinical judgement and the clinical decision tool.

Guest:

Dr. Justin Morgenstern is an emergency physician and the creator of the excellent #FOAMed project called First10EM.com

Case Overview

Case:

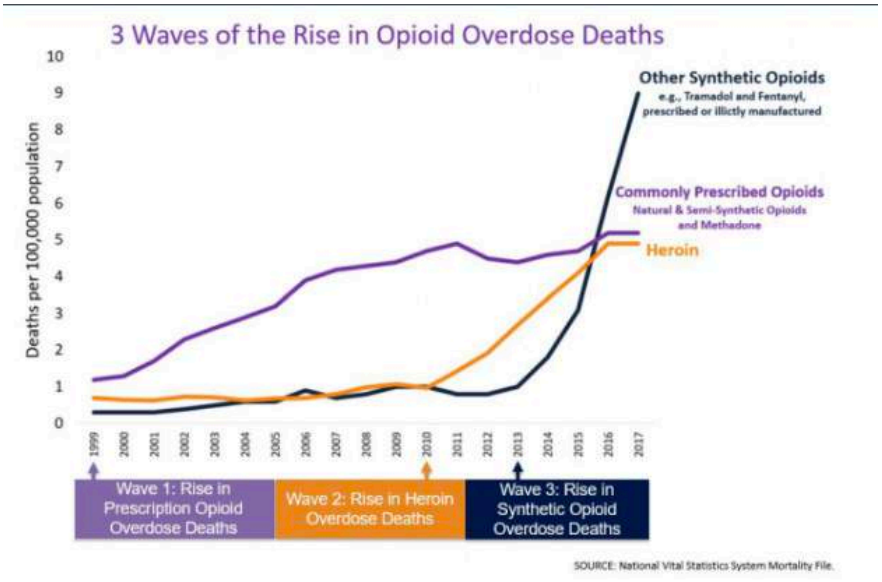
A 33-year-old man arrives via emergency medical services (EMS) after initially being found unresponsive with an oxygen saturation of 89%, respiratory rate of six, a systolic blood pressure of 75 mmHg, and pinpoint pupils. The EMS crew observes drug paraphernalia and suspect an intravenous (IV) opioid overdose. They quickly place an IV line and start a fluid bolus of normal saline; supplemental oxygen is applied and 1mg of naloxone IV given. He is alert and oriented times three with normal vital signs by the time he arrives in the emergency department. Sixty minutes after receiving naloxone he is GCS 15 and walking to the desk demanding to be discharged.

Background:

There have been close to 400,000 deaths from an overdose involving any opioid (prescription and illicit opioids) between 1999 and 2017. [1] Two-thirds of the all the drug overdoses in the US in 2016 (63,632) involved an opioid (42,249). [2]

Three distinct waves have been observed according to the Center for Disease Control and Prevention (CDC-P):

- Wave 1: Increase in prescription opioid overdose deaths in the 1990's [3].
- Wave 2: Rapid increase in overdose deaths involving heroin starting in 2010.
- Wave 3: Significant increase in overdose deaths involving synthetic opioids (like illicitly-manufactured or prescribed fentanyl) beginning in 2013 [4].



Opioids depress the heart rate and breathing, and overdoses can result in death. Naloxone is the specific treatment for opioid overdoses and is becoming widely available to first responders of all sorts (Police, Fire, First Aiders, lay people and EMS).

Naloxone 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).

Some clinicians have recommended observing opioid overdoses for four to six hours. This teaching has been challenged by a systematic review by Willman et al 2017. They concluded: *"For patients treated in the ED for opioid overdose, an observation period of one hour is sufficient if they ambulate as usual, have normal vital signs and a Glasgow Coma Scale of 15"*.

This recommendation was based on the St. Paul's Early Discharge Rule.

HOUR Decision Rule

One hour after the administration of naloxone for presumed opioid overdose, patients can be safely discharged from the ED if they meet all six criteria:

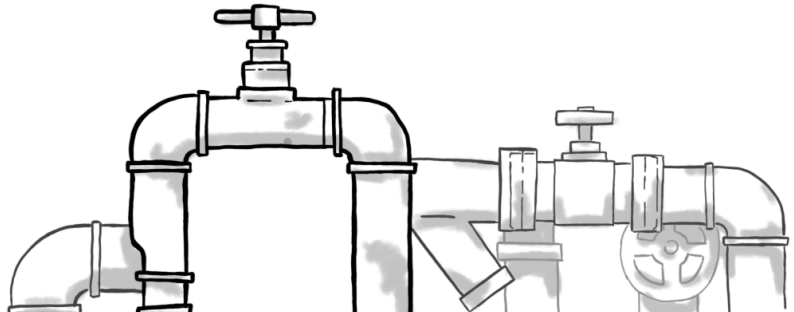
- Can mobilize as usual
- Have a normal O_2 saturation (>95%)
- Have a normal respiratory rate (>10 and <20 breaths/min)
- Have a normal temperature (>35.0 and <37.5°C)
- Have a normal heart rate (>50 and <100 beats/min)
- Have a GCS score of 15

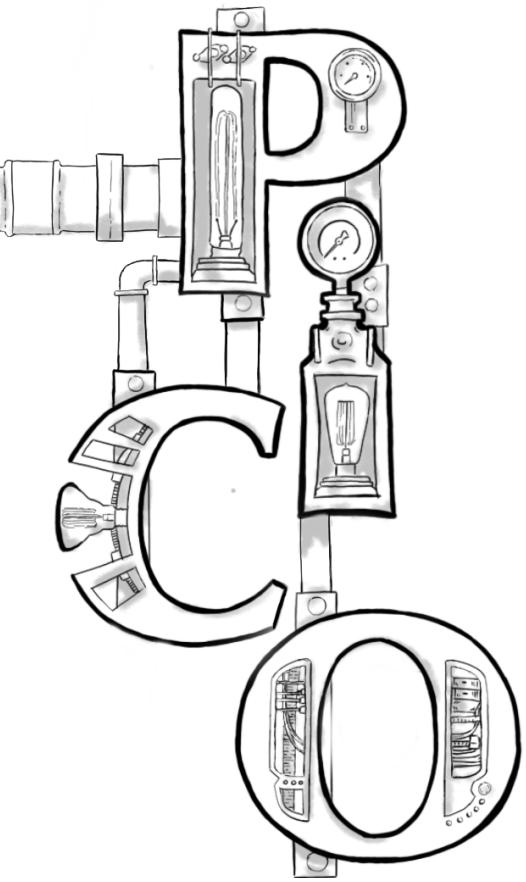
The Clinical Decision Rule (CDR) was first derived in Vancouver, BC almost 20 years ago [5]. However, this tool has never been externally validated.

We reviewed the Willman et al publication on SGEM#179 and generally agreed with the authors' conclusions. However, we were conservative in our bottom line recognizing there are patients that can be safely discharged home after an opioid overdose and administration of naloxone. You need to perform a careful clinical examination, be certain to observe the patient's respiratory pattern and mental status in a non-stimulated state and exercise caution.

Reference

Clemency et al. Hospital Observation Upon Reversal (HOUR) With Naloxone: A Prospective Clinical Prediction Rule Validation Study. AEM December 2018





Population:
A convenience sample of adult patients (18 years and older) who arrived at the emergency department after being treated with naloxone.

- **Exclusions:** Prisoners, under arrest, did not receive a 1-hour evaluation, had an incomplete but otherwise normal 1-hour evaluation, received naloxone in the hospital or requested to be withdrawn from the study.

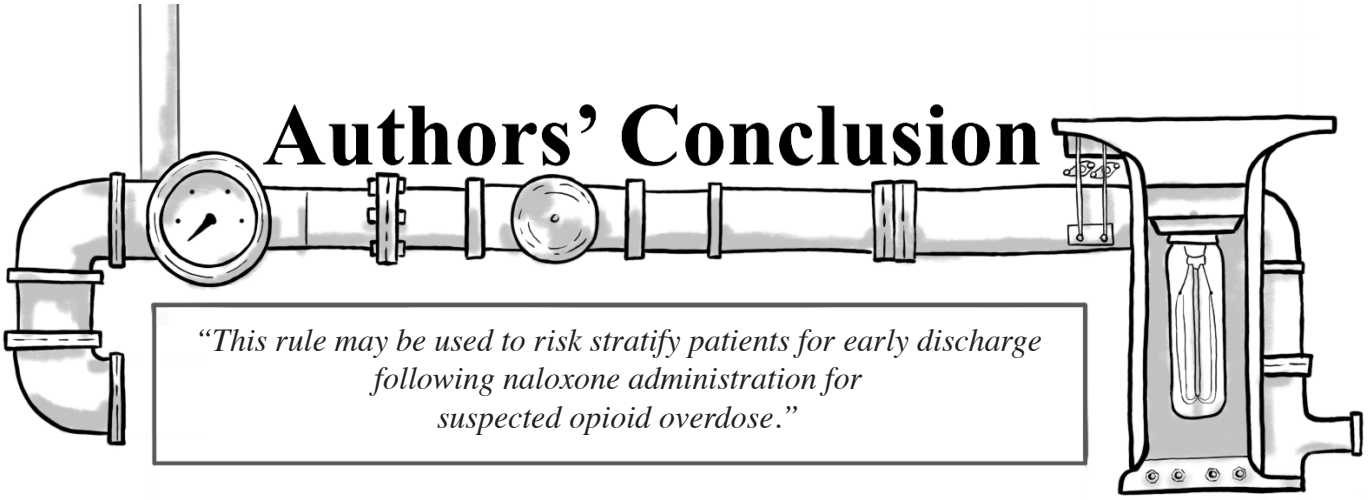
Intervention:
The HOUR clinical decision rule (tool)

Comparison:
Clinician judgment

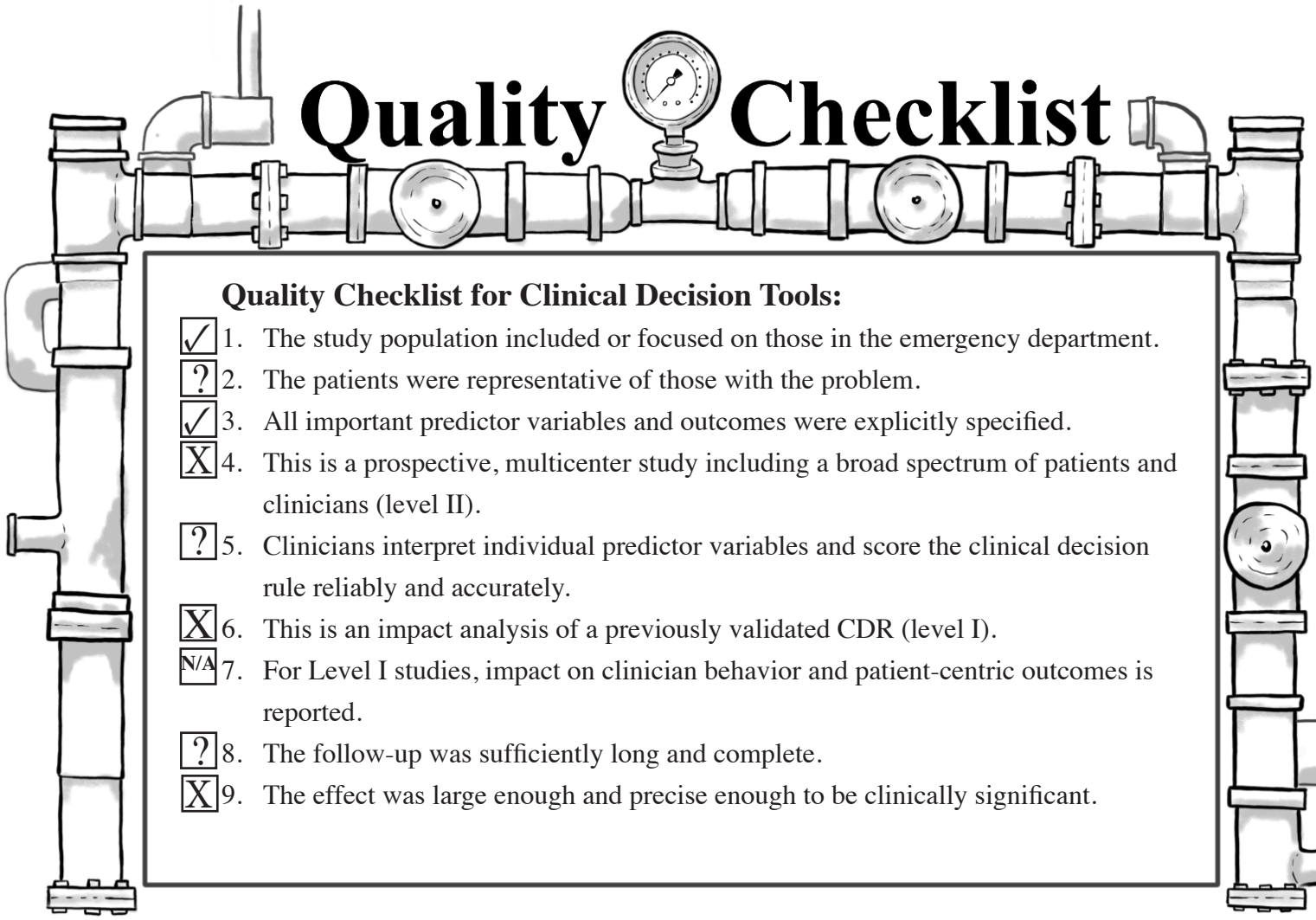
Outcomes:
Adverse events

- Clearly defined adverse events included death, repeat naloxone for respiratory depression, supplemental oxygen (for hypoxemia), assisted ventilation, IV inotropes, antiarrhythmics for sustained tachycardia, cardioversion, administration of mannitol, dialysis, and administration of bicarbonate for a bicarb level less than 5.
- There were a number of scenarios that were defined as unclear adverse events, such as the administration of naloxone without evidence of respiratory depression, IV antibiotics, administration of activated charcoal, and any unscheduled surgery. These all had guidelines to determine whether they were truly adverse events.

This paper is Hot Off the Press, trying to cut the knowledge translation window down to less than one month. As such, we have the lead author from this AEM paper. Dr. Brian Clemency is an Associate Professor at State University of New York at Buffalo, a local, regional, and national leader in prehospital care, education, and research. His research focuses on all aspects of prehospital care, including confirming or refuting existing best practices. Brian is also the EMS Fellowship Director and EMS Medical Director.



Quality Checklist



Quality Checklist for Clinical Decision Tools:

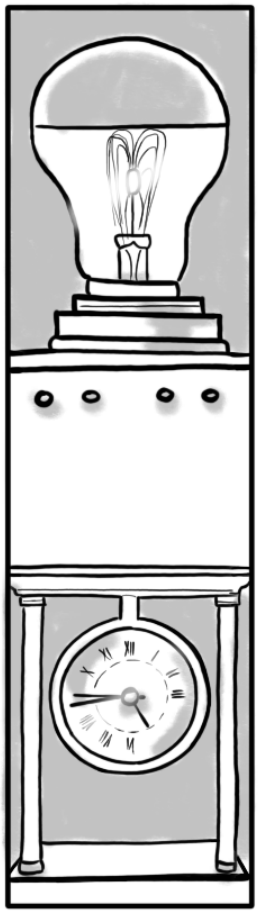
- [✓] 1. The study population included or focused on those in the emergency department.
- [?] 2. The patients were representative of those with the problem.
- [✓] 3. All important predictor variables and outcomes were explicitly specified.
- [X] 4. This is a prospective, multicenter study including a broad spectrum of patients and clinicians (level II).
- [?] 5. Clinicians interpret individual predictor variables and score the clinical decision rule reliably and accurately.
- [X] 6. This is an impact analysis of a previously validated CDR (level I).
- [N/A] 7. For Level I studies, impact on clinician behavior and patient-centric outcomes is reported.
- [?] 8. The follow-up was sufficiently long and complete.
- [X] 9. The effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
538 patients were included, out of 690 screened. The mean age was 33 years and two-thirds were male patients. Mean total naloxone dose was 3.1mg with 85% getting treated with intranasal naloxone. Two-thirds of the patients stayed in the emergency department for greater than four hours and only 6.5% left in under two hours. Overall, 82 patients (15.4%) had an adverse event. There were no deaths within 48 hours.

The hour rule and clinical judgement had very similar results. The sensitivity of both was about 85%, specificity 61%, npv 96% and ppv 29%.

	HOUR Rule	Clinical Judgment
Sensitivity	84.1% (95% CI 76.2%–92.1%)	85.4% (95% CI 77.7%–93.0%)
Specificity	62.1% (95% CI 57.6%–66.5%)	60.9% (95% CI 56.3%–65.4%)
Negative Predictive Value	95.6% (95% CI 93.3%–97.9%)	95.8% (95% CI 93.4%–98.1%)
Positive Predictive Value	28.6%	28.6%

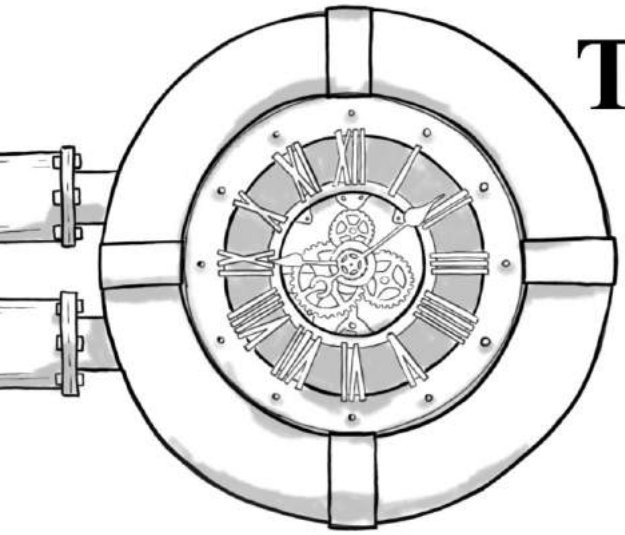


A combination of both clinician judgement and the HOUR rule, such that you had to pass both to be considered safe for discharge, was not clinically different.

- Sensitivity of 87.8% (95% CI = 80.7%–94.9%)
- Specificity of 53.0% (95% CI = 48.4%–57.7%)
- Negative predictive value of 96.0% (95% CI = 93.5%–98.4%),
- Positive predicative value of 25.5%

The HOUR rule would have missed 13 adverse events, clinician judgement 12, and a combination of both would have missed 10 adverse events. Three of the adverse events appeared to be clinically important. These cases may have led to morbidity or mortality if left untreated after the 1-hour evaluation:

- Two patients received a repeat dose of naloxone
- One patient was treated with artificial ventilation (bilevel positive airway pressure).



Time to Talk Nerdy

Listen to the podcast on iTunes or Google Play to hear Brian's responses to our ten nerdy questions.

1) Selection Bias:

A large number or patients were excluded because they didn't have a 1-hour assessment completed. Is it possible that these patients were systematically different than the included patients in some way, which could make the HOUR rule less accurate in the missed patients?

2) Modified the Rule:

The HOUR rule was changed between the derivation set and the validation set. You increased the normal oxygen saturation from >92% to >95%. Why did you make that change and what impact if any do you think it had on the results?

3) Clinical Judgement:

Most decision rules are never compared to clinical judgement. What made you decide to include that comparison here? In addition, the 1-hour evaluation was done by a variety of clinicians (attendings, residents or advanced practice providers). They were also asked if the patient appeared safe for discharge based on their clinical judgment. Clearly these groups would have different levels of clinical experience to base their *"judgment"* upon. Did you look at these subgroups?

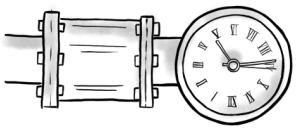
4) Incorporation Bias:

Clinician judgement was determined after the clinician filled out the decision tool. Therefore, there is a chance that the components of the rule were incorporated into clinician judgement. How do you think that might have affected the results?

5) Definitions of Adverse Events:

We really liked that the adverse events were clearly defined, and that there was a category of unclear adverse events with clear guidelines for definitions.

- Because adverse events were determined by chart review, I wonder whether some adverse events might have been missed, especially if they occurred after the patient left the hospital.
- The adverse events seem to include things that might not be related to the initial opioid overdose, such as dialysis, mannitol, or IV antibiotics. Is the decision rule supposed to catch bad outcomes from the opioid, or all possible bad outcomes in a population that has a number of health problems at baseline?
- A number of the adverse events are actually surrogate outcomes, such as the need for oxygen. Patients often desaturate while snoring when they are home, and nothing is done about it. There were no deaths in this cohort, and it isn't clear if there were any patient-oriented adverse events.



6) Disease Oriented vs. Patient Oriented Adverse Events:

The vast majority of adverse events identified were disease oriented. Supplemental oxygen for hypoxia was provided in 61/82 (74%) patients with an oxygen saturation of <93%. The vast majority of missed adverse events were also disease oriented (hypoxia requiring supplemental oxygen). The true patient oriented adverse events were rare making the use of Negative Predictive Value (NPV) much less useful. This is because NPV is based on prevalence and the prevalence of patient oriented adverse event would be only about 2-3%?

7) Reliability of the Score:

This validation study did not assess the accuracy of clinicians using the score or its individual components. The variables used were clearly defined, and mostly objective, although and the GCS score can have some subjectivity. Do you have a sense, either from prior studies or experience, about the inter-rater reliability of this rule?

8) Other Risk Factors:

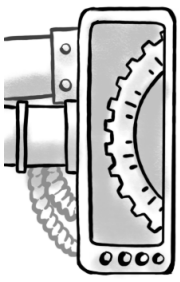
This is a validation study, so the rule was already formed, and therefore other risk factors were not studied. However, there are a number of other important risk factors in this population, included the type of opioid and route of ingestion, any polypharmacy, and comorbidities. Do you think these other factors could help make more accurate decisions?

9) Non-opioid Ingestions:

A number of patients with adverse events were listed as having poly-drug overdoses, or overdoses with a non-opioid, so that naloxone would not be expected to work. How might the inclusion of these patients have affected your results?

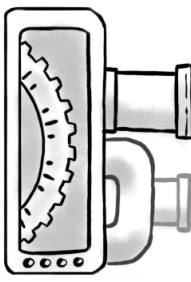
10) External Validity:

This study was conducted in a single urban academic tertiary care center that has specialize services including psychiatric and substance abuse care. Do you think this HOUR rule could be applied in community or rural hospitals without these specialised services?



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree that this clinincal decision rule (tool) may or may not be used to risk stratify patients for early discharge following naloxone administration for suspected opioid overdose.



Clinical Application:

This decision tool is no more accurate that clinician judgment, so it is unclear how it would improve patient care if used. Understanding what individual factors are predictive of adverse events is important, and so this study could be used to teach students and improve clinical judgement in settings where opioid overdose is less common.

Case Resolution:

Using your clinical judgement and the HOUR tool, you discharge the patient home with a prescription for a naloxone kit and offer a referral to an addiction counsellor.

What Do I Tell My Patient?

You have just had an opioid overdose and you feel better because we gave you a drug that blocks the effects (naloxone). If you feel like you are getting worse, you should return immediately. We would prefer if you go home with someone who can keep an eye on you for a period of time. If you would like to be referred to a detox program, we can arrange for you to meet with someone. We are also giving you a prescription for a naloxone kit to take home.

Episode End Notes

Other FOAMed:

- Academic Life in Emergency Medicine: 'Treat and Release' after Naloxone – What is the Risk of Death?
- REBEL EM

How long do you regularly observe suspected opioid overdose patients after receiving naloxone? #SGEMHOP

onlinelibrary.wiley.com/doi/full/10.11…
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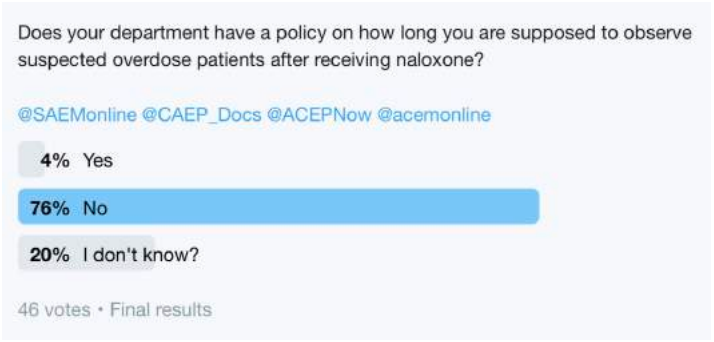
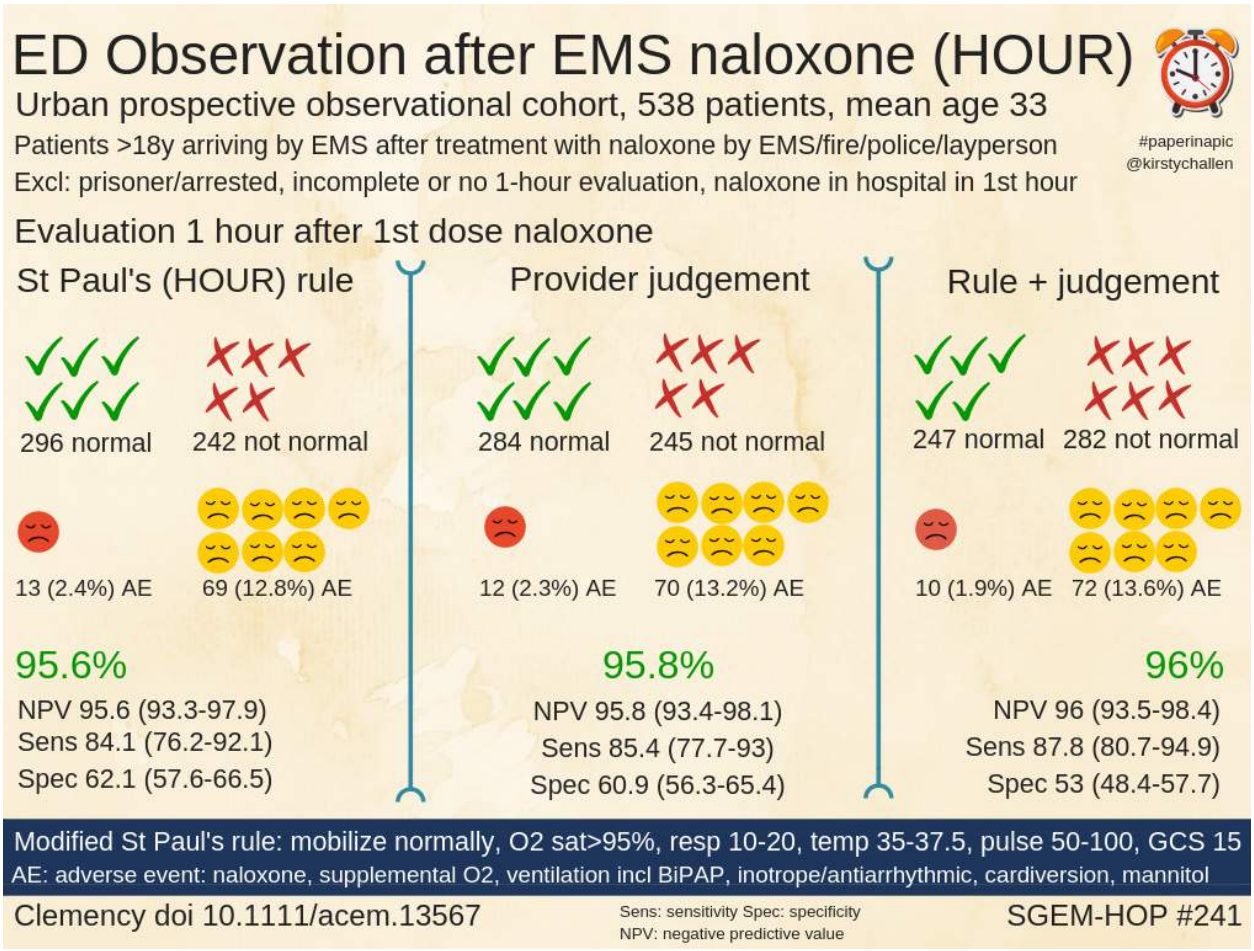
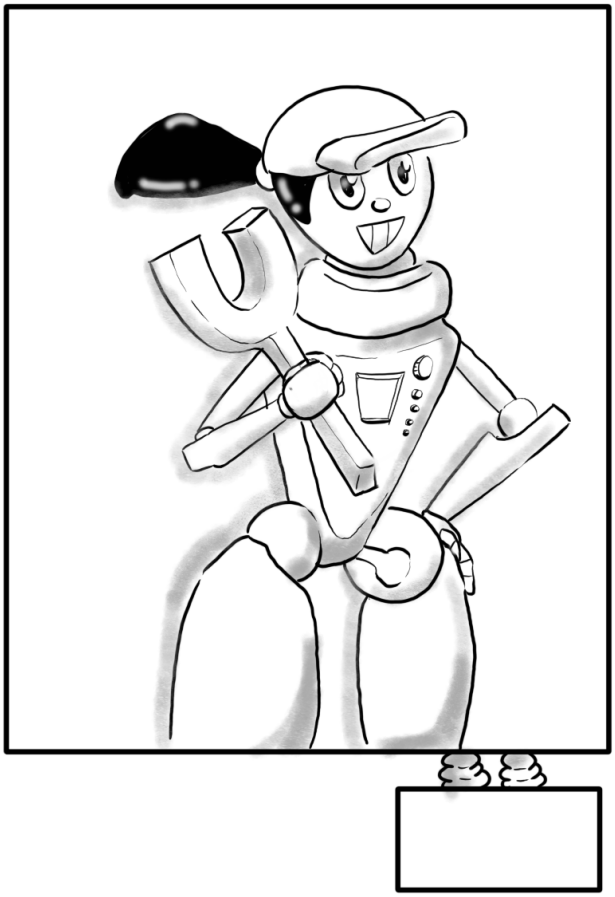




References:

1. Scholl L, Seth P, Kariisa M, Wilson N, Baldwin G. Drug and Opioid-Involved Overdose Deaths – United States, 2013-2017. WR Morb Mortal Wkly Rep. ePub: 21 December 2018.
2. Hedegaard H, Warner M, Miniño AM. Drug Overdose Deaths in the United States, 1999–2016. Hyattsville, MD: National Center for Health Statistics; 2017. NCHS Data Brief, No. 294.
3. Kolodny et al. 2015. The prescription opioid and heroin crisis: A public health approach to an epidemic of addiction. Annual Review of Public Health, 36, 559-74
4. Rudd RA, Aleshire N, Zibbell JE, Gladden RM. Increases in Drug and Opioid Overdose Deaths – United States, 2000-2014. MMWR 2016, 64(50); 1378-82.
5. Christenson J, Etherington J, Grafstein E, et al. Early dis- charge of patients with presumed opioid overdose: devel- opment of a clinical prediction rule. Acad Emerg Med 2000;7:1110–8.



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Pain, Pain, Go Away:

In Ketamine vs. In Fentanyl For Pediatric Pain Management

Clinical Question:

Is intranasal ketamine non-inferior to intranasal fentanyl for pain management in children presenting with acute extremity injuries?

Bottom Line:

Intranasal ketamine appears to be non-inferior to intranasal fentanyl for efficacy, but with more adverse events.

Guest:

Dr. Samina Ali is a pediatric emergency physician, clinician-scientist, and Professor of Pediatrics & Emergency Medicine at the University of Alberta in Edmonton. Her research is focused on improving the assessment and treatment of children's pain. Dr. Ali is currently an executive member of Pediatric Emergency Research Canada (PERC), a Faculty member with Pain in Child Health (PICH), co-chair of the PERC Pain Interest Group, pain content advisor for TREKKand faculty member of BEEM.

Case Overview

Case:

A 10-year-old girl presents to your emergency department (ED) after falling off a zipline at the playground. She used her arms to break her fall sparing her head in the process. She immediately realized that her left wrist was very sore, and her parents bring her to the hospital. She is crying and states that her pain is 8/10 at triage. There is a 3-4 hour wait in your ED that day. You want to provide pain management until she can be further assessed. Incidentally, her mother had severe hypotension after receiving IV opioids, and they are scared to use them with their daughter.

Background:

Pain is the most common reason for an ED visit in children. Patients who experience adequate pain relief during their ED stay have significant reductions in distress, improved rapport with their physician, improved intent to comply with discharge instructions and higher levels of personal and caregiver satisfaction.

Conversely, untreated pain in childhood leads to short and long-term problems including anxiety, needle phobia, hyperesthesia, and fear of medical care as adults. Effective pain management is being increasingly regarded as a cornerstone of high-quality care. In fact, the importance of providing optimal pain treatment is supported by the World Health Organization, the American Academy of Pediatrics, and the Joint Commission (USA).

Children represent one group of patients that are less likely to receive adequate analgesia (Brown et al, Selbst and Clark). This phenomenon is known as oligoanalgesia or poor pain management through the underuse of analgesia. We have covered pediatric pain with PEM super hero Dr. Anthony Crocco on SGEM#78. He even did a RANThony on this issue.

Musculoskeletal (MSK) injury is a very common cause for ED visits for children with pain, with a child's risk of sustaining a fracture ranging from 27-42% by the age of 16 years (Spady et al and CIHI). MSK injury is known to generate moderate to severe pain in most children and the ED serves as the critical entry point for these injured children.

Despite three decades of pain research in this area, recent evidence confirms that ED pain management in children is still suboptimal. A retrospective cohort study of children presenting to the ED with an isolated long-bone fracture showed almost 1/3 received inadequate medication and 59% received no pain medications during the critical first hour of assessment (Dong et al).

Previous studies have demonstrated that only 35% of children presenting to a Canadian pediatric ED with fractures or severe sprains received any analgesic (LeMay et al and Kircher et al). Further, a medical record review of two Canadian EDs showed unacceptably long delays in the provision of initial analgesia, with children waiting a mean of 118 minutes to the provision of first analgesia (Kircher et al).

As such, clinicians have sought faster-acting, effective, and easy to administer pain medications to children with acute MSK pain injury and moderate to severe pain. Two potential options are intranasal ketamine and intranasal fentanyl.

Ketamine is a noncompetitive N-methyl-D-aspartate (NMDA) and glutamate receptor antagonist that provides analgesia by virtue of decreasing central sensitization, "wind-up" phenomenon, and pain memory. Sub-dissociative ketamine has gained recent popularity for pain management in trauma, as another opioid-sparing alternative. Its use is associated with higher rates of minor but generally well-tolerated adverse effects.

We have covered low-dose ketamine (LDK) a number of times on the SGEM:

- SGEM#233: Larry in the Den with Kiwis (LDK) – Low dose ketamine vs. opioids for acute pain
- SGEM#198: Better Slow Down – Push vs. short infusion of low dose ketamine for pain in the emergency department
- SGEM#130: Low Dose Ketamine for Acute Pain Control in the Emergency Department
- SGEM#111: Comfortably Numb – Low dose ketamine as adjunct for ed pain control

Sub-dissociative ketamine appears to have the same analgesic efficacy as intranasal (IN) fentanyl or intravenous (IV) morphine in early studies for fracture pain in the ED. Intravenous dosing of sub-dissociative ketamine is 0.1–0.4 mg/kg and intranasal dosing for sub-dissociative ketamine is 0.5-1 mg/kg.

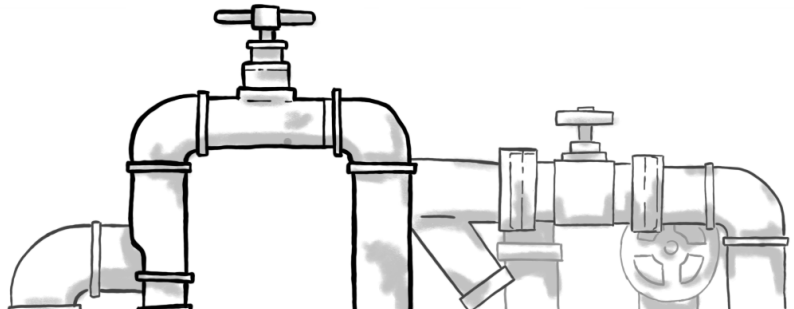
Similar to IN fentanyl, IN ketamine shares the advantages of early and rapid pain management for children who lack vascular access but confers the added benefit of longer-lasting analgesia (60 minutes for IN ketamine vs 30 minutes for IN fentanyl).

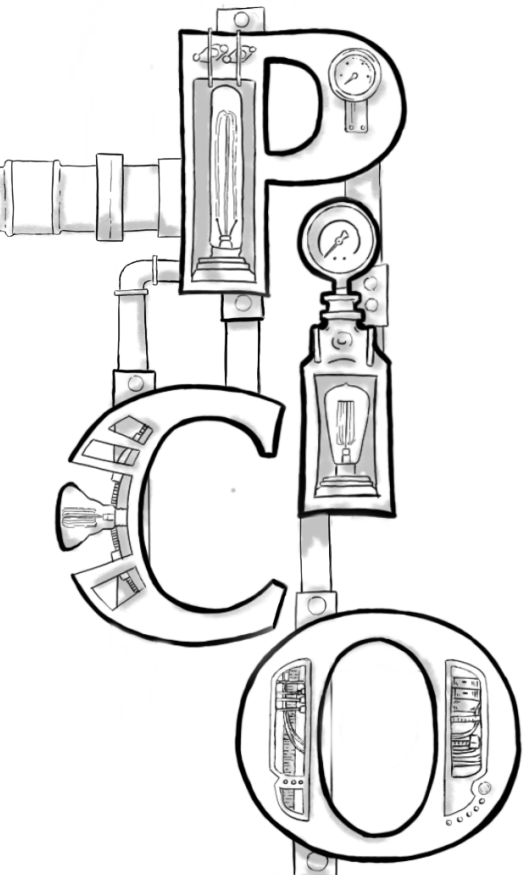
Intranasal fentanyl is an excellent alternative to oral or IV opioids when rapid acute pain management is desired (eg grossly displaced forearm fracture), or IV placement is not otherwise necessary (eg clavicular fracture). Intranasal fentanyl at doses of 1.5 to 2 micrograms/kg (minimum 20 mcg and maximum 100 mcg) provides adequate and rapid analgesia comparable to that of IV morphine.

The time to administration of analgesia is reduced when IN fentanyl is compared with IV analgesics such as morphine. IN fentanyl, administered via mucosal atomizer device, is an excellent medication choice for the rapid treatment of moderate to severe pain, while awaiting topical anesthetic cream to take effect, prior to IV cannulation. It is also useful in the prehospital setting.

Reference

Frey et al Effect of Intranasal Ketamine vs Fentanyl on Pain Reduction for Extremity Injuries in Children: The PRIME Randomized Clinical Trial. JAMA Pediatrics December 2018





Population:
Children aged 8 to 17 years presenting to the emergency department with moderate to severe pain due to traumatic limb injuries (with VAS >35mm).

- **Exclusions:** There were ten exclusions. Significant head, chest, abdomen or spine injury, GCS <15 or inability to report a VAS score, nasal trauma or aberrant nasal anatomy, active epistaxis, ketamine or fentanyl allergy, history of psychosis, opioid administration prior to arrival, non-English speaking, in police custody, and postmenarchal girls without a negative pregnancy test.

Intervention:
Intranasal ketamine 1.5 mg/kg (max 100mg)

Comparison:
Intranasal fentanyl 2mcg/kg (max 100 mcg)

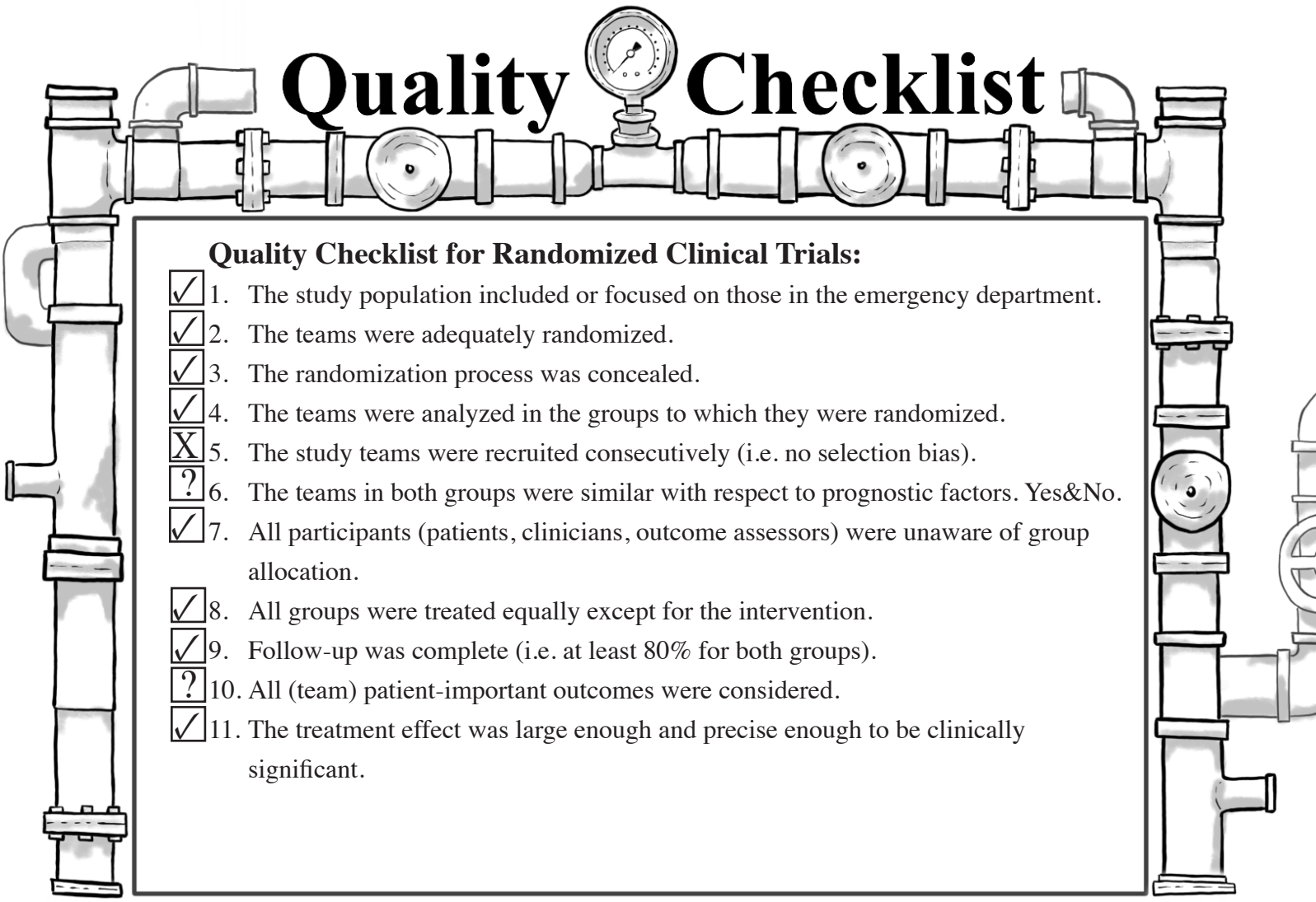
Outcomes:

- **Primary:** The difference in pain reduction between groups 30 minutes after treatment, as measured by the VAS.
- **Secondary:** Sedation level as measured by the University of Michigan Sedation Scale, capnometry values, adverse events, the need for rescue analgesia and the change in vital signs (using PALS as a reference).

Authors' Conclusion

"Ketamine provides effective analgesia that is noninferior to fentanyl, although participants who received ketamine had an increase in adverse events that were minor and transient. Intranasal ketamine may be an appropriate alternative to intranasal fentanyl for pain associated with acute extremity injuries. Ketamine should be considered for pediatric pain management in the emergency setting, especially when opioids are associated with increased risk."

Quality Checklist



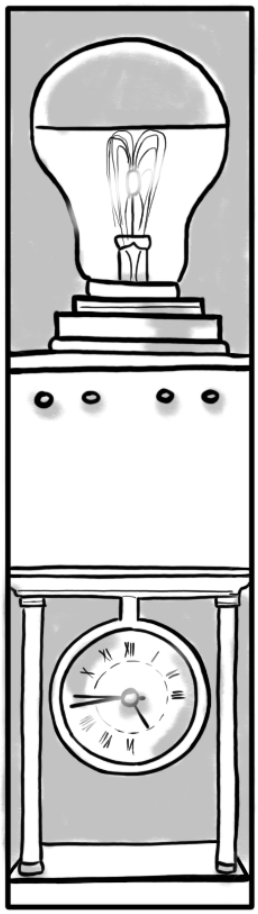
Quality Checklist for Randomized Clinical Trials:

- [✓] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [X] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [?] 6. The teams in both groups were similar with respect to prognostic factors. Yes&No.
- [✓] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [?] 10. All (team) patient-important outcomes were considered.
- [✓] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

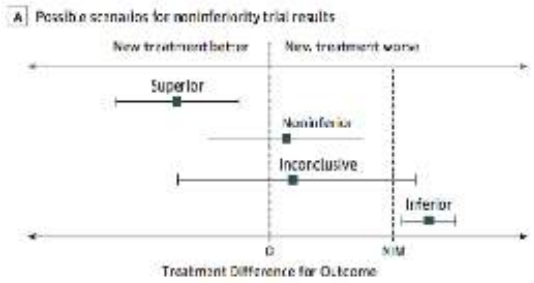
Key Results:
They enrolled 90 children with half allocated to each group. The mean age was 12 years.

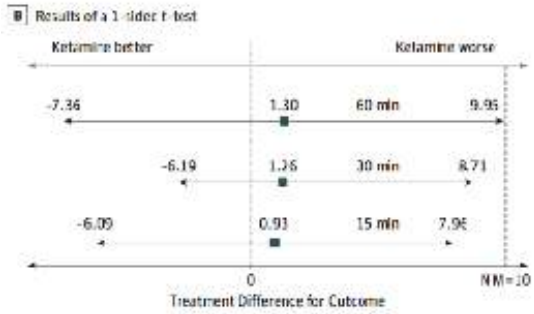
Ketamine was noninferior to fentanyl with regard to the primary outcome of pain reduction 30 minutes after study medication administration.

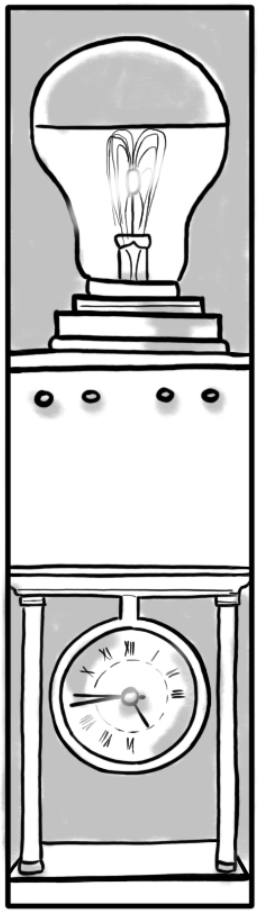


Primary Outcomes:

- Ketamine –30.6 (95% CI –35.8 to –25.4)
- Fentanyl –31.9 (95% CI –37.2 to –26.6)
- As the 95% confidence intervals crossed 0 but did not cross the prespecified noninferiority margin of 10mm.





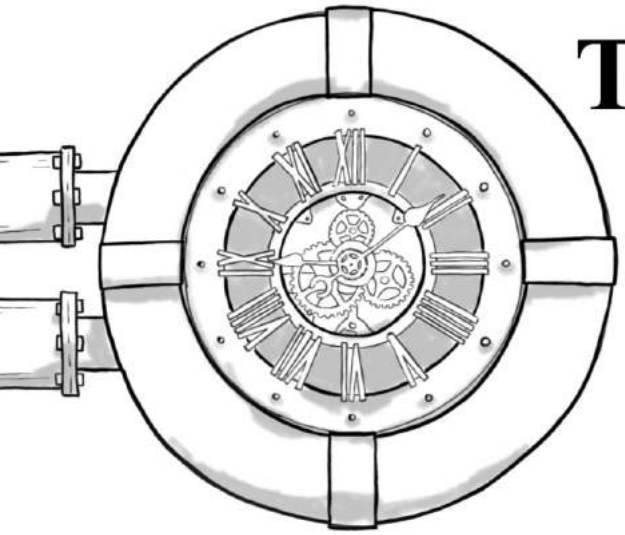


Secondary Outcomes:

- There were no significant differences observed in the highest achieved sedation scores, mean capnometry values, vital signs, or need for rescue analgesia between the two groups.

- There was a total of 47 patients that experienced 63 adverse events. More adverse events were observed in the ketamine group (49) vs. the fentanyl group (14). All the adverse events were minor and transient. The relative risk of adverse events in the ketamine group was 2.5 (95% CI 1.5 to 4.0). There was no significant difference in the number of adverse events between groups at each assessment point, except for the 15-minute assessment, where ketamine group had much more drowsiness (17 vs 4).

- Twenty patients (23%) requiring additional analgesia, 11 in the ketamine group and 9 in the fentanyl group (relative risk, 0.89; 95% CI, 0.5- 1.6).



Time to Talk Nerdy

1) Blinding:

They used sealed envelopes, but they did not specifically say they were opaque envelopes. This could have led to some gaming of the system and introduced selection bias. As previously stated, computer randomization is considered more secure and less likely to be broken.

2) Blinding (2):

We really like that they asked the staff to guess group allocation at the 30-minute assessment. Because more than 50% guessed correctly (63%) it suggests blinding was not maintained and could have introduced bias.

3) Selection Bias:

They did not have consecutive patients but rather a convenient sample of patients. Thirty-one out of 140 eligible patients (22%) were excluded because the research coordinator was not present, patient was not in proper location, study enrollment was on hold for regulatory purposes, and clinician preference. This could have introduced some selection bias into the study and impacted the results and the conclusion of non-inferiority.

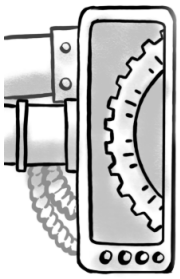
Another point to consider is why did the authors choose 35mm as the pain threshold for inclusion in the study? This seems kind of low. In my practice I would use oral pain medication first before considering intranasal medication. In general, I don't use intranasal pain medications as a first line option for 35mm of pain. In our soon to be launched multi-centre trial, the NO OUCH study, we will be using >49 mm for inclusion into the study, as our medication choices include a stronger oral opioid.

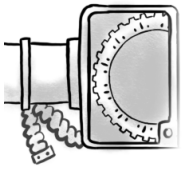
4) Removal of Co-Dosing:

They removed co-dosing of ibuprofen with intranasal medication in the study design. Ibuprofen works, it is opioid-sparing, and while in need of a study to confirm, it likely provides smoother and more sustained pain reduction over the ED visit, when combined with IN medication. While this design allowed for a 'pure' answer to the effectiveness question of these two meds, this is not how we should use it in practice.

5) Medication Dosing:

One of my pet peeves is when a study shows no difference between arms and one or more arms used sub-optimal dosing of a drug! So, their dosing regimen helps me feel more confident in their results.

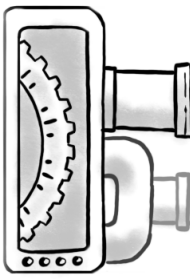


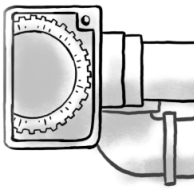


Comment on Authors' Conclusion Compared to SGEM Conclusion:

The authors' main conclusion regarding non-inferiority for efficacy seems reasonable and congruent with their results. However, I find the statement regarding pre-procedural sedation analgesia limiting of opioids to not be consistent with my decision-making. If I think opioid will provide the best pain relief and adverse event profile, I would use it and be mindful when dosing for procedural sedation analgesia. From the Bhatt paper they continually make this point:

"Although we do not recommend limiting opioid use to treat preprocedural pain, we believe that awareness of this risk factor will help clinicians prepare for sedation and anticipate potential adverse events." As such, I don't agree when they stress this as a reason to use ketamine. I think of ketamine as another valid pain-relieving tool in my toolkit, to be considered when making clinical decisions at the patient-level.





What Do I Tell the My Patient?

There is no reason your child needs to be in pain while we sort this out. If you have hesitations using opioids, I have another option for rapid pain relief. It works as well as opioids but will likely make your child drowsy or dizzy in the first hour after its use.

Case Resolution:

In consultation with the emergency department physician, the triage nurse administers 10mg/kg of ibuprofen orally and 1.5 mg/kg ketamine intranasal. The pain at 15 minutes is reduced from 80 to 50mm using the VAS. At 60 minutes, it is 40mm. She goes on to receive her x-ray, confirm her diagnosis of minimally displaced and minimally angulated distal radius fracture, splinted (SGEM#19) and sent home with appropriate follow-up, pain management and when to return to the ED if necessary.

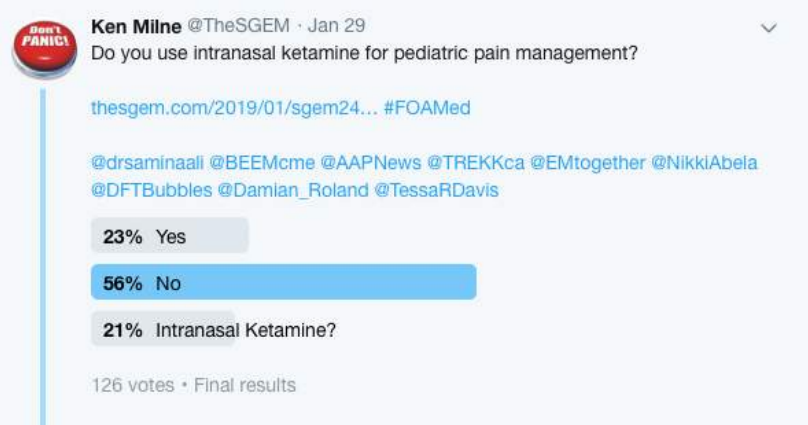
Clinical Application:

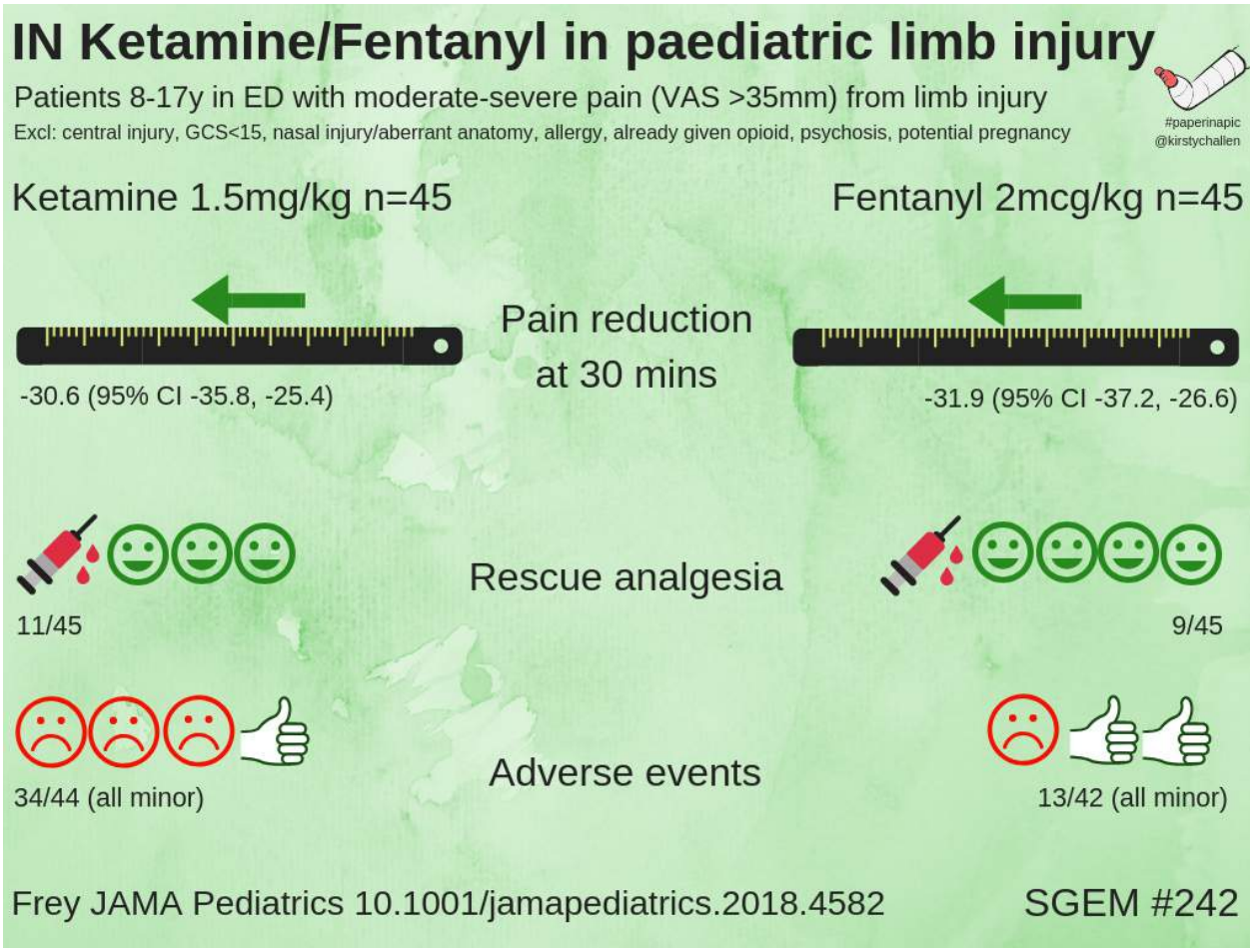
This is another reasonably well-executed study that shows that intranasal ketamine is a valid pain-relieving tool in our toolkits, to be considered when making clinical decisions at the patient-level. If monitoring neurological status is important to the clinical presentation (ie concomitant head injury), then intranasal fentanyl may be the better choice. However, some families voice strong opinions regarding the avoidance of opioids, and ketamine allows this to be respected. However, personally, I don't see ketamine as a *'safer'* option for addiction/dependence risk, as it is also a drug of abuse.

Episode End Notes

Other FOAMed:

- St. Emlyn's: Intranasal Ketamine vs. Fentanyl for kids.
- SGEM#123: Intranasal Fentanyl – Oh, What a Feeling
- PEM Playbook: Intranasal Medications and You
- ALiEM: Tricks of the trade: Intranasal fentanyl for pediatric patients
- EM Cases: Episode 67 Pediatric Pain Management





Other Key References:

1. Randomized Controlled Feasibility Trial of Intranasal Ketamine Compared to Intranasal Fentanyl for Analgesia in Children with Suspected Extremity Fractures. Reynolds SL, Bryant KK, Studnek JR, Hogg M, Dunn C, Templin MA, Moore CG, Young JR, Walker KR, Runyon MS. Acad Emerg Med. 2017 Dec;24(12):1430-1440. doi: 10.1111/acem.13313. Epub 2017 Nov 3. PMID: 28926159
2. The PICHFORK (Pain in Children Fentanyl or Ketamine) trial: a randomized controlled trial comparing intranasal ketamine and fentanyl for the relief of moderate to severe pain in children with limb injuries. Graudins A, Meek R, Egerton-Warburton D, Oakley E, Seith R. Ann Emerg Med. 2015 Mar;65(3):248-254.e1. doi: 10.1016/j.annemergmed.2014.09.024. Epub 2014 Nov 18. PMID: 25447557
3. Analgesic Efficacy of Intranasal Ketamine Versus Intranasal Fentanyl for Moderate to Severe Pain in Children: A Prospective, Randomized, Double-Blind Study. Quinn K, Kriss S, Drapkin J, Likourezos A, Pushkar I, Brady J, Yasavolian M, Chitnis SS, Motov S, Fromm C. Pediatr Emerg Care. 2018 Jul 24. PMID: 30045355
4. Demonstration of analgesic effect of intranasal ketamine and intranasal fentanyl for postoperative pain after pediatric tonsillectomy.
5. Yenigun A, Yilmaz S, Dogan R, Goktas SS, Calim M, Ozturan O. Int J Pediatr Otorhinolaryngol. 2018 Jan;104:182-185. doi: 10.1016/j.ijporl.2017.11.018. Epub 2017 Nov 23. PMID: 29287863
6. Intranasal ketamine for analgesia in the emergency department: a prospective observational series.Andolfatto G, Willman E, Joo D, Miller P, Wong WB, Koehn M, Dobson R, Angus E, Moadebi S. Acad Emerg Med. 2013 Oct;20(10):1050-4. doi: 10.1111/acem.12229. PMID:24127709
7. Sub-dissociative dose intranasal ketamine for limb injury pain in children in the emergency department: a pilot study. Yeaman F, Oakley E, Meek R, Graudins A. Emerg Med Australas. 2013 Apr;25(2):161-7. doi: 10.1111/1742-6723.12059. Epub 2013 Mar 20. PMID: 23560967
8. Intranasal fentanyl for the management of acute pain in children. Murphy A, O'Sullivan R, Wakai A, Grant TS, Barrett MJ, Cronin J, McCoy SC, Hom J, Kandamany N. Cochrane Database Syst Rev. 2014 Oct 10;(10):CD009942. doi: 10.1002/14651858.CD009942.pub2. Review PMID: 25300594

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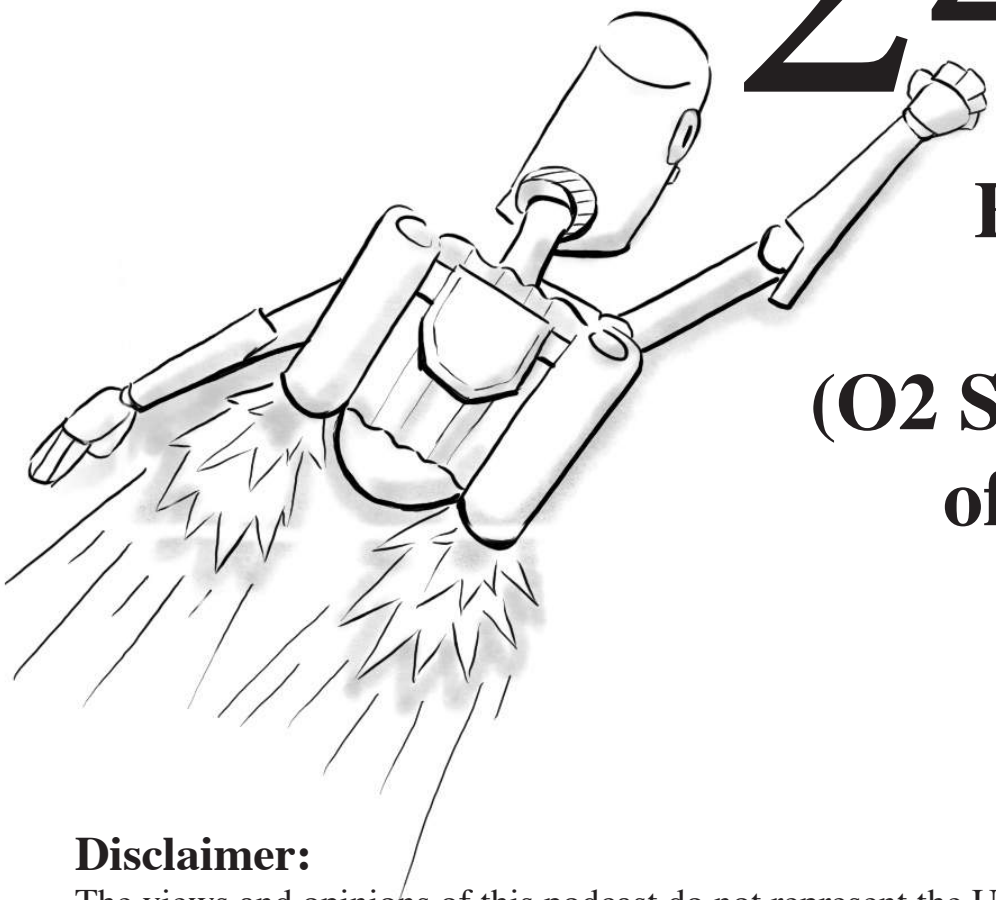


Enough Is Enough (O2 Saturation of 94-96%)

Disclaimer:

The views and opinions of this podcast do not represent the United States government or the US Air Force.

Clinical Question:

Is liberal oxygen therapy vs. Conservative oxygen therapy for acutely ill adults effective and safe?

Bottom Line:

The goal of oxygen therapy should not usually be 100% in critically ill patients but rather aim for the mid 90's%.

Guest:

Dr. Robert Edmonds is an emergency physician in the US Air Force in Virginia. This is Bob's ninth visit to the SGEM.

Case Overview

Case:

You're working a shift in a rural emergency department when a 68-year-old man presents with a two-day course of worsening cough, shortness of breath, and fever. Their workup reveals a multifocal pneumonia with signs of sepsis. The patient has an oxygen saturation of 98% on room air and your nurses ask if you want the patient to receive supplemental oxygen.

Background:

The liberal use of supplemental oxygen therapy in acutely ill adults has a long history in the hospital, but high-quality therapy supporting its practice is unclear.

Recently, the role of oxygen therapy in non-hypoxic patients has been challenged in myocardial infarction patients, as seen in a number of trials including DETO2X-AMI

We covered the DETO2X-AMI trial on SGEM#192. The SGEM Bottom Line was that the routine administration of supplemental oxygen in patients with suspected or confirmed acute myocardial infarction who are not hypoxic does not appear to provide a patient-oriented benefit.

In the 2015 AVOID study there was some suggestion of increased MI size in the group of STEMI patients that received oxygen at 8 L/min compared to a room air control group. This study expands upon that investigation to patients with other conditions as well.

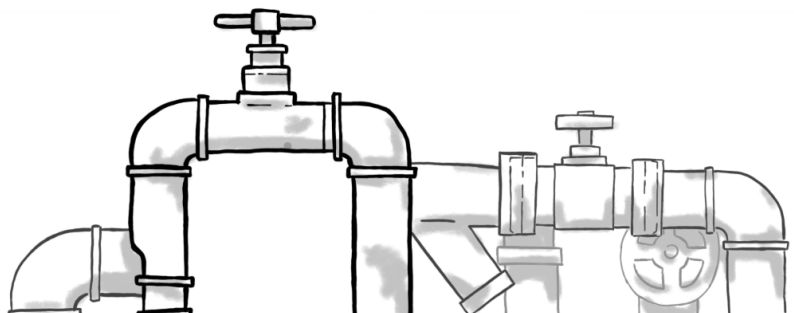
While supplemental oxygen is undoubtedly beneficial for patients acutely desaturating, in respiratory distress, or suffering from carbon monoxide poisoning just to name a few, there is widespread *"indication creep"* for this therapy.

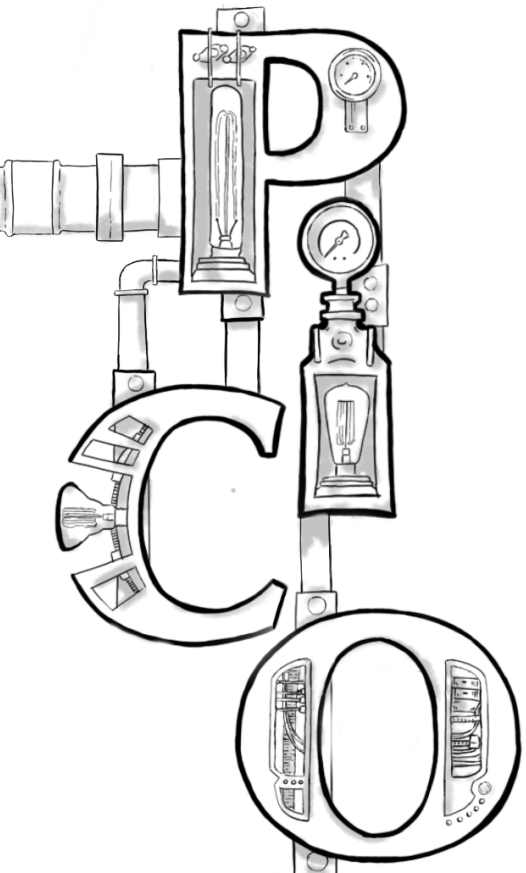
In neonatal resuscitation oxygen is treated like a drug that should be appropriately dosed, with careful attention to limit its use to the minimum required amount out of a fear of harm from its excess use.

In acutely ill adults, this same concept is not yet as widespread and liberal administration is still common place.

Reference

Chu DK et al. Mortality and morbidity in acutely ill adults treated with liberal versus conservative oxygen therapy (IOTA): a systematic review and meta-analysis. The Lancet 2018.





Population:
Acutely ill adults (>18 years old) with any condition requiring non-elective hospital admission and the potential to be exposed to supplemental oxygen

- **Exclusions:** Studies with patients who are younger than 18, pregnant, limited to patients with chronic respiratory disease, on extracorporeal life support, treated with hyperbaric oxygen or undergoing elective surgery

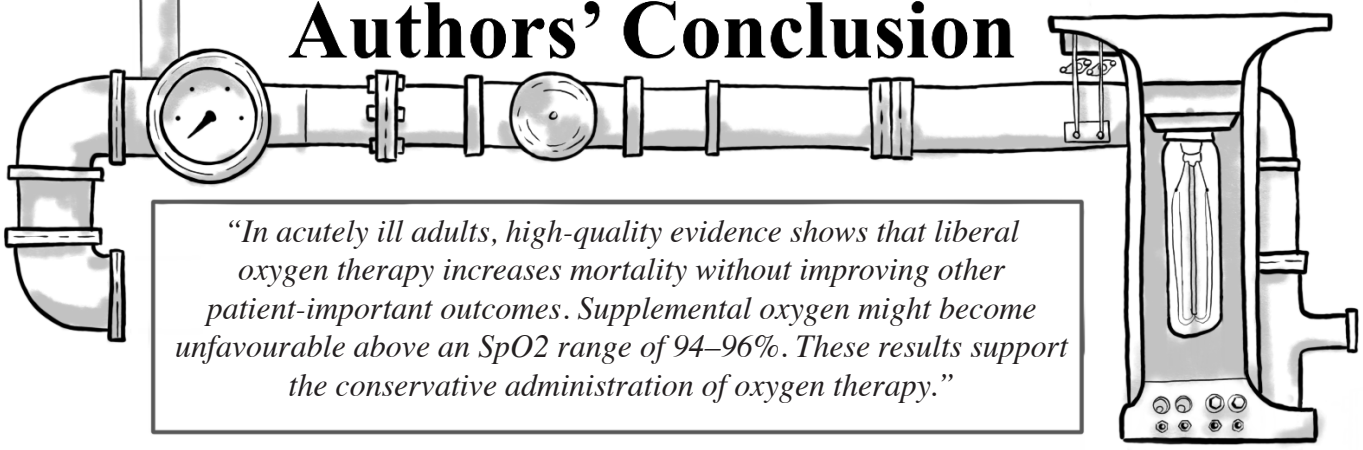
Intervention:
A higher oxygen target (liberal group). This was measured by FiO2, PaO2, arterial oxygen saturation measured by blood analysis or peripheral oxygen saturation measured by pulse oximeter

Comparison:
The lower oxygen target (conservative group)

Outcomes:
The authors do not report any one outcome as a primary outcomes, but instead listed morbidity and mortality.

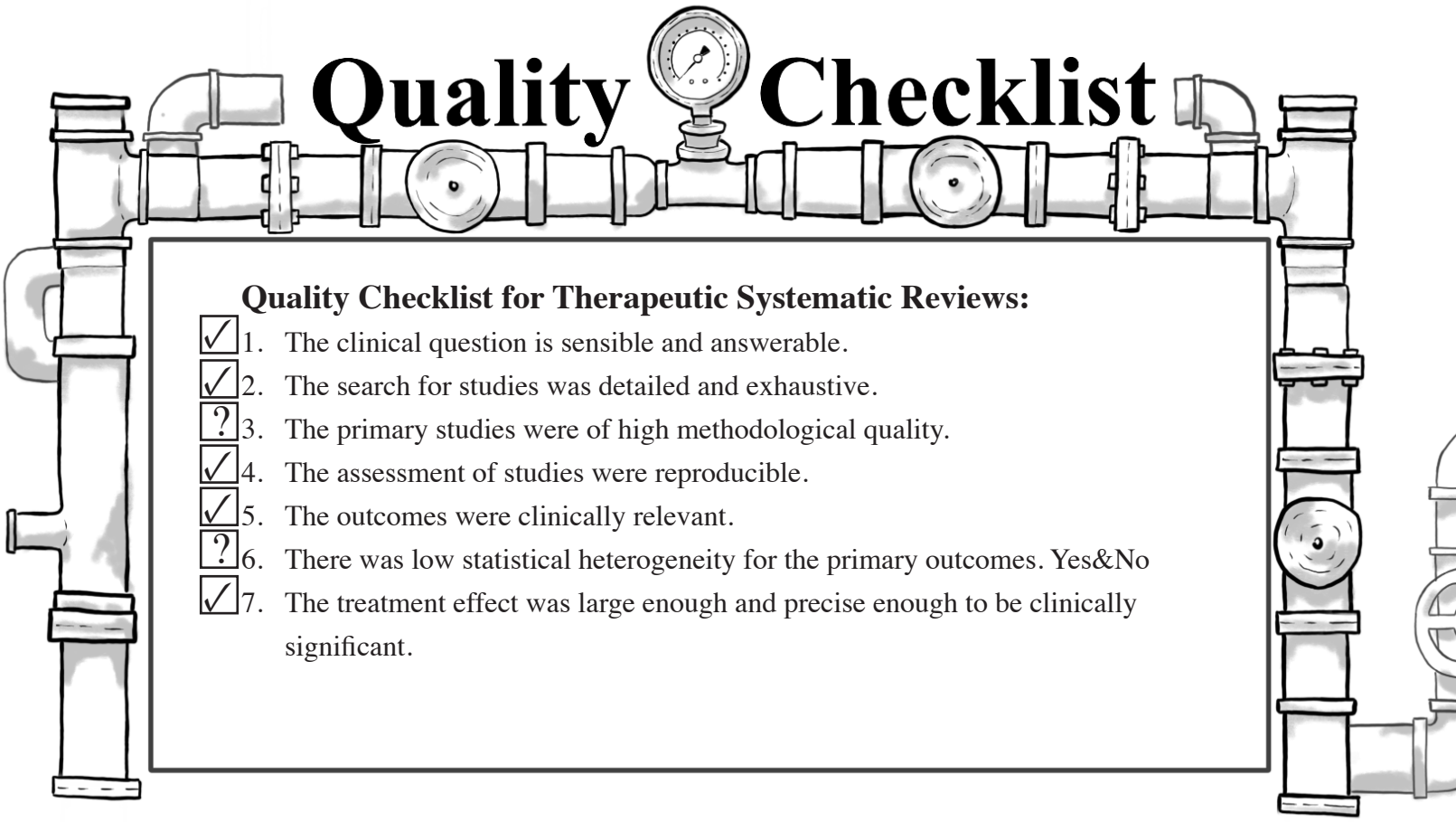
- **Mortality:** In-hospital, 30 days, and at the longest follow-up
- **Morbidity:** Disability measured by the modified Rankin Scale, risk of hospital-acquired pneumonia, risk of any hospital-acquired infection or hospital length of stay.

Authors' Conclusion



"In acutely ill adults, high-quality evidence shows that liberal oxygen therapy increases mortality without improving other patient-important outcomes. Supplemental oxygen might become unfavourable above an SpO2 range of 94–96%. These results support the conservative administration of oxygen therapy."

Quality Checklist



Quality Checklist for Therapeutic Systematic Reviews:

- ☑ 1. The clinical question is sensible and answerable.
- ☑ 2. The search for studies was detailed and exhaustive.
- ? 3. The primary studies were of high methodological quality.
- ☑ 4. The assessment of studies were reproducible.
- ☑ 5. The outcomes were clinically relevant.
- ? 6. There was low statistical heterogeneity for the primary outcomes. Yes&No
- ☑ 7. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

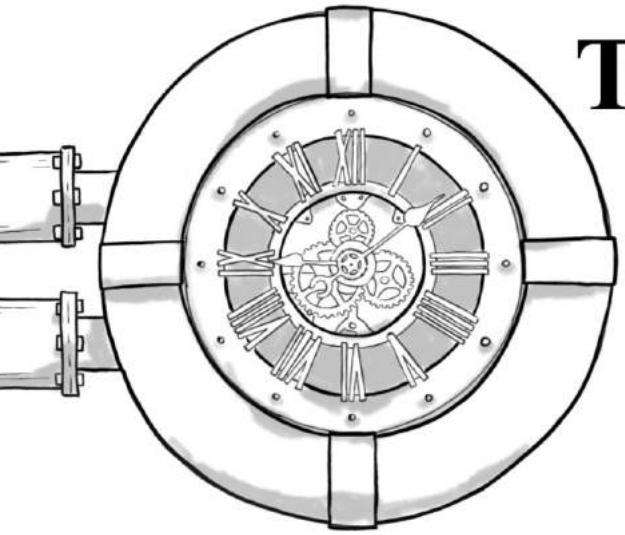
Key Results:
The search found 25 randomized control trials to include in the meta-analysis with 16,037 patients suffering from sepsis, critical illness, stroke, trauma, myocardial infarction, cardiac arrest or emergency surgery.

A liberal oxygen strategy increased the risk of death compared with a conservative strategy in hospital, at 30-days, and at longest reported follow-up.

Mortality	Patients	Relative Risk	95% Confidence Interval	NNT
In- Hospital	15,071	RR 1.21	1.03 to 1.43, p=0.020	138
30-Day	15,053	RR 1.14	1.01 to 1.28, p=0.033	125
Longest Follow-Up	15,755	RR 1.10	1.00 to 1.20, p=0.044	105

Meta-regression analysis demonstrated that increasing SpO2 was associated with high relative risky of in-hospital ant at longest follow-up mortality.

The morbidity findings (disability measured by the modified Rankin Scale, risk of hospital-acquired pneumonia, risk of any hospital-acquired infection or hospital length of stay) were similar between groups.



Time to Talk Nerdy

1) Statistical Power of Systematic Review Meta-Analysis:

This study collating multiple negative studies into a positive one. The claim of increased mortality from a liberal oxygen strategy is certainly eye catching. The liberal oxygen group had 283 deaths in 7,555 patients. More than three-quarters (78%) of these deaths are from four of the 19 studies (not all 25 included studies had mortality data). In each of these four studies, the 95% CI for the relative risk crossed or included the number 1.00 which would make the individual studies not statistically significant. Of these four studies demonstrating a higher incidence of death studies, three of them had a 95% CI that went as low as 0.81 and as high as 1.66; the 95% CI was 1.00-1.78 in the other study of these big four by Girardis et al. This is of concern as the meta-analysis is effectively turning insignificant studies into something else and is pretty heavily weighted by one particular study which constituted only 3% of the overall meta-analysis population but 26% of all deaths.

2) Variety:

There was a wide variety of patients included and a wide variety of protocols used in the individual trials. This can be a potential strength and potential weakness. It could demonstrate a robust negative impact of oxygen on something like mortality. It could also fail to find a small important difference that truly exists for a specific condition because the noise drowns out the signal.

3) Different Modes of Ventilation Matter:

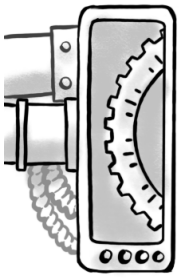
The Girardis study that has the most weight (32%) in the authors' evaluation of mortality is from 2016 and was of patients in critical care that were invasively mechanically ventilated-in sharp contrast to the patients from the other three of these big four higher incidence of death studies (Roffe 2017, Ronning 1999, and Hoffmann 2017) that underwent face- mask or nasal prong therapy. It's arguable that the overall medical condition of an intubated hyperoxic patient may be significantly different than a patient receiving noninvasive oxygen delivery, and this may add concern to the previous point of one study weighing the rest of the analysis heavily.

4) Heterogeneity:

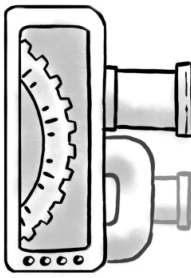
This is similar to the second point I was making earlier. While the heterogeneity for mortality was low (zero percent) the heterogeneity for morbidity was high. This makes it more difficult to interpret these results and have confidence in any conclusions.

5) Heterogenous Follow-Up:

The two main studies that contributed to the total population of this meta-analysis were the Hoffman and Roffe studies, which contributed 79% of the meta-analysis population. Hoffman reported 1-year survival and Roffe reported 90-day survival, and its arguable that this significantly impacts the reporting quality of the *"mortality at longest follow-up"* endpoint.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree that there does not appear to be a benefit to the liberal oxygen therapy approach and high-quality evidence demonstrated an increase in mortality using a liberal oxygen approach.



Clinical Application:
This is another study reminding us that oxygen is a drug and just like any other drug it can have potential benefit and potential harm depending on how and when it is used. Multiple recent studies support a conservative supplemental oxygen therapy approach should be used when treating critically ill patients.

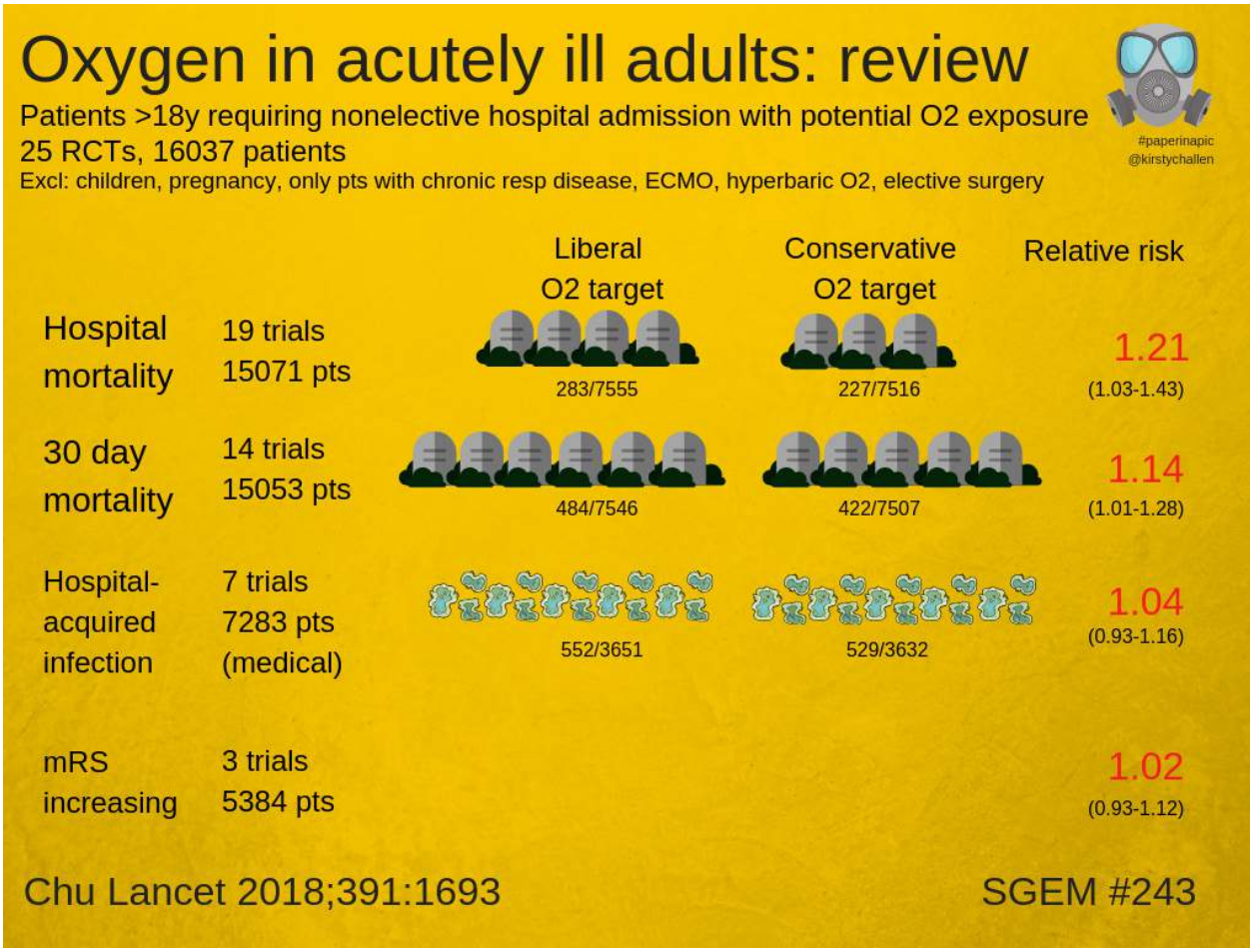
What Do I Tell My Patient?
We will be continuously monitoring your body and your vital signs during your hospitalization with us. It doesn't appear that additional oxygen will be helpful to you at this time, but if it becomes needed, we'll supply it at once.

Case Resolution:
As the patient is breathing easily and has adequate oxygen saturation, I request nursing only supply additional oxygen if the patient begins the have low oxygen saturations. The patient is admitted to the medical ward on room air.

Episode End Notes

Other FOAMed:

- St. Emlyn's: Oxygen in the Acutely Unwell Patient
- The Bottom Line: IOTA – Liberal vs Conservative Oxygen Therapy
- Clay Smith at Journal Feed: IOTA – Oxygen, Less is More
- REBEL EM: Hyperoxia in the Critically Ill



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Magnesium AF

Clinical Question:

Can IV magnesium sulfate reduce the ventricular rate safely and effectively in ED patients with rapid atrial fibrillation?

Bottom Line:

In patients receiving rate control for atrial fibrillation in the ED, magnesium may (may not) be a useful adjunct but can be associated with more side effects.

Guest:

Dr. Corey Heitz is an emergency physician in Roanoke, Virginia. He is also the CME editor for Academic Emergency Medicine.

Case Overview

Case:

You are working in your local freestanding emergency department (ED). This is an ED not physically attached to a hospital, for the non-American listeners. A 64-year-old male patient presents with a feeling of *"palpitations"* for about one week. His heart rate is 130-140 beats per minute, irregular, and his EKG shows atrial fibrillation with rapid ventricular response (RVR). You want to control his rate and have recently heard some of your colleagues talking about using intravenous magnesium in addition to their typical rate control agents.

Background:

Atrial fibrillation is the most frequent cardiac arrhythmia. Patients often present to the ED with increased heart rates, chest pain and weakness among other presentations.

Rate control vs. rhythm control is a debate that has gone on for many years. The management in the USA tends to be rate control while in Canada they tend to do more rhythm control.

In Canada, we tend to cardiovert patients with recent onset of atrial fibrillation (less than 48 hours). There is an aggressive protocol out of Ottawa using procainamide and electricity to rapidly cardiovert and discharge patients with these arrhythmias. A study by Stiell et al showed that the vast majority of patients (97%) were discharged home from the ED with 93% in normal sinus rhythm using this protocol (SGEM#88).

In patients with chronic atrial fibrillation or unknown time of onset and a rapid ventricular response (RVR), rate control and consideration of anticoagulation therapy are the standard ED approach.

Dr. Anand Swaminathan and I reviewed a RCT comparing diltiazem vs. metoprolol in the management of atrial fibrillation or flutter with rapid ventricular rate in the ED (SGEM#133). The SGEM bottom line was that the best available evidence shows that diltiazem will achieve more rapid rate control in patients with atrial

1. **Assessment**
   - Stable without ischemia, hypotension or acute CHF?
   - Onset clear and less than 48 hours?
   - Severity of symptoms?
   - Previous episodes and treatments?
   - Anticoagulated with warfarin and INR therapeutic?
2. **Rate control**
   - If highly symptomatic or not planning to convert
   - Diltiazem IV (0.25 mg/kg over 10 min; repeat at 0.35 mg/kg)
   - Metoprolol IV (5 mg doses every 15 min)
3. **Pharmacologic cardioversion**
   - Procainamide IV (1 g IV over 60 min; hold if blood pressure < 100 mm Hg)
4. **Electrical cardioversion**
   - Consider keeping patient NPO × 6 h
   - Procedural sedation and analgesia given by emergency physician (propofol IV and fentanyl IV)
   - Start at 150–200 J biphasic synchronized*
   - Use anterior–posterior pads, especially if not responding
5. **Anticoagulation**
   - Usually no heparin or warfarin for most patients if onset clearly < 48 h or if therapeutic INR for > 3 wk
6. **Disposition**
   - Home within 1 h after cardioversion
   - Usually no antiarrhythmic prophylaxis or anticoagulation given
   - Arrange outpatient echocardiography if first episode
   - Cardiology follow-up if first episode or frequent episodes
7. **Patients not treated with cardioversion**
   - Achieve rate control with diltiazem IV (target heart rate < 100 beats/min)
   - Discharge home on diltiazem (or metoprolol)
   - Discharge home on warfarin and arrange INR monitoring
   - Arrange outpatient echocardiography
   - Follow-up with cardiology at 4 wk for elective cardioversion
8. **Recommended additions to protocol**
   - Consider transesophageal echocardiography if onset unclear
   - Alternate rhythm-control drugs: propafenone, vernakalant, amiodarone
   - If TEE-guided cardioversion > 48 h, start warfarin
   - If $CHADS_2$ score ≥ 1, consider warfarin and arrange early follow-up

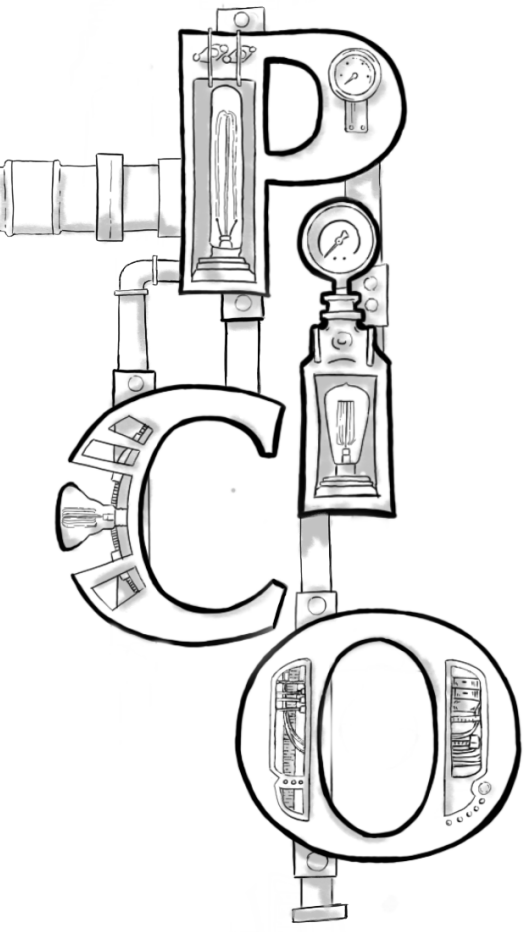
CHF = congestive heart failure; INR = international normalized ratio; IV = intravenously; NPO = nil per os (nothing by mouth); TEE = transesophageal echocardiography.*Most patients treated with electrical cardioversion in the current study were managed with monophasic cardioversion.

fibrillation than metoprolol (NNT 2).

Magnesium has been investigated as an alternative or adjunct for to rate control patients with rapid atrial fibrillation. Prior analyses have suggested that it is a safe and effective alternative strategy, however it has not been well studied in the ED, and the best dosing has been unclear.

Reference

Bouida et al. LOw dose MAGnesium sulfate versus HIgh dose in the early management of rapid atrial fibrillation: randomised controlled double-blind study. AEM February 2019.



Population:
Emergency department patients older than 18 years of age with rapid atrial fibrillation (>120 bpm).

- **Exclusions:** Hypotension (SBP < 90 mm Hg), impaired consciousness, renal failure (serum creatinine > 180 mmol/L), wide-complex ventricular response, or contraindication to MgSO4, acute myocardial infarction, acute congestive heart failure (New York Heart Association functional class 3 or 4), sick sinus syndrome, or rhythm other than atrial fibrillation.

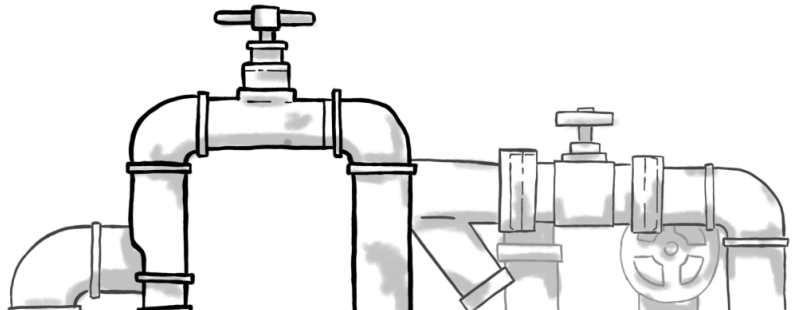
Intervention:
9g IV Magnesium sulfate (MgS) infused over 30 minutes.

Comparison:
5g IV Magnesium sulfate or placebo infused over 30 minutes.

Outcomes:

- **Primary:** Reduction of baseline ventricular rate to 90 beats per minute or less, or reduction of ventricular rate by 20% or greater from baseline.
- **Secondary:** Resolution time, sinus rhythm conversion rate and adverse events within 24 hours.

This is an SGEMHOP episode which means we should have an author on the show. However, the research group was from Tunisia and for a variety of reasons we were not able to have them on the show.



Authors' Conclusion

"Intravenous MgS appears to have a synergistic effect when combined with other AV nodal blockers resulting in improved rate control. Similar efficacy was observed with the 4.5 and 9g of MgS but a dose of 9g was associated with more side effects."

Quality Checklist

Quality Checklist for Randomized Clinical Trials:

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

Case Outcomes

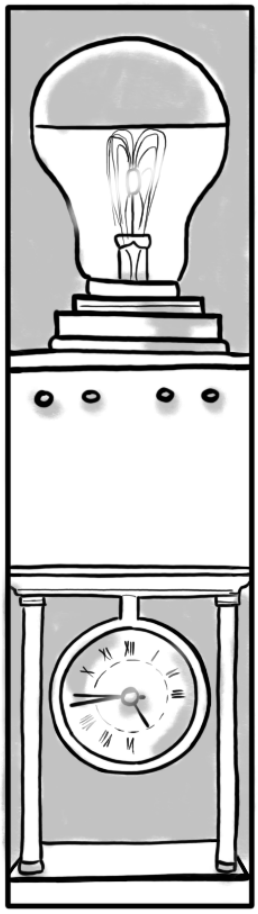
Key Results:
They enrolled 450 patients into the trial with 1/3 in each group. The mean age was 67 years and 60% were women. Rate control agents used were digoxin (47%), diltiazem (31%) and beta-blockers (22%).

Magnesium sulfate improved rate control in patients with atrial fibrillation with rapid ventricular response.

Primary Outcomes:

- Low dose (4.5g MgS) placebo: absolute difference 20.5%, risk ratio 2.31, 95% CI 1.45-3.69
- High dose (9g MgS) placebo: absolute difference 15.8%, risk ratio 1.89, 95% CI 1.20-2.99
- 5g vs. 9g MgS: absolute difference 4.7%, risk ratio 0.81, 95% CI 0.51-1.30

Dose	Absolute Difference	Risk Ratio	95% Confidence Interval
Low vs. Placebo	20.5%	2.31	1.45 to 3.69
High vs. Placebo	15.8%	1.89	1.20 to 2.99
Low vs. High	4.7%	0.81	0.51 to 1.30

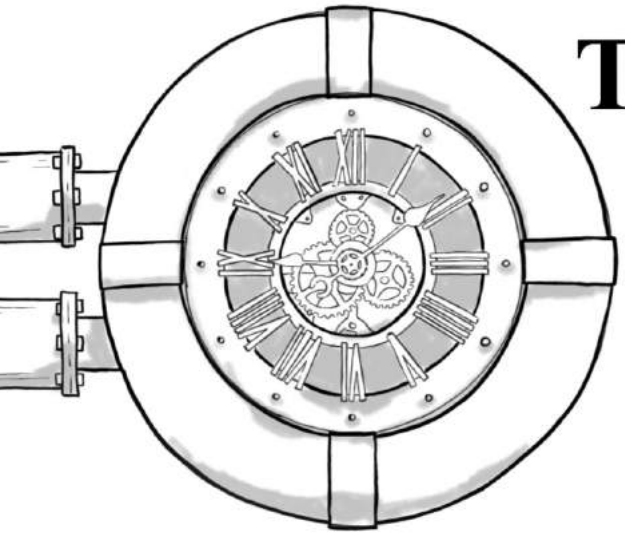


Secondary Outcomes:

Magnesium groups had faster time to resolution, low dose had a higher sinus rhythm conversion rate and rhythm control at 24 hours. However, adverse events (flushing) were higher in patients treated with magnesium.

- Mean resolution time: 8.4 +5 hours placebo, 6.1 +1.9 hours low dose, 5.2 + 2 hours high dose
- Sinus rhythm conversion at 4 hours 6.7% placebo, 12.1% low dose, 7.8% high dose
- Rhythm control at 24 hours 10.7% placebo, 22.9% low dose, 13.0% high dose
- Adverse events higher with MgS (flushing in 24 patients, transient hypotension in 4 patients – 2 high dose, 1 low dose, one placebo, bradycardia in one patient/group)

Dose	Placebo	Low Dose	High Dose
Resolution Time	8.4 Hours	6.1 Hours	5.2 hours
Sinus Rhythm at 4 Hours	6.7%	12.1%	7.8%
Rhythm Control at 24 Hours	10.7%	22.9%	13.0%
Adverse Events	3	8	21



Time to Talk Nerdy

1) Both Groups Treated Equally:

The choice of AV nodal blocking agents was up to the discretion of the treating physician. This could have impacted the results. It would have been cleaner to have specified an AV nodal blocker to use.

2) AV Nodal Blocker:

Digoxin was the most commonly used agent, with almost 50% of patients receiving this as their AV nodal blocker. In the US and Canada, this would likely be the least commonly chosen, with a calcium channel blocker such as diltiazem, or a beta blocker, being the most likely. This could impact the external validity of the results.

Their success rate at four hours (HR <90 bpm or ventricular rate reduction of >20%) was only about 60% in the intervention groups. We covered a study with Swami on SGEM#133 that showed diltiazem had a success rate (HR <100 bpm) of 96% at 30 minutes. Again, we question the external validity of this trial to our experience.

3) Target Heart Rate:

The primary endpoints for therapeutic response was a reduction of baseline ventricular rate to 90 bpm or less, or reduction of ventricular rate by 20% or greater from baseline. Some practitioners would be more liberal with the heart rate, allowing 100-110 bpm. As stated earlier, the Fromm et al trial had a target of <100 bpm

4) Disease-Oriented Outcome:

The primary outcome was an object number, but it was also a disease-oriented outcome. While it may be statistically significant, is the decrease in heart rate clinically significant? Why not have a more patient-oriented outcome like death, admission to hospital, stroke, MI, length of stay in the ED or hospital, or readmission rate?

This also relates to the potential benefit vs. potential harm of using magnesium as an adjunct for rate control. Is the 16-20% absolute benefit of a disease-oriented surrogate outcome worth the increased risk of side effects like flushing and hypotension? If yes, what would patients say?

5) Low Dose vs. High Dose:

The low dose magnesium group had greater efficacy in achieving rate control, time to resolution, sinus rhythm at four hours and rhythm control at 24 hours compared to high dose magnesium. We wonder why there was not a dose response noted or is it that MgS has a ceiling effect and a dose higher than 4.5g does not provide additional benefit.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions.

Case Resolution:
You decide to give your patient diltiazem for rate control and within one hour, the ventricular rate is approximately 95-100 bpm.

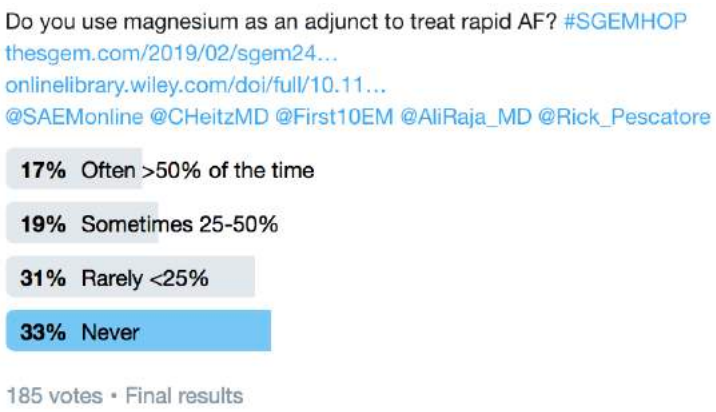
Clinical Application:
When giving rate control medications for rapid atrial fibrillation, specifically digoxin, magnesium can be considered as an adjunctive agent, with the caveat that minor side effects may be increased.

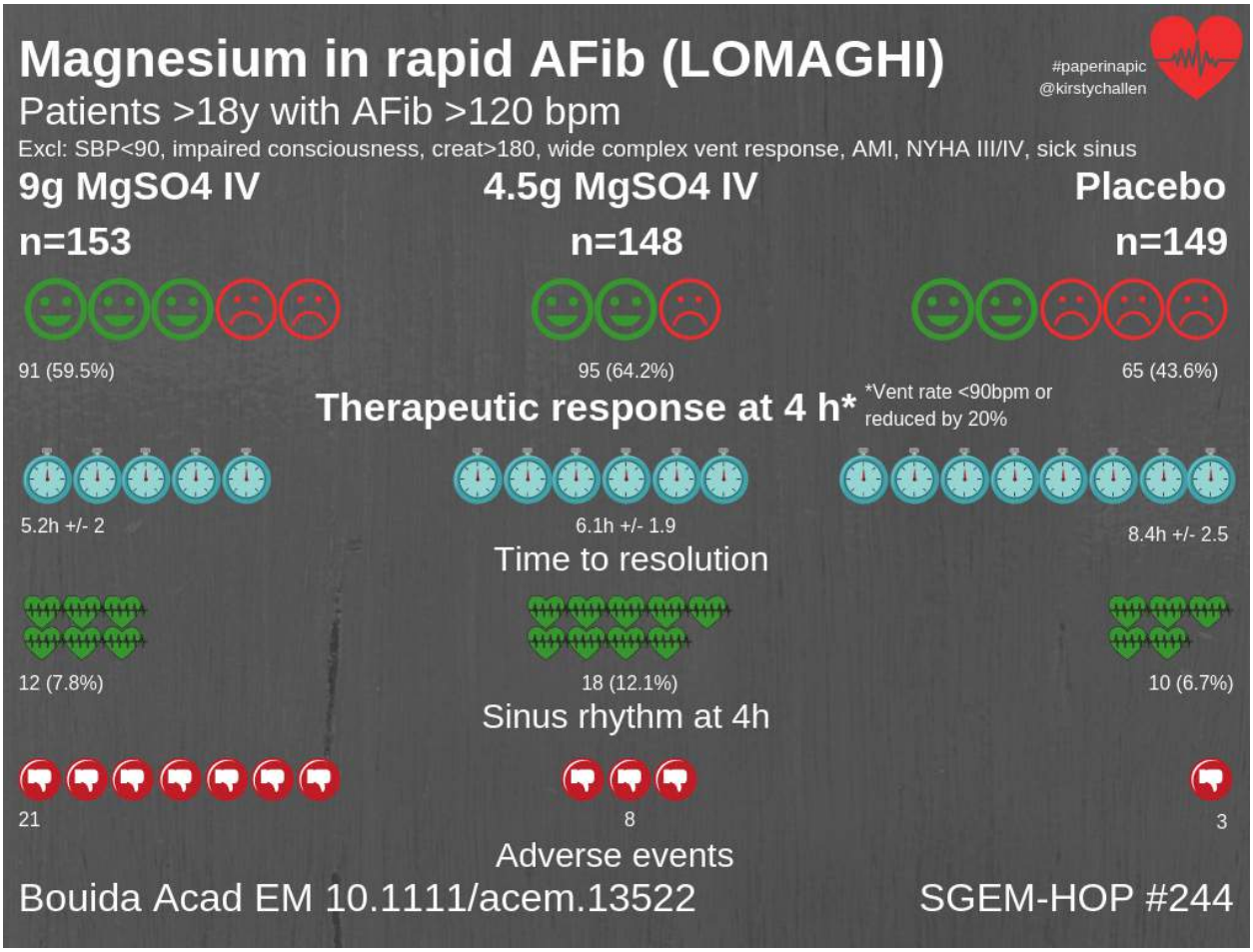
What Do I Tell My Patient?
Your heart rate is very high and irregular. We are going to treat you with a medication that should bring it down over the next few hours. If that doesn't work, there are other options we may consider.

Episode End Notes

Other FOAMed:

- REBEL EM: LOMAGHI Trial: Magnesium Sulfate for Rapid Atrial Fibrillation?
- PharmToxGuy: Low-dose vs. High-dose Magnesium in Rapid Afib
- Life in the Fast Lane: Magnesium
- FOAM Cast: Magnesium
- FOAM ShED: Magnesium for AF in the ED?





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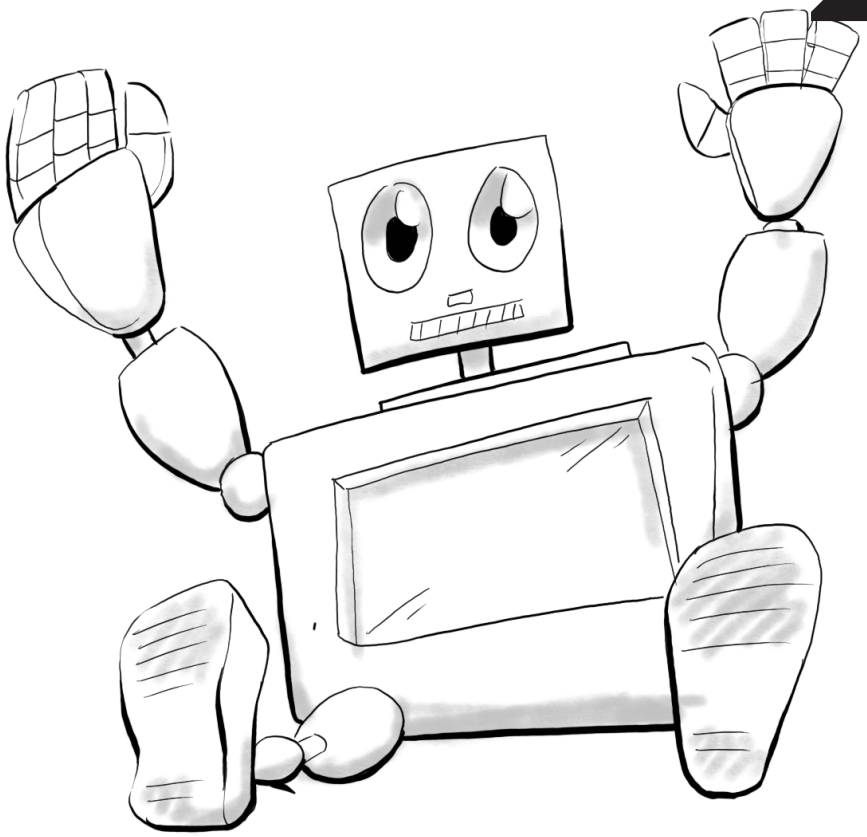
Flash-Errrs (Pocus For Retinal Detachments)



Clinical Question:

What are the testing characteristics of ocular point of care ultrasound when attempting to diagnose retinal detachment among a group of patients presenting with vision complaints?

Bottom Line:

Early on in your pocus training if you identify a retinal detachment make the call. Be wary if you don't see any pathology and make sure the patient has immediate consultation or immediate follow-up. As you progress in your pocus training you may be more confident with cases that you can rule out.

Guest:

Dr. Daniel Theodoro is an Assistant Professor of Emergency Medicine at Washington University School of Medicine in St. Louis and the Emergency Medicine Point of Care Ultrasound Section Chief.

Case Overview

Case:

A 54-year-old diabetic female presents to your emergency department (ED) complaining of floaters of flashing lights and blurry vision. She has no pain and no history of trauma. She noticed that she couldn't read her newspaper, like there was a wall of light between her left eye and the words on paper. She presents to the ED looking for answers.

The vision in her right eye is 20/40 and vision in the left eye is 20/50. The left eye field of vision is significant for floaters and decreased capacity to see medially. She has no afferent pupillary deficit and she has no obvious cranial nerve deficits. Her eye is not red, and her cornea is not hazy. The rest of her examination is unremarkable.

Background:

Ocular complaints account for 3-4% of all ED visits but the cause for the vast majority of these are benign. One in five of patients with eye complaints, however, will require an ED work up and referral for vision preservation. This group of pathology includes diagnoses such as uveitis, macular degeneration, occipital lobe disorders (amaurosis fugax), and posterior chamber pathology such as vitreous hemorrhage, vitreous detachment and retinal detachment.

Retinal detachment is important because, in some cases, there is an intervention that will prevent and possibly restore vision. Since the preservation of vision and quality of life are closely related, cases with retinal detachment deserve proper follow up and referral to a retina specialist.

Traditionally posterior chamber pathologies are diagnosed with direct and indirect ophthalmoscopy. However, few doctors other than ophthalmologists are sufficiently expert enough to do this examination. So, in the majority of ocular cases in the ED the examination is skipped entirely.

In the FOTO-ED study, ED physicians only did fundoscopy in 14% of appropriate cases. In the study trained nurse practitioners took photos of patient's funduscopic examination and the photos were reviewed by retina specialists in 24 hours. They enrolled 350 patients, but ED physicians only examined 33 patients whose findings were unknown and in whom fundoscopy may have had a role. In all 33 the diagnosis was missed. Granted that in two-thirds the findings were not in the posterior chamber (e.g. retinopathy and optic nerve pallor) but still, this observational study showed ED physicians haven't developed or maintained fundoscopic skills.

Further complicating matters is that one study in California demonstrated that fewer than 50% of rural EDs and only 75% of urban EDs have ophthalmology coverage. There are currently some tele-ophthalmology services going up online. They require a photograph taken of the fundus by the practitioner that is remotely reviewed. These are known as 45-degree non-mydriatic ocular fundus photographs and one such company is known as Topcon.

To make matters worse direct ophthalmoscopy has poor test characteristics and even indirect ophthalmoscopy has limits until it's in the hands of experienced and skilled ophthalmologists. In the hands of experienced operators, indirect ophthalmoscopy has an LR+ 44 and LR- of 0.23. Remember, you need a LR- of less than 0.01 to rule out a condition.

If you are repeatedly performing a skill or procedure, receiving feedback, and working to improve you are engaged in Ericsson's *"deliberate practice,"* the key to becoming an expert. Most emergency physicians don't get regular feedback when using an ophthalmoscope, so one has to ask, is there an easier way?

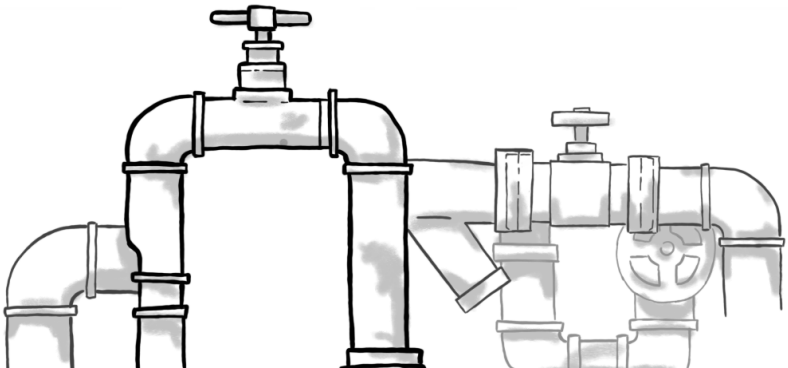
Physicians began to use ocular ultrasound for the diagnosis of posterior chamber (and anterior chamber) ocular pathology in the 1950s. It's been about 17 years since the idea first entered the emergency medicine academic literature. Ocular ultrasound devices are becoming more widespread in EDs across North America. They are portable so they can be brought to the patient's bedside and can be comparatively easier to perform than direct or indirect ophthalmoscopy.

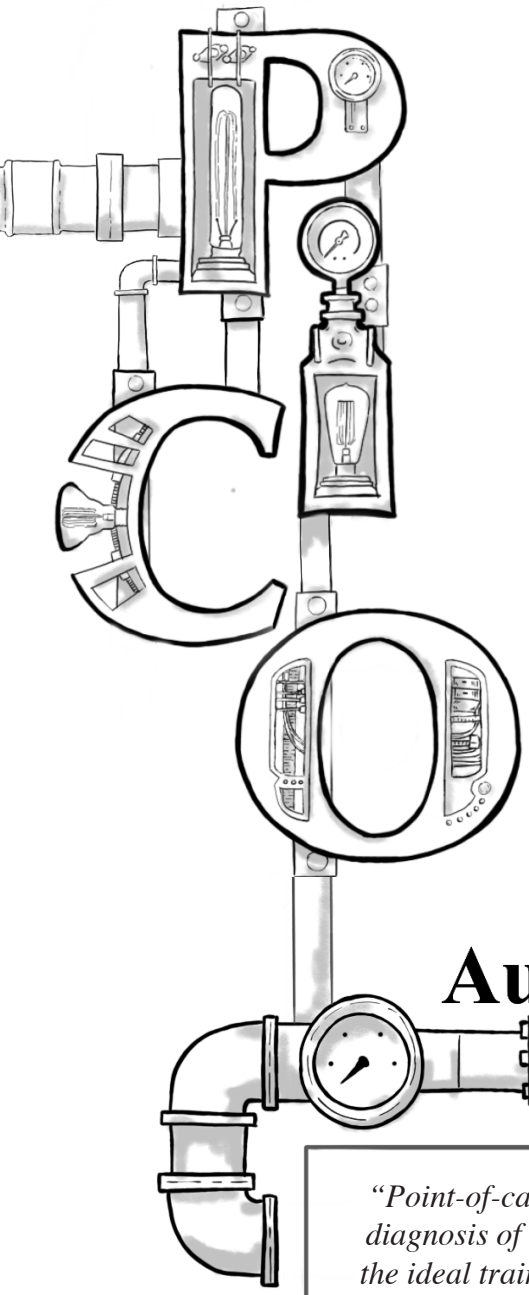
The visual information is magnified using ultrasound and for physicians to look at the data at once, and the exam is easily repeated. That allows for repetition with immediate feedback.

The cons are that it remains a skill that we have to learn (albeit theoretically a more readily *"learnable"* skill than ophthalmoscopy). In 2015, a systematic review by Dr. Vrablik out of the University of Indiana found three studies quoting very high sensitivity and specificity. Since that review was published, larger trials have been reported in the literature.

Reference:

Gottileb, Holladay and Peksa. Point-of-Care Ocular Ultrasound for the Diagnosis of Retinal Detachment: A Systematic Review and Meta-Analysis. AEM January 2019.





Population:
Prospective or RCTs of patients presenting to ED, Radiology Departments and other sites such as ophthalmology clinics being assessed for retinal detachment.

- **Exclusions:** Case reports, case series, retrospective studies, cadaver studies and conference abstracts.

Intervention:
Point of care ocular ultrasound (POCUS) performed by operators with backgrounds in Emergency Medicine and Radiology of varying experience levels without mention of a defined protocol other than the use of a *"portable"* ultrasound machine.

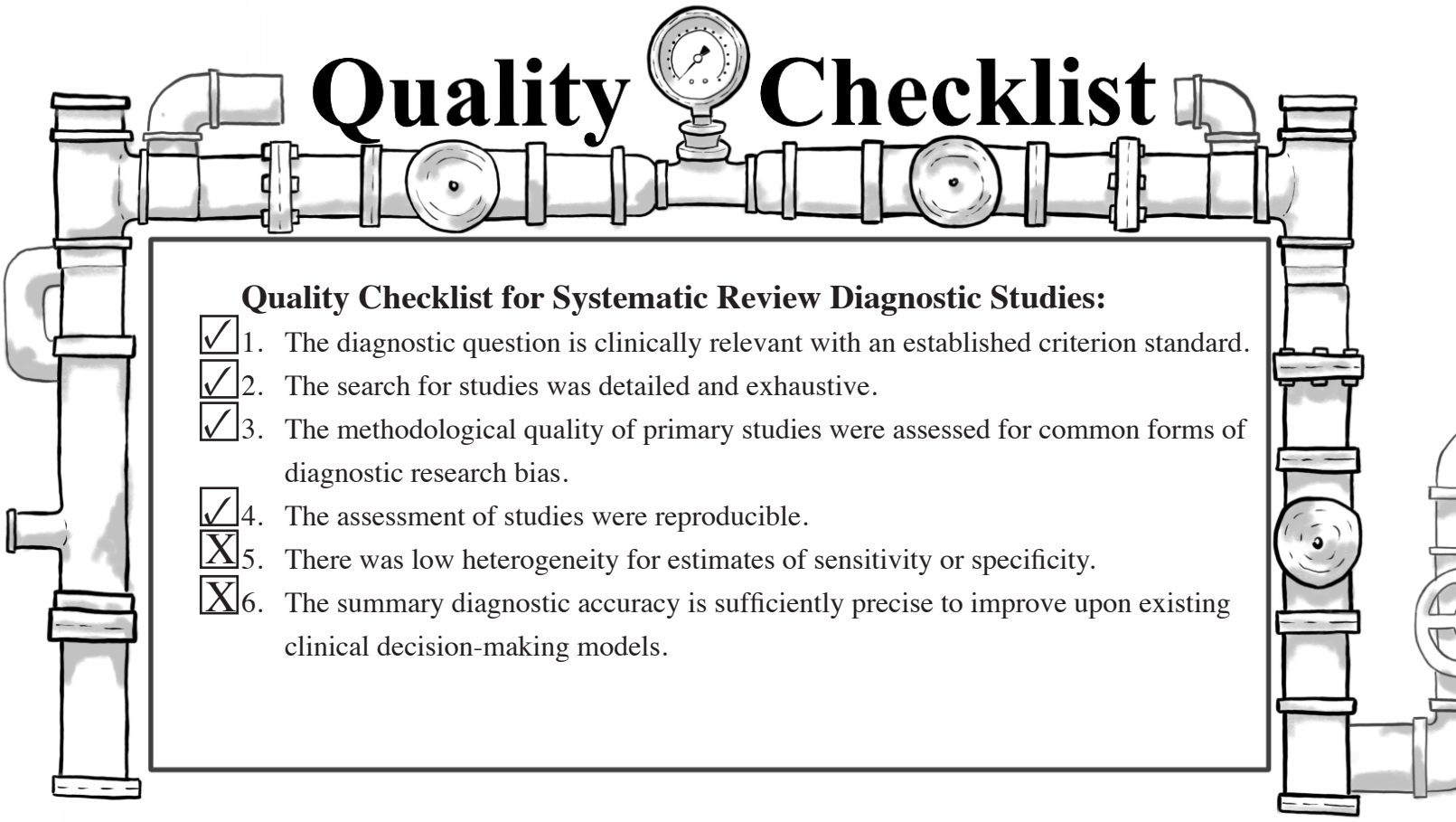
Comparison:
The *"Gold Standard"* or *"Reference Test"* had to include a confirmatory test defined as formal ophthalmologic exam, surgical findings, CT findings, MRI findings, or clinical follow up.

Outcome:
Diagnostic accuracy of POCUS (sensitivity, specificity, positive/negative likelihood ratio, positive/negative predictive value).

Authors' Conclusion

"Point-of-care ocular ultrasound is sensitive and specific for the diagnosis of retinal detachment. Future studies should determine the ideal training protocol and the influence of color Doppler and contrast-enhanced ultrasound on diagnostic accuracy."

Quality Checklist



Quality Checklist for Systematic Review Diagnostic Studies:

- ☑ 1. The diagnostic question is clinically relevant with an established criterion standard.
- ☑ 2. The search for studies was detailed and exhaustive.
- ☑ 3. The methodological quality of primary studies were assessed for common forms of diagnostic research bias.
- ☑ 4. The assessment of studies were reproducible.
- ☒ 5. There was low heterogeneity for estimates of sensitivity or specificity.
- ☒ 6. The summary diagnostic accuracy is sufficiently precise to improve upon existing clinical decision-making models.

Case Outcomes

Key Results:

Investigators found 2,620 articles in their literature search and 11 studies were included in the meta-analysis. The 11 studies were all observational studies with total of 844 patients. Emergency medicine clinicians performed the POCUS exam in six of the studies.

The overall diagnostic parameters of pocus to diagnose retinal detachment was very good.

	Sensitivity	Specificity	LR (+)	LR (-)
Overall	94.2% (95% CI 78.4% to 98.6%)	96.3% (95% CI 89.2% to 98.8%)	23.5	0.06
ED Provider	92.0% (95% CI 67.2% to 98.5%)	91.4% (95% CI 84.9% to 95.3%)	10	0.09
Non-ED provider	91.1% (95% CI 67.5% to 98.0%)	98.6% (95% CI 81.7% to 99.9%)	91	0.09
ED Patient	93.9% (95% CI 78.7% to 98.5%)	92.4% (95%CI 85.6% to 96.1%)	11.8	0.07
Non-ED Patient	74.1% (95% CI 61.0% to 84.7%)	85.3% (95% CI 75.3% to 92.4%)	4.93	0.31
CT for Appendicitis *	91–100%	91–99%	10-100	0.0-.01

*For comparison purposes only

The area under the receiver operating characteristic (ROC) curve demonstrated high accuracy (0.988; 95% CI = 0.974 to 0.994) while the heterogeneity was moderate (I2 = 0.59). The funnel plot did not show evidence of publication bias.

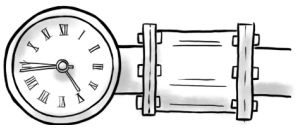
Time to Talk Nerdy

1) Methods:

They did an excellent job with their methods. They followed the PRISMA-DTA guidelines and registered their review with PROSPERO. The search was exhaustive, and they used the talents of a medical librarian. This found four studies that were not discussed in the prior systematic review and added another four studies of pretty high quality.

2) Confidence Intervals:

The 95% confidence intervals around the point estimates were really wide. This makes us less confident in the results. Some of the range in the confidence interval could have been due to heterogeneity.



3) Heterogeneity:

When putting together different studies into a systematic review there will be variability across studies. This variability can be clinical, methodological or both. Clinical variability can be due to the participants, interventions and outcomes studied. Methodological variability can be due to study design and risk of bias. The variability in studies is quantified using I2. Statistical heterogeneity then is the amount of difference in effect between studies being greater than expected by chance (randomness) alone. This study had an I2 of 0.59 suggesting moderate heterogeneity between the studies meta-analyzed.

The heterogeneity observed between the studies could have been due to a number of different biases. Biases are something that systematically moves us away from the truth.

- **Partial Verification Bias:** This isn't mentioned in the papers but in studies with lower specificities and higher sensitivities than the pooled estimate it makes one wonder if it took place.

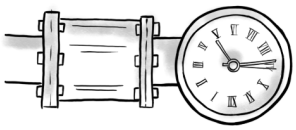
  How does this type of bias occur? Only some people get a true gold standard (like a formal eye exam) and the ones that do are dependent on the result of the ocular POCUS because the protocol is not strictly enforced on all patients with visual complaints.

  As and example, if the ocular POCUS has an obvious finding ophthalmology will likely see the patient and the patient will be entered into the study. Now imagine cases where the ocular POCUS is negative, the patient's complaints are seemingly minor, and the patient has non-ophthalmologic follow up. The gold standard is not applied based on not only the negative ultrasound but the intensity of the complaints. Many of the studies used *"convenience sampling"* meaning tests were only done if all the pieces were in place and this encourages partial verification bias.

  Statistically, when this happens the true negatives are decreased as are the false negatives. When this happens the false negatives are increased in greater proportion than the true negatives and this effect mathematically increases sensitivity and decreases specificity.

- **Differential Verification Bias:** In real estate it's *"location, location, location."* For differential verification bias (double gold standard bias), it can be *"timing, timing, timing."* This is when different follow-ups apply to different patients, hence the *"double"* gold standard. This is important because the disease can change according to what type of follow up the patient ultimately receives. As an example, positive POCUS exams with large obvious retinal detachments are referred to a specialist in six hours but minor findings get follow up 72 hours later.

  Another possible scenario is that the POCUS is negative for detachment but does identify a vitreous bleed. Follow up is assigned for 72 hours as opposed to six hours. If this vitreous bleed was really a mild tear missed by POCUS and it becomes worse in those 72 hours then POCUS looks bad because it categorized a mild tear as a false negative (decrease in sensitivity and specificity). Conversely, if the mild tear would re-adhere in 72 hours, the patient reports no vision trouble, the POCUS performance appears better than stated.



You need to dive into the studies that varied from the pooled estimates and see what they did. Sure enough in some there was one to six week follow up while in others there was immediate follow up. A lot can happen in six weeks, so readers have to be aware that this can happen and it could explain some of the heterogeneity when the results are way off the pooled estimate.

- **Spectrum Bias:** Did these studies include the sickest of the sick? How about the mild vision complaints? All diagnostic vision tests look great if you include only intense vision loss or if you exclude patients with vitreous detachments because they are similar.

  One can loosely judge this by prevalence and convenience sampling. The prevalence of disease in some studies is near 50% but we know the majority of eye complaints are benign. So, what's happening here? I don't think everyone with *"blurry vision"* is being considered for inclusion in these studies.

  However, I'm sure there are cases of potential stroke or other neurologic disease mimics that turn out to be posterior chamber pathologies. We just don't know if these candidates are included in any of these studies. This is an area one could pick for future study in a large, multi-centered study with hard clinical endpoints and pre-scheduled, pre-defined follow ups.

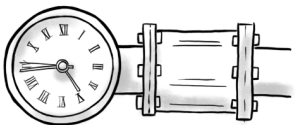
  Only one of the included studies followed the STARD criteria (Standards for Reporting of Diagnostic Accuracy Studies). The objective of the STARD initiative is *"to improve the completeness and transparency of reporting of studies of diagnostic accuracy, to allow readers to assess the potential for bias in the study (internal validity) and to evaluate its generalisability (external validity)"*. The lack of adherence to the STARD criteria suggests that the included studies were of lower quality. Seeing as the prevalence of disease seems to be high in all of the studies, the reader can assume this could have introduced some bias.

4) Index Test:

Another thing we wanted to mention was the index test. In this case the ocular POCUS, as it pertains to training as well as the training issues surrounding the *"criterion or gold standard."* Some of these studies had very experienced people that probably spent a lot of time learning how to perform these examinations. In some cases, the index test users got a 20-minute course. The study tries to addressed this with a series of post hoc analyses.

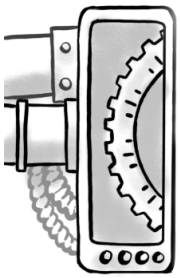
Likewise, some patients received follow up by retina specialists while others were followed by ophthalmology residents. In yet other cases highly trained POCUS providers were followed up by less trained ophthalmologists. This might set up an *"imperfect"* situation?

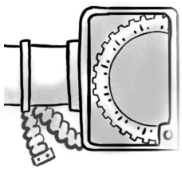
These relationships can go in many different ways and worse, they can arise on a case by case basis or *"at the patient level,"* a source of heterogeneity. The combinations are endless, and readers need to be aware of this possible source of bias and decide if it's a real *"apples to apples"* comparison.



5) Mac On or Mac Off:

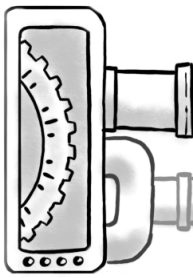
The risk of missing a retinal detachment depends on the status of the macula in relation to the detachment. If the retinal detachment has taken the macula off then there's not much to offer the patient. This is a *"macula off"* tear, meaning, the macula has been torn off. If the tear abuts but does not involve the macula then the macula is still on. A *"macula on"* tear is a true emergency because the patient can undergo interventions to tether the remaining retina and preserve vision.

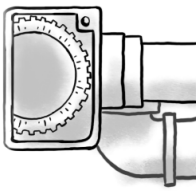




Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' that ocular POCUS is sufficiently specific to diagnose retinal detachments. We disagree that the sensitivity is sufficiently high to rule out the diagnosis in cases of floaters and vision changes but think that this has more to do with training than the actual limitations of the technology. We need to lobby our training programs to spend more time teaching how to do the procedure to instil a high level of performance and confidence in our trainees.





Clinical Application:

Ocular POCUS is highly specific meaning it's excellent if the pathology is readily visible. However, more research is needed to determine if it's unacceptable sensitivity is due to lack of training or limitations of ultrasound technology.

Case Resolution:

You make the diagnosis of a retinal detachment, but you are concerned the macula remains intact (Mac On) because the tear does not reach the optic nerve. You consult ophthalmology who schedules the patient for a procedure to preserve vision.

What Do I Tell the Patient?

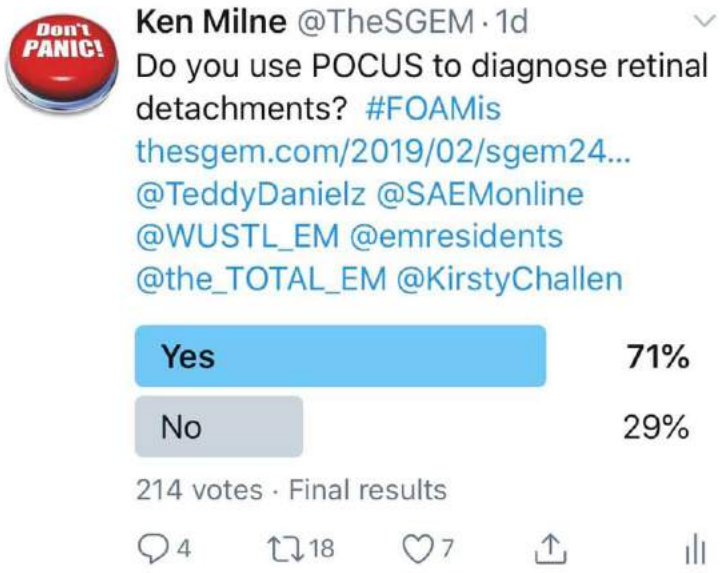
I typically use the "movie screen" analogy and say, imagine you're at the theatre looking up at your favorite movie and part of the screen peels off. If it's a large part of the screen then the movie is going to look all blurry and wavy. This is an emergency and I may have you see the eye surgeon right away. If I look into your eye and it seems like the screen is flat, then I'm going to ask you to see an eye doctor in the next two to three days because sometimes it appears like it's glued tightly but a small corner of the screen has come undone. That small corner can get pretty big over time.

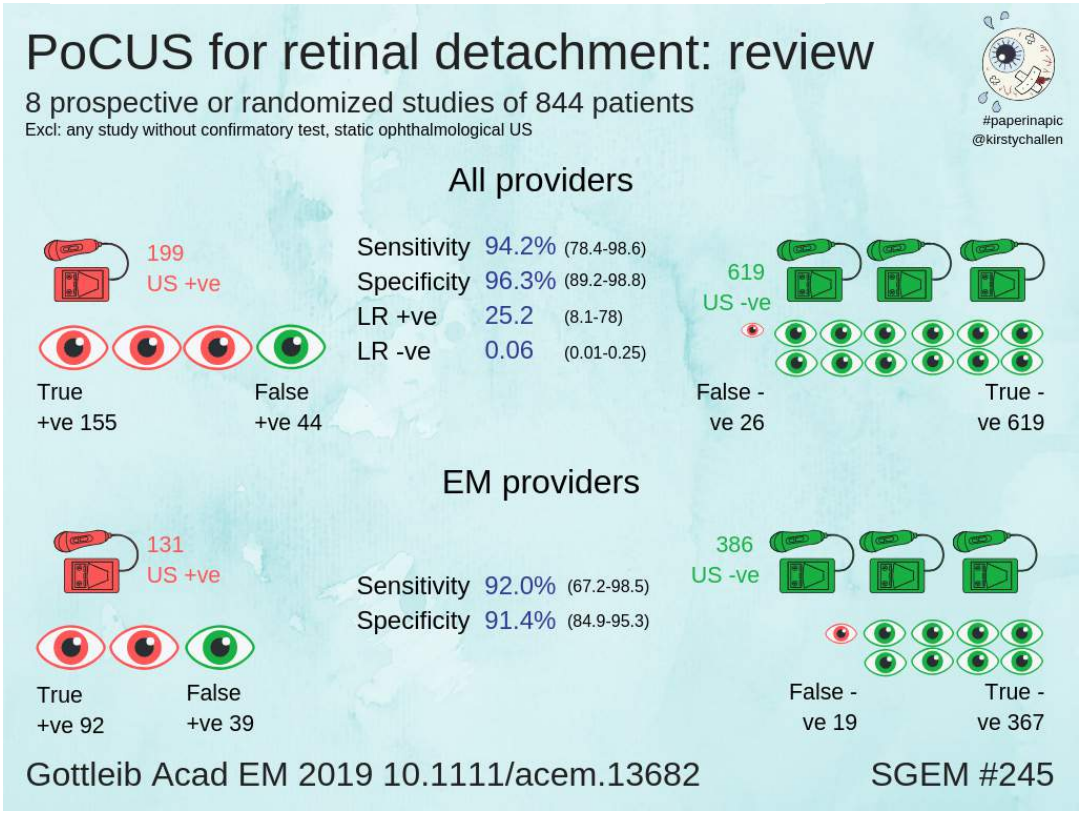
Episode End Notes

Other FOAMed:

There are several FOAM ED platforms with videos on how to perform the examination. Here are a few links on the topic.

- EM:RAP – Ultrasound of Retinal vs Vitreous Detachment
- Mike and Matt – Introduction to Bedside Ultrasound: Volume 2
- ACEP members can download a free iBook from the Apple store





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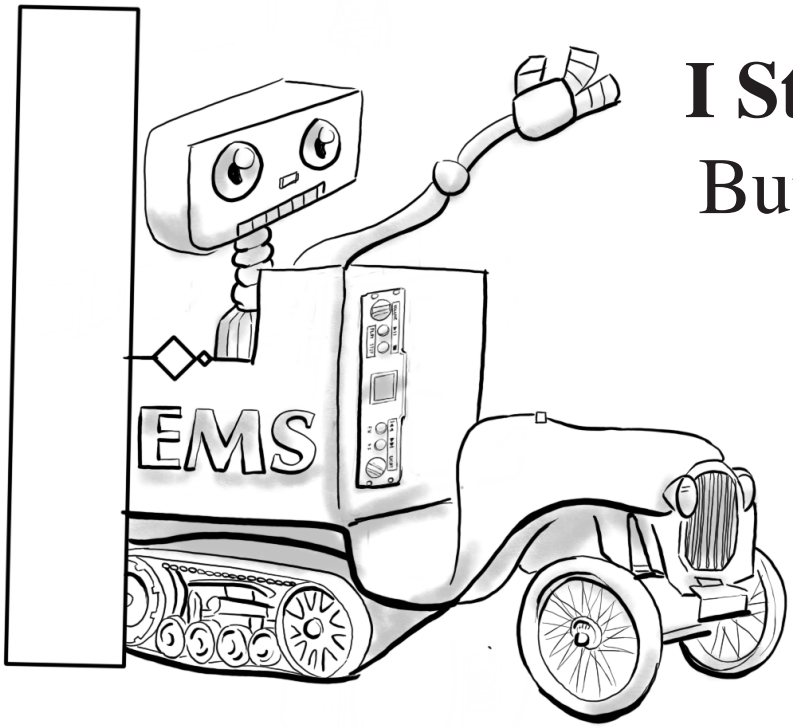


I Start the Line: But Will it Make a Difference?

Clinical Question:

Is IV fluid administration by paramedics for patients with suspected sepsis associated with reduced in hospital mortality rates?

Bottom Line:

In patients suspected of sepsis, we don't know if pre-hospital IV fluids will result in a patient-oriented benefit.

Guest:

Jay Loosley is the Superintendent of Education at Middlesex-London Paramedic Service. Jenn Doyle is a paramedic educator at Middlesex-London Paramedic Service.

Case Overview

Case:

A 77-year-old man's partner calls 911 because he has a fever, cough, shortness of breath and lethargy. The patient is known to have hypertension and dyslipidemia. Paramedics arrive quickly and find a man in bed with a temperature of 39.5C, heart rate of 111 beats per minute, respiratory rate of 24 breaths per minute, oxygen saturation of 91% and a blood pressure of 98/56. They suspect a respiratory infection, provided supplemental oxygen with a target of 94-96% (SGEM#243), establish IV access and begin a 500cc normal saline bolus.

Background:

Sepsis is a serious condition with high morbidity and mortality. It has been covered on the SGEM many times over the last seven seasons (SGEM# 69, 90, 92, 113, and 168).

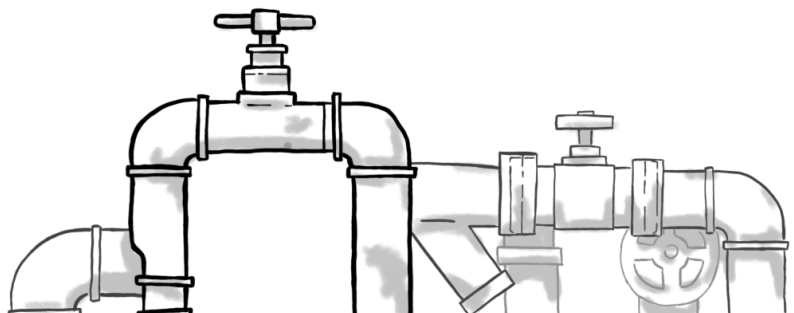
Recently we covered a paper looking at whether or not pre-hospital antibiotics could provide a benefit to patients with varying degrees of sepsis (SGEM #207). The study by Alam et al took adult patients with a diagnosis of suspected infection and randomized them to ceftriaxone 2g IV started pre-hospital or usual care with a primary outcome of all-cause mortality at 28 days.

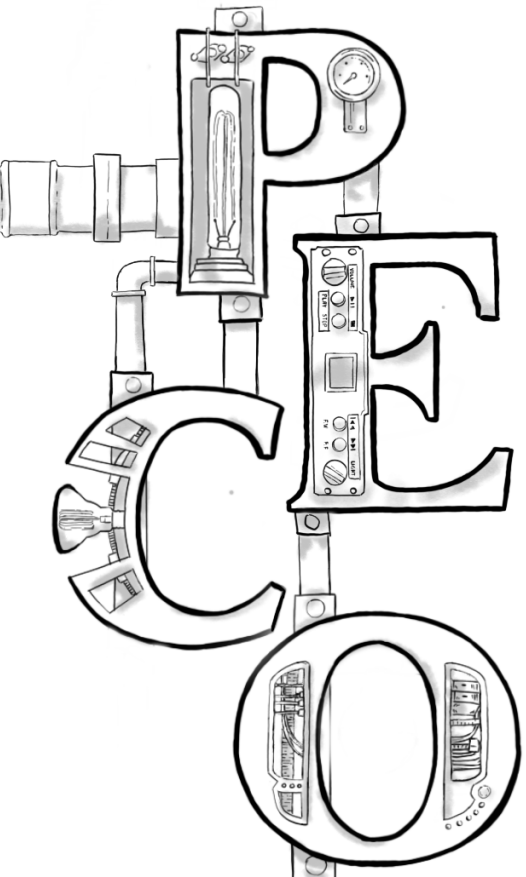
The bottom line from that episode pre-hospital antibiotics in the ambulance do not appear to have a mortality benefit in patients with varying degrees of sepsis in an optimized EMS system.

The Surviving Sepsis Campaign makes a number of recommendations in their 2016 guideline. One recommendation that they make is the rapid administration of 30ml/kg of crystalloid for hypotension. This is a strong recommendation from SSC based on low quality evidence. This was updated in 2018 with the 3-hour and 6-hour bundles combined into a single 1-hour bundle. This led to a petition requesting the SSC retract their 2018 guidelines (SGEM Xtra). For more information see PulmCrit recent post.

Reference:

Lane et al. Association Between Early Intravenous Fluids Provided by Paramedics and Subsequent In-Hospital Mortality Among Patients With Sepsis. JAMA 2018





Population:
Patients with sepsis identified using the international Statistical Classification of Disease and Related Health Problems, Tenth Revision (ICD-10CA) coding that was modified to be consistent with the Third International Consensus Definition for Sepsis and Septic Shock (Sepsis-3).

- Patients were classified as having sepsis if all three of the following conditions were present: they received a diagnosis in the ED of infection, they were admitted to the hospital or died in the ED, and they had evidence of organ dysfunction.
- **Excluded:** Patients discharged home or who left the ED without being treated

Exposure:
IV fluids initiation and/or administration of any volume of crystalloid fluid by Paramedics either on scene or enroute to the ED for patients with suspected sepsis.

Comparison:
Those patients with suspected sepsis who did not receive IV fluids by Paramedics.

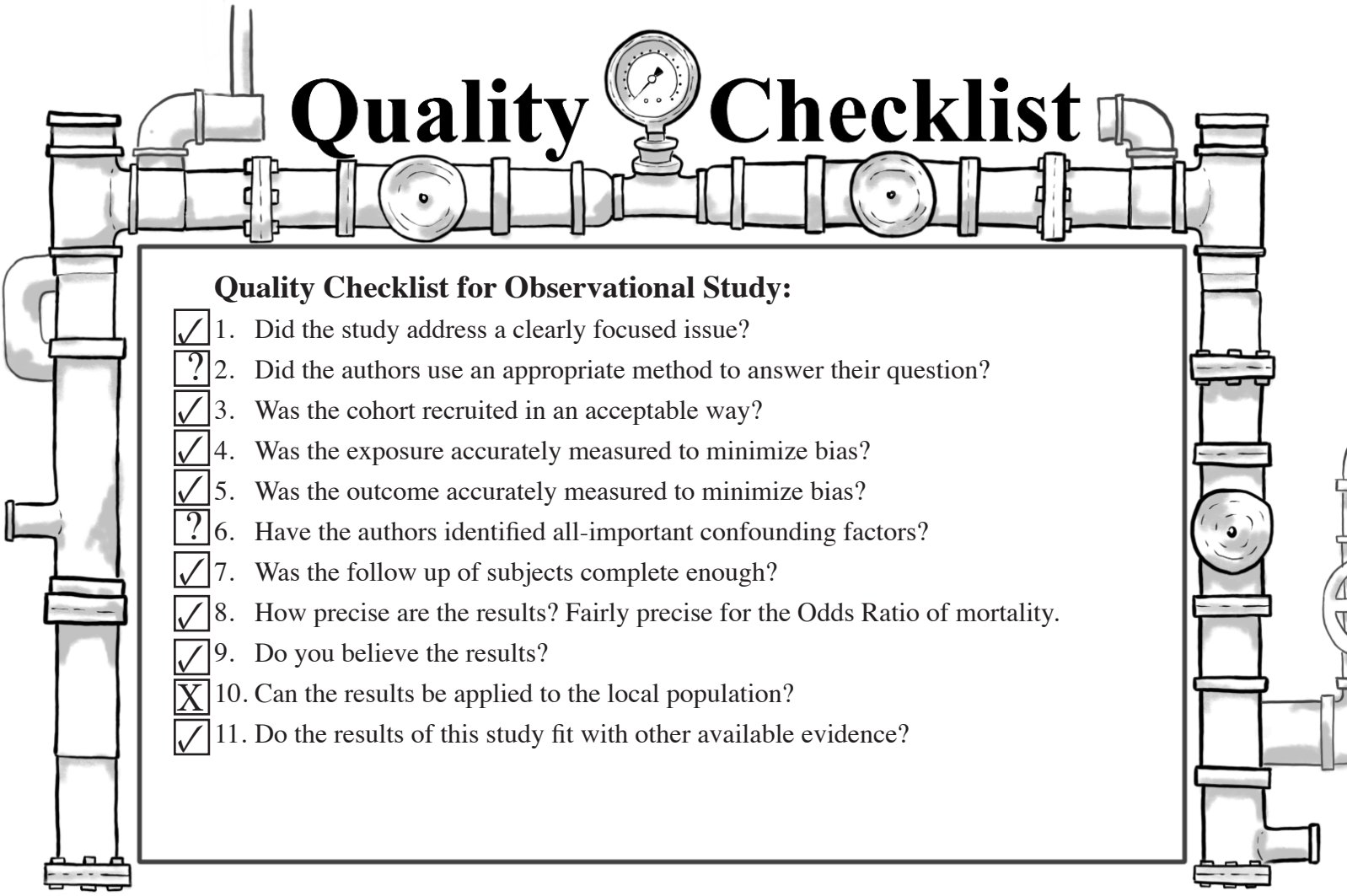
Outcomes:

- **Primary:** In hospital mortality.
- **Secondary:** Total volume of IV fluids administered by Paramedics, total prehospital time interval, or the time to assessment by a physician after arrival at the hospital.

Authors' Conclusion

"Intravenous fluids provided by paramedics were associated with reduced in-hospital mortality for patients with sepsis and hypotension but not for those with higher initial systolic blood pressure."

Quality Checklist



Quality Checklist for Observational Study:

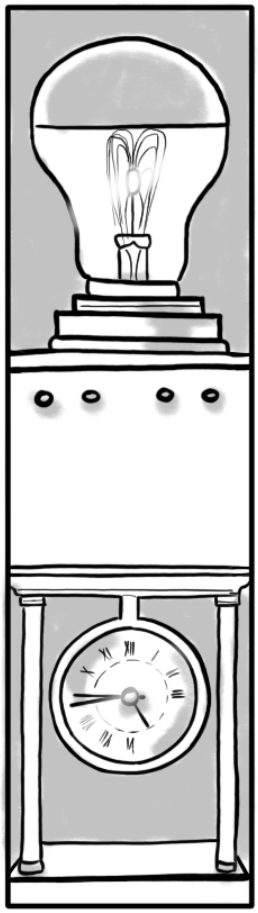
- ☑ 1. Did the study address a clearly focused issue?
- ? 2. Did the authors use an appropriate method to answer their question?
- ☑ 3. Was the cohort recruited in an acceptable way?
- ☑ 4. Was the exposure accurately measured to minimize bias?
- ☑ 5. Was the outcome accurately measured to minimize bias?
- ? 6. Have the authors identified all-important confounding factors?
- ☑ 7. Was the follow up of subjects complete enough?
- ☑ 8. How precise are the results? Fairly precise for the Odds Ratio of mortality.
- ☑ 9. Do you believe the results?
- ☒ 10. Can the results be applied to the local population?
- ☑ 11. Do the results of this study fit with other available evidence?

Case Outcomes

Key Results:

There were close to 150,000 adult patients transported to the hospital by Paramedics during the study period. They identified 1,871 patients in the ED as having sepsis. The median age was 77 years. More than half (54%) received IV fluids, 8% having an IV placed and 38% received no IV fluids. The overall mortality rate was 28% (2% in the ED and 26% in the hospital).

Mortality was higher in patients with sepsis treated by paramedics with IV fluids (31.7%) vs. Those with no IV fluid treatment (24.1%).



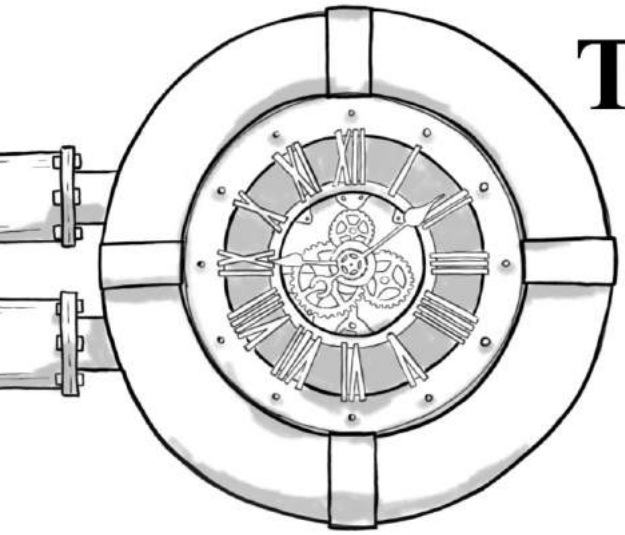
Primary Outcomes:

In hospital mortality gets complicated when you adjust for hypotension and consider those who received IV boluses. Those patients who received any fluid and wer e hypotensive or received a bolus had a lower odds ratio (OR) of mortality.

		Multivariable Adjusted OR (95% CI)	
Regression Model	Crude OR (95% CI)	Cohort Median	Hypotensive
Any Fluid	1.3 (1.0-1.6)	1.4 (0.81-2.44)	0.67 (0.49-0.9)
Saline Lock	0.7 (0.4-1.1)	1.35 (0.49-3.69)	0.79 (0.41-1.54)
TKVO	1.2 (0.9-1.6)	1.57 (0.79-3.15)	0.71 (1.32-1.58)
Bolus	1.5 (1.2-1.9)	1.38 (0.68-2.80)	0.62 (0.45-0.86)
Propensity Matched	NA	1.41 (0.93-2.14)	0.57 (0.37-0.89)

Secondary Outcomes:

- Median total volume of IV fluids administered by Paramedics was 400ml
- Patients who received IV fluids had longer prehospital times than patients not receiving intravenous fluids (median difference, 3.2 minutes; 95% CI, 1.7-4.7 minutes)
- Administration of IV fluids was not associated with time to MD assessment (median difference, 2.4 minutes; 95% CI, –2.4 to 7.3 minutes)



Time to Talk Nerdy

1) Diagnosis of Sepsis:

The can be a difference between ED diagnosis of sepsis and Paramedic impression of sepsis. Paramedics screen patients for sepsis using SIRS criteria. The patients in this study were classified as having sepsis if all three conditions were present: they received a diagnosis in the ED of infection, they were admitted to the hospital or died in the ED, and they had evidence of organ dysfunction.

2) Time to Physician Assessment:

Patients who were hypotensive had a shorter time to physician assessment as they were deemed to be more critical and thus required more rapid treatment. As paramedics do not administer antibiotics on scene, a faster time to physician assessment is highly likely to be associated with more rapid antibiotic administration. However, as we discussed in SGEM #207, even pre-hospital antibiotics did not provide a mortality benefit.

3) Right Amount of IV Fluids:

The median volume of IV fluids was only 400ml. This might not be enough to provide a clinically important benefit. Guidelines have suggested 30ml/kg of IV crystalloid be given in patients with sepsis induced hypoperfusion. However, this IV fluid bolus recommendation from the Surviving Sepsis Campaign is based on low quality evidence. The honest answer is we do not know what the right about of IV fluids are needed in these patients.

4) Missing Data:

How researchers handle missing data is important. This study had missing data from 0% for some data points to as high as 36%. However, it depends on what data was missing and was it clinically relevant. The most common data missing (36%) was for the patient's weight. Vital sign measurements were missing in <3% of patients. They then bootstrapped the data to see how well the data stood up.

5) Controlling for Confounders:

This was an observational study and represents the greatest limitation to the study. They attempted to control for any potential confounders. They also did propensity-matched analysis to match patients who received IV fluids to those who did not receive IV fluids. While this helps minimize some of the bias, it is not possible to control for all unmeasured confounders and these could be responsible for the results observed. To determine if pre-hospital IV fluids cause a reduction in mortality a properly designed randomized control trial would need to be conducted.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree that they demonstrated an association between pre-hospital IV fluids and in hospital mortality in patients with sepsis.

Case Resolution:

The patient arrives at the ED with a temperature of 37.9C, HR 98bpm, RR 20bmp, SpO2 95% with 2L nasal prongs and a blood pressure of 106/70. You relay you suspicions of sepsis secondary to pneumonia and the ED staff start working up the patient.

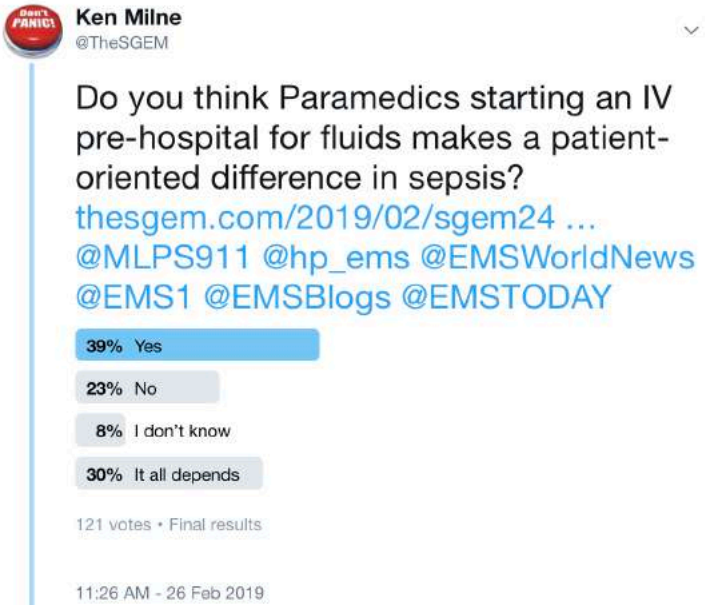
What Do I Tell My Patient?

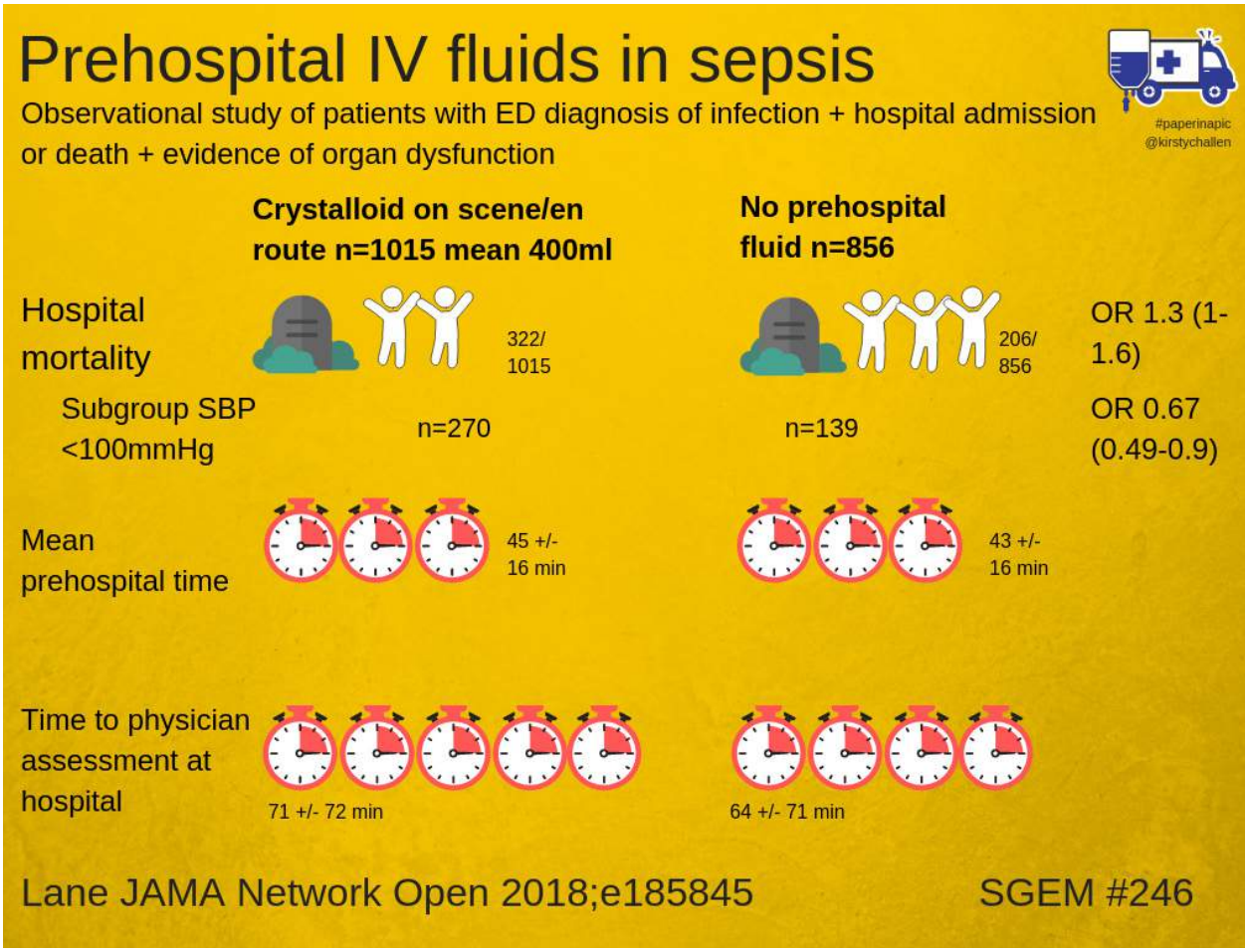
We think you have an infection in your lungs causing a fever and your blood pressure to be low. We are going to start and IV and give you some fluids. I will going to call ahead to the hospital to let them know we are coming, and by this IV already being in place, it will speed up your care.

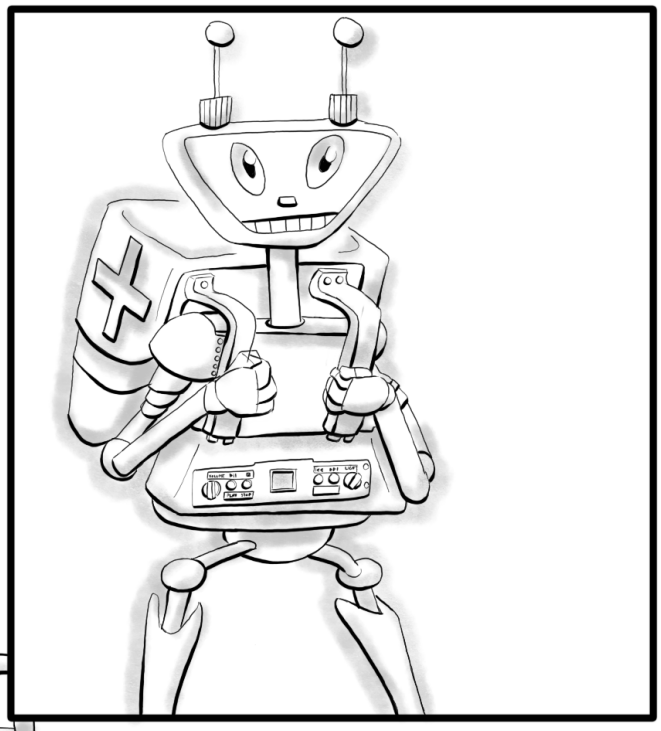
Clinical Application:

Paramedics have different medical directives in different jurisdictions. In Ontario, there is no standing medical direction for IV fluid administration for septic patients. This represents a barrier for implementing such a protocol in our EMS system. This patient was hypotensive and there are protocols for providing IV fluid boluses in these cases.

Episode End Notes







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Supraglottic Airways Gonna Save You for an OHCA?

Clinical Question:

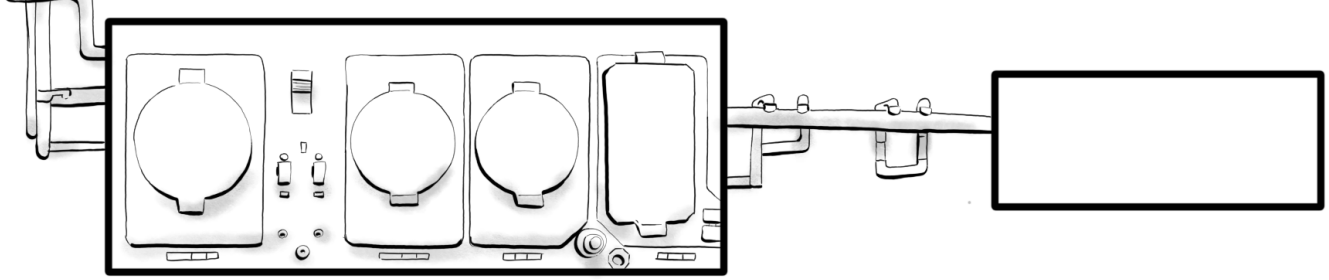
1) Are superglottic airway devices non-inferior to endotracheal intubation in OHCA with regards to neurologic outcome?
2) Does the use of the lt supraglottic device have an effect on 72-hour survival when compared to endotracheal intubation in OHCA?

Bottom Line:

In adults with OHCA, key factors for survival with good neurological outcome are early defibrillation and high-quality CPR. Airway strategies do not seem to be as important.

Guest:

Missy Carter, former City of Bremerton Firefighter/Paramedic, currently a physician assistant practicing in emergency medicine in the Seattle area and an adjunct faculty member with the Tacoma Community College paramedic program.



Case Overview

Case:

EMS arrive to your emergency department with a 68-year-old man post cardiac arrest patient. They had a difficult time getting a definitive airway pre-hospital. It required multiple attempts which caused several prolonged interruptions in CPR. After the patient is stabilized the medic asks you how he can improve his airway management skills during a cardiac arrest as it was difficult to intubate during compressions. What should you tell him?

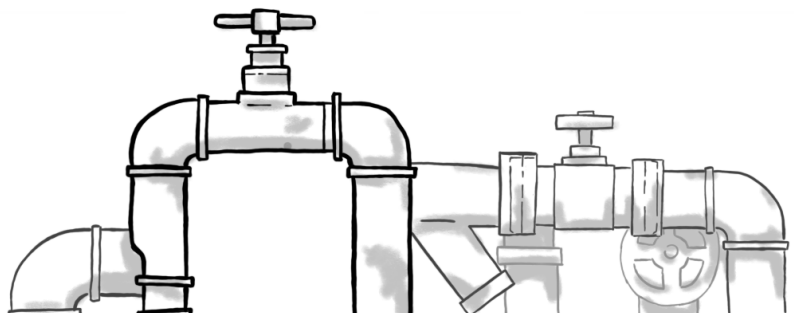
Background:

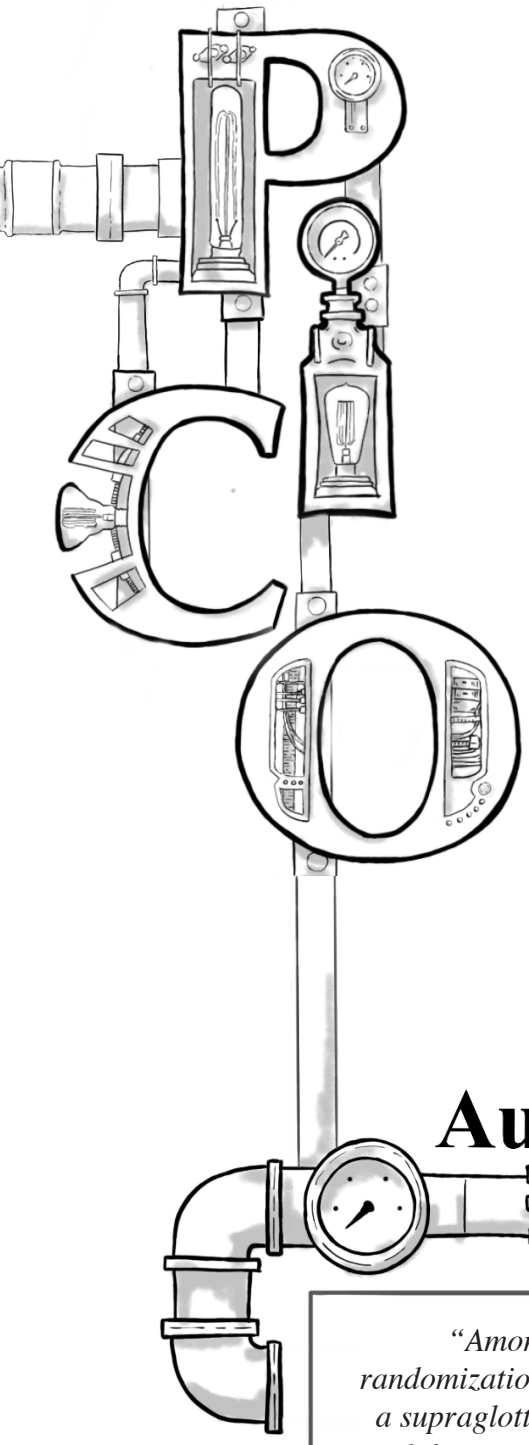
We have covered OHCA many times on the SGEM. Key to survival is high-quality CPR and early defibrillation. There is no evidence for a patient-oriented benefit with epinephrine (SGEM#238), other ACLS drugs (SGEM#64), pre-hospital therapeutic hypothermia (SGEM#54, SGEM#183), or mechanical CPR (SGEM#136). One issue we have not discussed is endotracheal intubation.

For many years endotracheal intubation has been the standard of care for airway management in out-of-hospital cardiac arrest (OHCA). Over recent years this practice has been questioned. Endotracheal intubation is a technical skill requiring optimal positioning, proficiency and a technical skill level which may be difficult to obtain in the pre-hospital cardiac arrest setting.

Reference

1. Benger et al. Effect of a Strategy of a Supraglottic Airway Device vs. Tracheal Intubation During Out-of-Hospital Cardiac Arrest on Functional Outcome. The AIRWAYS-2 Randomized Clinical Trial. JAMA 2018
2. Wang et al. Effect of a Strategy of Initial Laryngeal Tube Insertionvs. Endotracheal Intubation on 72-Hour Survival in Adults With Out-of-Hospital Cardiac Arrest A Randomized Clinical Trial. JAMA 2018





Question #1
Population:
Adults who had a non-traumatic OCHA.

- **Exclusions:** Prisoners, resuscitation deemed inappropriate, advanced airway already in place, and patient's mouth opened less than 2cm.

Intervention:
The intervention was the insertion of a second-generation supraglottic airway (SGA) device with a soft non-inflatable cuff (i-gel; Intersurgical).

Comparison:
Endotracheal tube intubation (ETI) with direct laryngoscopy

Outcomes:

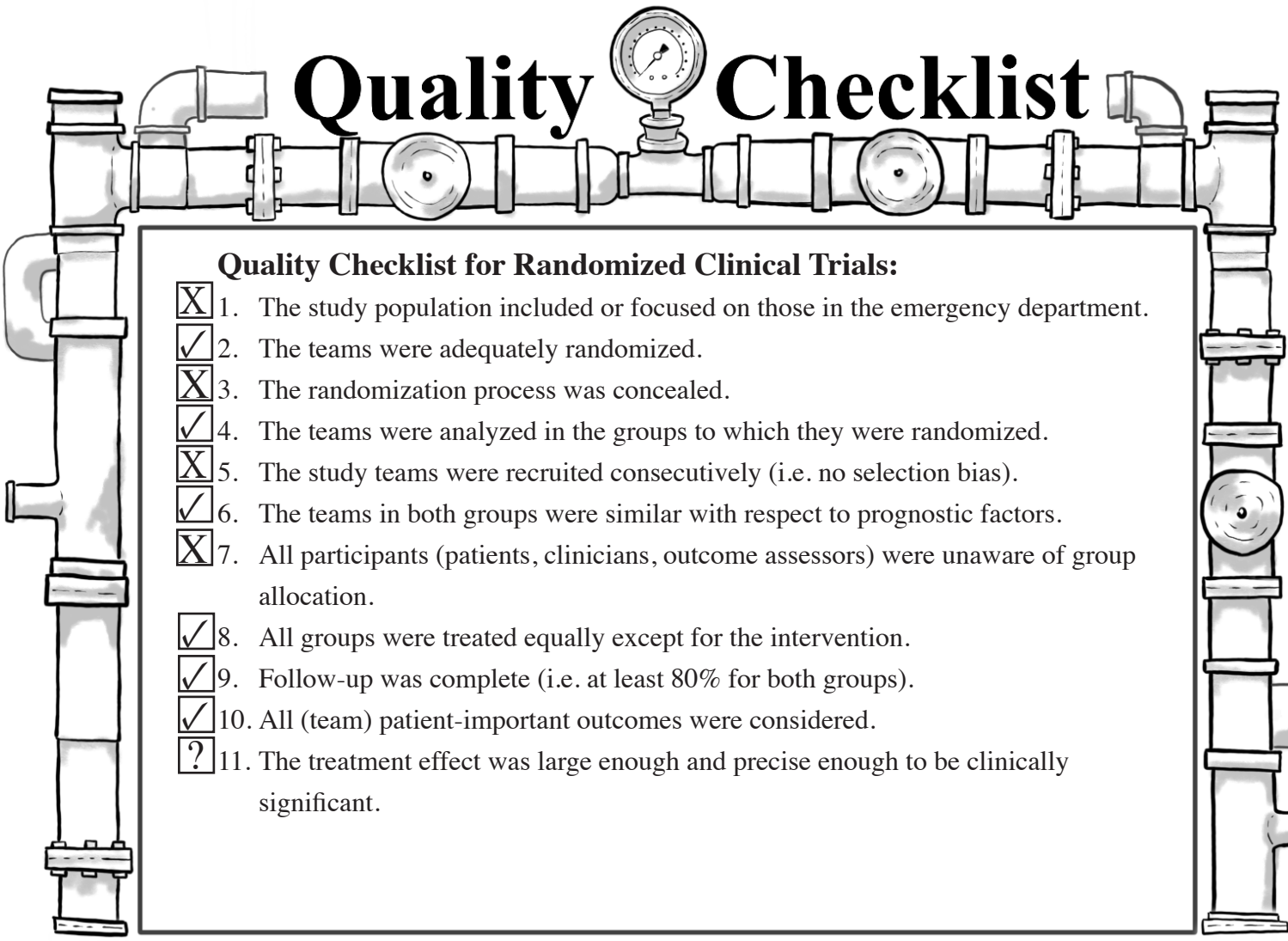
- **Primary:** Neurologic outcome at discharge or 30 days using the modified Rankin Scale (mRS score 0-3 = good outcome and mRS score 4-6 = bad outcome).

- **Secondary:** Initial ventilation success, which was defined as visualizing chest rise. Regurgitation (stomach contents visible in the mouth or nose) or aspiration (stomach contents visible below the vocal cords or inside a correctly placed tracheal tube or airway channel of a SGA device). Any unintended loss of a previously established airway. Sequence of airway interventions delivered. Return of spontaneous circulation (ROSC). Airway management in place when ROSC was achieved, or resuscitation was discontinued. Chest compression fraction. Time to death

Author's Conclusion

"Among patients with out-of-hospital cardiac arrest, randomization to a strategy of advanced airway management with a supraglottic airway device compared with tracheal intubation did not result in a favorable functional outcome at 30 days."

Quality Checklist



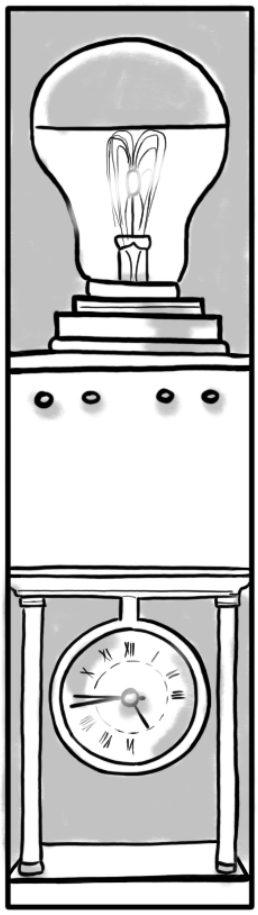
Quality Checklist for Randomized Clinical Trials:

- [X] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [X] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [X] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [✓] 6. The teams in both groups were similar with respect to prognostic factors.
- [X] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
- [?] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
They enrolled 9,296 patients with OHCA. The median age was 73 years and just over 1/3 (36.3%) were women.

Supraglottic airway was non-inferior to endotracheal intubation.



Primary Outcomes:

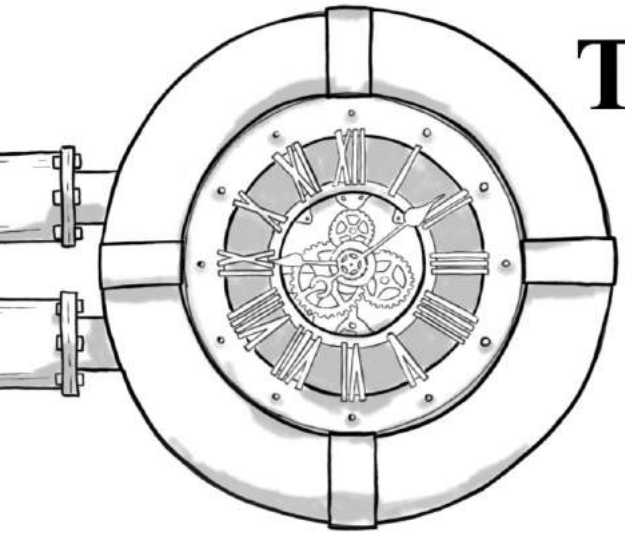
mRS 0-3 was 6.4% SGA group vs. 6.8% ETI group. The adjusted risk difference [RD], –0.6% [95% CI, –1.6% to 0.4%])

Secondary Outcomes:

- Two of the secondary outcomes (regurgitation and aspiration) were not significantly different between groups (regurgitation: 1,268 of 4,865 patients [26.1%] in the SGA group vs 1,072 of 4,372 patients [24.5%] in the ETI group; adjusted RD, 1.4% [95% CI, –0.6% to 3.4%]; aspiration: 729 of 4824 patients [15.1%] vs. 647 of 4,337 patients [14.9%], respectively; adjusted RD, 0.1% [95% CI, –1.5% to 1.8%]).

- Initial ventilation was successful in 4,255 of 4,868 patients (87.4%) in the SGA group compared with 3473 of 4,397 patients (79.0%) in the ETI group (adjusted RD, 8.3% [95% CI, 6.3% to 10.2%]).

- Patients randomized to receive ETI were less likely to receive advanced airway management (3,419 of 4,404 patients [77.6%] vs. 4,161 of 4,883 patients [85.2%] in the SGA group).



Time to Talk Nerdy

1) Cluster Randomization:

Cluster randomization trials (CRT) have been around for a long time. Rather than randomizing the individual patients, it randomizes groups of patients to the intervention or control. There are strengths and weaknesses to any trial design. One strength is to avoid contamination between interventions when trial participants are being managed within the same setting. One weakness is that CRTs have decreasing returns in power and precision as cluster size increases. They attempted to mitigate this limitation by having a large number of clusters to increase accuracy of the results.

2) Cross-Over:

Paramedics had the clinical freedom to adapt from assigned treatment groups. Only 81% of patients received an advanced airway, this was equal between groups. There was more crossover observed from the ETI to SGA group (18.6% vs 2.9%). Mitigating the problem of cross-over, they did an intention-to-treat (ITT) analysis.

3) Bias Against Endotracheal Intubation:

There did seem to be a bias against obtaining an advanced in paramedics who were randomized to the ETI group. They were less likely to perform an advance (14.1% vs. 22.2%) compared to SGA group. This bias could have impacted the results

4) First Pass Success:

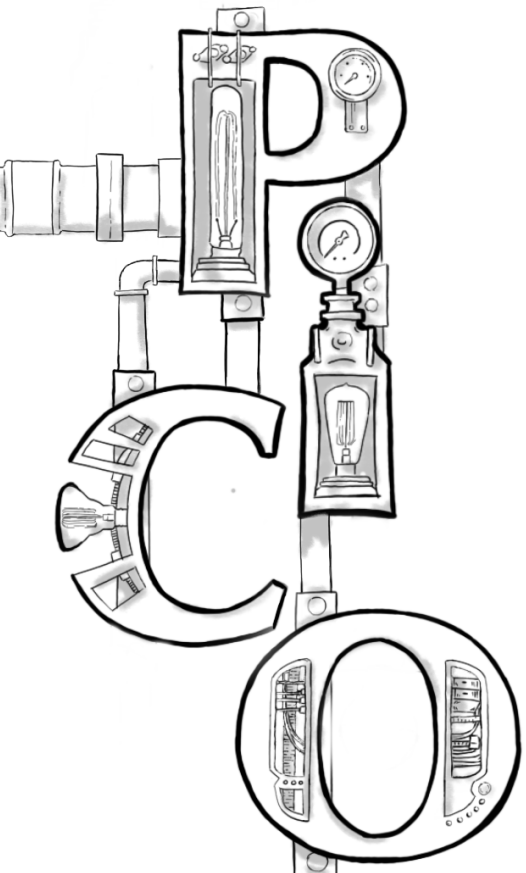
Multiple prior studies have shown an association between increased intubation attempts and increased mortality. This trial showed a 69% success rate in the ETI group compared to an 89% success rate in the SGA group. Although this trial had a low is a low first pass ETI success rate (69%) compared to prior meta analyses (91%) it's much higher than the 51% listed in the Wang et al trial.

5) Sensitivity and Subgroup Analyses for the Primary Outcome:

The patients who received advanced airway management (81%) were grouped by the first type of advanced airway intervention received. That is accounting for crossover and excluding the patients who did not receive an advanced airway. SGA insertion as the first method showed better outcomes compared to the ETI (4.2 vs 2.0) which was statistically significant. However, these subgroup analyses should be viewed only as hypothesis generating.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

This trial provides a large data set suggesting that supraglottic devices are not inferior to endotracheal intubation.



Question #2

Population:

Adults who had a non-traumatic OCHA.Adult patients (>17 years of age) suffering a nontraumatic OHCA treated by EMS and requiring advanced airway management or anticipated ventilatory support

- **Exclusions:** Pregnant women, prisoners, major facial trauma, major bleeding or exsanguination, patients with tracheostomy, LVAD, obvious asphyxia cardiac arrest and DNR

Intervention:

Laryngeal tube (LT) insertion

Comparison:

Endotracheal tube intubation (ETI)

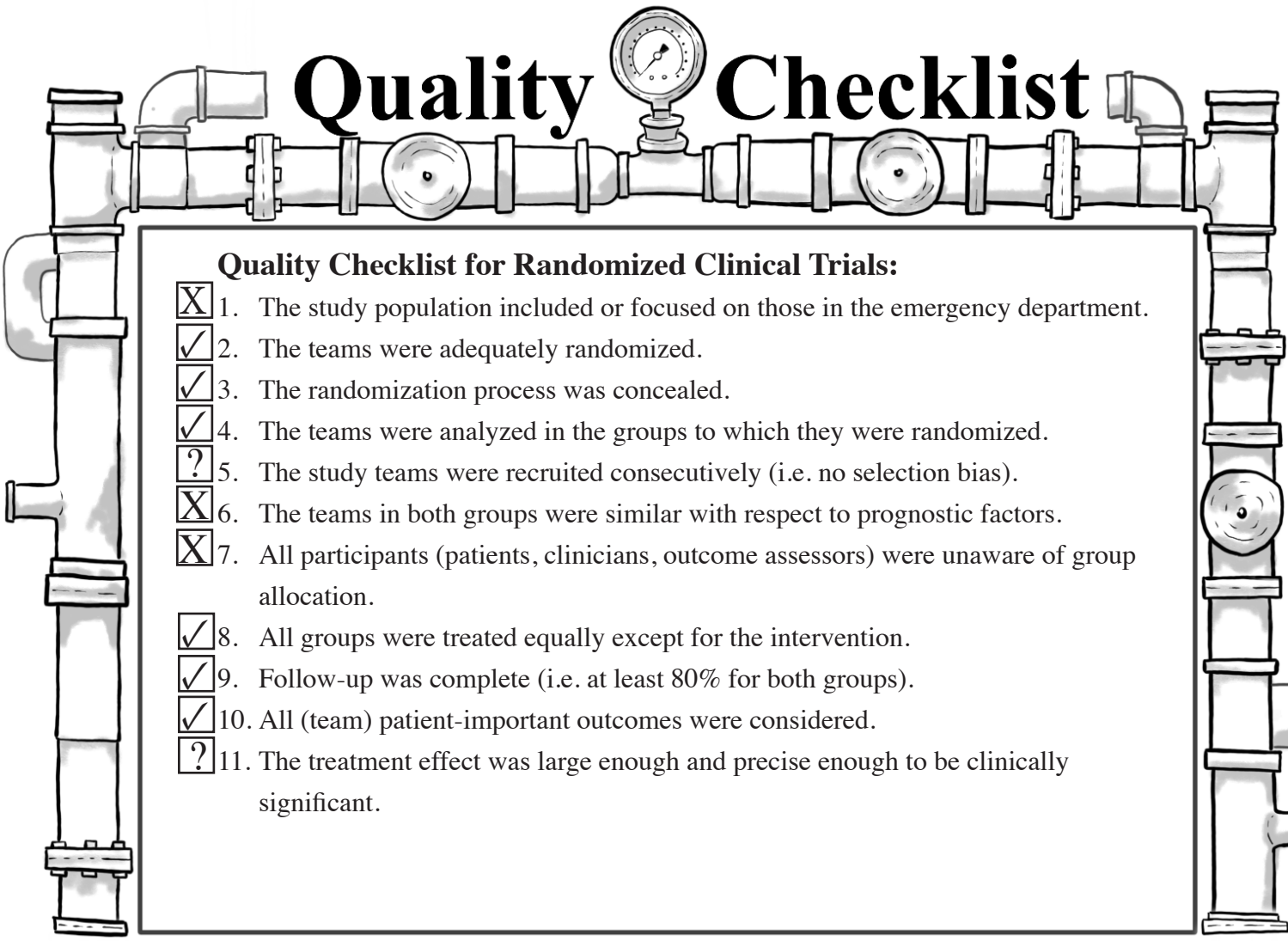
Outcomes:

- **Primary:** 72-hour survival rates
- **Secondary:** Return of spontaneous circulation (ROSC), hospital survival and favorable neurologic status at discharge (modified Rankin Scale score of 0-3).

Authors' Conclusion

"Among adults with OHCA, a strategy of initial LT insertion was associated with significantly greater 72-hour survival compared with a strategy of initial ETI. These findings suggest that LT insertion may be considered as an initial airway management strategy in patients with OHCA, but limitations of the pragmatic design, practice setting, and ETI performance characteristics suggest that further research is warranted."

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

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- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
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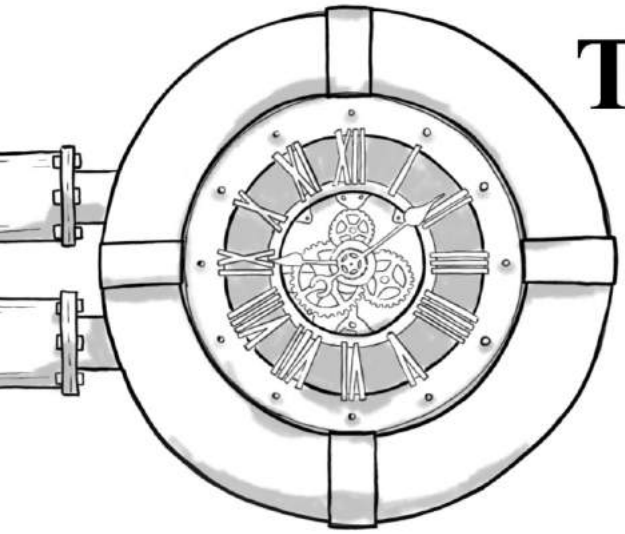
Case Outcomes

Key Results:
They enrolled 9,296 patients with OHCA. The median age was 73 years and just over 1/3 (36.3%) were women.

Supraglottic airway was non-inferior to endotracheal intubation.

	LT	ETI	% Difference (95%CI)
ROSC	27.9%	24.3%	3.6% (0.3 to 6.8) p=0.03
Hospital Survival	10.8%	8.1%	2.7% (0.6 to 4.8) p=0.01
Good Neruo	7.1%	5.0%	2.1% (0.3 to 3.8) p=0.02

Primary Outcomes:
72-hour survival was 18.3% in the LT group vs. 15.4% in the ETI group (2.9% difference [95% CI 0.2% to 5.6%, p=0.04]).



Time to Talk Nerdy

1) First Pass Success:
The initial LT and ETI success rates (excluding BVM) were 90.3% and 51.6% respectively. Patients with LT were much more likely to have first pass success over ETI. Multiple prior studies have shown increased mortality with increased intubation attempts. It's possible that the low first pass success ETI rates seen in this trial could have skew that data towards LT.

2) Bag Valve Mask:
The primary outcome showed a mortality benefit with LT. However, they included patients who had only a BVM (no LT or ETI). In the authors' results section they list the data with the BVM group removed. In this as treated analysis, the 72-hour survival was not statistically different (16.0% LT vs. 13.5% ETI; P = .07).

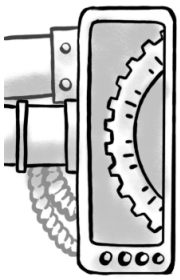
3) Lack of Blinding:
There was not blinding to interventions, allocation, crossover timings, and outcomes ascertainment. All of this could have biased the results.

4) Unbalanced Groups:

Cluster randomization can lead to unbalanced baseline characteristics. One of the most powerful prognostic factors in survival of OHCA is the initial rhythm. Shockable rhythms were observed in 20% of patient in the LT group vs. 18% in the ETI group. When they did a post-hoc analysis and adjusted for age, sex, rhythm, response time, witness status and bystander chest compression the statistical difference in survival was gone.

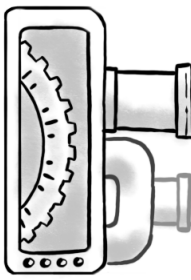
5) Fragility Index:

Looking at their primary outcome (72-hour survival) the fragility index of this study was 3. There were also four patients missing from the data set. This severely limits any strong conclusions that can be drawn from this trial.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We would change the conclusions to say that among adults with OHCA, LT insertion may or may not be considered as an initial airway management strategy.



Clinical Application:

Using a supraglottic airway device is a reasonable management option in adult patients with OHCA. This could cognitively unload paramedics and allow them to concentrate on those things that have been demonstrated to improve patient-oriented outcomes like early defibrillation and high-quality CPR.

Case Resolution:

The patient goes on to have a poor neurologic outcome like most patients with OHCA.

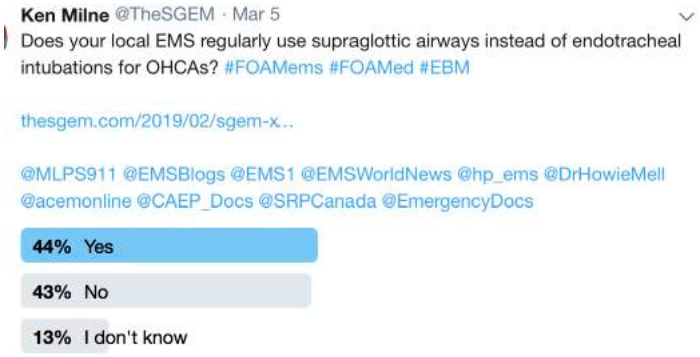
What Do I Tell the Medic?

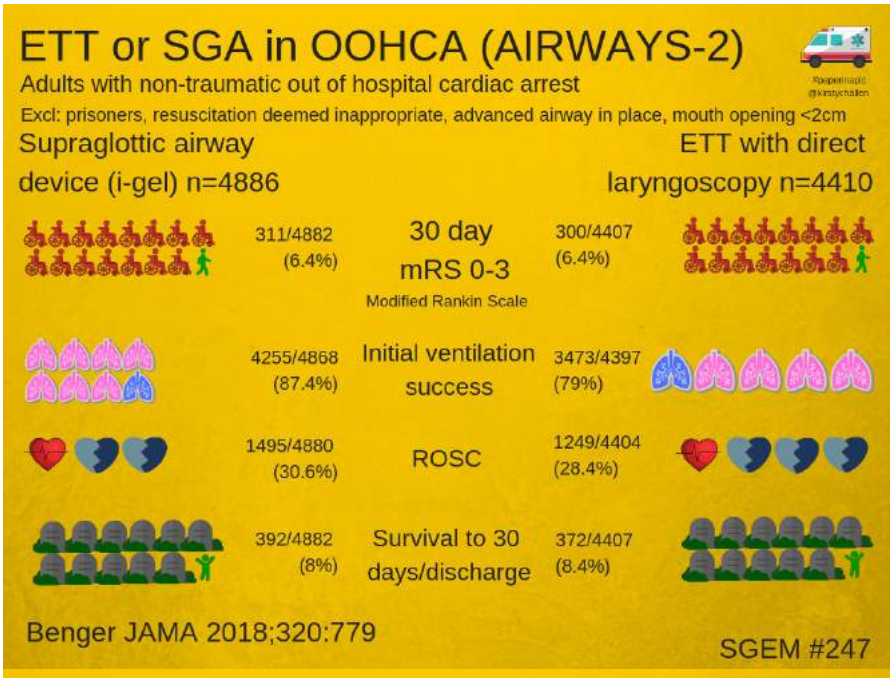
You tell the medic that we do not have good evidence on what is the best strategy for airway management in these cases. Inserting a supraglottic airway is easier, faster and more successful. However, it does not appear to result in better patient outcomes. Don't get distract with the airway and focus on early defibrillation and high-quality CPR.

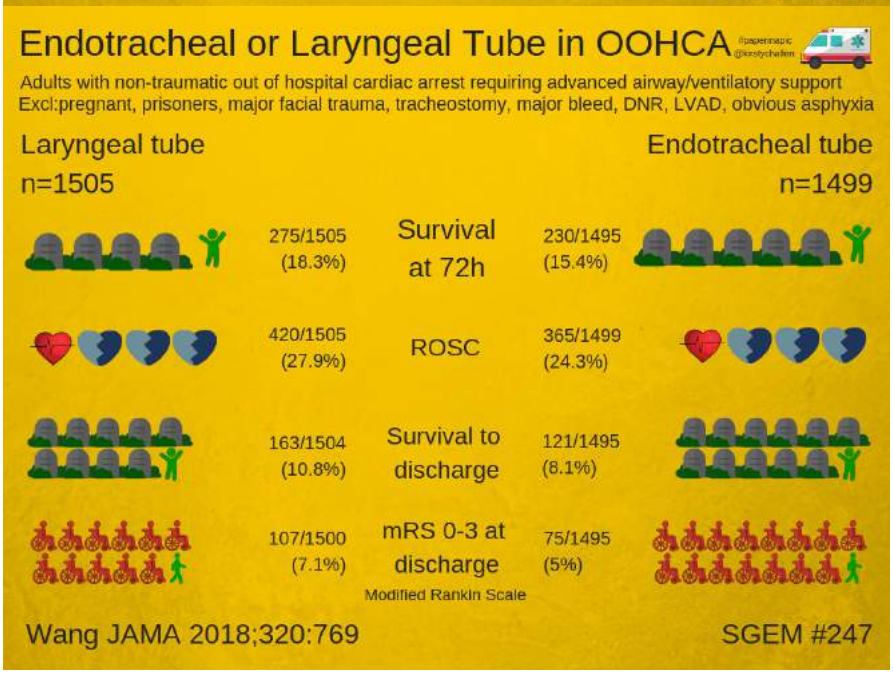
Episode End Notes

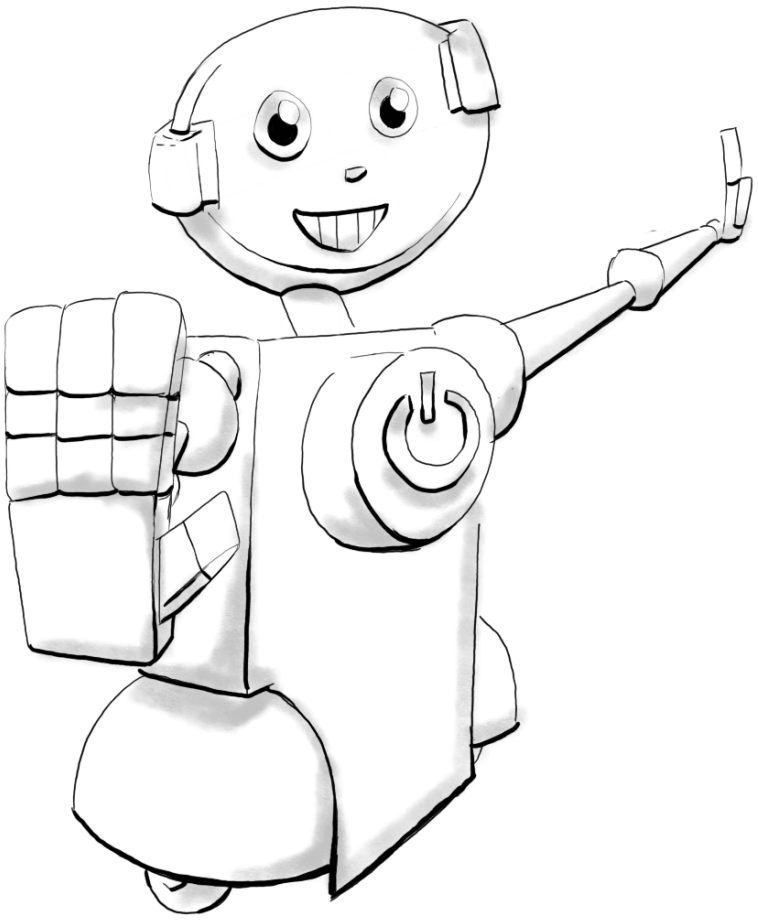
Other FOAMed:

- REBEL Cast Ep 59: AIRWAYS-2 – Supraglottic vs Tracheal Intubation in OHCA









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She Works Hard for the Money: Time's Up in Healthcare

Clinical Question:

Is there a difference in compensation for men and women emergency physicians practicing in the United States?

Bottom Line:

There continues to be an unexplained pay gap between men and women academic emergency physicians in the United States.

Guest:

Dr. Esther Choo. She is an emergency physician and researcher who studies health disparities, substance use disorders, and gender bias. Esther is an Associate Professor at Oregon Health and Sciences University and also is a founding member of the non-profit TIME'S UP Healthcare.

Case Overview

International Women's Day:

This SGEMHOP was recorded on International Women's Day. It was the SGEM's part in the Time's Up in Healthcare initiative.

> ***The clock has run out on sexual assault, harassment and inequity in the healthcare workplace. It's time to do something about it.***

Here is some more information on Time's Up in Healthcare:

- Can we put an end to gender inequality and harassment in medicine? BMJ 2019
- Time's Up Tackles Gender Bias and Harassment in Health Care. Scientific American March 2019
- Men in Medicine Speak Out Against Harassment in Powerful 'TIME'S UP Healthcare' Video. Men's Health March 2019
- Health Organisations Slow to Tackle Inequality. Financial Times March 2019
- Time's Up Takes on Sexual Abuse and Discrimination in Healthcare. InStyle February 2019

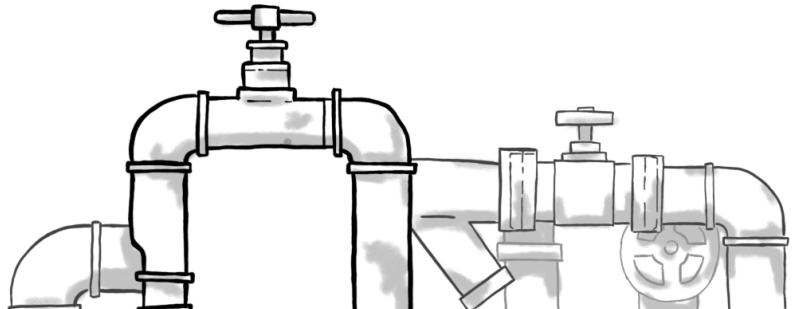
Case:

A women colleague is being hired for an emergency department attending job wants to know why her pay is less than that of a man at the same hospital with the same years of training and the same accomplishments?

Background:

Salary disparity between men and women has existed forever, and despite efforts such as the Equal Pay Act of 1963, this disparity continues to exist. This gap is seen across numerous professions, including law, marketing, administration and medicine. In the United States, women working full time are typically paid just 80 percent of what men are paid (1-4).

According to one 2010 analysis, the disparity in medicine is one of the highest for any professional industry, trailing only dentistry (5). Women now represent half of medical school graduates and 38% of faculty members in U.S. medical schools (6). After controlling for multiple factors, including specialty, age, faculty rank and metrics of productivity, male physicians earned nearly $20,000 more per year than their female counterparts (7,8). Within emergency medicine, studies have shown female faculty are paid 10% to 13% less than males (9,10).

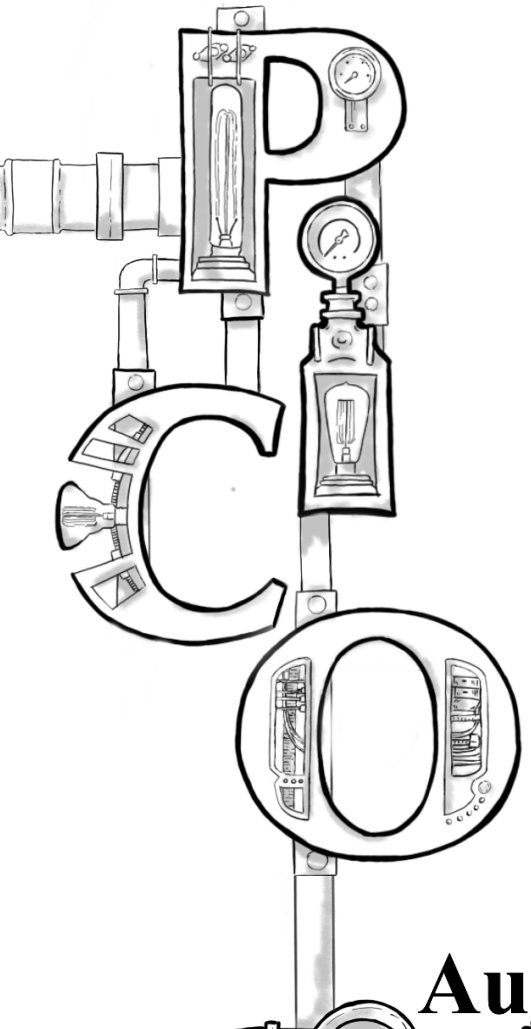


In Canada, this gender disparity also exists and occurs across specialties and within academia.

- Why are Women Still Earning Less than Men in Medicine? CMAJ 2018
- Why is There a Gender Wage Gap in Canadian Medicine? Healthy Debate 2018

Reference

Wiler et al. Continuation of Gender Disparities in Pay Among Academic Emergency Medicine Physicians. AEM March 2019.



Population:
Academic emergency medicine physicians in the United States

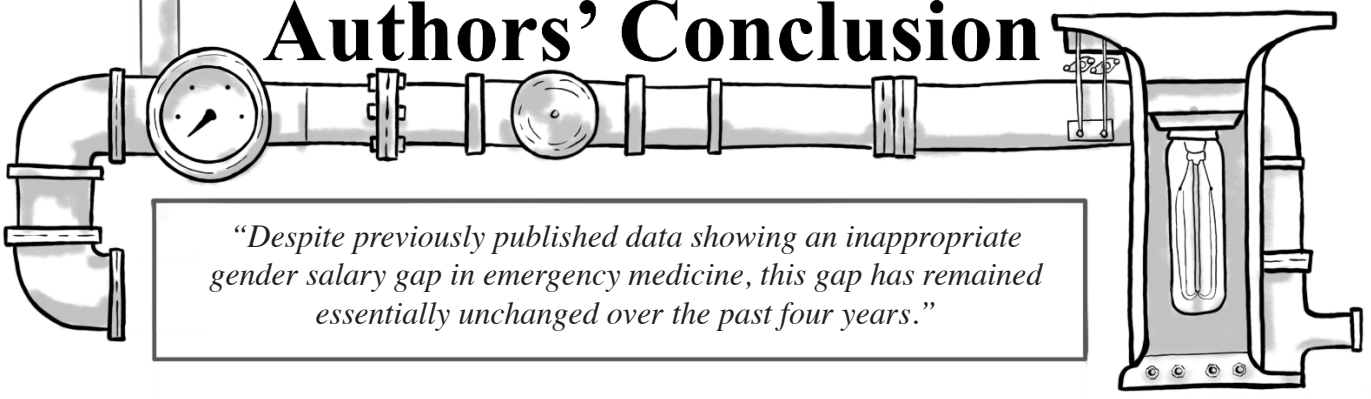
Intervention:
No intervention, this was a cross-sectional observational study of academic emergency physician salaries across the United States. It was done over 4 years from 2013-2017 (excluding 2014).

Comparison:
Women vs. men emergency physicians

Outcome:
Adjusted median annual base salary for physicians

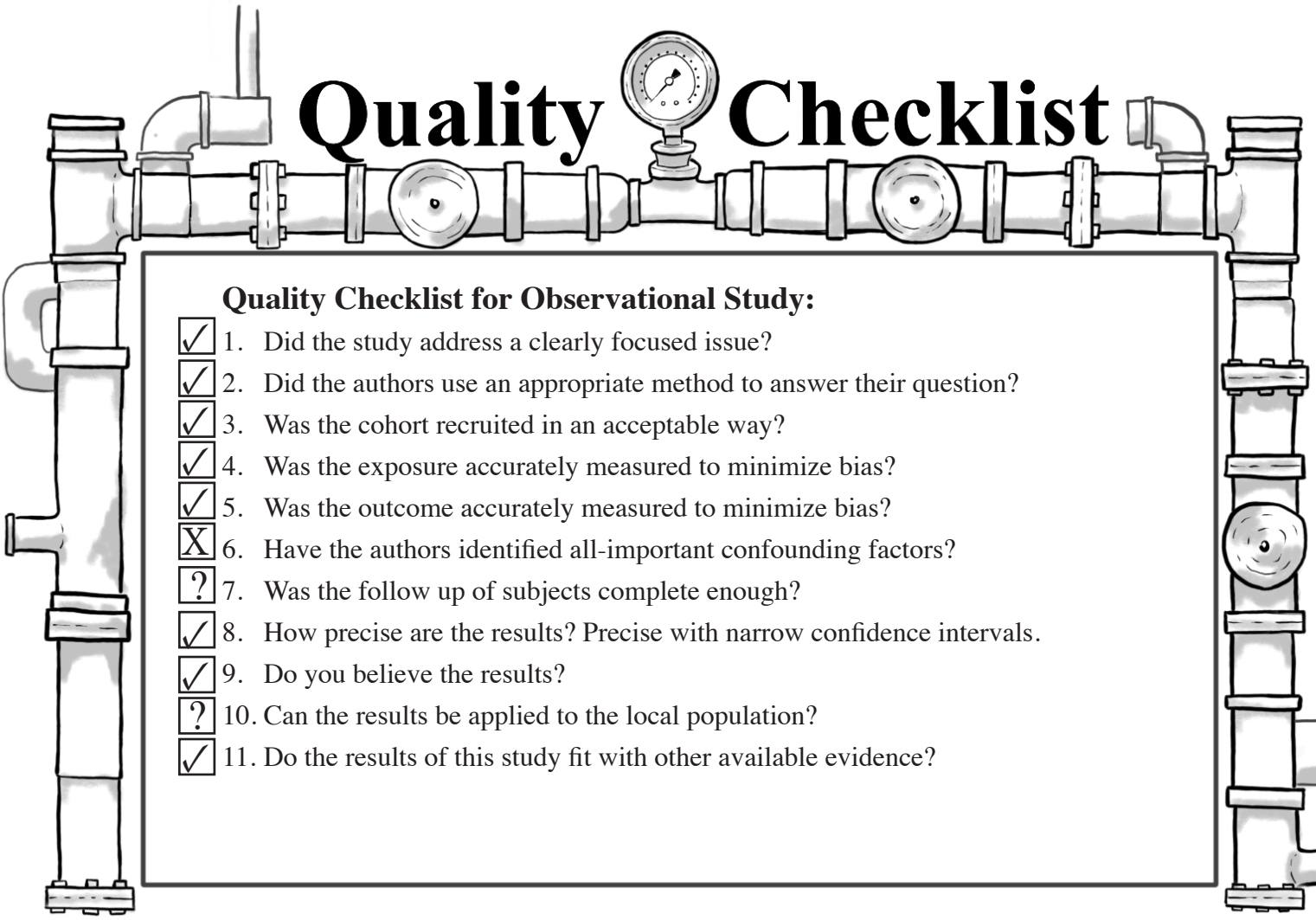
This is an SGEMHOP episode which means we have the lead author on the show. Dr. Jennifer Wiler is a Professor and Executive Vice Chair, Department of Emergency Medicine, CU School of Medicine; and Professor, CU School of Business. She has served in numerous state and national leadership positions including Chair of the American Medical Association Women Physicians Congress.

Authors' Conclusion



"Despite previously published data showing an inappropriate gender salary gap in emergency medicine, this gap has remained essentially unchanged over the past four years."

Quality Checklist



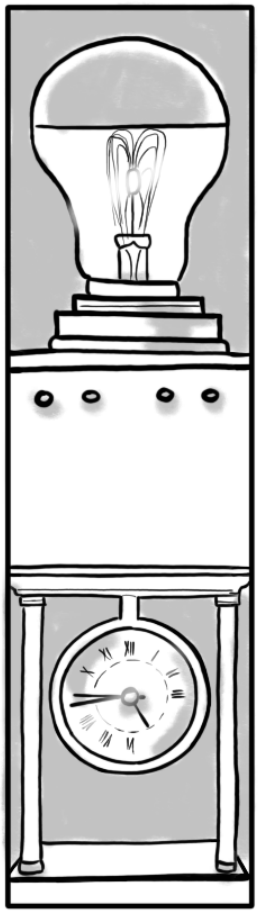
Quality Checklist for Observational Study:

- [✓] 1. Did the study address a clearly focused issue?
- [✓] 2. Did the authors use an appropriate method to answer their question?
- [✓] 3. Was the cohort recruited in an acceptable way?
- [✓] 4. Was the exposure accurately measured to minimize bias?
- [✓] 5. Was the outcome accurately measured to minimize bias?
- [X] 6. Have the authors identified all-important confounding factors?
- [?] 7. Was the follow up of subjects complete enough?
- [✓] 8. How precise are the results? Precise with narrow confidence intervals.
- [✓] 9. Do you believe the results?
- [?] 10. Can the results be applied to the local population?
- [✓] 11. Do the results of this study fit with other available evidence?

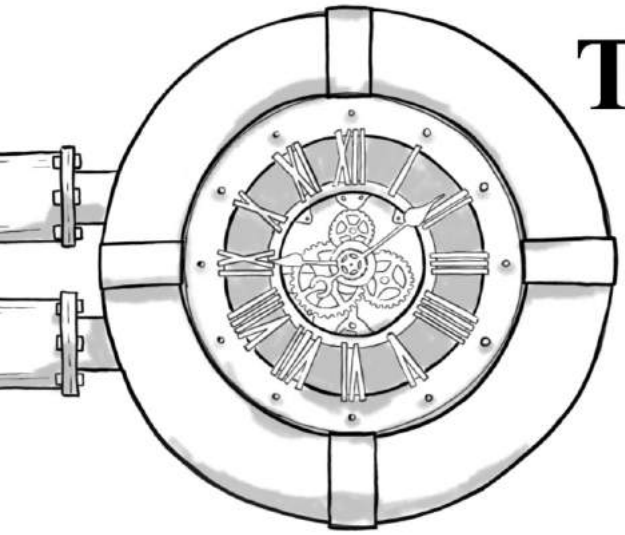
Case Outcomes

Key Results:
There were 7,102 respondents over all time periods (2013, 2015-17) from 81 emergency departments, representing four geographic regions of the US. Most were from the Northeast (38%) and male (65%) and reported they worked at pure academic emergency departments (94%)

Women EM physicians' pay was significantly less per year than men EM physicians.



- Median salary increase for men was higher ($226,746 in 2013 to $252,000 in 2017) than women ($217,000 in 2013 to $240,000 in 2017)
- Overall salaries increased across all four years studied with an overall increase of 10.8% (95% CI 9.6% to 12%)
- Women 10.6% (95% CI 9.4% to11.8%) vs. men 11.1% (95% CI 10.2% to 12%).
- The overall difference in salary for males was higher and this was significant at all four time points ($Z=6.33$, $P<0.001$)
- This pay difference persisted in the predictive model controlling for co-variates (Table 4).
- Between 2016 and 2017, women's salaries increased at a rate of 6.56% compared to 3.82% for men.
- At all time points, the proportion of respondents at higher academic ranks and higher salaries was always greater for men than women.



Time to Talk Nerdy

Listen to the podcast on iTunes or Google Play to hear Jennifer's responses to our ten nerdy questions.

1) Response Rate:
This was not reported in the study. Can you comment on what the response rate was to your survey?

2) Selection Bias:
These surveys were sent to listservs for AAAEM and AACEM. These are academic emergency departments. How do we know this sample represents all US emergency department physician groups?

3) Administrators:
Most of the surveys were completed by department administrators and not the individual physicians. Do you think this is an accurate way to determine physicians' salaries?

4) Exclusion of 2014:
Why was the year 2014 excluded from the study?

5) Confounder:
Is there any reason you can think of that pay differences would be discrepant besides gender? Some examples from a Canadian article of gender pay differences were things like more breast disease patients and rectal prolapse being referred to female general surgeons. These are both lower compensation visits/procedures and thus contributes to lower compensation for women surgeons. Is there anything like this that could account for disparity in this study?

6) Payment Scheme:
What do you think of a fee for service system or hourly contracted rate of pay system to eliminate these pay discrepancies?

7) Rise is Pay Rate:
In 2016 and 2017, the rise in pay rate was greater for women (7%) compared to men (4%). Is this continuing and is it an active intervention to eliminate this gender pay gap?

8) Future Research:
What future research questions are you planning to explore on the issue of gender pay inequity?

9) Fixing the Problem:
How do you think the problem of the gender pay gap can be fixed?

10) Anything Else:
Is there anything else you want to say about your study, or the issue of gender pay gap?

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions.

Clinical Application:

We all need to be more aware of this persistent pay gap and how it continues despite our best intentions. We also need to try to employ means of being more objective and consistent in the way that we allocate pay compensation. Every few years a review should be performed to look at salaries and other forms of compensation are distributed across a group of physicians. This is to ensure we correct any unexplained differences to make sure we have a save and equitable environment.

Case Resolution:

The objective information is taken to the proper leadership and a salary audit is request across the entire faculty.

What Do I Tell the Colleague?

Do not sit on this issue. I think it can be really tough to feel like you are not being treated equally, say nothing and slowly get disenchanted with your work place. You feel like you are not valued. Because these things are due to unconscious bias, I think often the people that you are attributing devaluing you as devaluing you are doing it and not realizing it. We need to make the implicit things explicit. I would encourage the colleague to talk about it with the leadership, express concerns and allow them to take corrective action.

Episode End Notes

Ken Milne
@TheSGEM

Do you think there is a gender pay gap among academic emergency medicine physicians in the USA? #SGEMHOP #TIMESUPHC

thesgem.com/2019/03/sgem24…
onlinelibrary.wiley.com/doi/full/10.11…

@AcademicEmerMed @SAEMonline @choo_ek @DrJenniferWiler

63% Yes
14% No
23% I dont' know

153 votes • Final results

10:18 AM - 12 Mar 2019

Gender and pay in academic EM

Salary survey via AACEM & AAAEM n=7102 in 81 US EDs

65% male, 94% at pure academic EDs, 38% North East

#paperinapic
@kirstychallen

♀		♂
$217,000 $193,000–$233,172	2013 Median (IQR)	$226,746 $204,538–$247,000
$224,000 $197,358–$248,981	2015	$240,000 $210,143–$260,700
$225,222 $200,889–$255,000	2016	$242,727 $213,945–$273,276
$240,000 $217,241–$266,012	2017	$252,000 $228,286–$281,429
Salary increase 10.6% (4-11.8%)		Salary increase 11.1% (10.2-12%)

Multivariable analysis of predictors of salary

- Gender -$11,623 p<0.001
- US region $28,025 - $30,592 p<0.001
- Community vs academic $10,925 p<0.001
- Years at faculty $338 p=0.001
- Academic rank $45,654 - $83,081 p<0.001
- Year of survey $18,311 p<0.001

Wiler doi 10.1111/acem.13685

SGEM-HOP #248

References:

1. Weichselbaumer D, Winter-Ebmer R. A meta-analysis of the international gender wage gap. J Econ Surv 2005;19:479–511.
2. Ross AH. The Equal Pay Act of 1963: A Decade of Enforcement. Boston College Law Review Nov 1974; 16(1):1. Available at: https://lawdigitalcommons.bc.edu/ cgi/viewcontent.cgi?article=1460&context=bclr. Accessed October 28, 2018.
3. Proctor BD, Semega JL, Kollar MA. Income and poverty in the United States: 2015. Washington, DC: U.S. Government Printing Office. U.S. Census Bureau, Current Population Reports, 2016. https://www.census.gov/ content/dam/Census/library/publications/2016/demo/p60– 256.pdf Accessed October 28, 2018.
4. U.S. Bureau of Labor Statistics 2016, TED The Economics Daily. Women's Median Earnings 82 Percent of Men's in 2016. Available at: https://www.bls.gov/opub/ ted/2017/womens-median-earnings-82-percent-of-mens-in- 2016.htm. Accessed October 28, 2018.
5. Nguyen Le TA, Lo Sasso AT, Vujicic M. Trends in the earnings gender gap among dentists, physicians, and lawyers. J Am Dent Assoc 2017;148:257–62.e2.
6. Lautenberger DM, Dandar VM, Raezer CL, Sloane RA. The State of Women in Academic Medicine: The Pipeline and Pathways to Leadership. Association of American Medical Colleges. 2014. Available at: https://members.aa mc.org/eweb/upload/The%20State%20of%20Women%20 in%20Academic%20Medicine%202013-2014%20FINAL. pdf. Accessed October 28, 2018.
7. Jena AB, Olenski AR, Blumenthal DM. Sex differences in physician salary in US public medical schools. JAMA Intern Med 2016;176:1294–304.
8. Freund KM, Raj A, Kaplan SE, et al. Inequities in academic compensation by gender: a follow-up to the national faculty survey cohort study. Acad Med 2016;91:1068–73.
9. Watts SH, Promes SB, Hockberger R. The Society for Academic Emergency Medicine and Association of Academic Chairs in Emergency Medicine 2009–2010 emergency medicine faculty salary and benefits survey. Acad Emerg Med 2012;19:852–60.
10. Madsen TE, Linden JA, Rounds K, et al. Current status of gender and racial/ethnic disparities among academic emergency medicine physicians. Acad Emerg Med 2017;24:1182–92.

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Ace in the Hole: Confirming Endotracheal Tube Placement with Pocus

Clinical Question:

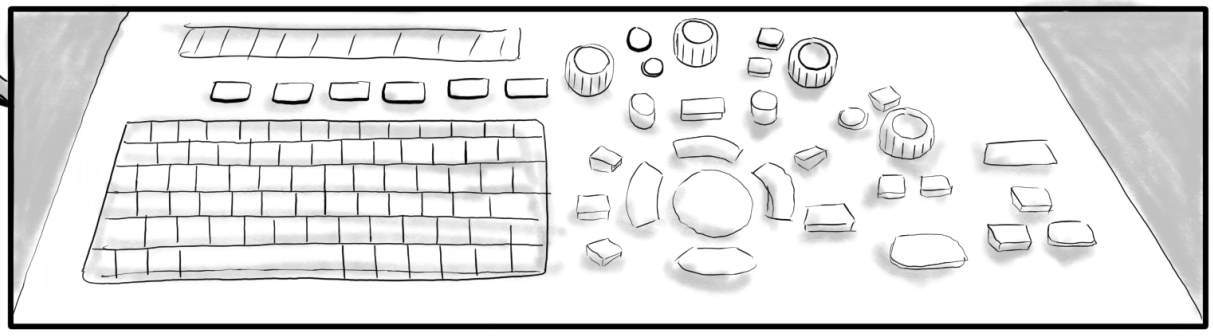
What is the accuracy of ultrasonography for confirmation of endotracheal tube placement?

Bottom Line:

Transtracheal sonography represents a potential fast and accurate way to help confirm endotracheal tube placement in conjunction with other methods.

Guest:

Chip Lange is an Emergency Medicine Physician Assistant (PA) working primarily in rural Missouri in community hospitals. He hosts a great #FOAMed blog and podcast called TOTAL EM. Chip is also the CEO of a new educational company called Practical POCUS.



Case Overview

Case:

A 48-year-old male is in cardiac arrest and is not being successfully oxygenated by bag valve mask or with a supraglottic airway (SGEM#246). While preparing to intubate the patient, you consider ways of quickly confirming endotracheal tube placement. You have a colleague in the room who is proficient at ultrasound and asks if there is a role for bedside ultrasound in this situation.

Background:

We have talked about ultrasound a number of times on the SGEM:

- SGEM#245: Flash-errrs (POCUS for Retinal Detachments)
- SGEM#177: POCUS – A New Sensation for Diagnosing Pediatric Fractures
- SGEM#153: Simulation for Ultrasound Education
- SGEM#124: Ultrasound for Skull Fractures – Little Bones
- SGEM#119: B-Lines (Diagnosing Acute Heart Failure with Ultrasound)

The SGEM has also discussed endotracheal intubation a number of times:

- SGEM#247: Supraglottic Airways Gonna Save you for an OHCA?
- SGEM#197: Die Trying – Intubation of In-Hospital Cardiac Arrests
- SGEM#186: Apneic and the O, O, O2 for Rapid Sequence Intubations
- SGEM#75: Video Killed Direct Laryngoscopy?

Endotracheal intubation can be challenging and if incorrectly performed can lead to death. Rapid confirmation of endotracheal tube placement is vital and ACEP has a policy statement on this issue. The various methods to confirm tube placement include:

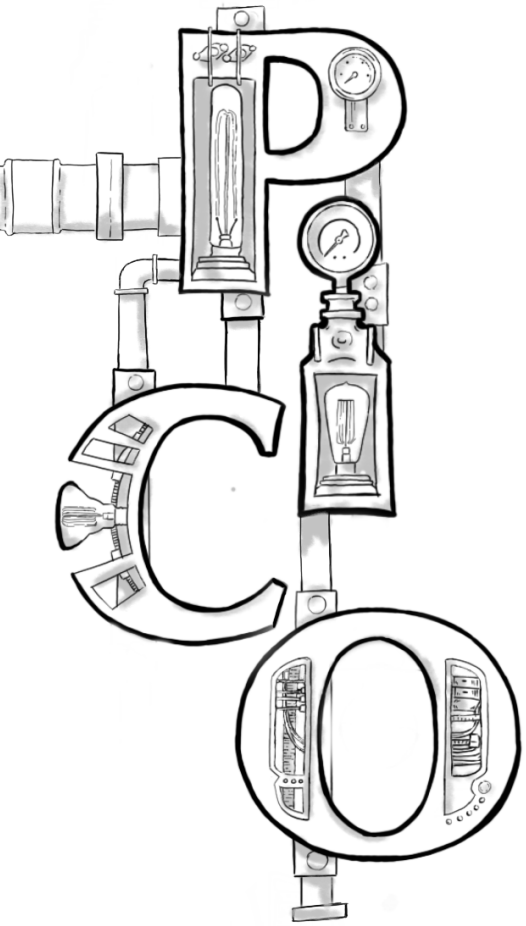
- Physical exam (auscultation of chest and epigastrium, chest wall movement, and condensation/ fogging in the tube)
- Direct visualization or videolaryngoscope of the tube going through the cords
- Pulse oximetry
- Chest x-ray
- Esophageal detector devices
- End-tidal carbon dioxide (CO2) detection (continuous wave form capnography, colorimetric and non-wave form capnography)

There is evidence indicating that commonly used endpoints for rapid confirmation can be inaccurate. Quantitative waveform capnography, thought to be one of the best methods, correctly confirms tube placement only two-thirds of the time in cardiac arrest (Takeda et al, Tanigawa et al and Tanigawa et al).

A fast and reliable alternative would be great. Point of care ultrasound (POCUS), has become more popular over time for its easy usability and accuracy in a variety of applications. A number of small studies have been done using POCUS to confirm endotracheal tube placement. These studies have been relatively small with wide confidence intervals.

Reference

Gottlieb, Holladay and Peksa. Ultrasonography for the Confirmation of Endotracheal Tube Intubation: A Systematic Review and Meta-Analysis. Ann Emerg Med 2018.



Population:
Patients over 18 years of age in a prospective or randomized controlled trial undergoing assessment of transtracheal ultrasonography for endotracheal tube placement confirmation.

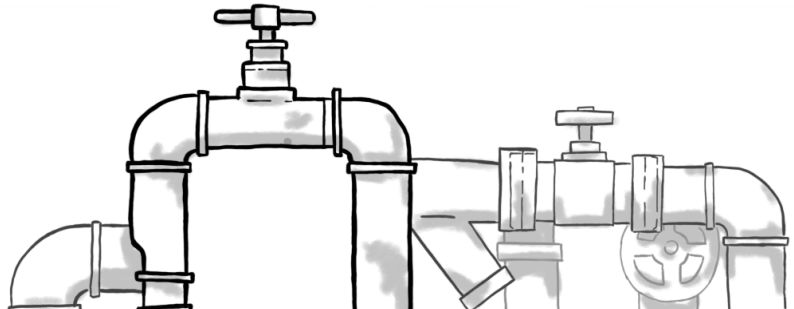
- **Excluded:** Case reports, case series, retrospective studies, cadaver studies, pediatric studies, and conference abstracts.

Intervention:
Transtracheal ultrasonography to confirm endotracheal tube placement.

Comparison:
Confirmatory testing of endotracheal tube placement such as end-tidal capnography, colorimetric capnography, or direct visualization.

Outcomes:

- **Primary:** Diagnostic accuracy of transtracheal ultrasound
- **Secondary:** Time to confirmation and subgroup analyses.



Authors' Conclusion

"Transtracheal sonography is rapid to perform, with an acceptable degree of sensitivity and specificity for the confirmation of endotracheal intubation. Ultrasonography is a valuable adjunct and should be considered when quantitative capnography is unavailable or unreliable."

Quality Checklist

Quality Checklist for Systematic Review Diagnostic Studies:

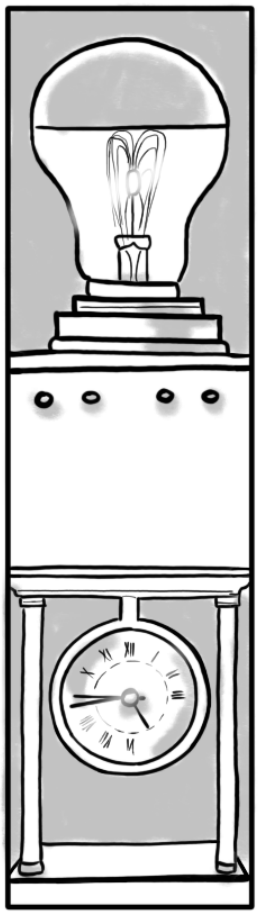
- [?] 1. The diagnostic question is clinically relevant with an established criterion standard.
- [✓] 2. The search for studies was detailed and exhaustive.
- [✓] 3. The methodological quality of primary studies was assessed for common forms of diagnostic research bias.
- [?] 4. The assessment of studies was reproducible.
- [✓] 5. There was low heterogeneity for estimates of sensitivity or specificity.
- [?] 6. The summary diagnostic accuracy is sufficiently precise to improve upon existing clinical decision-making models.

Case Outcomes

Key Results:

Their search identified 17 studies (15 prospective observational studies and two randomized controlled trials) with 1,595 patients. Twelve of the 17 studies were done in the emergency department. The mean age was 55 years with 57% being male patients. Esophageal intubation rate was 15%.

Transtracheal ultrasonography was 98.7% Sensitive and 97.1% Specific.



Primary Outcomes:

Diagnostic accuracy of transtracheal ultrasound for endotracheal tube placement.

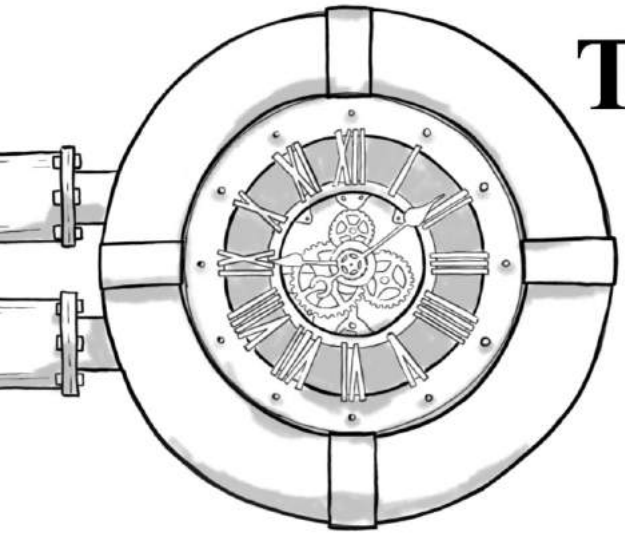
	Point Estimate	95% Confidence Interval
Sensitivity	98.7%	97.8% to 99.2%
Specificity	97.1%	92.4% to 99.0%
Likelihood Ratio Positive	34.4	12.7 to 93.1
Likelihood Ratio Negative	0.01	0.01 to 0.02
ROC Curve	0.994	0.982 to 0.998

Secondary Outcomes:

Mean time to confirmation was 13.0 seconds (95% CI: 12.0 to 14.0)

Subgroup Analyses:

These did not demonstrate a significant difference by location, provider specialty, provider experience, transducer type, or technique.



Time to Talk Nerdy

1) Included Studies:

As stated in the background material, a number of studies have been done using POCUS to confirm endotracheal tube placement. These studies have been relatively small with wide confidence intervals. Most of the studies included in this SRMA were at low risk of bias. However, 15 out of the 17 of the included studies were prospective observational studies. Only 216 patients (14%) were in randomized controlled trials. In addition, 13 of the 17 studies did not enrol consecutive patients but used convenience sampling which can introduce selection bias. These limitations of included studies make it hard to make any strong statement on using transtracheal ultrasound for endotracheal tube placement.

2) Lack of Gold Standard:

There is no set established criterion standard to confirm endotracheal tube placement. A number of methods are available and often used in combination. Each confirmation modality has their potential benefits and limitations. Chest x-ray takes a long time to confirm, capnography especially in cardiac arrest has low sensitivity, and auscultation can be inaccurate or difficult to detect especially in loud environments.

3) Esophageal Intubation Rate:

This was very high at 15%. A previous study has shown the rate in the ED to be only 3%. (Brown et al. Ann Emerg Med 2015). This could be due to the different level of training of those performing the intubations. Studies included medical students, residents and attending physicians.

4) Accurate and Fast:

When confirming endotracheal intubation, you want a method that is both accurate and fast. We talked about the potential limitations with sensitivity of waveform capnography. Ultrasound provides a much more rapid evaluation to confirm which means fewer potential complications like regurgitation of stomach contents or worsening hypoxia do to improper endotracheal tube placement. Ultrasound confirmed placement in 13 seconds while capnography can take about 60 seconds. It is unsure if this difference in time results in a patient-oriented benefit.

5) Publication Bias:

The funnel plot analysis demonstrated evidence of publication bias. The bias would be towards not publishing negative studies. This is a well-known phenomenon in the medical literature. This form of bias would skew the results and make transtracheal ultrasound placement confirmation look better.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree that transtracheal sonography is rapid, seems to have very good diagnostic accuracy and could be a valuable adjunct when quantitative capnography is unavailable or unreliable.

Clinical Application:

POCUS for confirmation of endotracheal tube placement is another example of emergency medicine embracing this new technology. It represents another potential tool that can be used in combination with existing methods to verify correct tube placement. As these bedside devices become pocket size and more affordable, it will be interesting to see how clinicians continue to include POCUS in their practice.

What Do I Tell the Patient?

Since the patient is intubated, there really is not much to tell them. However, you may tell your team that to help rapidly confirm endotracheal intubation you will use transtracheal ultrasound along with other measures such as direct visualization of the tube's passage through the cords, auscultation, and waveform capnography.

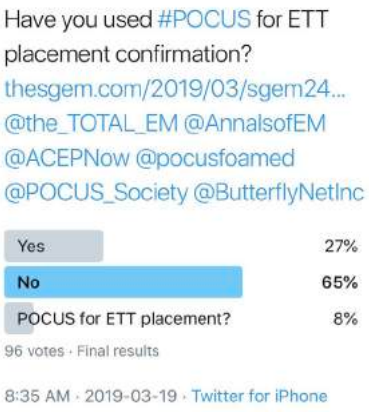
Case Resolution:

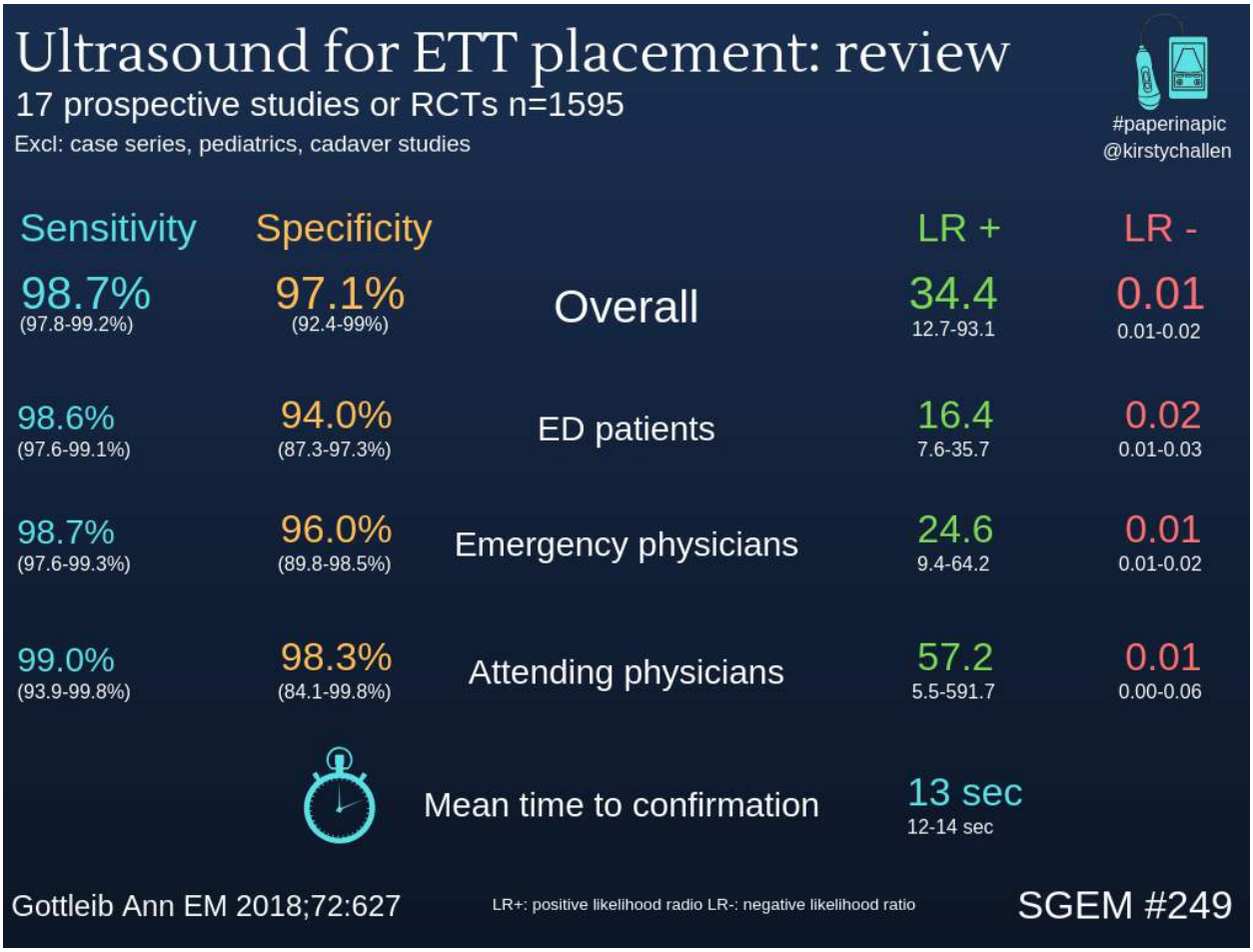
Your colleague is familiar with the application of POCUS for endotracheal tube placement and agrees to assist you in your intubation attempt. While you directly visualize the passage of the endotracheal tube through the vocal cords, she is able to see the appropriate findings consistent with successful placement. Waveform capnography is used in addition and further supports the appropriate placement. With this successful intubation, the patient's oxygen saturations improve.

Episode End Notes

Other FOAMed:

- TOTAL EM: Confirming Intubation with Ultrasound
- FOAMfrat: Airway Sono with Cynthia Griffin
- REBEL EM: POCUS for Endotracheal Tube Confirmation
- Ultrasound G.E.L. Podcast: Tracheal Ultrasound for Intubation
- ALiEM: Ultrasound for Verification of Endotracheal Tube Location





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Scribes: I Want To Break Free (From The EMR)

Clinical Question:

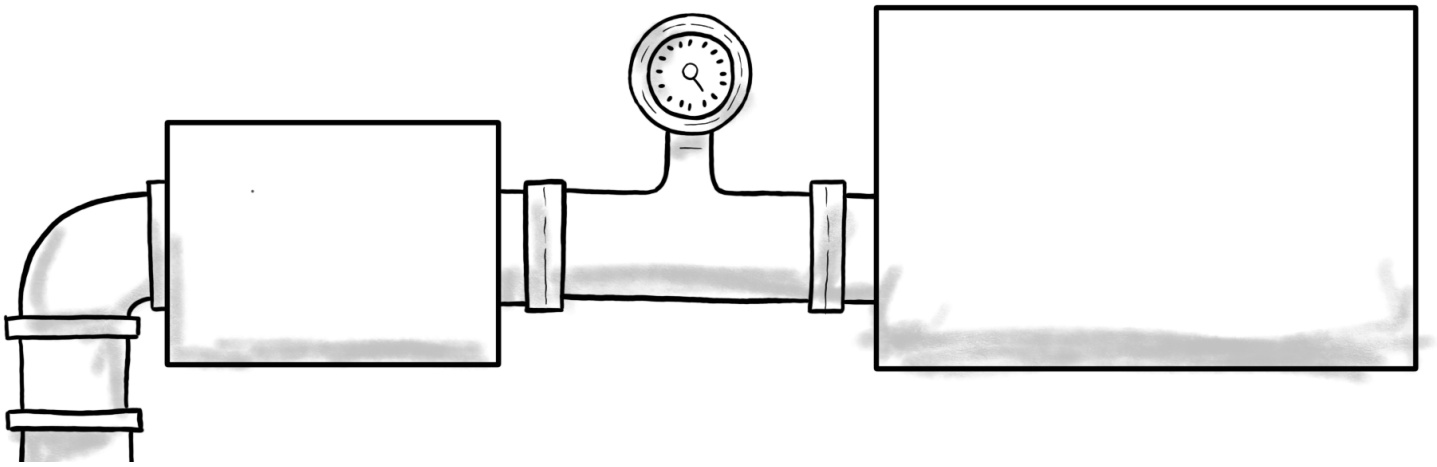
What is the impact of scribes on emergency medicine physicians' productivity and patient throughput.

Bottom Line:

Scribes could have a positive impact of productivity and patient throughput depending on your practice environment.

Guest:

Dr. Katie Walker is an emergency physician in Melbourne, Australia. She is a clinical researcher at Cabrini Hospital and an Adjunct Clinical Associate Professor at Monash University.



Case Overview

Case:

The emergency department is backing up. You have ambulances ramping and patients queuing at triage. Your medical team is great, but you notice that the busier you all become, the more you see your docs at their computers, rather than at patient bedsides. You are frustrated that whilst you frantically fill in data in the Electronic Medical Record (EMR) from your last consultation, your neighbor is in your waiting room with a dislocated shoulder and you haven't been able to get to her yet. Is there a better way of working than this way?

Background:

One in ten health high-income country consultations are now in Emergency Medicine. Most emergency physicians use some form of electronic medical records (EMRs) when seeing patients.

The EMR tasks we undertake are expanding rapidly, far beyond simply documenting history and physical examination and every implementation slows us down.

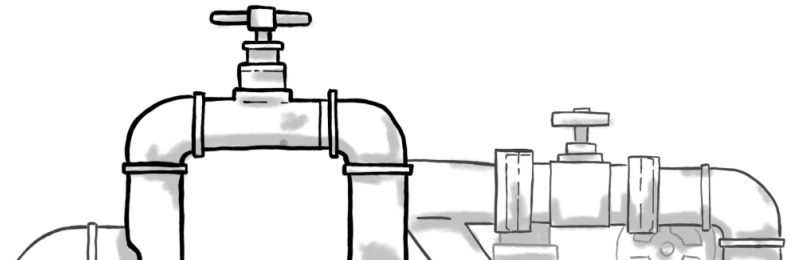
Research by Hill et al (1) demonstrated that an ED shift can have 4,000 clicks. Physicians are spending more time on EMRs (40%) than any other activity including direct patient care (30%). SGEM#159 looked at the implementation of an EMR in a tertiary care ED. Median wait times, length of stay, left without being seen, and length of stay for admitted patients all got worse with adding computerized physician order entry (CPOE) as part of their EMR (2).

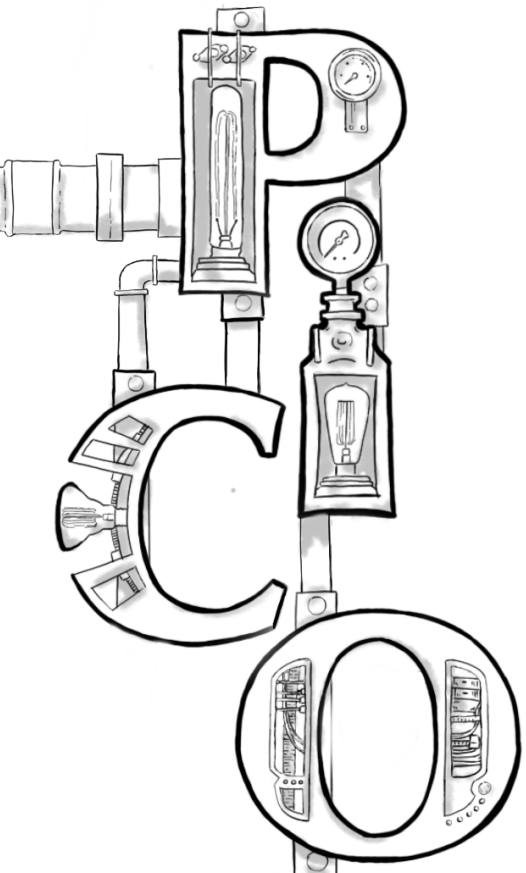
The implementation of the EMR into clinical practice represents a very large, global, medical productivity loss. It could also have a negative impact on patient care.

There are studies showing that EMRs are one of the biggest causes, if not the number one cause of physician burnout (3). Physicians suffering from burnout provide a lower quality and safety of care (4). This means there is an association between EMRs and worse patient care. If we have to use EMRs, how can we improve our productivity? There haven't been any large, independent, multi-centre, randomised evaluations of scribe effectiveness and safety, until now.

Scribes are individuals who help physicians by doing the clerical tasks. There is a long list of things that they do including documentation of the clinical encounter, information retrieval, and discharge preparation.

Most physicians (85%) prefer working with scribes (5) and most patients tolerate scribes being involved in the clinical encounter (6). They have been used in US departments for years, but are only now beginning to be used in Canada and Australia.





Reference

Impact of scribes on emergency medicine doctors' productivity and patient throughput: multicentre randomised trial, BMJ January 2019

Population:
Five emergency departments in Australia

Intervention:
Scribes rostered to a physician for a shift

Comparison:
Same physicians working shifts without scribes

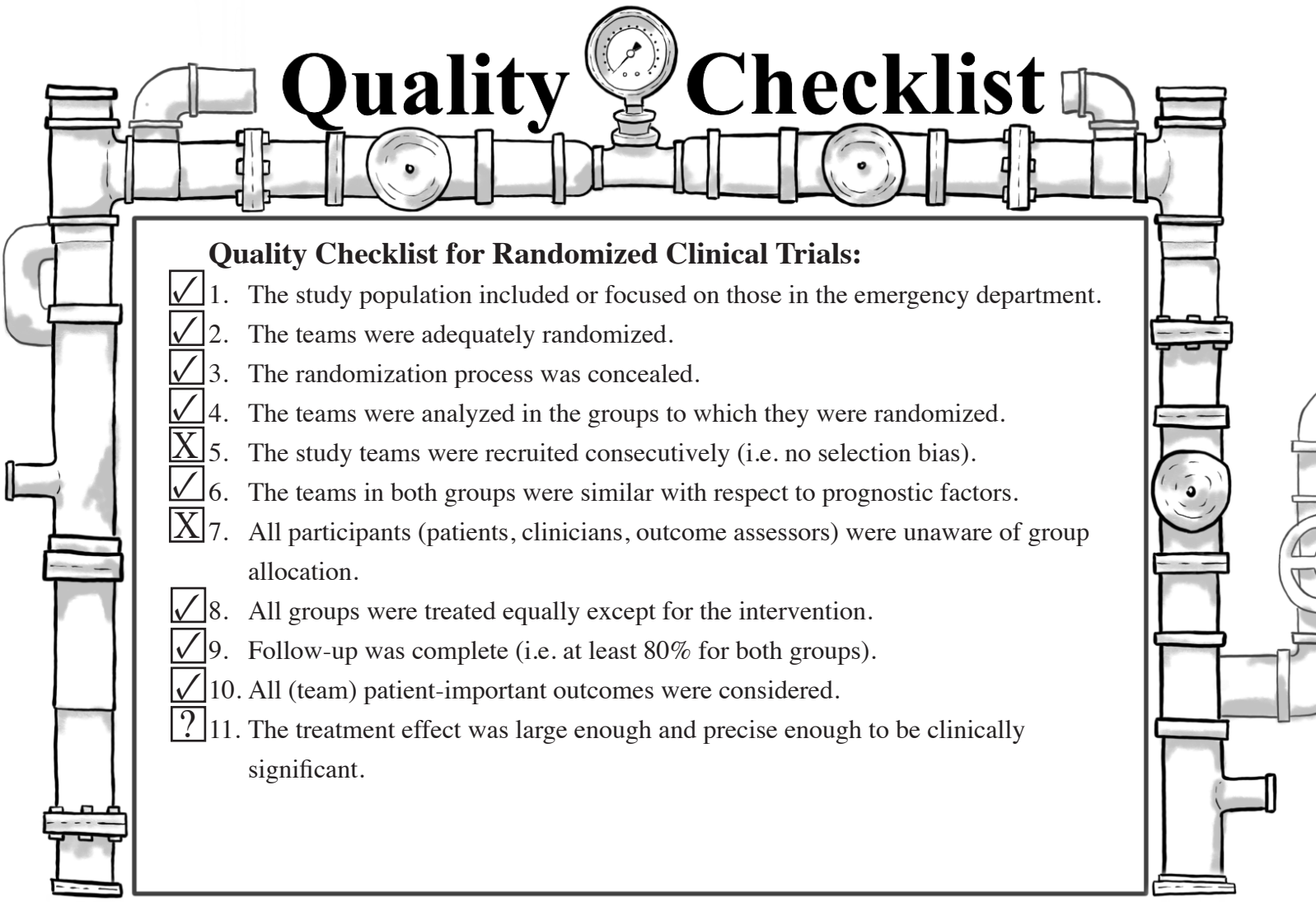
Outcomes:

- **Primary:** Total patients/physician/hour (including medical triage and handovers, where another doctor undertakes the primary/main consultation)
- **Secondary:** Primary patients/physician/hour, door-to-doctor time, door-to-discharge time, regions of emergency department patients/physician/hour, patient safety events (scribe group only, no comparator) and retrospective cost-benefit analysis

Authors' Conclusion

"Scribes improved emergency physicians' productivity, particularly during primary consultations, and decreased patients' length of stay. Further work should evaluate the role of the scribe in countries with health systems similar to Australia's."

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

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

Case Outcomes

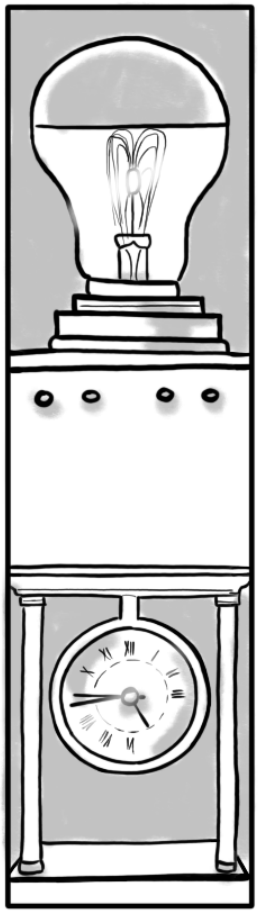
Key Results:
There were 12 scribes and 88 physicians working at five sites.They compared 589 scribed shifts to 3,296 non-scribed shifts. This included 5,098 scribed consultations and 23,838 non-scribed consultations.

Total patients seen per hour increased with scribes.

Primary Outcomes:

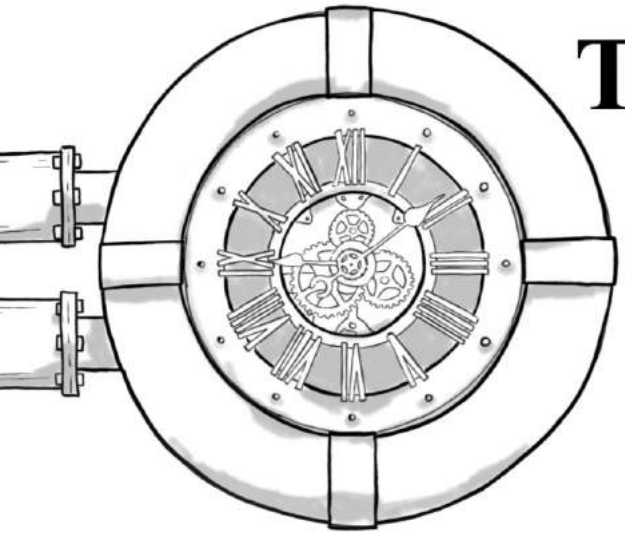
Patients seen per hour

- Without a Scribe: 1.13 (95% CI; 1.11 to 1.17)
- With a Scribe: 1.31 (95% CI; 1.25 to 1.38)
- Absolute increase of 0.18 more patients per hour
- Relative increase of 15.9%



Secondary Outcomes:

- Primary consultations per hour increased from 0.83 to 1.04 (25.6% gain)
- Door-to-doctor times were unchanged
- Door-to-discharge times reduced from 192 to 173 minutes (19 minutes shorter)
- Within ED productivity changes:
  - Medical triage increased by 0.53 patients per hour
  - Acute areas increased by 0.10 patients per hour
  - Sub-acute/Short stay showed no gains
  - Pediatrics increased by 0.17 patients per hour
- There was a minor patient safety event reported for 1:300 consultations. Events mainly related to wrong patient selection in EMRs, half the events reported involved the scribe identifying a problem in someone else's patient and intervening to prevent harm.
- The cost analysis was in favour of employing scribes, given the productivity and throughput gains



Time to Talk Nerdy

1) Selection Bias:

Scribes were not used at the discretion of the physician or if the patient declined. The number of times patients declined a scribe was not recorded. This could have introduced selection bias. Scribes were also not present on nights and public holidays. This also could have introduced selection bias and could limit the validity to those shifts.

2) Lack of Blinding:

Scribe research, like most complex intervention evaluations, is hard. It is not practical to blind physicians/patients/scribes to the intervention. This lack of blinding could have introduced a Hawthorne effect. There are issues with measuring the intervention that don't get properly incorporated into studies. Examples include physicians staying late to complete medical notes after their shift ends (unrostered / unpaid / unrecorded overtime) when unassisted but going home on time with a scribe. When scribes were used in our observation wards / short stay, the intern had no role and went and picked up new patients (again unmeasured by the study). A rigorous study protocol can also be upset by simple day-to-day ED operations glitches like last minute sick leave. No scribe study will be academically perfect, but hopefully pragmatic studies will better resemble the real-life working environments in our EDs.

3) Payment Models:

Some jurisdictions may (or may not) find that per-patient billing/revenues increase when a scribe is present. This wasn't measured in the study but may (or may not) provide a stronger economic argument for scribes in some settings. It will all depend. A lower volume community ED not using CPOE a scribe would make little sense. However, in a high volume setting that is using CPOE and paid on productivity it might make great sense to have scribes on shift.

4) External Validity:

More work should be undertaken in several areas. Similar studies should be considered in settings outside Australia such as the USA, Canada, the UK and European countries. As clinicians, we should advocate for ourselves/our patients and partner with information technology (IT) designers to make EMRs that work for us. We should also rigorously explore the scribe role in alternate settings such as clinics, offices and in-patient wards.

5) Band-Aid:

While we would all like our IT systems to be better designed/integrated, able to reduce duplication or give us improved functionality, the scribe role could provide an immediate (even if temporary) fix. Until IT research is able to demonstrate productivity gains with a similar cost profile, we should offload our clerical tasks in a safe way and return to our core medical roles – information synthesis and communication.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions.

Case Resolution:

You decide to implement a scribe program at your hospital. The IT and processes still remain tedious but you have offloaded many of them. You rediscover what it is like to be a physician who is enabled to walk from one room to another, seeing patients, providing high-quality/evidence-based care and moving rapidly to where you are needed. You go home less tired despite a bigger patient load.

What Do I Tell the Patient?

This is John, he what is called a scribe. His job is to organize everything you need today and write down all my instructions for the emergency team. This will help me focus on being your physician.

Clinical Application:

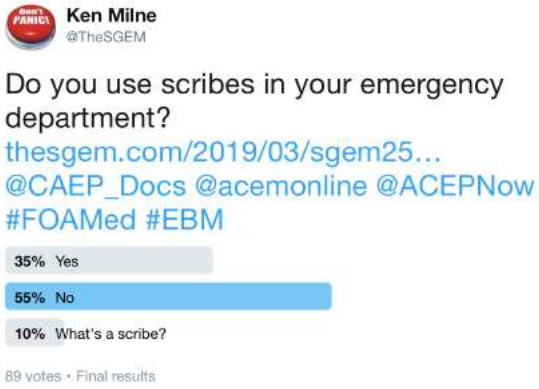
When working with a scribe, enjoy your work and get used to being enabled to see more patients, whilst feeling like you have done less.

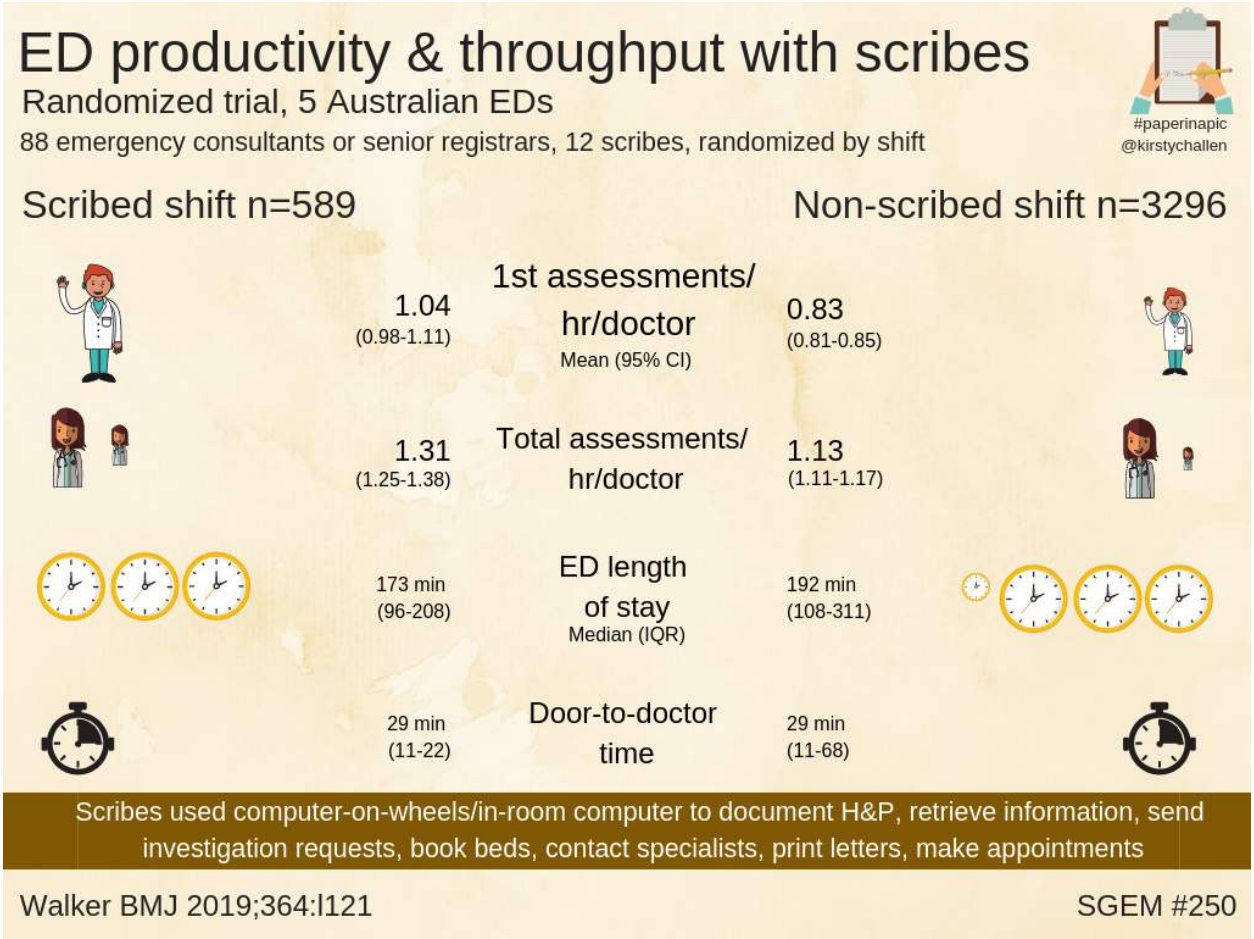
Enable your scribe to speak up if they see anything untoward happening in the department, they may be the only one to notice it. Check every time you open the EMR that you have selected the correct patient.

Episode End Notes

Other FOAMed:

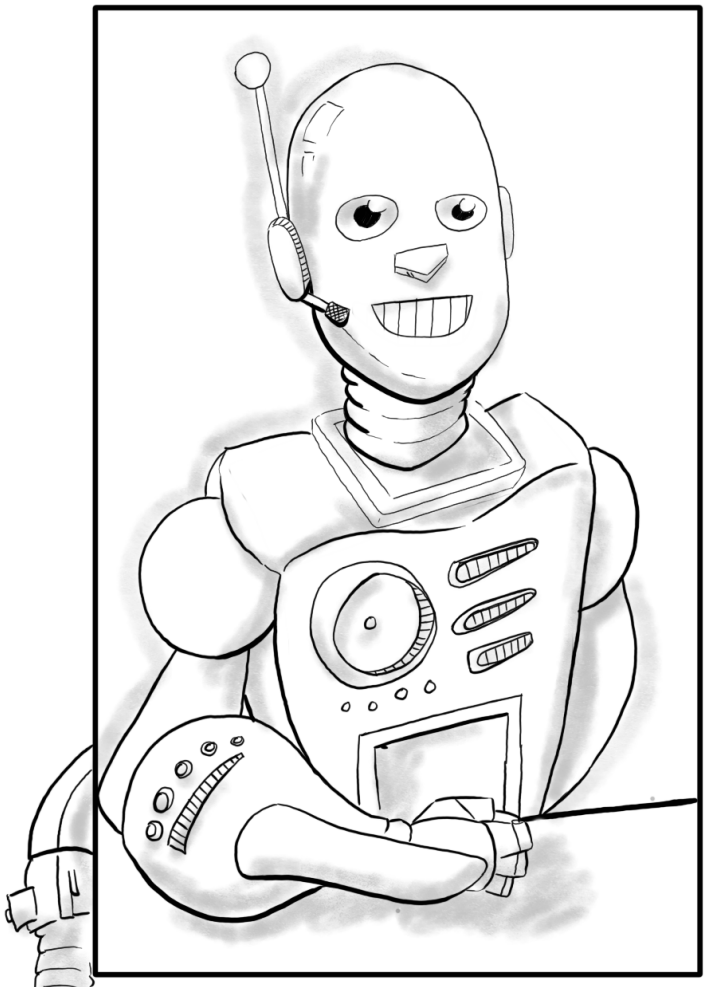
- ZDoggMD – EHR State of Mind
- REBEL EM – Hate Using Electronic Hospital Records? An Evaluation of Medical Scribes in Emergency Departments.
- St. Emlyn's – Do we need scribes in the ED?
- St. Emlyn's – Scribes in the ED?





References:

1. Hill et al. 4000 Clicks: a productivity analysis of electronic medical records in a community hospital ED. AJEM 2013
2. Gray et al. The impact of computerized provider order entry on emergency department flow. CJEM 2016
3. Shanafelt et al. Relationship Between Clerical Burden and Characteristics of the Electronic Environment With Physician Burnout and Professional Satisfaction. Mayo Clinic Proc 2016
4. Salyers et al. The Relationship Between Professional Burnout and Quality and Safety in Healthcare: A Meta-Analysis. JGIM 2017
5. Cowan et al. Emergency consultants value medical scribes and most prefer to work with them, a few would rather not: a qualitative Australian study. Emerg Med J 2018
6. Yan et al. Physician, Scribe, and Patient Perspectives on Clinical Scribes in Primary Care. J Gen Intern Med 2016



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Nothing Compares to You… Because There Was No Comparison Group

Clinical Question:

Should andexanet alfa be used to treat serious bleeding events in patients taking factor Xa inhibitors?

Bottom Line:

The routine use of andexanet alfa in the management of bleeding patients on factor Xa inhibitors cannot be recommended at this time.

Guest:

Dr. Ryan Radecki is an Emergency Physician at Kaiser Permanente NW, co-host of the Annals of Emergency Medicine podcast and Journal Club section editor.

Case Overview

Case:

You are caring for a 72-year-old man who comes in after having slipped on the ice. A routine evaluation finds only minor bumps and bruises, including a rather nasty one on his occiput where he struck a step. He reports he has been taking apixaban to prevent stroke in the context of atrial fibrillation, which you easily recognize as one of the modern oral anti-Factor Xa inhibitors. You order a non-contrast CT to rule out hemorrhage. It demonstrates a 7mm subdural hematoma with 3mm of midline shift. As you are reassessing your patient and treatment plan, the question presents itself – how should we reverse his anticoagulation?

Background:

More and more patients are being treated with direct oral anticoagulants (DOACs). This number will probably increase since the AHA/ACC/HRS 2019 updated guidelines for atrial fibrillation guidelines. It now contains the following recommendation:

> ***NOACs (dabigatran, rivaroxaban, apixaban, and edoxaban) are recommended over warfarin in NOAC-eligible patients with AF (except with moderate-to-severe mitral stenosis or a mechanical heart valve). Level A***

One of the concerns clinicians had with DOACs was there was no way to reverse these new anti-coagulants when they were introduced. In contrast, protamine could be used for heparin and LMWH reversal and vitamin K, fresh frozen plasma and prothrombinase complex concentrate could be used to reverse coumadin (Hunt and Levi BMJ 2018).

This changed in 2015 when the Food and Drug Administration (FDA) approved idarucizumab for the reversal of dabigatran. Dabigatran is a direct thrombin inhibitor. We covered the interim analysis of 90 patients included in a prospective cohort study by Pollack et al NEJM 2015 on SGEM#139. Our bottom line for that episode was that idarucizumab is here (USA) and probably works but its patient-oriented efficacy and safety are still pending.

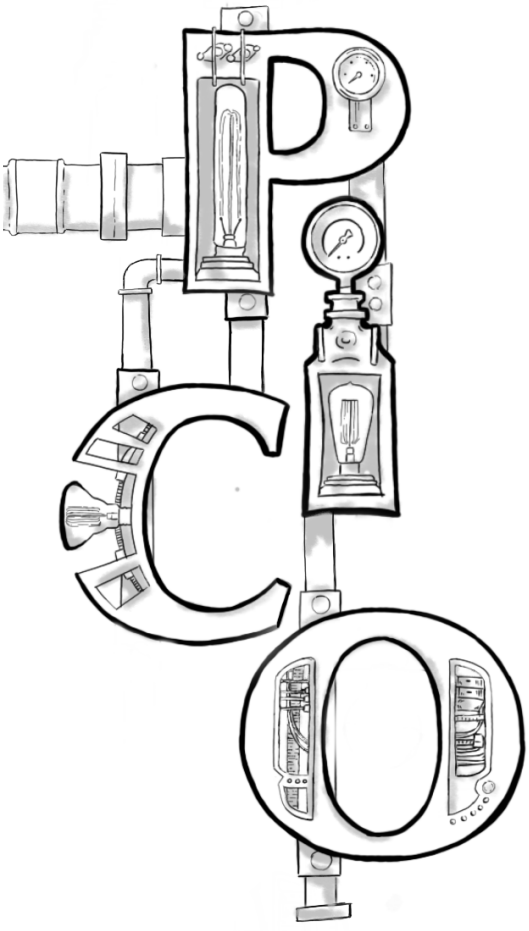
The full study cohort of 503 patients has since been published (Pollack et al NEJM 2017) and we are in the same place we were in 2015. Idarucizumab clearly and effectively removes dabigatran from circulation and this ought to be occasionally clinically useful. I would certainly exhaust all potential supportive and expectant management options first, as well as try to definitively confirm dabigatran as the culprit for abnormal hemostasis (EM Lit of Note).

The FDA granted accelerated approval for andexanet alfa (Andexxa) in May of 2018. Andexxa is an antidote for factor Xa inhibitor like rivaroxaban, apixaban and edoxaban. It acts as a decoy and binds to the factor Xa inhibitors.

The American College of Cardiology has published a fact sheet to provide some guidance for the use of anticoagulation reversal agents.

Reference

Connolly et al. Full Study Report of Andexanet Alfa for Bleeding Associated with Factor Xa Inhibitors. NEJM 2019



Population:
Adult patients presenting with an acute major bleed, and had received a DOAC (apixaban, rivaroxaban, or edoxaban) at any dose or enoxaparin at a dose of at least 1 mg per kilogram of body weight per day within the previous 18 hours.

- **Acute Major Bleed:** Bleeding having one or more of the following features: potentially life-threatening bleeding with signs or symptoms of hemodynamic; bleeding associated with a decrease in the hemoglobin level of at least 2 g per deciliter or bleeding in a critical area or organ.

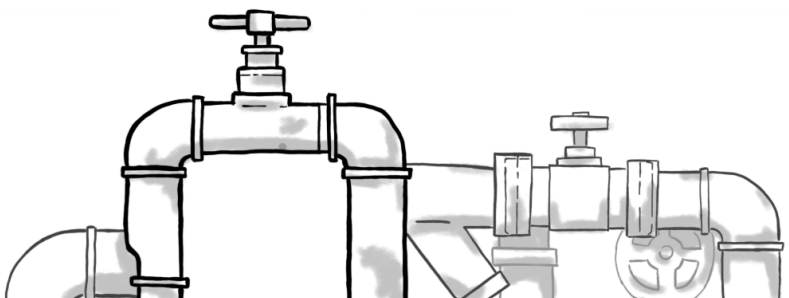
- **Exclusions:** There were a number of exclusions listed in supplemental material but the key ones were as follows: Planned surgery within 12hrs; ICH in a patient with a GCS<7 or an estimated hematoma volume of more than 60 cc; expected survival of <1 month; the occurrence of a thrombotic event within 2 weeks before enrollment; or use of vitamin K antagonist, dabigatran, prothrombin complex concentrate, recombinant factor VIIa, whole blood, or plasma within the previous 7 days.

Intervention:
Andexanet intravenous (IV) bolus over a period of 15 to 30 minutes, followed by a 2-hour infusion of the drug.

Comparison:
None

Outcomes:

- **Co-Primary Efficacy Outcome:** The percent change in anti–factor Xa activity after andexanet treatment and the percentage of patients with excellent or good hemostatic efficacy at 12 hours after the end of the infusion.
- **Primary Safety Outcomes:** Death, thrombotic events, and the development of antibodies to andexanet or to native factor X and factor Xa at 30 days.



Authors' Conclusion

"In patients with acute major bleeding associated with the use of a factor Xa inhibitor, treatment with andexanet markedly reduced anti–factor Xa activity, and 82% of patients had excellent or good hemostatic efficacy at 12 hours, as adjudicated according to prespecified criteria."

Quality Checklist

Quality Checklist for Observational Study:

- [X] 1. Did the study address a clearly focused issue?
- [?] 2. Did the authors use an appropriate method to answer their question?
- [X] 3. Was the cohort recruited in an acceptable way?
- [✓] 4. Was the exposure accurately measured to minimize bias?
- [?] 5. Was the outcome accurately measured to minimize bias? Yes&No
- [X] 6. Have the authors identified all-important confounding factors?
- [✓] 7. Was the follow up of subjects complete enough?
- [?] 8. How precise are the results?
- [✓] 9. Do you believe the results?
- [X] 10. Can the results be applied to the local population?
- [✓] 11. Do the results of this study fit with other available evidence?

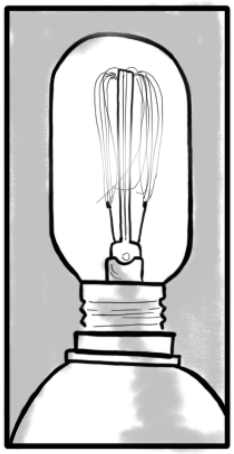
Case Outcomes

Key Results:
They enrolled 352 patients into the study. The mean age was 77 years and 80% of patients were taking anticoagulation for atrial fibrillation. Two-thirds of the patients had ICH and one-quarter had GI bleeds.

Andexanet decreased anti-factor Xa activity and four out of five patients had excellent or good hemostasis.

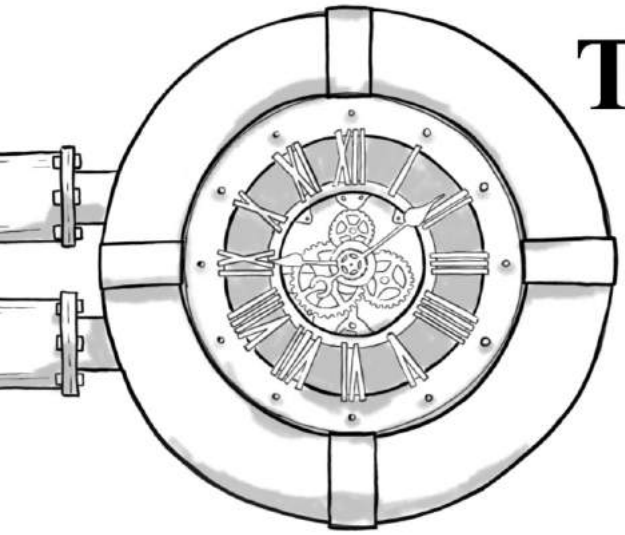
Co-Primary Outcome:

- Excellent or good hemostasis occurred in 204 of 249 patients (82%)
- Decreased in anti-factor Xa activity from 149.7ng/ml to 11.1ng/ml (92% reduction; 95% CI: 91% to 93%)



Primary Safety Outcomes:

- **Death:** 49/352 (14%)
- **Thrombotic Events:** 34/352 (10%)
- Development of antibodies to andexanet or to native factor X and factor Xa: None



Time to Talk Nerdy

We are not going to specifically talk about the fact this was an industry funded study and the authors listed multiple conflicts of interest. I have said multiple times it does not make the data wrong but should make us more skeptical of the results and the interpretation.

1) Recruitment:

An important first step to any study is the recruitment of subjects. There were multiple problems with their recruitment, most prominently including multiple changes to their inclusion and exclusion criteria. The authors amended these criteria four times over the duration of the study enrolled between 2015 and 2018. One key change was during 2016 and 2017 when the authors restricted to only patients with intracerebral hemorrhage in order to "enrich" the study with these patients.

The intent to *"enrich"* the study population with intracranial hemorrhage could be in response to observations regarding its lack of ability to improve control of extracranial hemorrhage. After all, the underlying theory behind its efficacy is that the short period of restored hemostasis will allow for clot formation that is sustained following cessation of the infusion and subsequent drop in anti-Factor Xa activity.

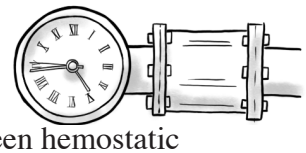
This is probably more likely to be efficacious in a small volume bleed into a closed space, such as intracranially. However, is this any better than alternative strategies recommended by the neurocritical care societies, such as those using prothrombin concentrate complexes? This exact question is being addressed by a clinical trial that has only just now started enrollment, and our data regarding andexanet's true clinical effectiveness will remain uncertain until its completion.

There were other substantial changes made during the study in the recruitment of patients making it hard to generalize the results to the entire cohort.

2) Co-Primary Outcome:

As the SGEM listeners know, there can be only ONE primary outcome. The authors amended their study to have two *"coprimary"* outcomes. One of which is ostensibly a surrogate for the other. The percent change in factor Xa activity is a simple pharmacokinetic evaluation and not typically the purpose of a Phase III clinical trial.

The original primary outcome was rate of hemostatic efficacy assessed at 24 hours from the start of the andexanet bolus. The change in anti-factor Xa activity was considered as a secondary efficacy endpoint. It was elevated to one of two coprimary outcomes and the hemostatic efficacy was changed from 24 hours to 12 hours. They state in the supplementary appendix that these changes were made based on regulatory feedback.



Another thing about their efficacy outcome was that they found no relationship between hemostatic efficacy and the reduction observed in anti-factor Xa activity in all patients. This seriously calls into question the clinical impact of andexanet. There was a weak association with the subgroup analysis of patients suffering from ICHs. This should be viewed as hypothesis generating.

3) Confounding Factors:

This was an observational study so we must always consider confounders that could be responsible for the results seen.The authors consider a handful of factors influencing their pharmacokinetic and clinical outcomes, but there is substantial variation within the cohort observed. They generally describe the influence on outcomes as relates to bleeding site and baseline anti-factor Xa levels, but otherwise do not include a detailed evaluation of other individual patient features predicting hemostatic efficacy.

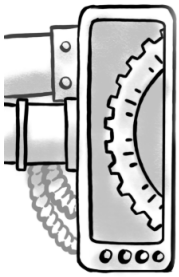
4) Harm:

When evaluating a new drug, we should always consider the harm. The safety outcomes were rather concerning, as well, including 34 thrombotic events within 30 days. Half of these were cases of arterial thrombosis, such as myocardial infarction. Then, there were 49 deaths within 30 days – 35 of cardiovascular causes. This mismatch between the total cardiovascular deaths and their reports of only 7 myocardial infarction and 5 pulmonary embolism may indicate harms related to andexanet not fully captured by their counting of thrombotic events.

5) No Comparison Group:

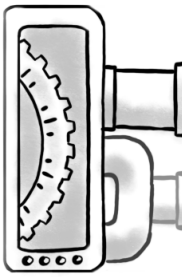
The lack of an active comparator is the biggest limitation of this study. How do we know if this is any better or worse than usual care? This study joins RE-VERSE AD as one of the least informative trials in recent memory. Like RE-VERSE AD, featuring idarucizumab, this is a single-arm assessment of efficacy without a comparator.

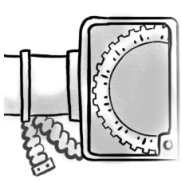
However, unlike RE-VERSE AD and dabigatran, there are viable management strategies for management of anti-Factor Xa-associated bleeding, there is clinical equipoise for a comparative trial, and the impermanent underlying pharmacology of andexanet suggests it ought to be substantially less effective. It might even be considered, rather than not having equipoise for a trial, it was unethical to perform this trial and expose participants to this experimental intervention without creating substantial generalizable knowledge.

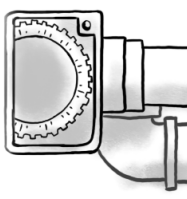


Comment on Authors' Conclusion Compared to SGEM Conclusion:

The authors' conclusion is factual and narrow, accurately reflecting the definitions in their protocol. Andexanet alfa clearly binds circulating anti-Factor Xa during administration, and – as expected – rapidly diminishes afterwards. According to their arbitrary criteria for classifying patients as having *"good"* or *"excellent"* hemostasis, patients met those criteria 82% of the time. The clinical relevance of their criteria, as well as the utility of andexanet alfa, remain unclear.







Case Resolution:

The patient is treated, according to local protocol, with fixed-dose prothrombin concentrate complexes and admitted to the intensive care unit for ongoing monitoring of his neurologic status. A repeat CT shows a small amount – <20% – increase in size of his subdural hematoma, representing " " hemostasis. His neurologic status remains unchanged. Within 24-hours, the patient is discharged from the intensive care unit to the medical floor to complete planning for discharge.

What Do I Tell the Team?

Unfortunately, the patient and family need to be informed of the presence of life-threatening intracranial bleeding and the limitations in our current management options. We will be providing care using the best evidence and recommendations available, which involves treatment with PCCs and vigilant supportive care in the intensive care unit.

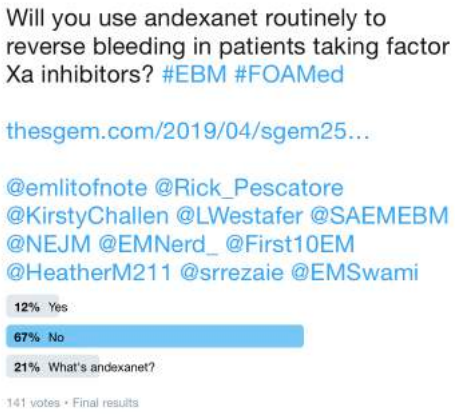
Clinical Application:

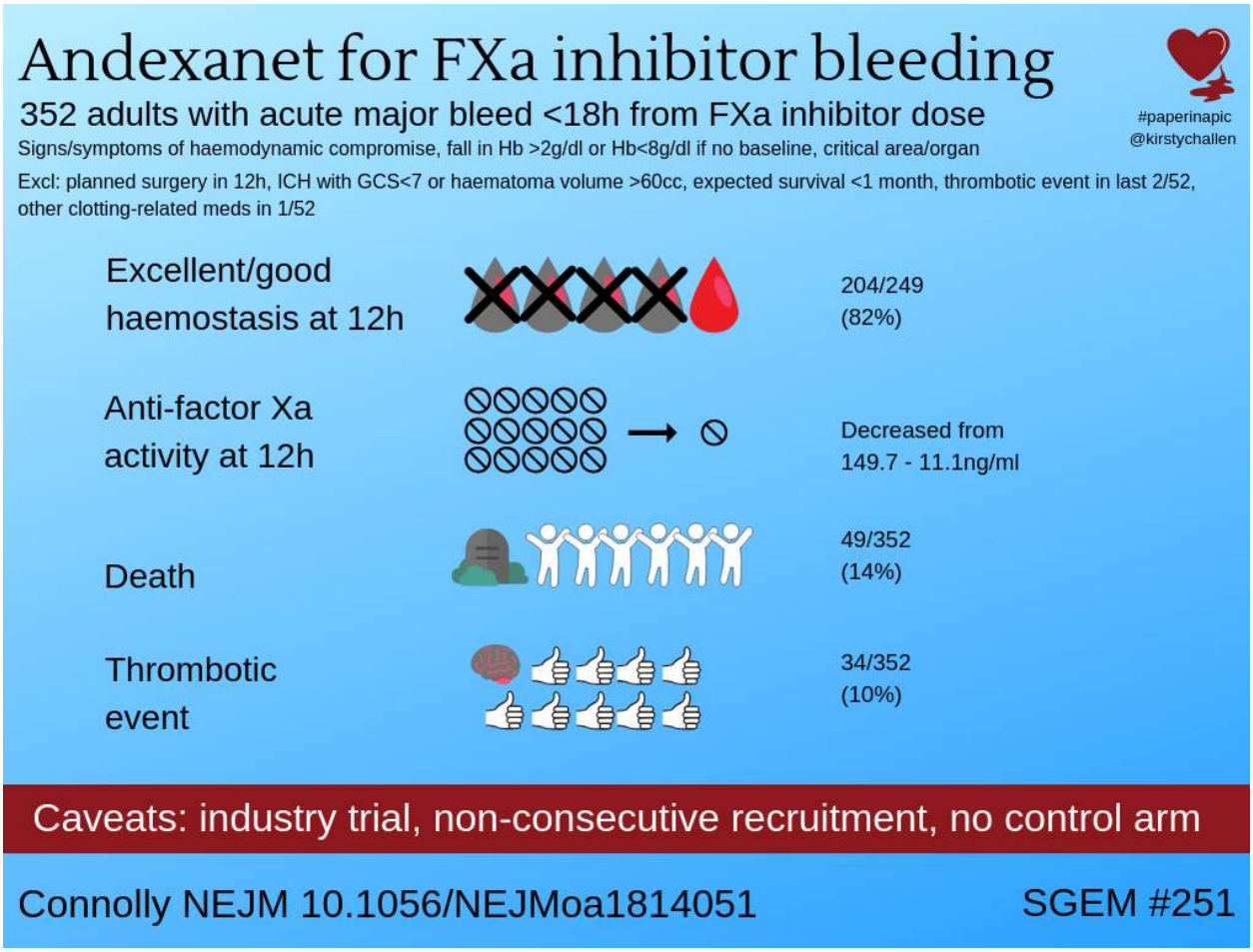
There is no obvious clinical application for andexanet alfa. At $25k to $50k per dose, it should first demonstrate superiority with regard to current management strategies of factor replacement using prothrombin concentrate complexes. There may be a subset of patients, specifically those with certain types of intracranial hemorrhage, whose hematoma growth is attenuated with andexanet alfa, but this cannot yet be determined from the evidence provided at present. The most important problem with clinically applying this study is the lack of a comparison group.

Episode End Notes

Other FOAMed:

- First10EM: Andexanet Alfa – More garbage science in the NEJM
- EM Lit of Note: Disutility, Thy Name is ANEXXA-4
- EMCrit: I Have Issues with Andexanet by K. Kipp, PharmD
- St. Emlyn's: Reversal of DOACs with Andexanet Alfa. St.Emlyn's
- REBEL EM: ANNEXA-4: Andexanet Alfa and Factor Xa Inhibitors





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Warning:

This SGEM episode discusses suicide. This is a warning to those listening to the podcast or reading the blog post. The SGEM is free and open access initiative trying to cut the knowledge translation down from over ten years to less than one year. It is intended for clinicians providing care to emergency patients, so they get the best care, based on the best evidence. If you are feeling upset by the content, then please stop listening or reading. There will be resources listed at the end of the blog for those looking for assistance.

Blue Monday: Screening Adult ES Patients for Risk of Future Suicidality

Clinical Question:

Can the CFI-S improve on clinician gestalt for screening of all adults to an emergency department for suicidal ideation?

Bottom Line:

Physician gestalt is probably still the most accurate and efficient manner of screening of psychiatric disease in the emergency department.

Guest:

Dr. Justin Morgenstern is an emergency physician and the Director of Simulation Education at Markham Stouffville Hospital in Ontario. He is the creator of the excellent #FOAMed project called First10EM.com

Case Overview

Case:

A 32-year-old woman presents to the emergency department after spraining her ankle playing basketball. Although she has no other health problems, and no other complaints, you are aware of data that indicates there is a high level of psychiatric illness and suicidal ideation among emergency department patients and wonder what is the best way to approach this problem?

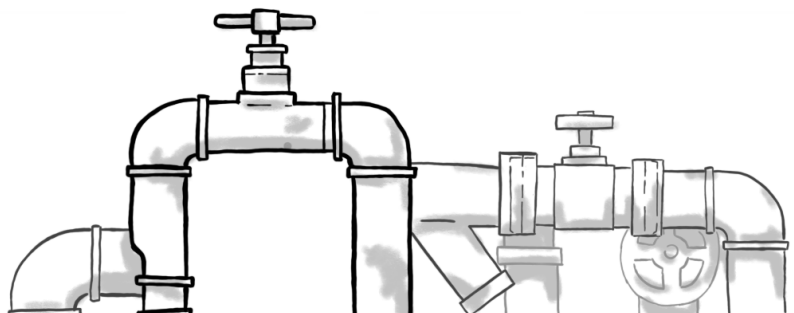
Background:

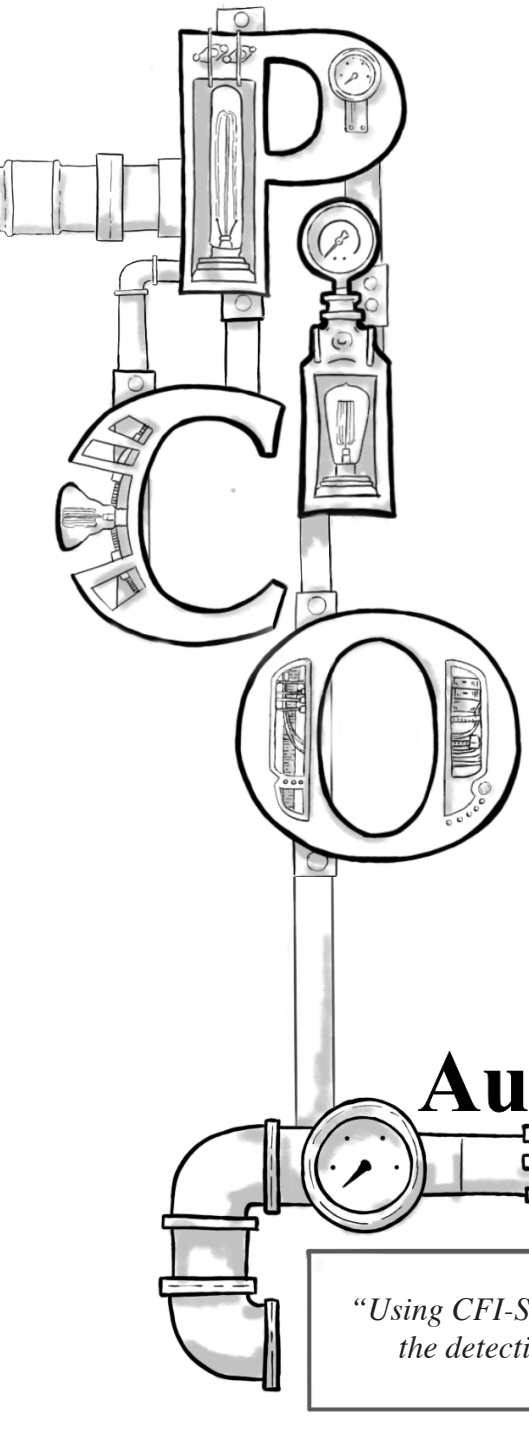
Suicidal ideation is common; it accounts for about 1% of emergency department visits, or about 1.4 million visits a year in the United States [1]. Although there are numerous validated screening tools, such as the PHQ9, the ED-Safe Patient Safety Screener, and the Suicide Behaviors Questionnaire–Revised (SBQ-R), none have been tested against physician gestalt, and none are widely used in clinical practice [2,3,4].

The Convergent Functional Information for Suicidality (CFI-S) is a validated screening tool for suicidal ideation, but it has not been tested in an emergency department (ED) setting [5,6]. The current trial aimed at assessing the accuracy of the CFI-S in the ED, while comparing it to a screening tool already in use and physician gestalt [7].

Reference:

Brucker et al. Assessing Risk of Future Suicidality in Emergency Department Patients. AEM April 2019





Population:
Adult patients presenting to the emergency department, without regard to the chief complaint.

- **Exclusions:** Severe trauma or illness requiring emergent intervention or acute intoxication.

Intervention:
The Convergent Functional Information for Suicidality (CFI-S) screening tool.

Comparison:
Physician gestalt.

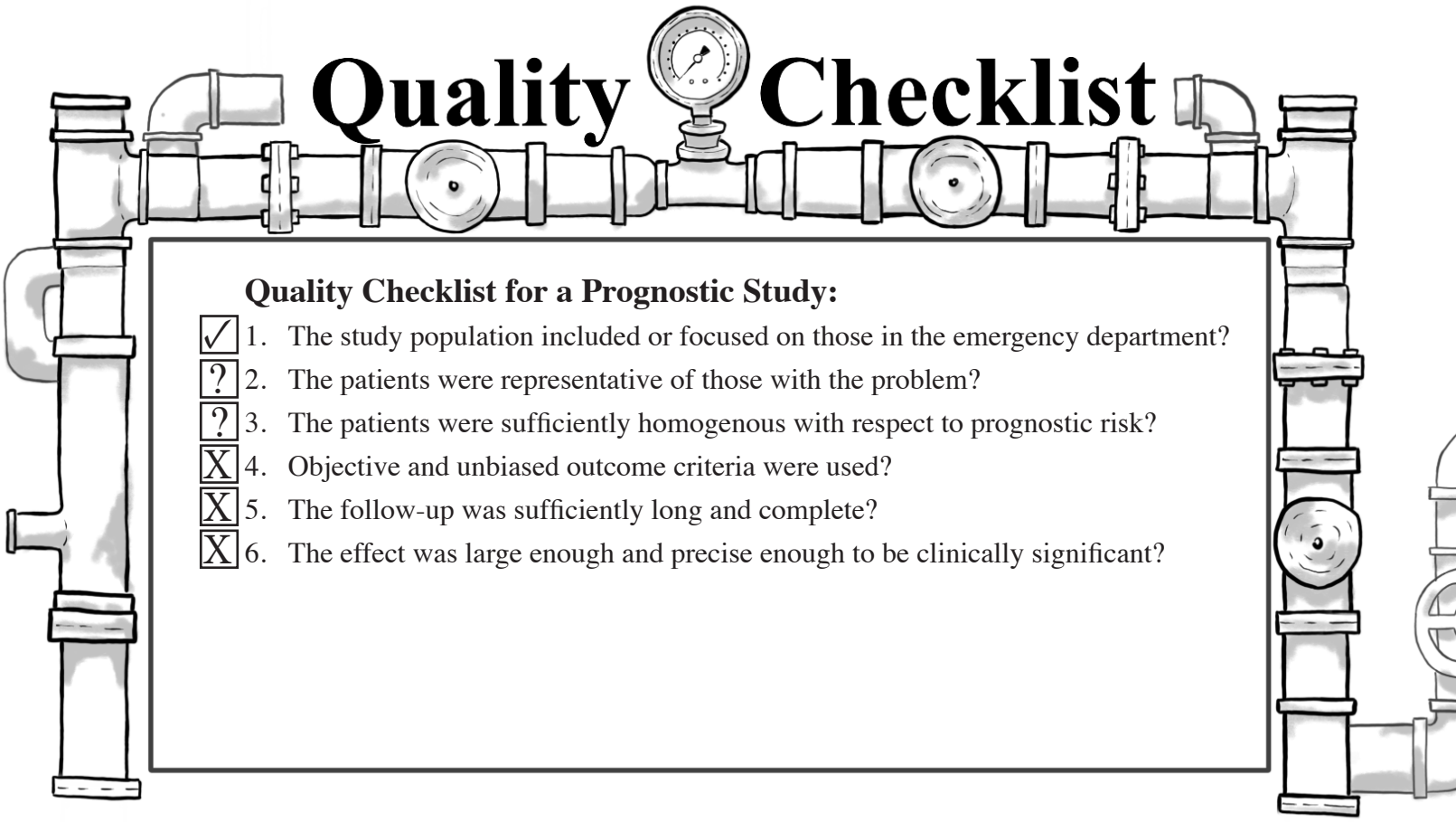
Outcomes:
Any suicidality spectrum event in the six months after the ED visit. This was defined as a repeat ED visit or admission for suicidal ideation, preparatory acts, suicide attempts, aborted or interrupted attempts, or completed suicide.

This is an SGEMHOP episode which means we have the lead author on the show. Dr. Krista Brucker is an emergency physician in South Bend, IN. With the help of a dedicated team of medical students and some very patient mentors, Dr. Brucker completed this work while she was an assistant professor of emergency medicine at Indiana University school of Medicine.

Authors' Conclusion

"Using CFI-S, or some of its items, in busy EDs may help improve the detection of patients at high risk for future suicidality."

Quality Checklist



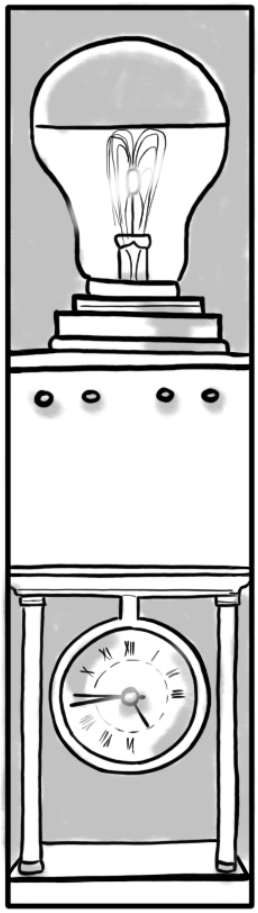
Quality Checklist for a Prognostic Study:

- [✓] 1. The study population included or focused on those in the emergency department?
- [?] 2. The patients were representative of those with the problem?
- [?] 3. The patients were sufficiently homogenous with respect to prognostic risk?
- [X] 4. Objective and unbiased outcome criteria were used?
- [X] 5. The follow-up was sufficiently long and complete?
- [X] 6. The effect was large enough and precise enough to be clinically significant?

Case Outcomes

Key Results:
A total of 367 patients were approach and 338 agreed to participate in the study. The mean age was around 40 years with about 50/50 male/female split. The majority of the patients were non-white. Physician gestalt data was only available on 190 of the patients.

9.5% Of screened patients had a suicidality spectrum event by 6-months.



Primary Outcomes:

- Initial suicide screening was positive in 45/338 (13.3%) of the patients
- Suicidality spectrum event 32/338 patients (9.5%) as mentioned
- Of these 32, 18 (56%) were not suicidal at first presentation
- Suicide attempts 10/338 (3%) but there were no completed suicides
- Psychiatric hospitalizations 16/338 (5%)
- Aborted/interrupted attempt 11/338 (3%)
- Preparatory acts 13/338 (4%)
- ED visit for suicidal thoughts 29/338 (9%)

Table 2
SSEs That Occurred in the 6 Months Following the Original ED Visit

	Number (%)
Total patients	32
Suicide attempt	10 (31.3)
Psychiatric hospitalization for suicidality	16 (50.0)
Aborted/interrupted attempt	11 (34.40)
Preparatory acts	13 (40.6)
ED visit for suicidal thoughts	29 (90.1)

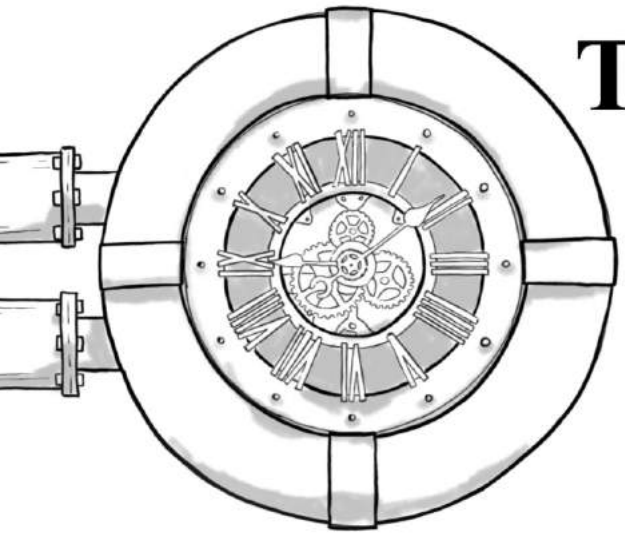
SSEs = suicide spectrum events.

The CFI-S took a median of three minutes to complete. It was done twice in 10 patients, with reasonable agreement (the scores were within 10% of each other in 8 out of 10 patients).

The health system's existing two question screening tool missed 18 of the 32 SSEs (56%). Both

physician gestalt and the CFI-S had moderate accuracy for SSEs.

If you look at the population of patient that had data for both tests, the area under the curve for the CFI-S was 0.77 and for physician gestalt 0.75, which are neither clinically nor statistically different.



Time to Talk Nerdy

Listen to the podcast on iTunes or Google Play to hear Krista's responses to our ten nerdy questions.

1) Consecutive or Convenience:

In the methods you refer to the patients being enrolled as "consecutive and non-selected". In the limitation section you say it was a convenience sample. Out of 95,000 visits over the year, only 338 patients were included in the trial. It wasn't clear to us how these 338 patients were selected, nor how their demographics compare to the other 95,000 who weren't included. Can you clarify this for us and is there a chance of selection bias?

2) Excluded Patients:

You excluded intoxicated patients. However, intoxicated patients make up a large percentage of the patients presenting to the ED with suicidal ideation. Why did you decide not to include intoxicated patients?

3) External Validity:

You focused on an urban ED, with a higher percentage of non-Caucasian and low-income patients, and a higher than average risk of suicidality. Do you see this being applied to a community hospital or rural setting with different patient populations?

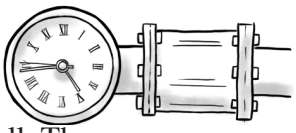
4) Screening:

You decided to try screening all adult ED patient, regardless of presenting complaint. We know test results are less accurate when applied to patients with very low pretest probabilities. Why did you decide to focus on all comers, rather than attempting to select patients at higher risk for psychiatric disease?

5) Composite Outcome:

You used a composite outcome for the primary outcome. It combines things that are really important, such as completed suicide, with less important outcomes, like representation to the ED. Why did you decide to set a bigger target for the primary outcome?

Some physicians like myself might consider patients coming back to the ED to seek help for their



suicidal thoughts a positive outcome not a negative outcome. They weren't missed at all. They knew where to turn for help and were comfortable enough with the care to return.

6) Length of Follow-up:

You decided to look at outcomes up to six months. That is a very long time. It is highly likely that patients' moods will change over a 6-month period, and patients who were not suicidal at the initial visit may become so at some point. Why did you choose such a long time frame?

7) Harms:

Your screening tool only took three minutes to complete, which is excellent when applying it to a single patient. However, if you wanted to apply this tool to all 95,000 presentations a year at your ED, it would take almost 5,000 hours to complete. That is the equivalent of almost 600 extra 8 hour physician shifts a year. Is this tool worth that cost, or the cost of other things we could be doing with that time in an already very busy environment?

8) Misses:

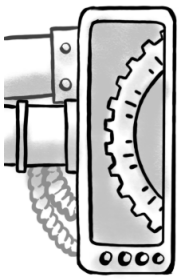
There were 18 patients missed by the existing two question screen used in the department. However, there is not any information provided about these misses. Were they dangerous misses, in which patients actually came to harm, so simply patients that represented to the emergency department with suicidal ideation?

9) Predefined vs. Post-hoc Cut-Offs:

You present cut-offs for the CFI-S of 0.65 and for clinician gestalt of 1.2. However, as far as I can tell, these were not predetermined, but rather based on this dataset. That would mean they could be overfit the current data and should be validated in an external population. Am I correct?

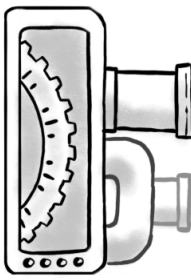
10) Clinical Gestalt:

Why did you only have clinical gestalt on 190 of the 338 patients who agreed to participate in the study?



Comment on Authors' Conclusion Compared to SGEM Conclusion:

The CFI-S MAY or MAY NOT help improve the detection of patients at high risk for future suicidality, but it doesn't seem to improve on physician gestalt.



Clinical Application:
Unless demonstrated to be better than clinical gestalt, it isn't clear how an extra screening tool for suicidal ideation can help all comers in the emergency department.

Case Resolution:
After a brief discussion, you have no concerns about psychiatric problems, and discharge the patient home without any formal testing.

What Do I Tell the Team?
You have sprained your ankle. We use a tool called the Ottawa ankle rule to decide if you need an x-ray. Based on this tool an x-ray is not needed and I can confidently say you have not broken your ankle. We will put a tensor bandage around your ankle, and you can take acetaminophen or ibuprofen for the pain. The nurse will give you are standard information sheet for managing a sprained ankle. Obviously if you have any other concerns about your health we are always happy to see you again in the emergency department.

Episode End Notes

Do you think we should be screening all adult ED patients for suicidality?
onlinelibrary.wiley.com/doi/full/10.11...
#sgemhop @SAEMonline
@CAEP_Docs @ACEPNow
@First10EM @KirstyChallen
@AliRaja_MD

Yes 16%
No 84%
121 votes · Final results

Suicide Resources:

Telephone or Text

- Prevention Hotline 1-800-273-8255 (SAFE)
- USA Text HOME to 741741
- Canada Text 686868

Website

- Suicide Prevention Life Line
- American Foundation for Suicide Preventio (AFSP)
- Suicide Prevention Resource Center
- AFSP for Professionals

References:

1. Owens PL, Fingar KR, Heslin KC, Mutter R, Booth CL. Emergency Department Visits Related to Suicidal Ideation, 2006–2013. Statistical Brief # 200. Rockville (MD): Agency for Healthcare Research and Quality, 2017.
2. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001;16:606–13.
3. Boudreaux ED, Jaques ML, Brady KM, Matson A, Allen MH. The patient safety screener: validation of a brief suicide risk screener for emergency department settings. Arch Suicide Res 2015;19:151–60.
4. Osman A, Bagge CL, Gutierrez PM, Konick LC, Kopper BA, Barrios FX. The Suicidal Behaviors Questionnaire-Revised (SBQ-R): validation with clinical and nonclinical samples. Assessment 2001;8:443–54.
5. Levey DF, Niculescu EM, Le-Niculescu H, et al. Towards understanding and predicting suicidality in women: biomarkers and clinical risk assessment. Mol Psychiatry 2016;21:768–85.
6. Niculescu AB, Le-Niculescu H, Levey DF, et al. Precision medicine for suicidality: from universality to subtypes and personalization. Mol Psychiatry 2017;22:1250–73.
7. Brucker K, Duggan C, Niezer J, et al. Assessing Risk of Future Suicidality in Emergency Department Patients Acad Emerg Med. 2018;

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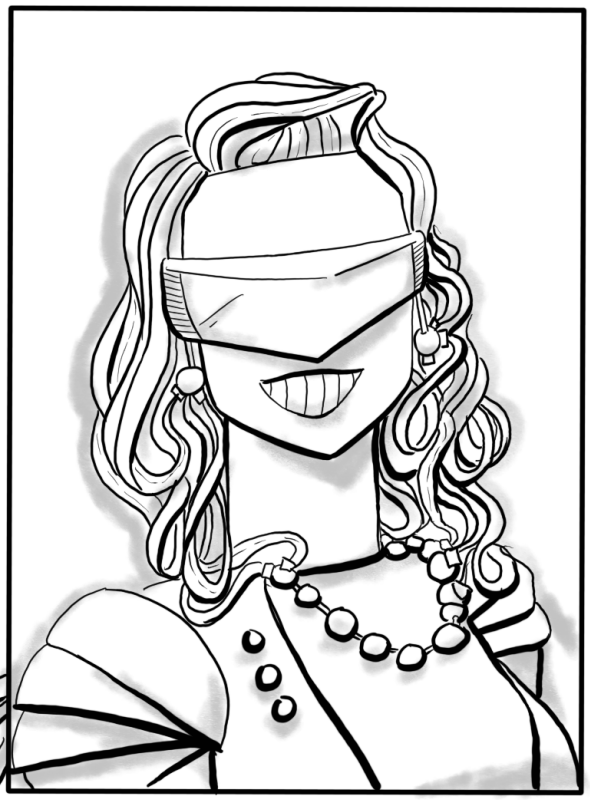


Everybody's Working on The Weekend

Clinical Question:

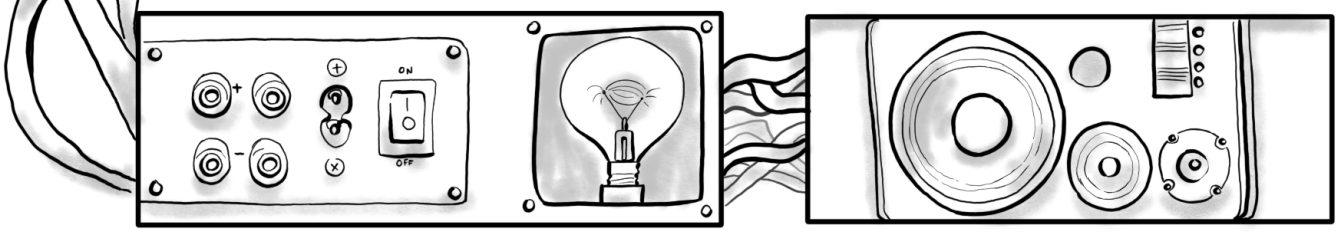
Does the *"weekend effect"* exist (increased mortality) in a UK trauma centre?

Bottom Line:

It is still unknown if the *"weekend effect"* exists in trauma centres and it also depends on how you define weekend.

Guest:

Alison Armstrong is a Certified Emergency Nurse, Trauma Program Coordinator and TNCC Course Director.



Case Overview

Introduction:

This was a special episode of the SGEM done live at the Talk Trauma 2019 Conference help in London, Ontario. Talk Trauma is a two-day conference for nurses, allied health and EMS professionals involved in providing care for the adult and paediatric trauma patient. Our philosophy for Talk Trauma is to have fun while learning so we put on a conference packed with useful tips for all trauma care providers but in a really fun way! It attracts participants from all over Ontario and even the US.

To get the crowd warmed up for our nerdy structured critical appraisal we reviewed a paper by Dr. Esther Choo et al. The article was called *"A lexicon for gender bias in academia and medicine: Mansplaining is the tip of the iceberg"*. It was published in the December 2018 edition of the BMJ.

Theme music is an important part of the SGEM. Alison picked the song *"It's A Man's World"* by James Brown for this paper on gender bias in academia and medicine.

Mansplaining is defined as explaining something in a condescending or patronizing way, typically to a woman.

Alison picked out five of her favourite terms from the BMJ publication and presented them to the audience. This included: misteria, himpediment, hystereotyping, mutehism, and bromoteher. As a rural physician, I added one more term to the medical lexicon called *"urbansplaining"*

You can down load a copy of the slides, watch the presentation on the SGEM Facebook page and get a PDF copy of Dr. Choo's article.

Background:

We have busted many myths on the SGEM over the years. This have included the following medical myths:

- **Myth:** Epinephrine saves lives with good neurologic outcome in OHCA (SGEM#64 and SGEM#238)
- **Myth:** All buckle and greenstick fractures should be casted (SGEM#19)
- **Myth:** A vitamin C cocktail can cure sepsis based on an observational study (SGEM#173)
- **Myth:** Ketorolac 30mg IV is better than 10mg or 15mg IV for pain control (SGEM#174)
- **Myth:** OHCA patients need an endotracheal airway (SGEM#247)

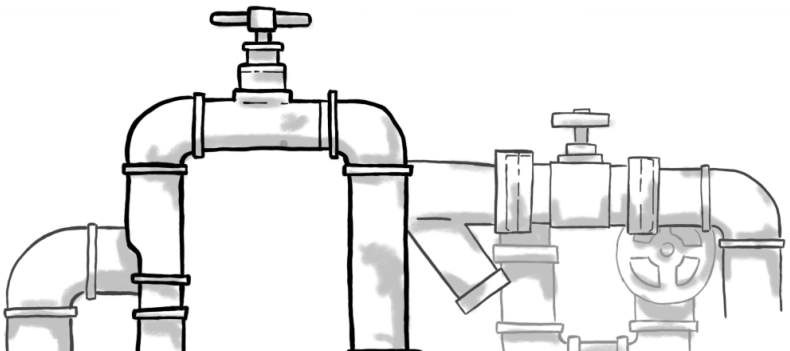
There are many other myths in medicine like that of the full moon effect (lunar effect). One large area of controversy is that of the *"weekend effect"*. This urban legend is that mortality rates go up when patients are admitted on the weekend vs. the weekdays.

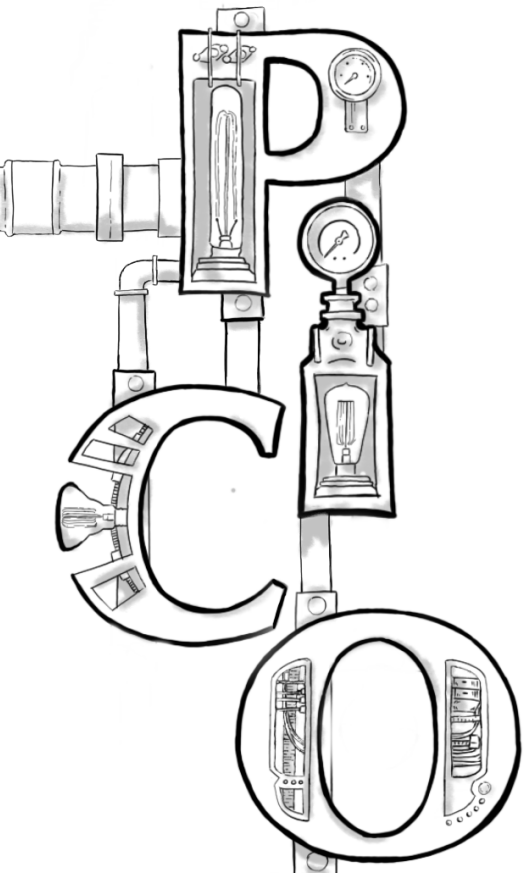
Case:

A 52-year-old man presents to the emergency department via EMS after a motor vehicle collision while driving home from the city. It is 2am Saturday morning and the night shift has been busy. You suspect he has been drinking. He has a Glasgow Coma Scale (GCS) score of 13 and an Injury Severity Score (ISS) of 19. There is small frontal head laceration. He is complaining of some right sided chest wall pain and shortness of breath. There is an obvious knee injury. While he is waiting to get imaging and laboratory tests done, he asks if he will be more likely to die because it's a weekend?

Reference:

Little et al. Major trauma: Does weekend attendance increase 30-day mortality? Injury 2019





Population:
Trauma patients presenting to the emergency department defined as Injury Severity Score greater than eight admitted between 2013 – 2015.

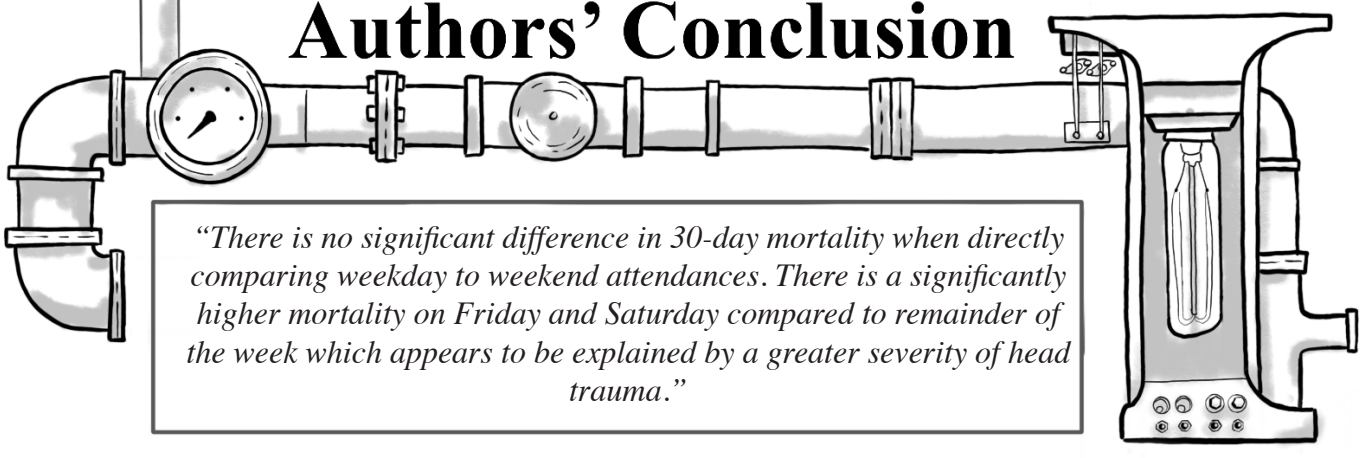
Intervention:
None

Comparison:
Weekday (Monday 00:00 to Friday 23:59) vs. weekend (Saturday 00:00 – Sunday 23:59).

Outcomes:

- **Primary:** Mortality by 30 days
- **Secondary:** Age, Glasgow Coma Scale (GCS), Injury Severity Score (ISS), mortality by days of the week, and mortality by 30 days on Friday 00:00 to Saturday 23:59 vs. Sunday 00:00 to Thursday 23:59.

Authors' Conclusion



"There is no significant difference in 30-day mortality when directly comparing weekday to weekend attendances. There is a significantly higher mortality on Friday and Saturday compared to remainder of the week which appears to be explained by a greater severity of head trauma."

Quality Checklist

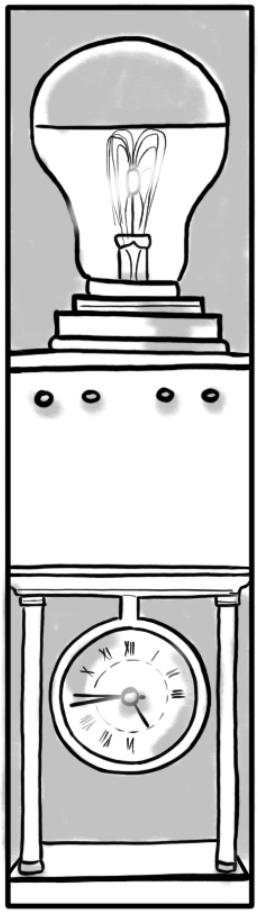
Quality Checklist for Observational Study:

- ☑ 1. Did the study address a clearly focused issue?
- ☑ 2. Did the authors use an appropriate method to answer their question?
- ☑ 3. Was the cohort recruited in an acceptable way?
- ☑ 4. Was the exposure accurately measured to minimize bias?
- ☑ 5. Was the outcome accurately measured to minimize bias?
- ? 6. Have the authors identified all-important confounding factors?
- ☑ 7. Was the follow up of subjects complete enough?
- ☑ 8. How precise are the results? The 95% confidence intervals were fairly tight around the estimate of risk. They might be improved slightly by increasing the sample size, but they might also widen if validation is done in varying geographic areas and healthcare systems.
- ☑ 9. Do you believe the results?
- ? 10. Can the results be applied to the local population?
- ? 11. Do the results of this study fit with other available evidence?

Case Outcomes

Key Results:
They identified 1,424 patients in their Trauma Audit and Research Network (TARN) database. The mean age was 52 years, two-thirds were male patients and the mean Injury Severity Score was 19. One-third of patients were admitted on the weekend and two-thirds were admitted on the weekdays.

No difference in 30-day mortality between weekend (7.8%) And weekdays 7.7%).

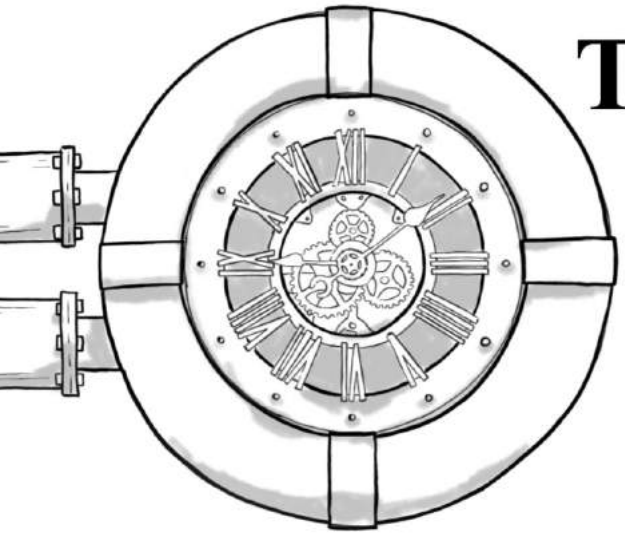


Primary Outcome: 30-day mortality

- Odds Ratio of mortality in the weekend group compared to the weekday group was 1.01 (95% CI 0.67–1.54)
- Relative Risk of death in the weekday group compared to the weekend group was 0.987 (95% CI 0.671–1.451)

Secondary Outcomes:

- **Age:** There was no significant difference in age between the two groups. However, the mean age of patients who died within 30 days was significantly greater than those who survived (70.8 vs 50.9 years, $p < 0.0001$)
- **Glasgow Coma Scale (GCS) Score:** No significant difference when comparing different days of the week. However, patients who attend on a Friday or Saturday have a tendency to have more significant head injuries, as indicated by a lower average GCS, and were more likely to die from these.
- **Injury Severity Score (ISS):** No significant difference in the ISS when comparing different days of the week.
- **30-day Mortality by Day of the Week:** It was highest in patients attending on Fridays (10.8%) and lowest in those attending on Sundays (5.5%).
- **30-days Mortality Friday or Saturday:** The relative risk was 1.584 (95% CI 1.102–2.278)



Time to Talk Nerdy

1) GCS and ISS:

There is some subjectivity to both the GSC and the ISS. This can lead to a lack of inter-rater reliability of the GCS (Reith et al 2016) and the ISS (Ringdal et al 2013). The subjectivity and lack of inter-rather reliability of these scores could impact their accuracy. It is unclear if this would influence the direction or precision of the results.

2) Age:

They did not specifically state these were adult patients. Including pediatric patients could change the results and the interpretation.

They did include geriatric patients, if you define that as 65 years and older. Older adults with blunt trauma and normal vital signs tend to be under triaged but have higher mortality despite the same ISS (Heffernan et al. J Trauma 2010). This is thought to be due to higher incidence of head injuries.

Older patients could skew the results. Especially since the inclusion criteria was ISS>8. These authors observed an association between increase in age and increase in mortality. It would have been interesting to see what the dataset looked like for those with an ISS of 8 or less. Also, do a specific test for mortality in all those over the age of 65 that the trauma team was activated.

3) Staffing:

The same staffing levels, imaging resources and the ability to perform intervention did not vary according to the day of the week at this trauma centre. It is unclear if these results could be applied to other systems where staffing level is different on the weekend compared to weekdays.

4) External Validity:

This was a single trauma centre in the UK. It is unsure if these results would be replicated in different trauma centres, in different countries with different healthcare systems.

5) Define Weekend:

They defined weekend as Saturday and Sunday and did not find a *"weekend effect"*. However, when they defined a weekend as Friday and Saturday they did find a difference compared to Sunday through Thursday. This seemed to be more related to lower GCS and increased head injuries on Friday and Saturdays and not related to staffing.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the authors' conclusions.

Clinical Application:

It is unclear how we can apply this information clinically. It would be a great research project to find out if there is a "weekend effect" in Ontario's trauma centers.

What Do I Tell the Team?

We have a great trauma team and we will take great care of you. There is no evidence that more trauma patients are more likely to die in a health care system like ours on the weekend compared to the weekdays.

Case Resolution:

The trauma team at LHSC is activated, they assess and identify all his injuries and he is admitted to hospital. He is found to have a tibial plateau fracture, a couple non-displaced rib fractures, a hemopneumothorax and a head laceration. After a four day stay, he is transferred from the trauma centre to his home community hospital outside the city for on-going rehabilitation of his knee.

Episode End Notes

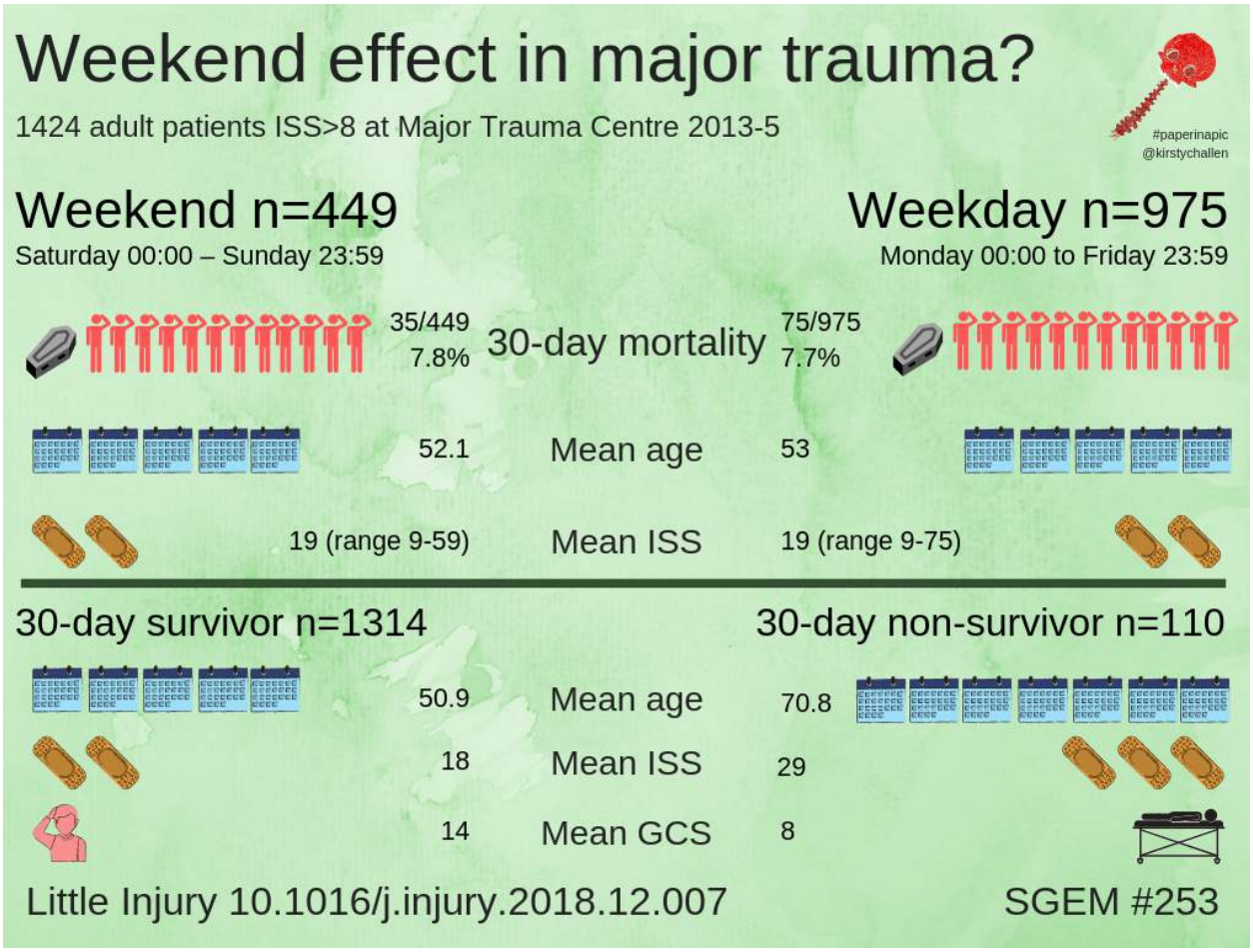
Do you think the "weekend effect" (increased mortality on weekends) exists in your trauma centre? #FOAMed #EBM
thesgem.com/2019/04/sgem25...
@alisontraumaRN @rob_leeper @CAEP_Docs @ACEPNow @acemonline @SchulichMedDent @WUSTL_EM @Qemerg @emergmedottawa @MacEmerg @umanamd @KirstyChallen

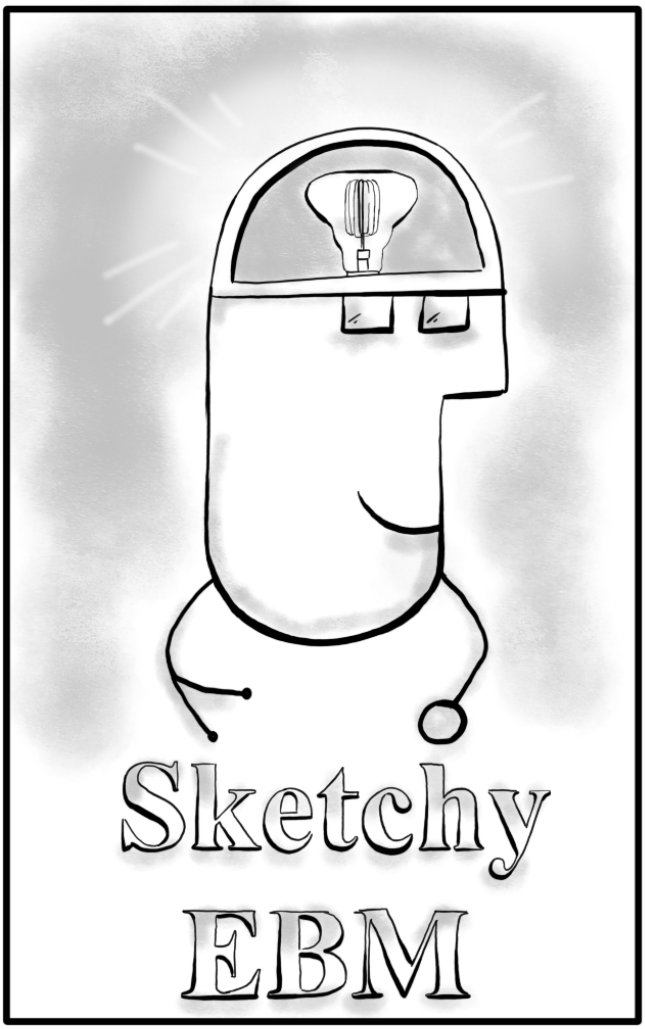
59% Yes

28% No

13% Unsure

58 votes • Final results





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Probiotics For Pediatric Gastroenteritis: I Can't Go For That…No Can Do

Clinical Question:

Does prescribing probiotics to children with gastroenteritis, specifically giving l. Rhamnosus, improve the course of the illness?

Bottom Line:

Prescribing l. Rhamnosus to children with acute gastroenteritis cannot be recommended at this time.

Guest:

Dr. Anthony G. Crocco is a Pediatric Emergency Physician and is the Medical Director & Division Head of the Division of Pediatric Emergency at McMaster's Children's Hospital. He is an Associate Professor at McMaster University. Anthony is known for his online RANThonys and website SketchyEBM.

Case Overview

Case:

A two-year-old girl presents with two days of non-bloody watery stools and one episode of vomiting. She is otherwise well appearing and has normal vitals and examines normally. After you explain the diagnosis of gastroenteritis to the parents, and the importance of hand washing at home, they ask you whether they should give probiotics to help shorten the course of her illness.

Background:

We have covered many pediatric topics with you on the SGEM. One of them included a RANThony on getting x-rays for constipation. This time we are talking about stuff coming out too much rather than not enough.

Viral gastroenteritis is rivalled by bronchiolitis for one of the most common Pediatric presentations to the emergency department. The discomfort this illness imbues, the time away from daycare required, and the time away from parental work necessitated can be quite disruptive. Even small changes to the course of this illness, due to its prevalence, could have huge comfort and economic benefit.

We looked at a trial by Freedman et al using half-strength apple juice or fluids of choice to treat mild gastroenteritis in children who were minimally dehydrated (SGEM#158). The bottom line from that episode was that this strategy was a better choice compared to electrolyte solutions.

We have also reviewed a couple of papers that looked at using ondansetron in pediatric gastroenteritis (SGEM#12 and SGEM#122).

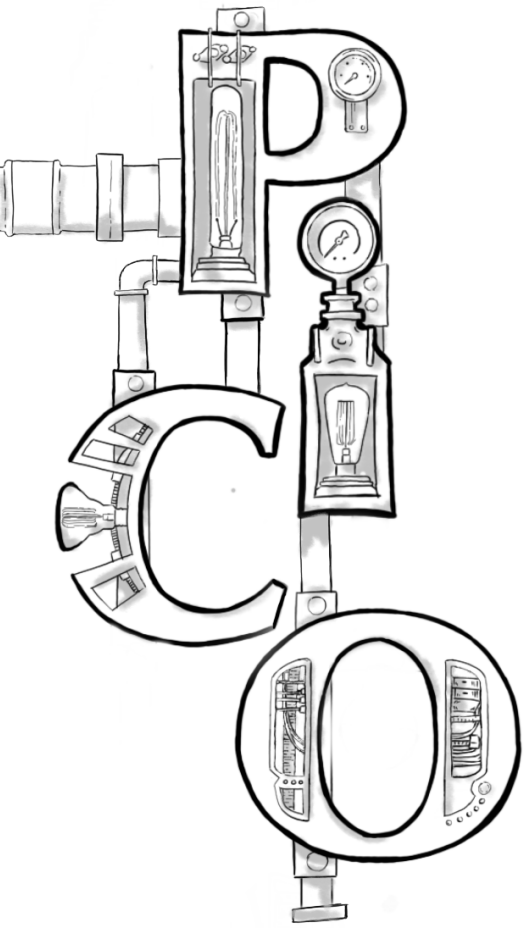
There are some guidelines on managing gastroenteritis:

- TREKK– Gastroenteritis
- AAP– Managing Acute Gastroenteritis Among Children
- NICE– Diarrhoea and vomiting caused by gastroenteritis in under 5s: diagnosis and management
- AAFP– Gastroenteritis in Children
- Sick Kids– Acute Gastroenteritis

In this episode we are going to be looking at using probiotics to treat pediatric gastroenteritis. The theory of using probiotics to replenish the normal gut flora to minimize disease is neither new nor unstudied. Previous work in this area has been described as being *"underpowered or had methodology problems related to the trial design and choice of appropriate end points."*

Reference:

Schnadower et al. Lactobacillus rhamnosus GG versus placebo for acute gastroenteritis in children. NEJM 2018



Population:
Children three months to four years of age presenting to the emergency department with a diagnosis of acute gastroenteritis. This was defined as *"three or more episodes of watery stools per day, with or without vomiting, for fewer than 7 days."*

- **Exclusions:** There were 18 exclusion criteria and these can be found at ClinicalTrials NCT 01773967.

Intervention:
L. rhamnosus GG twice a day for five days

Comparison:
Placebo twice a day for five days

Outcomes:

- **Primary:** Moderate-to-severe gastroenteritis. This was defined as an illness episode with a modified Vesikari scale greater than 8 during the 14-day follow-up period. The modified Vesikari Scale helps establish severity of gastro symptoms using a 7-item scale that ranges from 0-20 overall points. Although I have never used this scale clinically, its utility is in being able to quantify symptom improvement in research.

Table 1. Modified Vesikari Scale.*

Scale component	Score on the Vesikari Scale			
	0 Points	1 Point	2 Points	3 Points
Duration of diarrhea (hr)	0	1–96	97–120	≥121
Maximum no. of watery stools per 24 hr	0	1–3	4–5	≥6
Duration of vomiting (hr)	0	1–24	25–48	≥49
Maximum no. of vomiting episodes per 24 hr	0	1	2–4	≥5
Maximum recorded rectal temperature (°C)†	<37.0	37.1–38.4	38.5–38.9	≥39.0
Unscheduled health care visit	None	NA	Primary care	Emergency department
Treatment	None	Rehydration with intravenous fluids	Hospitalization	NA

* In the modified Vesikari scale score, one variable (percent dehydration) in the original score was replaced with the variable of unscheduled health care visits to better measure the effect of acute gastroenteritis in outpatients, given that the ability to perform frequent in-person assessments in an outpatient cohort of children can be challenging. Scores range from 0 to 20, with higher scores indicating more severe disease. Children with a score of 9 or more were considered to have moderate-to-severe gastroenteritis.[25,26] NA denotes not applicable.
† Temperatures were adjusted for the location of measurement: 1.1°C was added to axillary temperatures and 0.6°C was added to oral temperatures.[27]

- **Secondary:**
  - Frequency and duration of diarrhea and vomiting, the incidence of unscheduled health care visits for symptoms of gastroenteritis within two weeks after the index visit, the number of days of day care missed by participants, the number of hours of work missed by caregivers, and the rate of household transmission.
  - Safety outcomes included extra intestinal infection by *L. rhamnosus* GG (e.g., bacteremia), side effects and adverse events

Authors' Conclusion

"Among preschool children with acute gastroenteritis, those who received a 5-day course of L. rhamnosus GG did not have better outcomes than those who received placebo."

Quality Checklist

Quality Checklist for Randomized Clinical Trials:

- ✓ 1. The study population included or focused on those in the emergency department.
- ✓ 2. The teams were adequately randomized.
- ✓ 3. The randomization process was concealed.
- ? 4. The teams were analyzed in the groups to which they were randomized. Yes&No
- ✓ 5. The study teams were recruited consecutively (i.e. no selection bias).
- X 6. The teams in both groups were similar with respect to prognostic factors.
- ✓ 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- ✓ 8. All groups were treated equally except for the intervention.
- ✓ 9. Follow-up was complete (i.e. at least 80% for both groups).
- ✓ 10. All (team) patient-important outcomes were considered.
- X 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

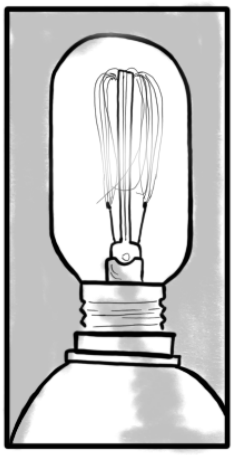
Key Results:
They included 971 children in this trial with a median age of 1.4 years. The median number of diarrhea stools in 24 hours was six and the median number of vomiting episodes in 24 hours was three. Intravenous fluids were given to 13% of children and 5% were admitted to hospital.

No identified significant difference between the probiotic group and the placebo group.

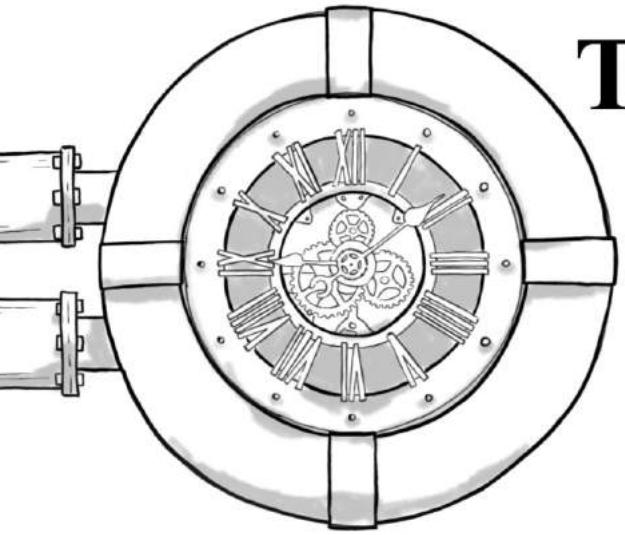
Primary Outcome:
Modified Vesikari scale score RR 0.96 (95% CI 0.68 to 1.35; P=0.83)

Table 3. Trial Outcomes, According to Assigned Trial Group.*

Outcome	*L. rhamnosus* GG (N=468)	Placebo (N=475)	Relative Risk (95% CI)	P Value†
Primary outcome‡				
Modified Vesikari scale score of 0 to 8 — no. (%)	413 (88.2)	415 (87.4)		
Modified Vesikari scale score ≥9 — no. (%)	55 (11.8)	60 (12.6)	0.96 (0.68–1.35)	0.83



Secondary Outcomes:
No significant differences were noted in the secondary outcomes when the data was adjusted for multiple comparisons.



Time to Talk Nerdy

1) It's OK to Be Negative:

Although this is a negative study, in that they could not show a significant improvement with the use of probiotics, it should be seen as useful. Studies like these help us understand when we should consider the value of therapeutic choices we're making.

2) Not All Probiotics are the Same:

Much like antibiotics, we have to be careful not to lump all probiotics together. We wouldn't do a study on cephalosporins for enterococcus infections (which are resistant) and conclude that no antibiotics work for enterococcus. This means we cannot conclude that probiotics do not work but rather that the probiotics used in this study have not been demonstrated to have a net benefit. However, the burden of proof is on the probiotic advocates to prove their claim of efficacy. Until that burden of proof has been met, probiotics for the treatment of pediatric gastroenteritis cannot be recommended.

3) Freedman et al 2018:

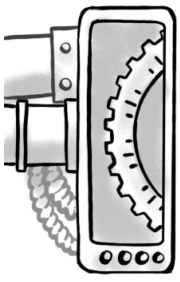
There is a companion study in this same NEJM edition with a similar design, population and outcomes who reached the same conclusions. They did use a combination treatment of L. rhamnosus and L. helveticus. Once again, I am reminded of the quality and relevance of Freedman's work – X-rays for constipation? Freedman. Ondansetron use for gastro? Freedman. Juice for gastro? Freedman. See a research paper by Stephen Freedman? My advice: Read it.

4) NEJM:

I have said before on the SGEM that the NEJM is not my favorite journal. It is good to see them publish a negative study that does not promote a commercial interest and they deserve credit.

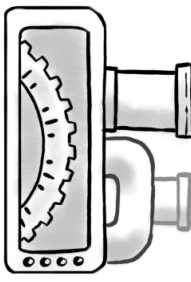
5) Unbalanced at Baseline:

One minor concern with more visible minorities in the treatment arm could have created bias in that group.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' conclusions. It appears that given the results of this trial, and its companion trial by Freedman et al, we should not be prescribing L. rhamnosus to children with acute gastroenteritis. Further work is required to clarify if there is a role for other probiotics in this patient population.



Clinical Application:

In children with acute gastroenteritis we should not prescribe L rhamnosus. Of interest, a Cochrane SR by Goldenberg et al in 2015 looking at probiotics for antibiotic associated diarrhea found that *"moderate quality evidence suggests a protective effect of probiotics in preventing antibiotic associated diarrhea" but that "probiotic use should be avoided in children at risk for side effects."*

What Do I Tell the Patient?

Do not use L. rhamnosus or any other probiotic for your child with acute gastroenteritis. However, if you child is put on antibiotics in the future you may want to consider probiotics at that time.

Case Resolution:

Welcoming the parents' enlightened question, you answer that we have not been able to find any improvement in children like theirs if given L. rhamnosus. We are unsure whether we can recommend other forms of probiotics, but we are currently skeptical. We used to suggest the BRAT (Bananas, rice, applesauce and toast) diet but this has gone out of favor. Although easily digested, the BRAT diet has very low nutritional value and is no longer recommended. My approach is to ensure adequate fluid intake, whatever the child will tolerate – not necessarily an electrolyte solution, then advance to an age-appropriate diet as tolerated.

Episode End Notes

Other FOAMed:

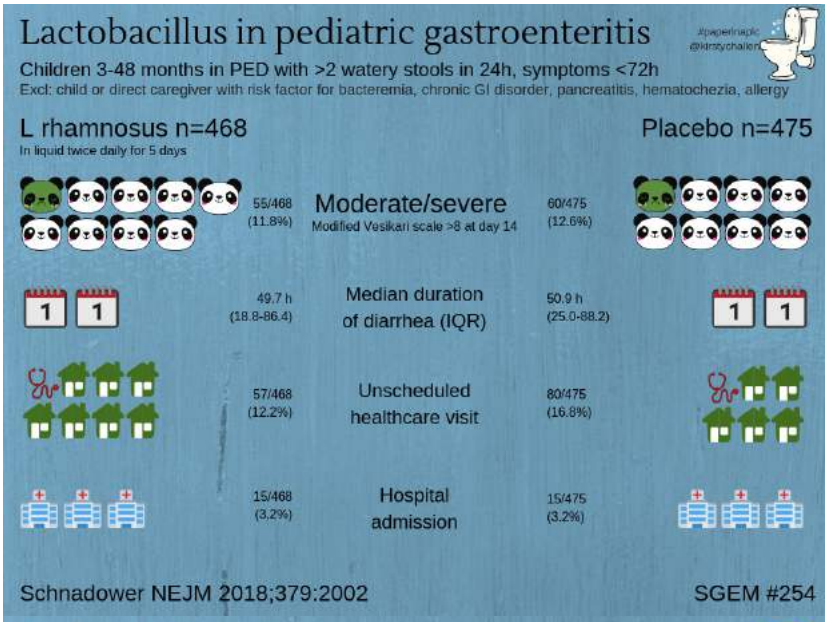
- PEM Blog: Should we prescribe probiotics for gastroenteritis?

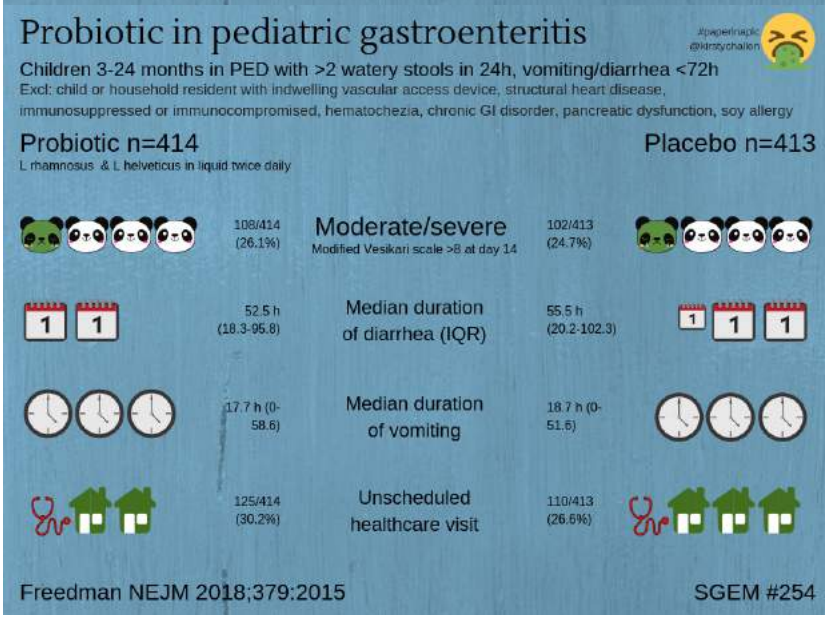
Do you usually recommend probiotics for pediatric acute gastroenteritis?
thesgem.com/2019/04/sgem25...
@AmerAcadPeds @AAPNews
@SketchyEBM @TREKKca @NEJM

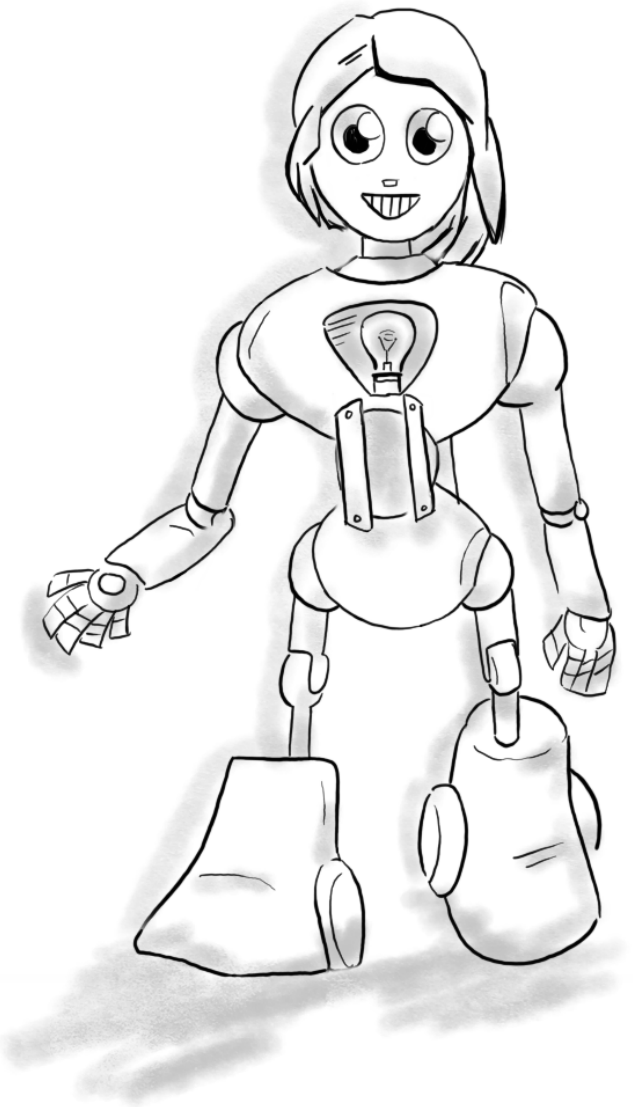
11% Yes

89% No

94 votes • Final results







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It Don't Matter Now:
Fluid Type and Infusion Rate in Paediatric DKA

Clinical Question:
Does rate or sodium chloride content of intravenous fluids contribute to brain injuries in children with DKA?

Bottom Line:
Don't worry about causing cerebral edema by giving a child with DKA intravenous fluids (0.45% NaCl or 0.9% NaCl) too fast or too slow as it does not appear to make a clinically important difference.

Guest:
Dr. Nikki Abela is a final year trainee in Emergency Medicine and Paediatric Emergency Medicine in Liverpool, UK from sunny Malta. She is a blog editor for RCEM Learning. She is a mum of one who wants to run.

Case Overview

Case:

6-year-old Caroline is brought to the emergency department by her parents. She is known to have diabetes and has had diarrhea and vomiting for the last 24 hours. In spite of using her sick day regime of insulin, she still has *"high"* blood glucose readings and can not tolerate oral fluids. On her blood gas her pH is 7.1 and her glucose is 35 mmol/l (630mg/dl). You confirm her bedside ketones to be 6 and have secured a cannula (intravenous) ready to reverse her dehydration – but what fluids should you use and at what rate?

Background:

The study we are going to talk about today comes from PECARN (Pediatric Emergency Care Applied Research Network). They are a fantastic group that conducts high-quality, clinically relevant research in the management and prevention of acute injuries and illnesses in children. We've mentioned PECARN before when discussing pediatric traumatic brain injury (TBI) on SGEM#112.

There is a similar group in the UK and Ireland. It is called PERUKI (Paediatric Emergency Research in UK and Ireland).

Canada has something similar to PECARN called Pediatric Emergency Research Canada (PERC). They are *"dedicated to improving care in pediatric emergency medicine through multi-centre research"*.

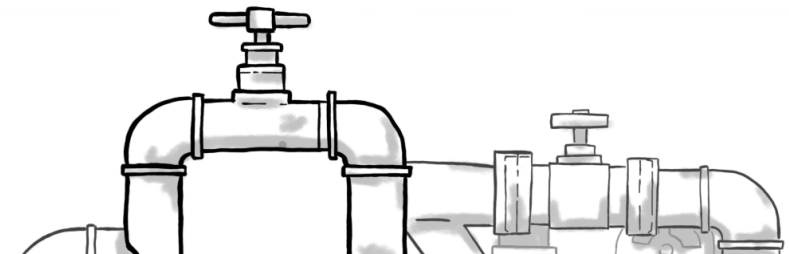
Each country has their own pediatric research groups. These different groups often come up with a different clinical decision instruments, for example, to decide when to get neuroimaging in pediatric head trauma. There is the PECARN from the USA, CATCH Tool from Canada and the CHALLICE Tool from the UK. A study by Easter et al (Ann Emerg Med 2014) concluded that PECARN seemed to be the best of the three tools.

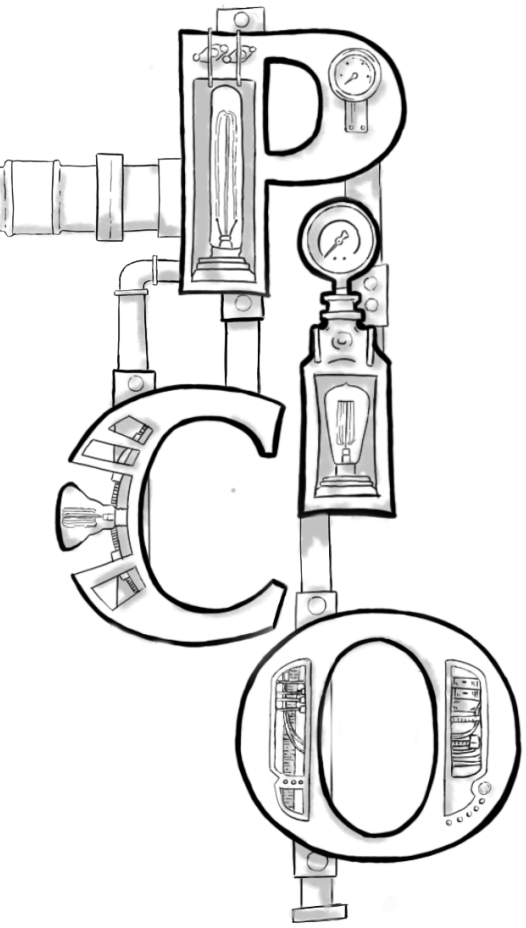
But we are not talking about TBIs today we are talking about diabetic ketoacidosis (DKA). Almost 1% of children presenting with an episode of DKA exhibit clinically apparent brain injuries. These injuries are associated with morbidity and mortality (1-3).

It has been historically thought that the cerebral edema from rapid rehydration with IV fluids could be causing these injury (4-5). As such, protocols recommend slow administration of IV fluids in children with DKA.

Reference:

Kuppermann et al. Clinical Trial of Fluid Infusion Rates for Pediatric Diabetic Ketoacidosis. NEJM June 2018





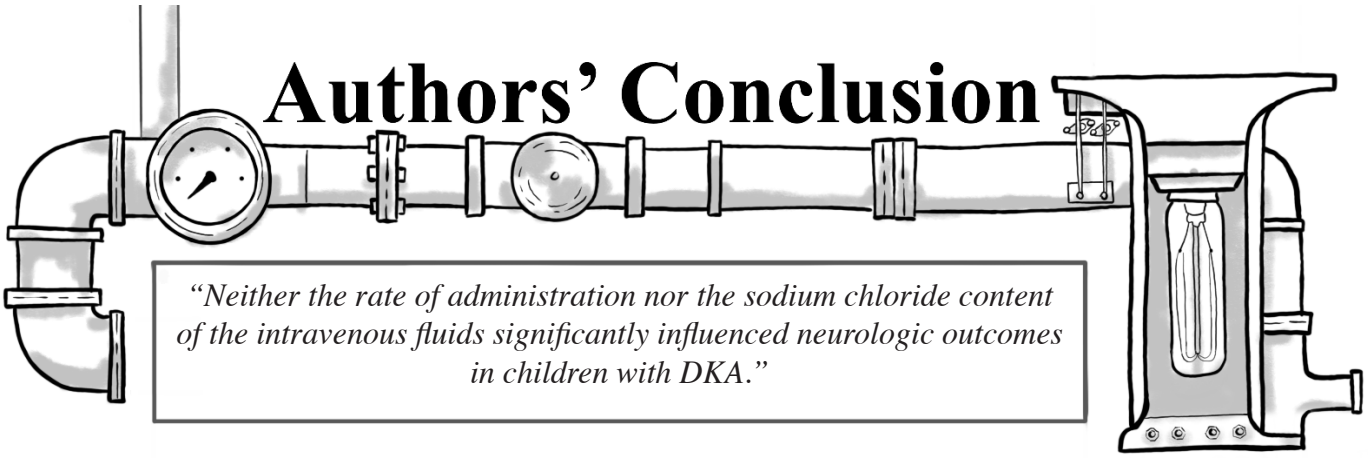
Population:
Population: Children 0-18 years of age with a diagnosis of DKA (blood glucose > 16.7 mmol/l or > 300 mg/dl, and either pH < 7.25 or a serum bicarbonate level of < 15 mmol/l)

- **Key Exclusions:** *"Underlying disorders that could affect mental status testing or neurocognitive evaluation; concurrent alcohol or narcotics use, head trauma or other conditions that could affect neurologic function; diabetic ketoacidosis for which the patient had already received substantial treatment; known pregnancy; or factors for which treating physicians determined that a specific fluid and electrolyte therapy was necessary. Children who presented with a Glasgow Coma Scale score of 11 or lower (on a scale ranging from 3 to 15, with lower scores indicating worse mental status) were excluded after year 2 because many participating clinicians believed that fluid regimens for such children should not be deter- mined on the basis of randomization."*

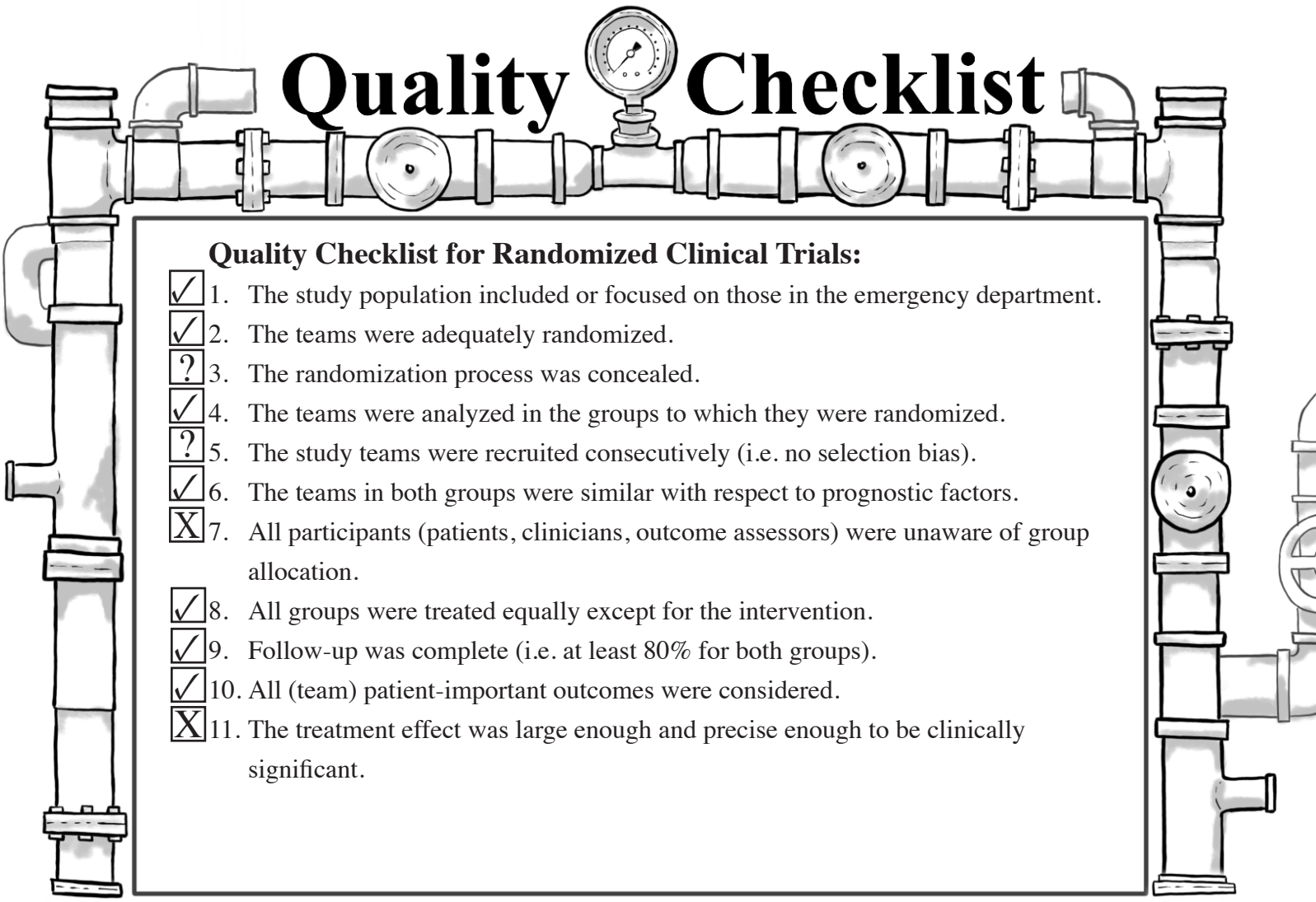
Intervention:
Fast rehydration (20ml/kg bolus) with either 0.45% or 0.9% NaCl (assumed 10% deficit with half being replaced in first 12 hours with the rest in the next 24hrs plus maintenance fluid). Insulin 0.1u/kg/hr IV

Comparison:
Slow rehydration (10ml/kg bolus) with 0.45% or 0.9% NaCl (assumed 5% deficit replaced evenly over 48hrs plus maintenance fluid). Insulin 0.1u/kg/hr IV

Outcomes:
- **Primary:** Decline in neurologic status. This was defined by two consecutive Glasgow Coma Scale (GCS) of < 14 during an hour within the first 24hrs of treatment.
- **Secondary:** Clinically apparent brain injury (defined as a deterioration in neurologic status leading to initiation of hyperosmolar therapy or endotracheal intubation or death), short-term memory during treatment (measure by forward and backward digit-span recall); and short-term memory, contextual memory and IQ test two to six months after their treatment for DKA.



Quality Checklist



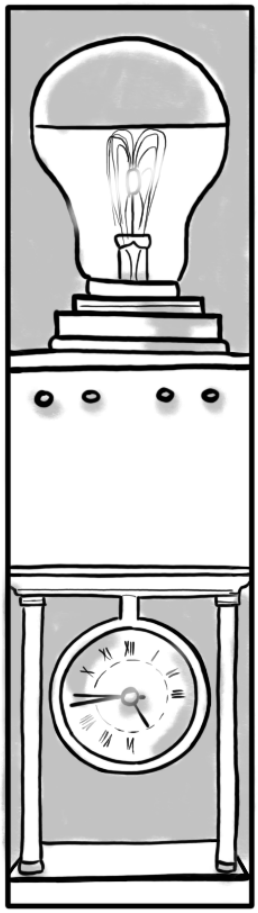
Quality Checklist for Randomized Clinical Trials:

- [✓] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [?] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [?] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [✓] 6. The teams in both groups were similar with respect to prognostic factors.
- [X] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
- [X] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
They recruited a total of 1,389 DKA episodes in 1,255 patients. The mean age was about 12 years old with slightly less males than females in the study. Just over half of the patients presenting with DKA had a previous diagnosis of diabetes. More than 90% had a GSC score of 15 at randomization.

There was no difference demonstrated in the primary outcome based on how fast or what type of intravenous solution was used.



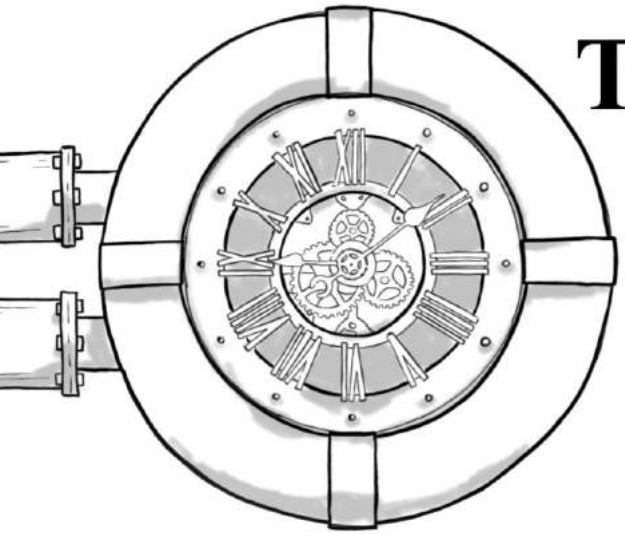
Primary Outcomes:

Decline in neurologic status

- 98% of children had a GCS 14-15 and were included in their analyses
- Only 3.5% had a decline to a GCS of less than 14
- Fast vs. Slow: Relative risk reduction of decline in GCS of 0.76 (95% CI 0.44-1.33) p=0.34
- 45% NaCl vs. 0.9% NaCl: Relative risk reduction of decline in GCS of 0.8 (95% CI 0.46-1.40) p= 0.43

Secondary Outcomes:

- No difference in any of the secondary outcomes
- **Brain Injury (fast vs. slow):** Relative risk reduction of 0.49 (95% CI 0.15-1.64) p=0.24
- **Brain Injury (0.45% vs 0.9%):** Relative risk reduction of 1.43 (95% CI 0.46-4.40) p=0.53
- Most interestingly, the closest p value to significance was in favour of fast administration for the digit span recall test with p=0.06



Time to Talk Nerdy

1) Hats Off:

This is such a massive study, over approximately five years in 13 hospitals. It represents a huge feat and must have come across many challenges especially because it went against dogma. Hats off to the authors and PECARN.

2) External Validity:

The population included in this study is somewhat different to those in the UK (and fluid management ideas can not be translated across populations – if there was something we learned from the FEAST trial – this was it). In the UK we use BSPED guidance which uses different criteria to define DKA – our cut off pH is 7.3 and bicarb 18 (higher than those used in the study) – so the trial patients were potentially sicker.

3) Exclusion Criteria:

We just listed the key exclusions but there were many in total. Most of them seemed reasonable except for one that said: *"factors for which treating physicians determined that a specific electrolyte or fluid therapy was necessary"*. This means subjectively anyone could be excluded and that has the potential to introduce selection bias.

4) Excluding GCS less than 12:

They decided to exclude the sickest children with a GCS <12 starting in year two because clinicians didn't want them randomised. This is disappointing, not only because it will skew the data, but this is the patient cohort you worry the most about cerebral edema with.

5) Patient Oriented Outcome:

Clinicians and patients might be more interested in the secondary outcomes of brain injury, IQ and death rather than a decline in neurologic status during the first 24hrs of the trial. However, it would have needed to be a much bigger trial to look at some of these outcomes because of the rare events. There was one death and twelve clinically apparent brain injuries.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions.

Case Resolution:

In this case, I would probably still use my local protocol, as the rate of administration has not been proven to be better for patient outcomes. However, if the patient needs a fluid bolus for rehydration, I would feel less paranoid about giving it.

What Do I Tell My Patient?

"We will start to make you better by placing a magic straw in your arm that gives you superpowers by letting your body drink through there too. We used to think that this would also make your brain big and puffy, but we were wrong".

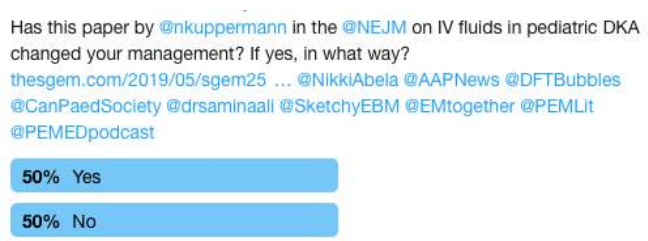
Clinical Application:

This paper fails to support the previously held notion that rapid fluid administration caused brain edema in children with DKA. We should review our own hospital DKA protocols and update them based on this new high-quality trial. Researchers should also be looking for the true cause of this serious complication.

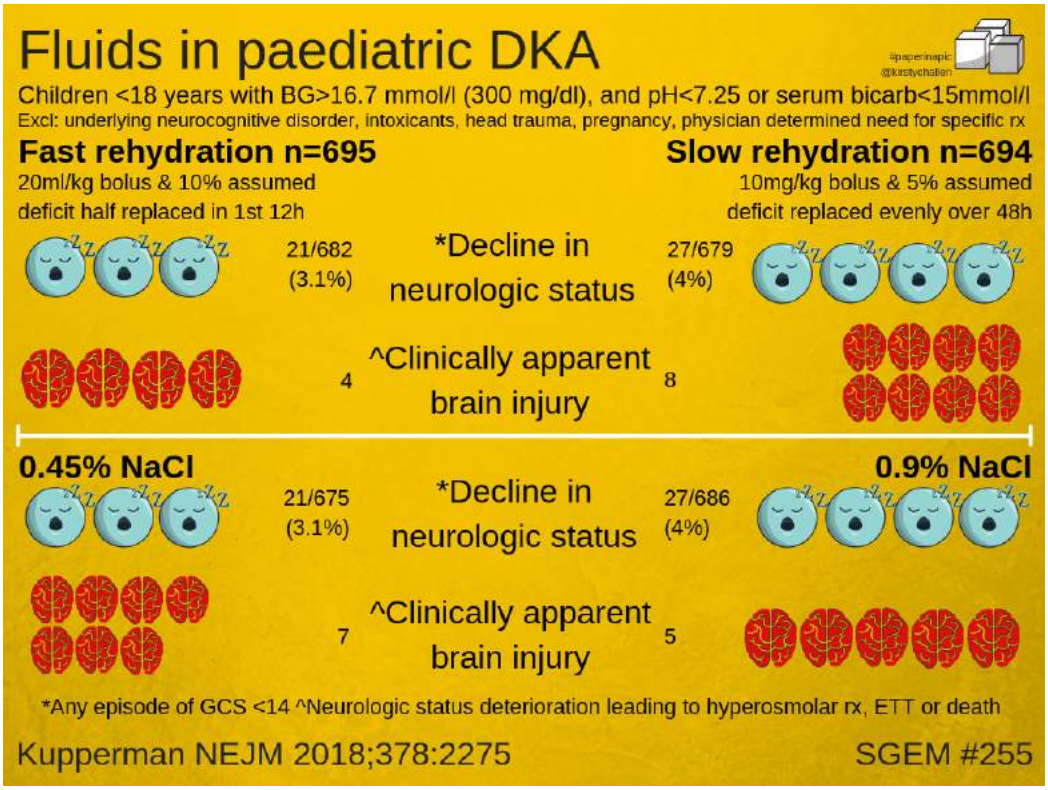
Episode End Notes

Other FOAMed:

- REBEL EM: Pediatric DKA – Do Fluids Really Matter?
- DFTB: Sweet and Salty – Fluids in DKA
- First10EM: IV fluids do not cause cerebral edema in pediatric DKA
- St. Emlyn's: Fluid Resuscitation in Paediatric DKA
- EM Literature of Note: The Rate of Resuscitation in Pediatric DKA



1. Edge JA, Hawkins MM, Winter DL, Dunger DB. The risk and outcome of cere- bral oedema developing during diabetic ketoacidosis. Arch Dis Child 2001;85:16-22.
2. Glaser N, Barnett P, McCaslin I, et al. Risk factors for cerebral edema in chil- dren with diabetic ketoacidosis. N Engl J Med 2001;344:264-9.
3. Lawrence SE, Cummings EA, Gaboury I, Daneman D. Population-based study of incidence and risk factors for cerebral edema in pediatric diabetic ketoacidosis. J Pediatr 2005;146:688-92.
4. Duck SC, Wyatt DT. Factors associat- ed with brain herniation in the treatment of diabetic ketoacidosis. J Pediatr 1988; 113:10-4.
5. Harris GD, Fiordalisi I, Finberg L. Safe management of diabetic ketoacidemia. J Pediatr 1988;113:65-8.



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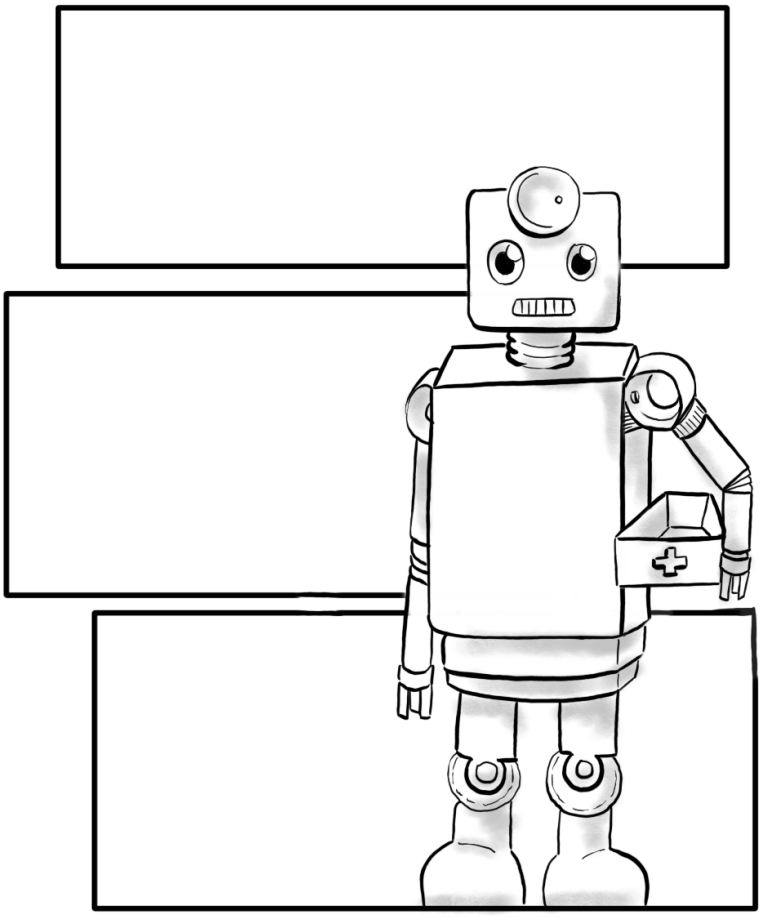


Doctor Doctor Give Me the News, I Gotta Bad Case of RLQ Pain: Should I Have an Appendectomy?

Clinical Question:

Operative treatment or non-operative treatment of acute grade 1 (uncomplicated) appendicitis?

Bottom Line:

Nonoperative management of acute uncomplicated appendicitis may be better than we thought in selected patients but comes with a cost of a small absolute increase in some complications.

Guest:

Dr. Robert Leeper is an assistant professor of surgery at Western University and the London Health Sciences Centre. His practice is in trauma, emergency general surgery, and critical care with an academic interest in ultrasound and medical simulation.

Case Overview

Case:

An 18-year-old woman presents with a Grade 1 appendicitis (Tominaga et al J Trauma Acute Care Surg 2016).

TABLE 1. Data Dictionaries for AAST Grading System for EGS Conditions

AAST Grade	Description	Clinical Criteria	Imaging Criteria (CT Findings)	Operative Criteria	Pathologic Criteria
A. Acute Appendicitis					
I	Acutely inflamed appendix, intact	Pain, leukocytosis and right lower quadrant (RLQ) tenderness	Inflammatory changes localized to appendix +/− appendiceal dilation +/− contrast nonfilling	Acutely inflamed appendix, intact	Presence of neutrophils at the base of crypts, submucosa +/− in muscular wall
II	Gangrenous appendix, intact	Pain, leukocytosis, and RLQ tenderness	Appendiceal wall necrosis with contrast nonenhancement +/− air in appendiceal wall	Gangrenous appendix, intact	Mucosa and muscular wall digestion; not identifiable on hematoxylin-eosin stain
III	Perforated appendix with local contamination	Pain, leukocytosis, and RLQ tenderness	Above with local periappendiceal fluid +/− contrast extravasation	Above, with evidence of local contamination	Gross perforation or focal dissolution of muscular wall
IV	Perforated appendix with periappendiceal phlegmon or abscess	Pain, leukocytosis, and RLQ tenderness; may have palpable mass	Regional soft tissue inflammatory changes, phlegmon or abscess	Above, with abscess or phlegmon in region of appendix	Gross perforation
V	Perforated appendix with generalized peritonitis	Generalized peritonitis	Diffuse abdominal or pelvic inflammatory changes +/− free intraperitoneal fluid or air	Above, with addition of generalized purulent contamination away from appendix	Gross perforation

Background:

The first documented appendectomy was done by Claudius Amyand in 1735. The standard treatment for acute appendicitis has been appendectomy ever since Charles McBurney described it in 1889.

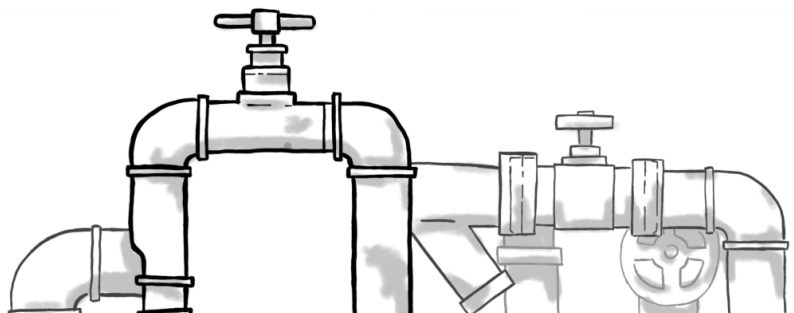
Omar et al (2008) showed just how safe laparoscopic appendectomies have become. They found in a study of over 230,000 UK patients under the age of 49 there were no deaths.

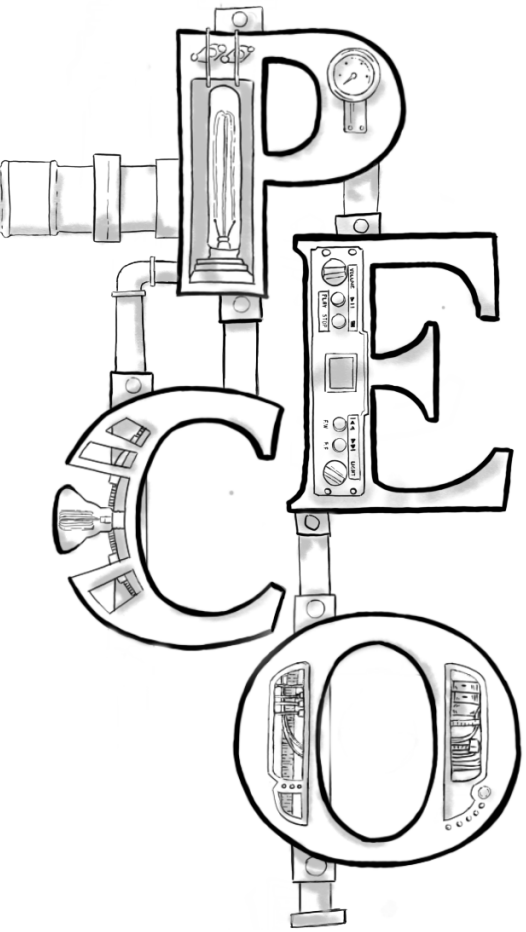
Being that there are doctors out there without scalpels, and that diverticulitis has often been treated successfully with antibiotics. Some clinicians have hypothesized that perhaps acute appendicitis could also be treated successfully with antibiotics.

Two meta-analyses have been done and they looked at nearly the same studies on "uncomplicated" acute appendicitis and came up with two opposite conclusions. This is an example of why things in evidence-based medicine can be *"complicated"* (SGEM#115 and SGEM#180)

Reference:

Sceats et al. Nonoperative Management of Uncomplicated Appendicitis Among Privately Insured Patients. JAMA Surgery 2018





Population:
Adult patients admitted to hospital with a diagnosis of acute uncomplicated (Grade I) appendicitis.

- **Exclusion:** Patients with co-occurring diagnosis or procedure codes consistent with complicated appendicitis and patients lacking appendectomy codes.

Exposure:
Non-operative management of appendicitis

Comparison:
Operative management of appendicitis

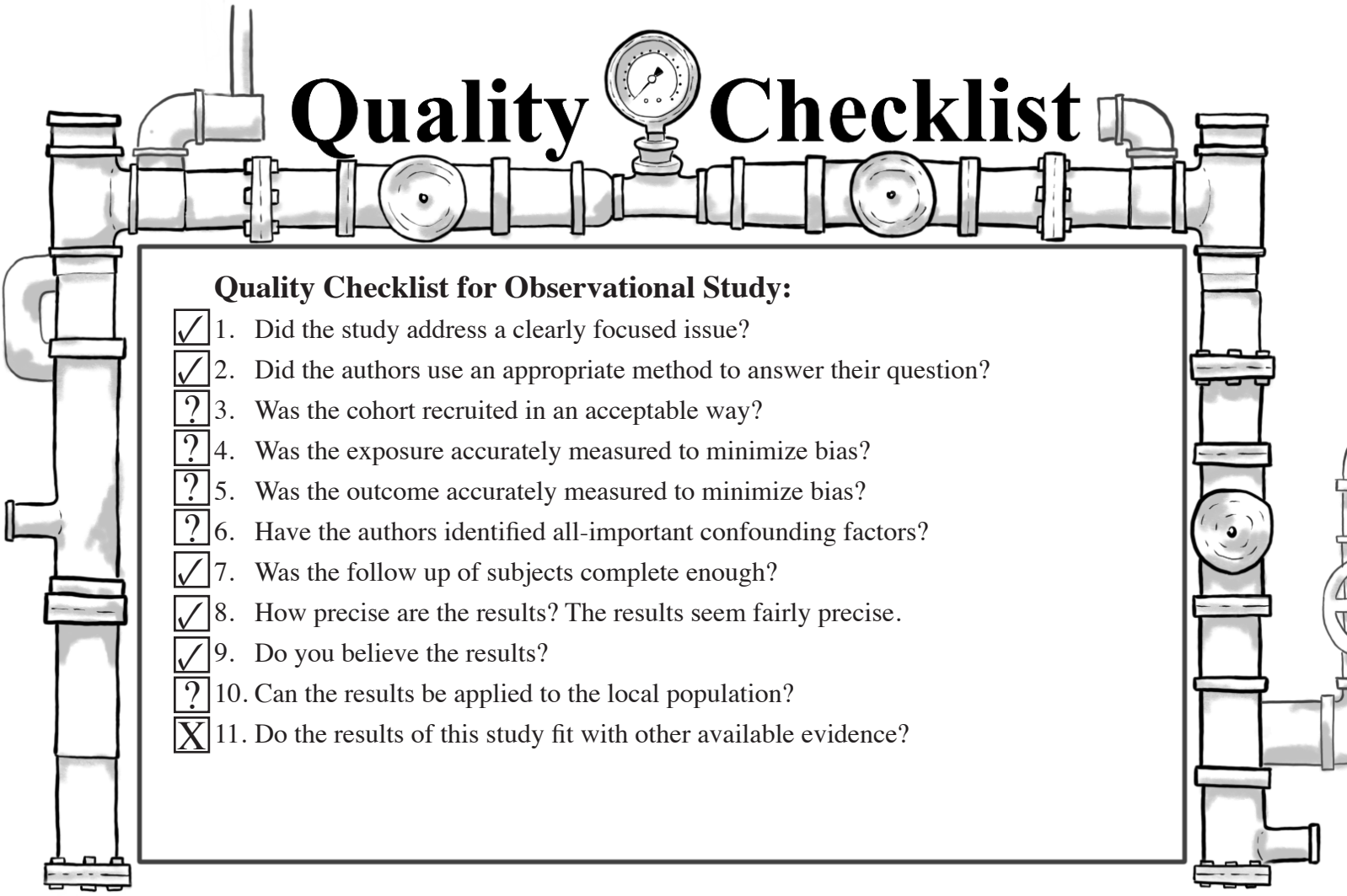
Outcomes:

- **Primary:**
  - **Short Term (<30 days) Complications:** ED visits, all-cause readmissions, appendicitis-associated readmissions, rate of abdominal abscess and C. difficile.
  - **Long Term (>30 days) Complications:** Readmission for small-bowel obstruction, diagnosis of incisional hernia, and diagnosis of appendiceal cancer.
- **Secondary:** *"Length of stay during index hospitalization, cost of index hospitalization, number of follow-up visits required in the following year, and the total cost of appendicitis-associated care in the year after diagnosis. Total cost of appendicitis-associated care was determined by summing the total cost for every in-patient and outpatient encounter associated with appendicitis for the following year, including the index hospitalization."*
- **Post Hoc Analysis:** Rates of non-operative management failure (<30 days) and rates of appendicitis recurrence (>29d days) as well as timing of the failure or recurrence.

Authors' Conclusion

"According to results of this study, nonoperative management failure rates were lower than previously reported. Nonoperative management was associated with higher rates of abscess, readmission, and higher overall cost of care. These data suggest that nonoperative management may not be the preferred first-line therapy for all patients with uncomplicated appendicitis."

Quality Checklist



Quality Checklist for Observational Study:

- ☑ 1. Did the study address a clearly focused issue?
- ☑ 2. Did the authors use an appropriate method to answer their question?
- ? 3. Was the cohort recruited in an acceptable way?
- ? 4. Was the exposure accurately measured to minimize bias?
- ? 5. Was the outcome accurately measured to minimize bias?
- ? 6. Have the authors identified all-important confounding factors?
- ☑ 7. Was the follow up of subjects complete enough?
- ☑ 8. How precise are the results? The results seem fairly precise.
- ☑ 9. Do you believe the results?
- ? 10. Can the results be applied to the local population?
- ☒ 11. Do the results of this study fit with other available evidence?

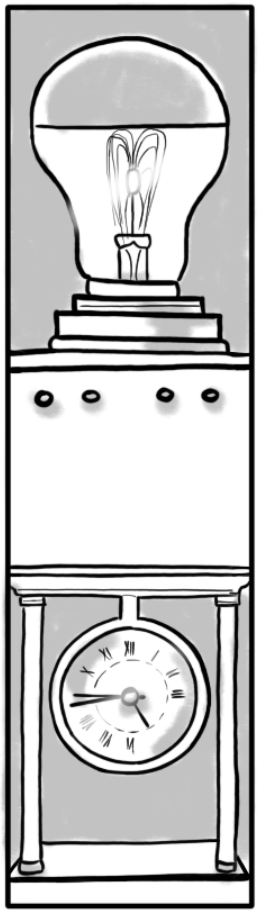
Case Outcomes

Key Results:

Their database search found 58,329 patients with a primary admission diagnosis of uncomplicated (Grade 1) acute appendicitis. There were slightly more men than women in the cohort. The mean age was 32 years. The vast majority (95.5%) underwent appendectomy with only a few (4.5%) treated nonoperatively. Of those who had an appendectomy, 83% were done laparoscopically and the rate increased over the duration of the study.

The patients in the nonoperative group were statistically significantly older (34 vs. 32), had more comorbidity and lived in the Northeast or South USA. There were also differences observed on insurance plans with the nonoperative patients more likely to have a high-deductible.

There were less short-term complications with operative management vs. nonoperative management.
No statistical difference was found in long-term complications except for patients to be diagnosed more often with appendiceal cancer.



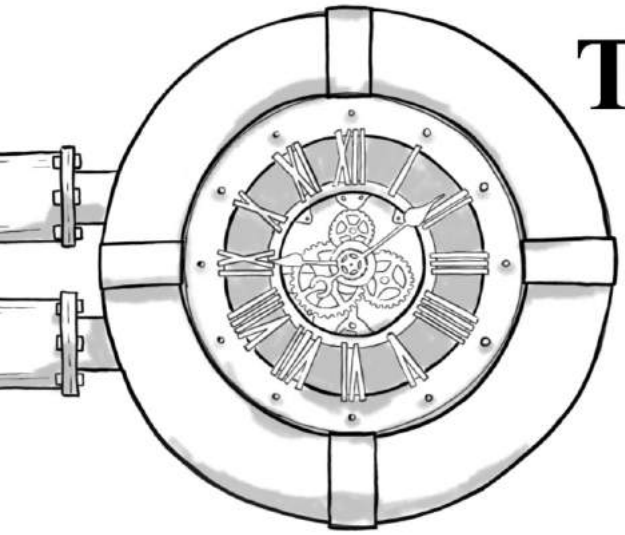
	Operative	Nonoperative	Adjusted OR	P Value
SHORT-TERM				
ED Visit	5.9%	6.4%	0.96 (0.81-1.14)	0.65
All-Cause Readmit	2.5%	4.6%	1.60 (1.29-1.97)	<0.001
App.- Assoc. Readmit	1.2%	2.6%	2.13 (1.63-2.77)	<0.001
Abscess	1.3%	2.3%	1.42 (1.05-1.92)	0.02
C. difficile Diagnosis	0.1%	0.1%	0.04 (0-10.32)	0.25
LONG-TERM				
Admit SBO	0.4%	0.7%	1.29 (0.73-2.29)	0.38
Incisional Hernia	0.9%	1.1%	1.19 (0.80-1.77)	0.39
Cancer	0.2%	0.3%	4.07 (2.56-6.49)	<0.001

Secondary Outcomes:

Length of stay was 0.15 days longer in the appendectomy group while those in the nonoperative group had more follow-up visits. Costs are listed in the original paper and will not apply outside the USA.

Post Hoc Analysis:

A total of 101 cases (3.9%) were considered failure of nonoperative management (1.7% in 30 days and 2.2% after 30 days).



Time to Talk Nerdy

1) ICD-9 Codes:

Has this been validated as an accurate way to measure exposure and outcomes? We were not able to find any publication that quantified using this tool and the authors provided no reference. They also assumed that if the patient had appendectomies the did have appendicitis. We know that there is a small number of patients that will have a negative appendectomy.

2) Patient Satisfaction:

It would have been nice to know how satisfied patients were with their management. Would those in the operative group liked to have been treated nonoperatively and visa versa.

3) Complications and Failures:

The short-term complication rate was higher in the nonoperative group. The absolute difference was 1% for abscesses. The increase in readmit and appendicitis associated readmit rates would be associated with this complication. Are patients willing to accept a 1% abscess rate to avoid a surgery in the short therm.

In addition, the overall *"failure"* rate was just under 4%. If you wanted to promote the nonoperative management protocol you could say it has a 96% success rate. The cohort is skewed because 96% of patients were in the operative management cohort.

Another important point is that this 4% *"failure"* rate is lower than has been previously reported in randomized trials. It could be that privately insured patients in the USA are different than patient included in randomized control trials and therefore limit the external validity of these findings to other populations.

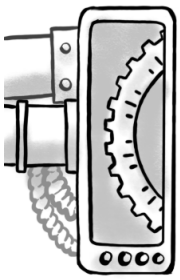
There is an ENORMOUS selection bias. Of course, when providers and patient use the full extent of their good judgement to choose treatment options we should expect them to be able to bias the results towards the good. The lower rate of failure simply tells us that providers and patients were choosing wisely.

4) Missed Cancer:

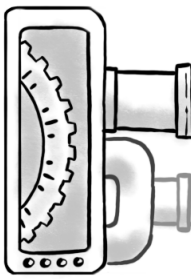
They highlight the small difference in missed cancers. They correctly point out that the incidence was so small the study is underpowered for this complication. However, a more important question would be whether or not a delay in identifying an appendicular cancer resulted in a worse patient-oriented outcome.

5) Asked the Wrong Question:

We want to know if it is better to cut or not to cut in patients with uncomplicated appendicitis. Only a well-designed, blinded randomized trial could provide the answer. Their retrospective study design could have unmeasured confounders influencing the results. We need to be careful not to over interpret their findings.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the authors' conclusions. The last sentence could have also been written: *"These data suggest that nonoperative management [may or] may not be the preferred first-line therapy for all patients with uncomplicated appendicitis."*



Clinical Application:
Empower appropriately selected patients with the evidence and your clinical judgment. Engage them in shared decision making and ask about their preference.

Case Resolution:
She chooses to have her appendix removed, does well and is discharged home that night.

What Do I Tell My Patient?
You are lucky because there are two pretty good options to treat appendicitis. Option one is to take your appendix out and you will be home later tonight and you should never have trouble again. The rate of a successful operation is really, really high. The price you will pay is three small holes in your belly and some pain over the next week or so. The other option, if you prefer, is to take oral antibiotics for one week. There is about a 95% success rate with a small risk of bouncing back to the hospital with appendicitis or an abscess. I think either option would work well for you.

Episode End Notes

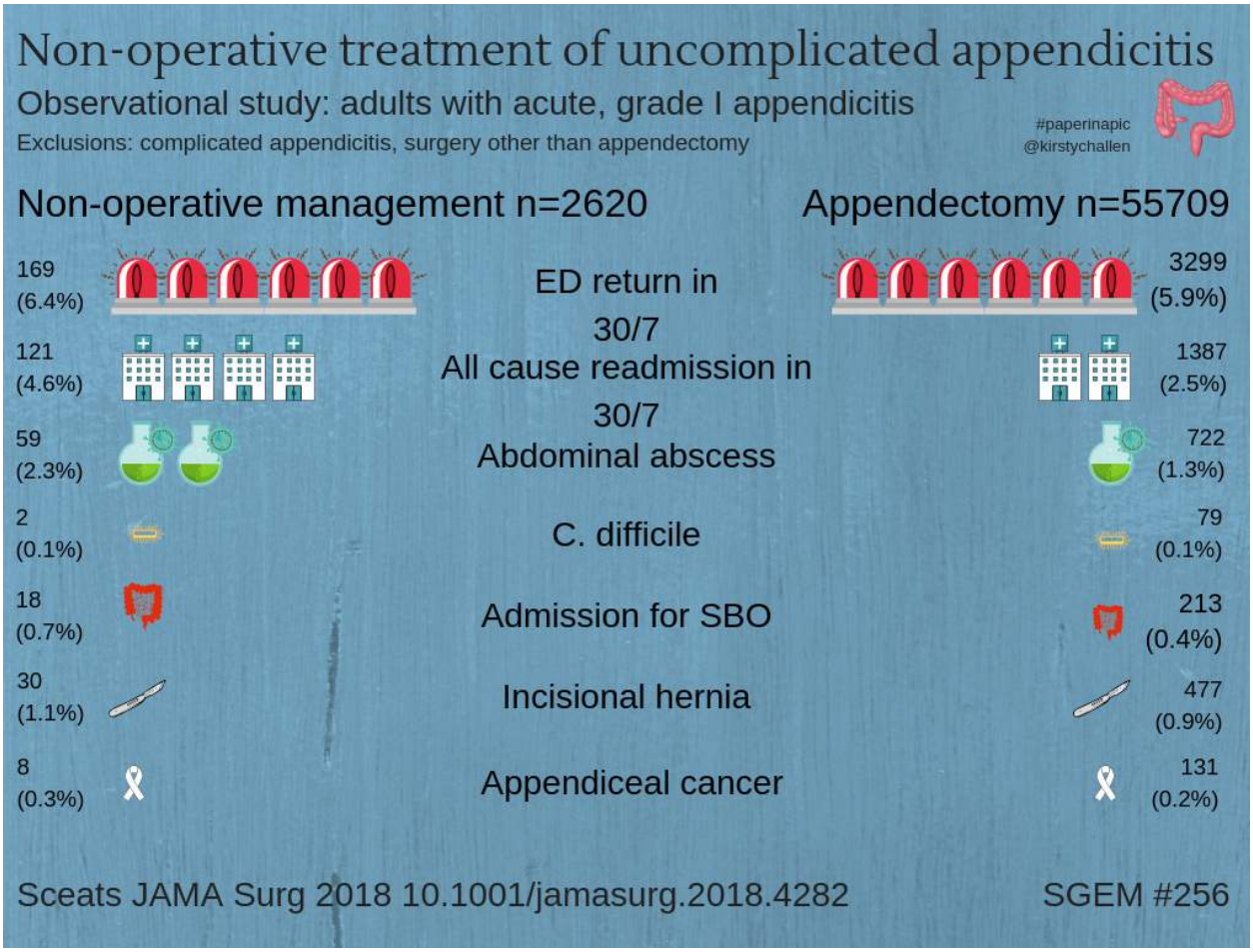
What would you want if diagnosed with acute uncomplicated appendicitis? #FOAMed #EBM

thesgem.com/2019/05/sgem25...

@rob_leeper @Rick_Pescatore @choo_ek @srrezaie @KirstyChallen

Appendectomy	76%
Antibiotics	24%

414 votes · Final results



SGEM#

257

EMTALA:
It's the Law of the Land

Clinical Question:

What are the characteristics of civil monetary penalties related to EMTALA violations involving psychiatric emergencies compared to non-psychiatric emergencies?

Bottom Line:

Civil monetary penalties for emtala violations involving psychiatric patients are increasing, and very expensive for hospitals. Institutions need to have protocols in place to avoid inadequate stabilization, screening, and inappropriate transfer of patients.

Guest:

Dr. Corey Heitz is an emergency physician in Roanoke, Virginia. He is also the CME editor for Academic Emergency Medicine.

Case Overview

Case:

You are working in your emergency department at a hospital that has an on-site psychiatric unit. You are holding several patients in the department who have been placed on involuntary holds for suicidal ideation while a bed search occurs at facilities elsewhere in the region. Your charge nurse tells you that she has learned the psychiatric unit has open beds that currently aren't being used.

Background:

The Emergency Medical Treatment and Labor Act (EMTALA) was passed in 1986 to combat and prevent delayed, denied, or inadequate treatment of uninsured ED patients.

This federal US law mandates that patients who present to an emergency department must have a medical screening evaluation, stabilization of their emergent needs and arrange transfer to higher level of care if necessary.

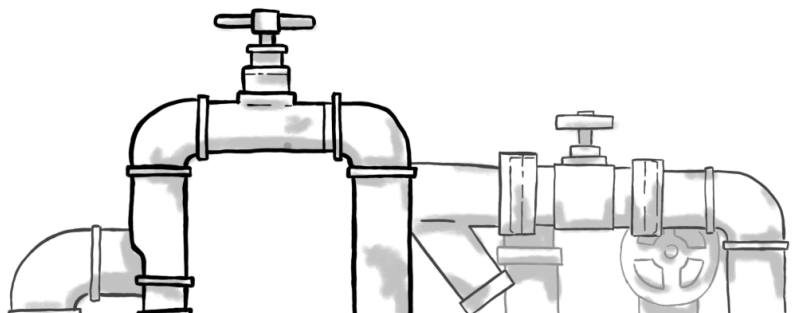
There is also an obligation on the receiving hospital. They must accept these patients in transfer if they have a specialist on-call with the ability to manage the patient.

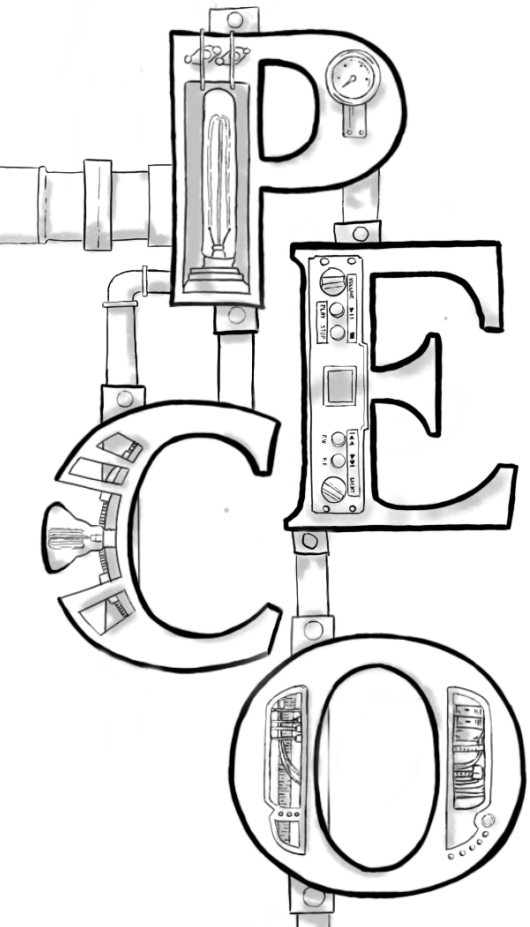
The Center for Medicare and Medicaid Services (CMS) has clarified that EMTALA applies to psychiatric emergencies.

CMS has terminated Medicare provider agreements to 12 hospitals, four of which were related to psychiatric emergencies. Civil monetary penalties may also be levied for EMTALA violations.

Reference:

Terp et al. Civil Monetary Penalties Resulting from Violations of the Emergency Medical Treatment and Labor Act (EMTALA) Involving Psychiatric Emergencies, 2002 to 2018. AEM May 2019





Population:
All civil monetary penalty settlements between 2002 and December 11, 2018

Exposure:
EMTALA violations related to psychiatric emergencies.

Comparison:
EMTALA violations not involving psychiatric emergencies..

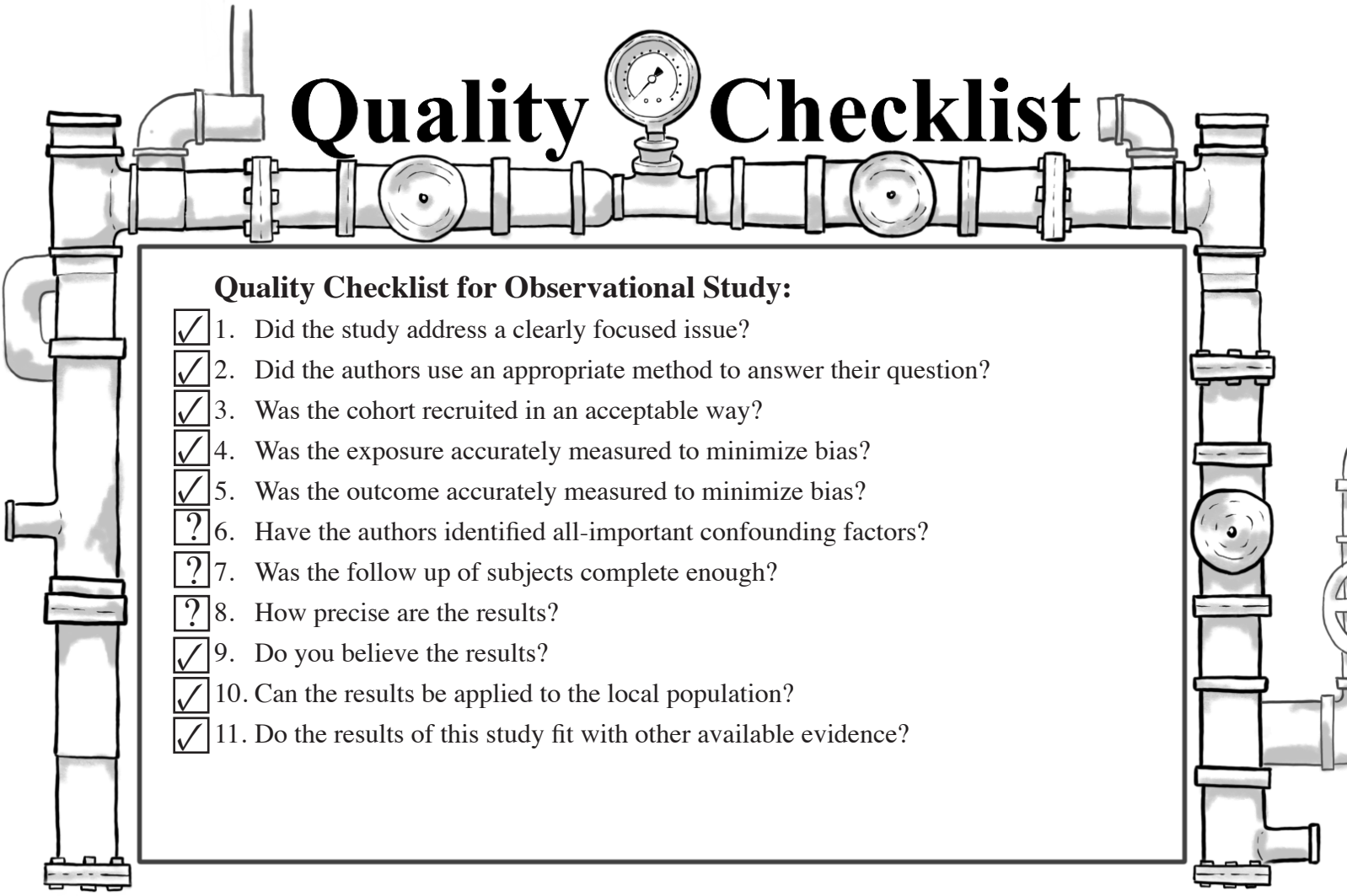
Outcome:
Civil monetary penalties levied by the Office of the Inspector General (OIG).

This is an SGEMHOP episode which means we have the lead author on the show. Dr. Sophie Terp is an is an assistant professor of clinical emergency medicine in the Department of Emergency Medicine at the Keck School of Medicine of USC. Her research focuses primarily on access to emergency care for vulnerable populations and specifically on enforcement of the Emergency Medical Treatment and Labor Act (EMTALA).

Authors' Conclusion

"Nearly one in five civil monetary penalties related to Emergency Medical Treatment and Labor Act violations involved psychiatric emergencies. Settlements related to psychiatric conditions concentrate in two of the 10 Centers for Medicare & Medicaid Services regions, with half of all settlements occurring in three states (Florida, North Carolina, and Missouri). Average financial penalties related to psychiatric emergencies were over twice as high as penalties for nonpsychiatric complaints. Recent large penalties related to violations of the Emergency Medical Treatment and Labor Act law underscore the importance of improving access to and quality of care for patients with psychiatric emergencies."

Quality Checklist



Quality Checklist for Observational Study:

- ☑ 1. Did the study address a clearly focused issue?
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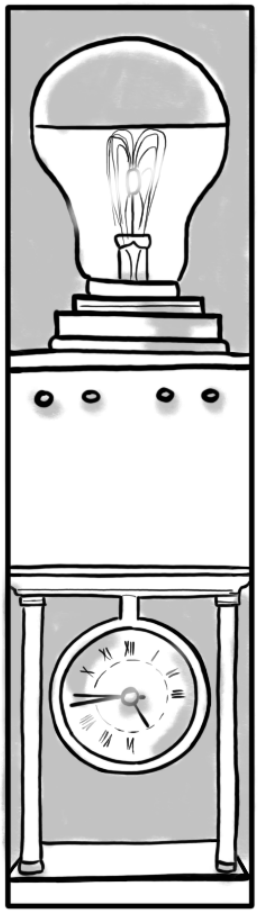
- ☑ 5. Was the outcome accurately measured to minimize bias?
- ? 6. Have the authors identified all-important confounding factors?
- ? 7. Was the follow up of subjects complete enough?
- ? 8. How precise are the results?
- ☑ 9. Do you believe the results?
- ☑ 10. Can the results be applied to the local population?
- ☑ 11. Do the results of this study fit with other available evidence?

Case Outcomes

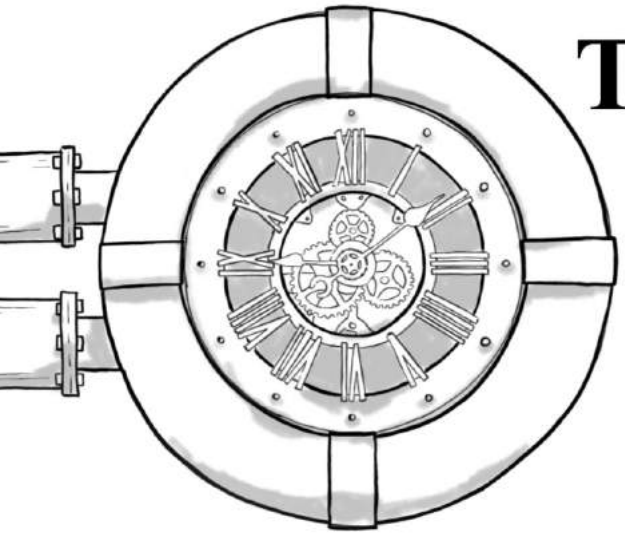
Key Results:
They searched 16 years and identified 230 civil monetary penalty settlements related to EMTALA violations. There were 222 (97%) penalties levied against facilities and 8 (3%) against individuals. A decline in settlements related to non-psychiatric emergencies was noted, with an increase in those related to psychiatric emergencies.

One in five settlements involved psychiatric emergencies. The average psychiatric-related settlement was 2.6 Times the average non-psychiatric settlement.



	Psychiatric	Non-Psychiatric	P-Value
Total Number	44 (19%)	186 (81%)	
Mean $ Settlement	$85,488	$32,004	0.003
Settled Against MD	0 (0)	8 (4%)	0.036
Failure to do MSE	37 (84%)	137 (74%)	0.147
Failure to Stabilize	30 (68%)	95 (51%)	0.041
Failure to Transfer	13 (30%)	40 (22%)	0.363
Failure to Accept	6 (14%)	28 (15%)	0.812

- The settlements involving psychiatric patients were all against the hospital
- Five (83%) of the six settlements more than $100,000 were for psychiatric complaints
- The three largest settlements were $1,295,000; $260,000; and $200,000
- Psychiatric Cases: Mean $85,488.64 (95% CI 25,766.07 – 145,211.20)
- Non Psychiatric Cases: Mean $32,004.45 (95% CI 28,802.75 – 35,206.16)



Time to Talk Nerdy

Listen to the podcast on iTunes or Google Play to hear Sophie's responses to our five nerdy questions.

1) Medical Screening Evaluation (MSE):

Failure to do an MSE was the most identified EMTALA violation for psychiatric patients (37/44 – 84%). Are we doing a poor job in screening these patients?

2) Failure to Stabilize:

This was the second most common identified EMTALA violation and the only one statistically different from the non-psychiatric settlements. Can you discuss what you think this specifically means, and provide some examples?

3) Increasing Numbers:

One-in-five settlements were for psychiatric cases and the number is rising. Any idea why this might be happening?

4) Penalties:

Can you speculate as to why penalties are higher for psychiatric vs non-psychiatric violations?

5) Case Study:

You presented a case study in your paper of an EMTALA violation involving a hospital in the southeast and boarding a psychiatric patient for 38 days in the ED. Can you briefly describe what happened?

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with their conclusions.

Case Resolution:

You call on the on-call psychiatrist who arranges for nursing staff to open up the remaining beds in the psychiatric unit.

Clinical Application:

Do an appropriate medical screening exam on all ED patients including psychiatric patients. Stabilize any emergent needs and arrange transfer of any patient to a higher level of care if necessary.

What Do I Tell My Patient?

You need emergency mental healthcare. We have a bed for you in our hospital and our great psychiatric team will take care of you.

Episode End Notes

Ken Milne @TheSGEM · May 21

Civil monetary penalties due to EMTALA violation involving psychiatric emergencies are higher or lower than non-psychiatric emergencies? #SGEMHOP

onlinelibrary.wiley.com/doi/full/10.11…

thesgem.com/2019/05/sgem25…

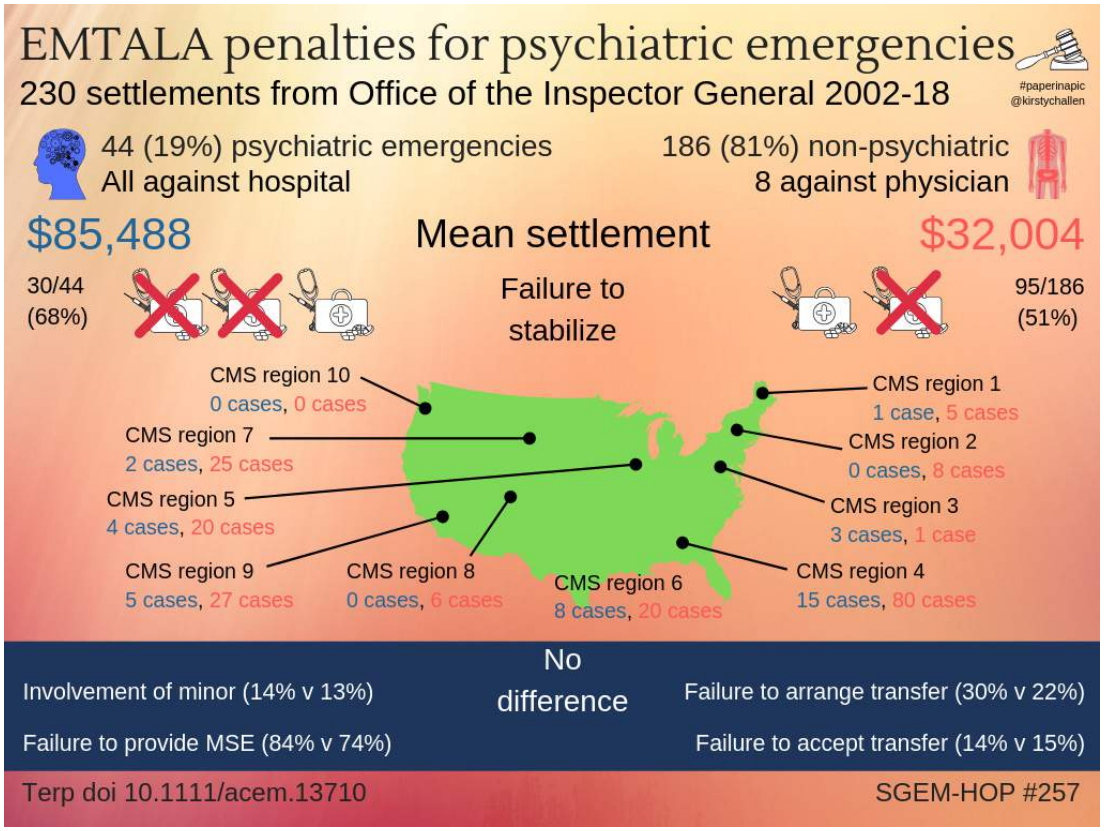
@SAEMonline @AcademicEmerMed @CHeitzMD @Rick_Pescatore @AliRaja_MD @meganranney

35% Higher

10% Lower

55% I don't know

40 votes • Final results



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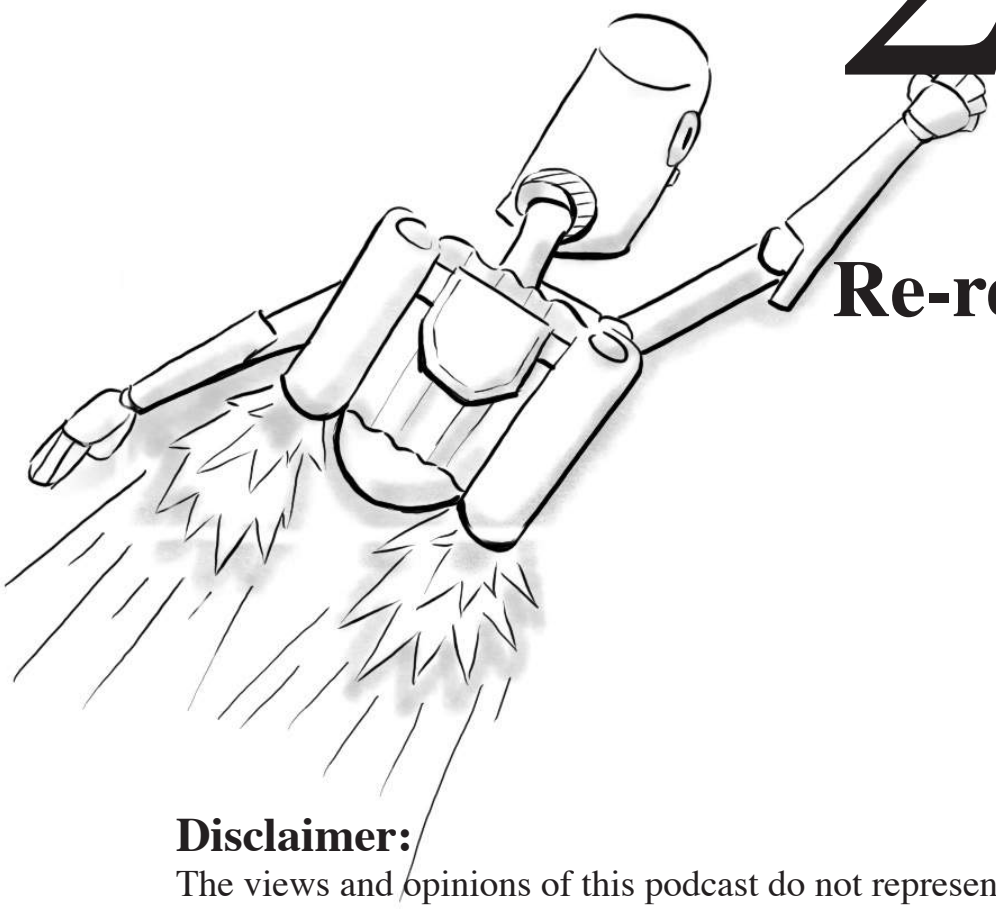
REBOA, Re-re-re-REBOA



Disclaimer:

The views and opinions of this podcast do not represent the United States government or the US air force.

Clinical Question:

What are the outcomes of trauma patients after reboa placement?

Bottom Line:

Reboa is currently an intervention of uncertain benefit. Although it has shown promise in some studies, this investigation leaves its therapeutic potential in question, and arguably demonstrates harm. There may be substantial benefit in select groups of trauma patients, but these groups are not yet known.

Guest:

Dr. Robert Edmonds is an emergency physician in the US Air Force in Virginia. This is Bob's tenth visit to the SGEM.

Case Overview

Case:

You are working at a Level 1 Trauma Center and are alerted to an incoming Type A trauma. After donning your PPE (personal protective equipment) and greeting the trauma surgeon in your resuscitation bay, nursing delivers report that you are about to receive a 24-year-old male that was involved in an explosion that knocked the patient from their vehicle. They have an unstable pelvis and were intubated in the field for airway protection due to a low Glasgow Coma Scale (GCS) score. Vitals are heart rate 112 bpm, blood pressure 110/60 mmHg, respiratory rate 16 bpm (intubated), oxygen saturation 94%, afebrile and the patient is four minutes from arrival. You have a brief conversation with your trauma surgeon regarding these findings, and upon arrival of the patient, you note an intubated airway, equal bilateral breath sounds, and a rapid regular heart rate. The patient's eyes are closed and makes minimal movements with his extremities. Your surgeon rapidly asks for the REBOA kit and begins catheterization of the femoral artery while you have a professional yet rapid debate about the need to complete the primary survey and roll the patient to examine their back.

Background:

Resuscitative endovascular balloon occlusion of the aorta (REBOA) was first used 50 years ago in the Korean War but was not mentioned in emergency medicine literature until 1986. Its use declined in the 1990s and early 2000s, but during the past decade, it has gained the attention of trauma surgeons in military and civilian settings, potentially due to advances in the technology and smaller catheter sizes.

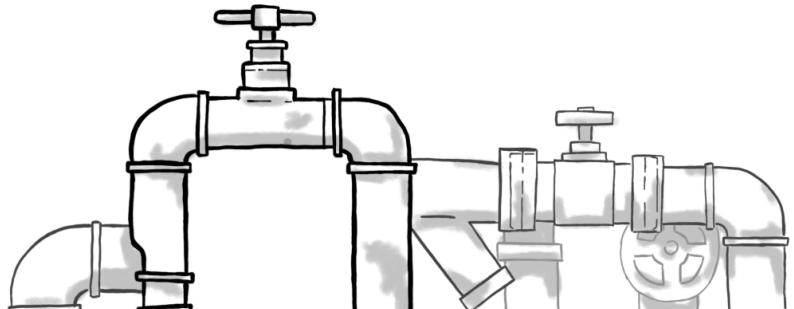
The evidence for REBOA is conflicting. Animal studies have shown REBOA to temporize exsanguinating hemorrhage and to restore perfusion. Some human studies [1,2] have shown benefit but a recent registry study from Japan [3] showed the use of REBOA associated with higher mortality. The authors noted a lack of multi-institutional data at a national level regarding efficacy and safety of REBOA in the United States, which prompted their study.

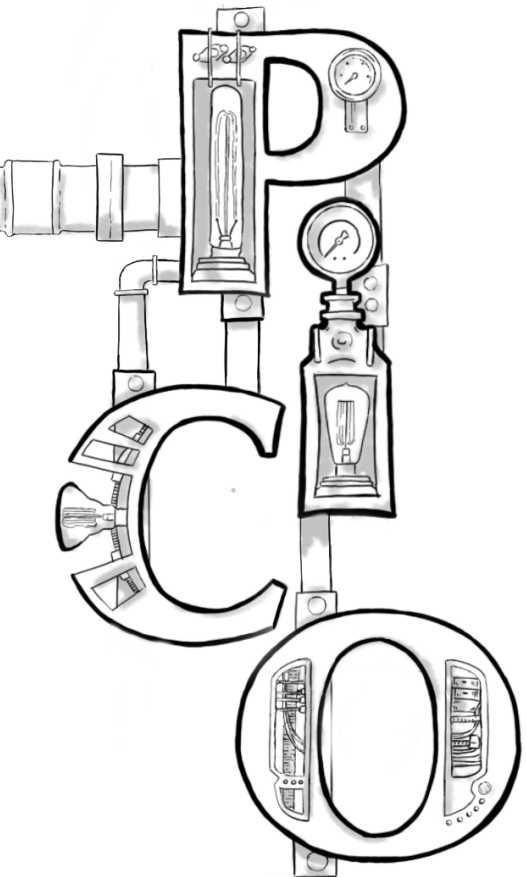
The American College of Emergency Physicians (ACEP) and American College of Surgeons Committee on Trauma (ACS COT) in 2018 put out a joint statement for the use of REBOA [4]. They discuss some general observations, indication for REBOA, and guidelines for REBOA use and implementation.

ACEP and ACS COT also discuss the transfer, management, special circumstances (deployed military settings), training, credentialing and quality assurance of REBOA.

Reference:

Joseph et al. Nationwide Analysis of Resuscitative Endovascular Balloon Occlusion of the Aorta in Civilian Trauma. JAMA Surgery March 2019.





Population:
All adult (over 18 years of age) patients in the ACS-TQIP database from 2015-2016.

- **Exclusions:** Patients who were dead on arrival, were transferred from other facilities, had missing physiological parameters, or who underwent resuscitative thoracotomy were excluded.

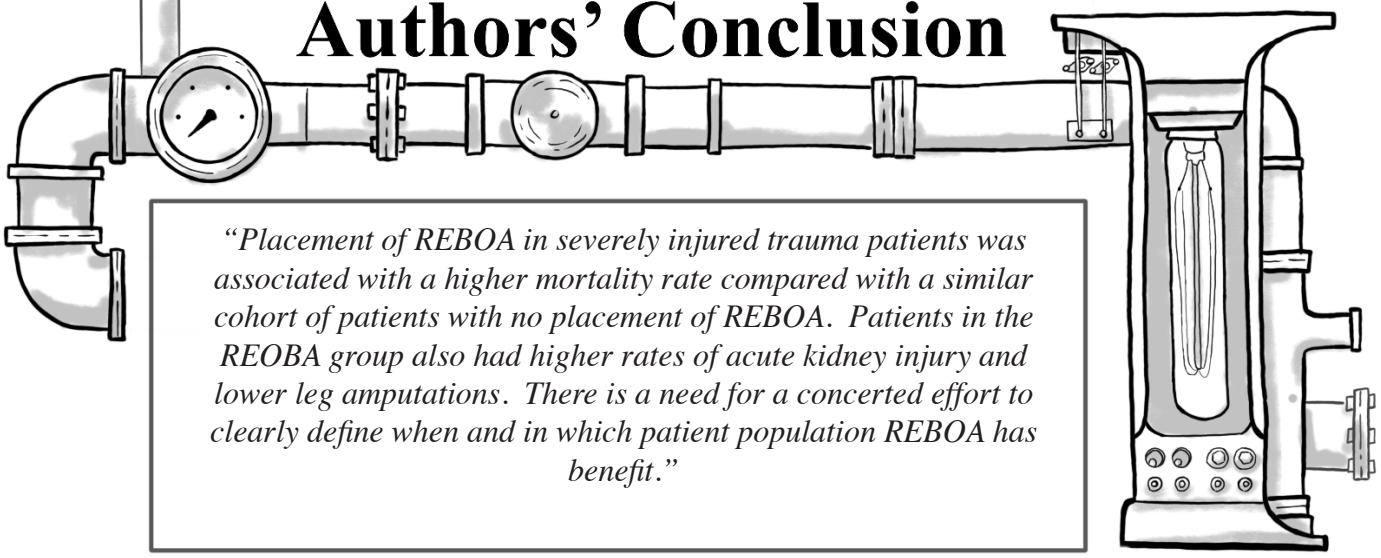
Intervention:
Patients who received REBOA within one hour of presentation to the emergency department

Comparison:
Patients who did not receive REBOA (matched in a 1:2 intervention to comparison group)

Outcomes:

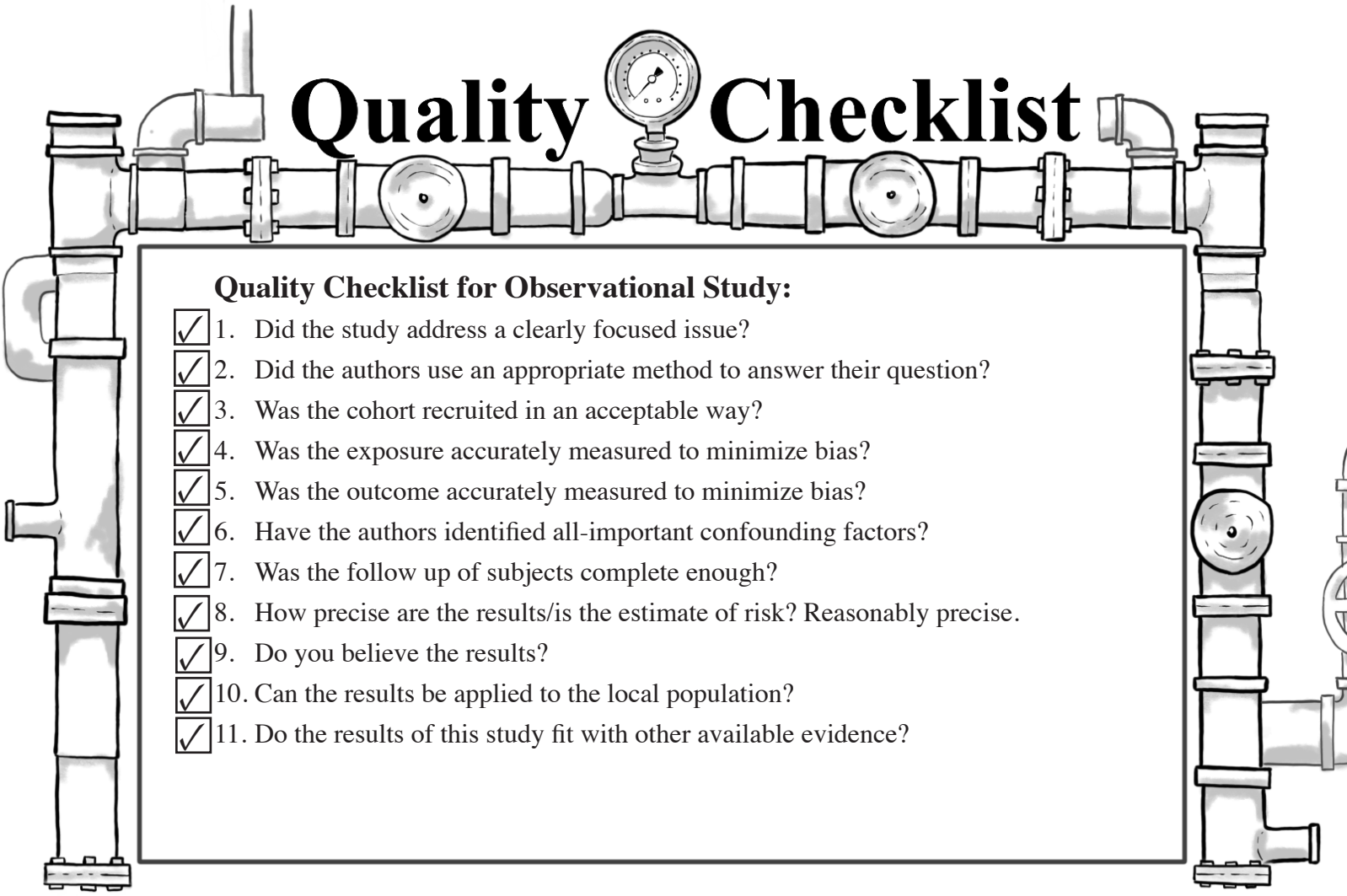
- **Primary:** Emergency department mortality, 24-hour mortality, and mortality after 24 hours
- **Secondary:** Transfusion requirements at four hours and 24 hours after injury, in hospital complications (DVT, PE, CVA, MI, extremity compartment syndrome, unplanned return to the operating room, lower limb amputation), hospital length of stay and intensive care length of stay

Authors' Conclusion



"Placement of REBOA in severely injured trauma patients was associated with a higher mortality rate compared with a similar cohort of patients with no placement of REBOA. Patients in the REOBA group also had higher rates of acute kidney injury and lower leg amputations. There is a need for a concerted effort to clearly define when and in which patient population REBOA has benefit."

Quality Checklist



Quality Checklist for Observational Study:

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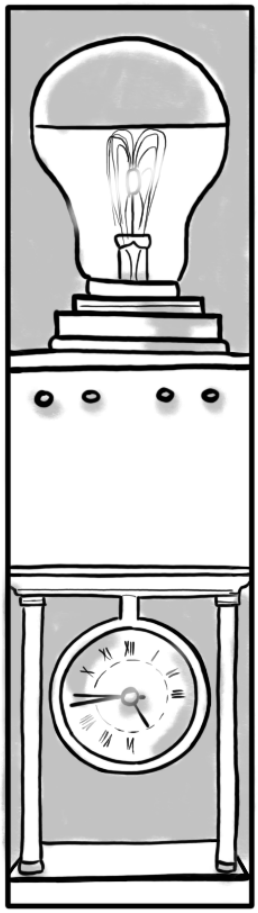
- ☑ 5. Was the outcome accurately measured to minimize bias?
- ☑ 6. Have the authors identified all-important confounding factors?
- ☑ 7. Was the follow up of subjects complete enough?
- ☑ 8. How precise are the results/is the estimate of risk? Reasonably precise.
- ☑ 9. Do you believe the results?
- ☑ 10. Can the results be applied to the local population?
- ☑ 11. Do the results of this study fit with other available evidence?

Case Outcomes

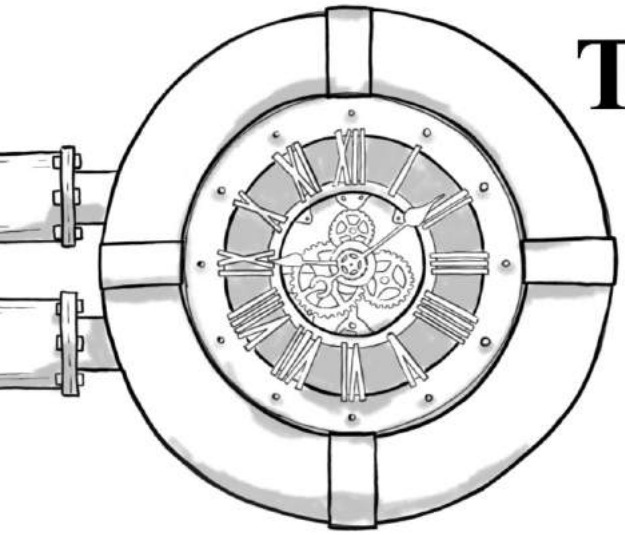
Key Results:
There was 593,818 adult trauma patients identified in the retrospective analysis. They matched the 140 patients who received REBOA to 280 patients who did not receive REBOA. The mean age of patients was around 43 years, ¾ being male and a median Injury Severity Score (ISS) of 28.

Overall mortality rate was higher in the reboa group compared to the no-reboa group.



Primary Outcomes:
- Overall mortality was worse (35.7% vs. 18.9%, p=0.01)
- Mortality in the emergency department was not different
- 24-hour mortality was worse (26.4% vs. 11.8%, p =0.01)
- In hospital mortality after 24 hours was not different

Secondary Outcomes:
- Transfusion requirements, hospital LOS and ICU LOS were not different
- Most of the in-hospital complications were not different (DVT, PE, CVA, MI, extremity compartment syndrome, unplanned return to the operating room)
- Acute kidney injury was worse in the REBOA group (10.7% vs. 3.2% p=0.02)
- Amputation of lower limbs was greater in the REBOA group (3.6% vs. 0.7% p=0.04)



Time to Talk Nerdy

1) Confounders:

The authors mention in their conclusion that a limitation of this study is the retrospective nature of the database.Specifically, they couldn't account for some important confounders, such as the type and size of the catheter used, the zone of placement (zone 1, 2, or 3), the duration of aortic occlusion, or the responsiveness of the patient to the initial resuscitation *before* REBOA placement. Each of these factors may have impacted the findings, most significantly the responsiveness to the initial resuscitation may have significantly impacted the selection of patients for REBOA placement.

2) Propensity Score and Matching:

The propensity score was described by Rosenbaum and Rubin in 1983 to be the probability of treatment assignment conditional on observed baseline covariates. Propensity score matching takes treated and untreated subjects with a similar propensity score and matches them. These authors did propensity score matching for a variety of things (demographics, vital signs, mechanism of injury, injury severity score, head abbreviated injury scale score, each body region abbreviated injury scale score, pelvic fractures, lower extremity vascular injuries and fractures, and number and grades of intra-abdominal solid organ injuries). While this can help improve the accuracy of observational studies, this statistical technique cannot achieve the same rigor of a randomized trial design.

3) 1:2 matching:

The authors used 1:2 matching of REBOA to control. This likely was done in an attempt to increase statistical power of a fairly rare event. Only 140 of the 593,818 patients underwent REBOA (0.02% of the study population). It bears mentioning that this underpins their allegation that despite 50 deaths in intervention and 53 deaths in the control, the denominators were different, so the overall mortality in the intervention (35.7%) was nearly double the control (18.9%).

4) Multiple Primary Outcomes:

How many times will I have to say…there can only be one primary outcome (Highlander)? Another way of saying this would be…I do not think "primary" means what they think it means (Princess Bride).

5) Additional Secondary Outcomes:

The authors' methods outline several primary and secondary outcomes. Acute kidney injury is not listed in their methods or abstracted data but makes a surprise appearance in their results section as a statistically significant finding without mention of their definition of acute kidney injury.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with their conclusions.

Clinical Application:

In civilian settings, the use of REBOA appears to have substantial risks of harm without clear evidence of benefit. Outside of a trial setting to find select groups that could benefit, it is doubtful that this is safe or effective for patient care.

Case Resolution:

After several frustrated unsuccessful attempts by the trauma surgeon to place the femoral artery line to later upsize to a REBOA catheter, the patient is finally rolled, and two large wounds are noted on the patient's back. These are explored briefly and dressed with combat gauze just prior to transporting the patient to the operating room.

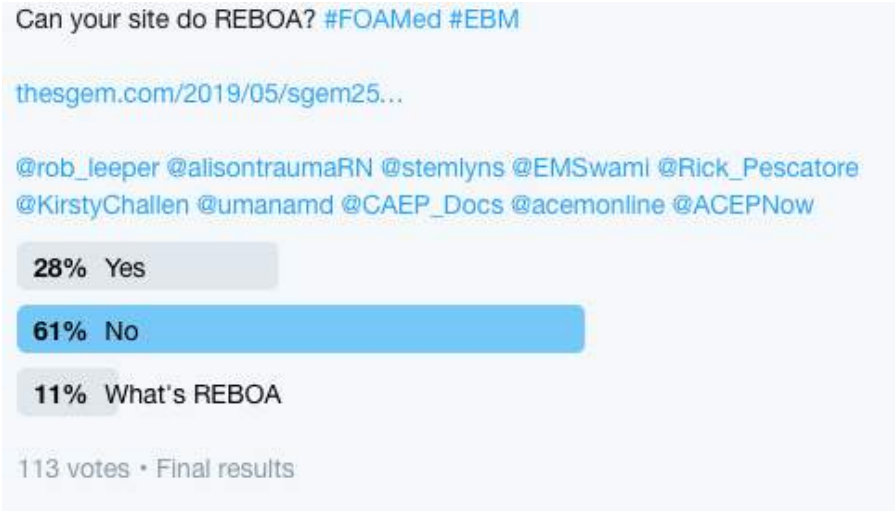
What Do I Tell My Patient?

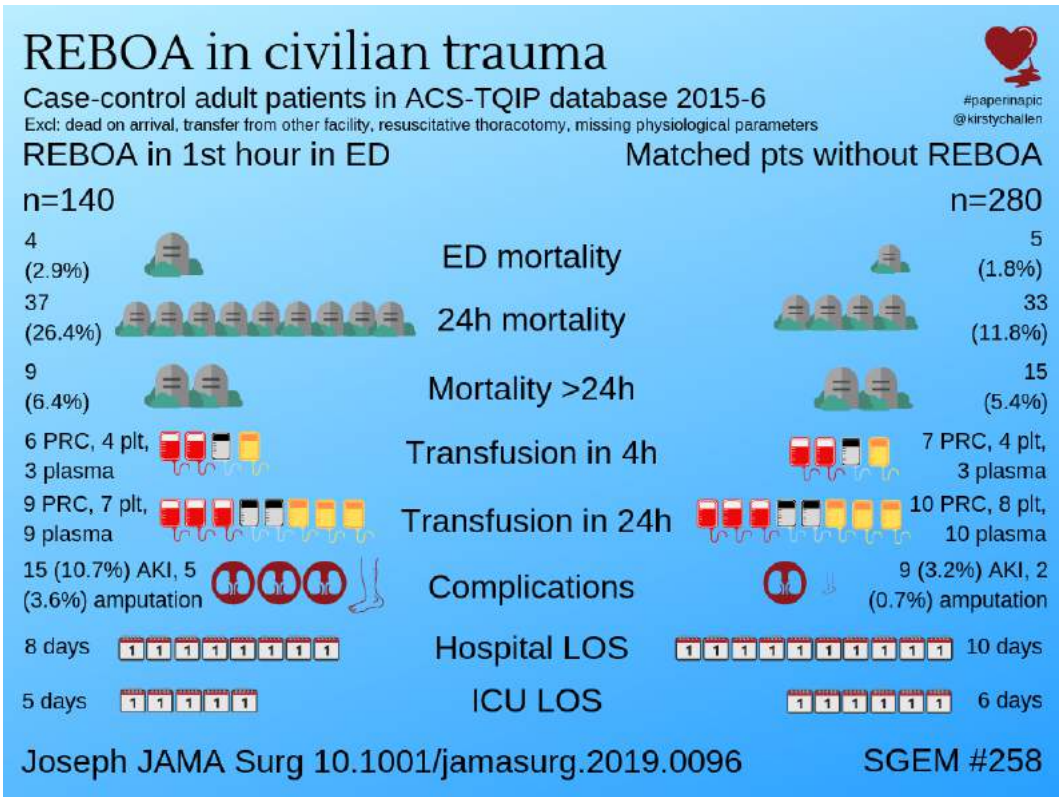
If my patient is injured enough to be a possible candidate for REBOA, I'm probably not able to have much of a conversation with them. I can tell their family afterwards that REBOA is a therapy that still has an evolving body of evidence, and as there are very real threats of harm, it is not always an intervention our hospital elects to perform.

Episode End Notes

Other FOAMed:

- WikiEM: REBOA
- LITFL: REBOA in Resuscitation
- St. Emlyn's: Time to put the REBOA balloon away? Maybe, maybe not…





References:

1. DuBose JJ, Scalea TM, Brenner M, et al; AAST AORTA Study Group. The AAST prospective Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) registry: data on contemporary utilization and outcomes of aortic occlusion and resuscitative balloon occlusion of the aorta (REBOA).J Trauma Acute Care Surg. 2016;81 (3):409-419. doi:10.1097/TA.0000000000001079
2. Brenner M, Inaba K, Aiolfi A, et al; AAST AORTA Study Group. Resuscitative endovascular balloon occlusion of the aorta and resuscitative thoracotomy in select patients with hemorrhagic shock: early results from the American Association for the Surgery of Trauma's Aortic Occlusion in Resuscitation for Trauma and Acute Care Surgery Registry.J Am Coll Surg. 2018;226(5):730-740. doi:10.1016/j.jamcollsurg.2018.01.044
3. Norii T, Crandall C, Terasaka Y. Survival of severe blunt trauma patients treated with resuscitative endovascular balloon occlusion of the aorta compared with propensity score–adjusted untreated patients.J Trauma Acute Care Surg. 2015; 78(4):721-728. doi:10.1097/TA.0000000000000578
4. Brenner et al. Joint statement from the American College of Surgeons Committee on Trauma (ACS COT) and the American College of Emergency Physicians (ACEP) regarding the clinical use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA). BMJ 2018

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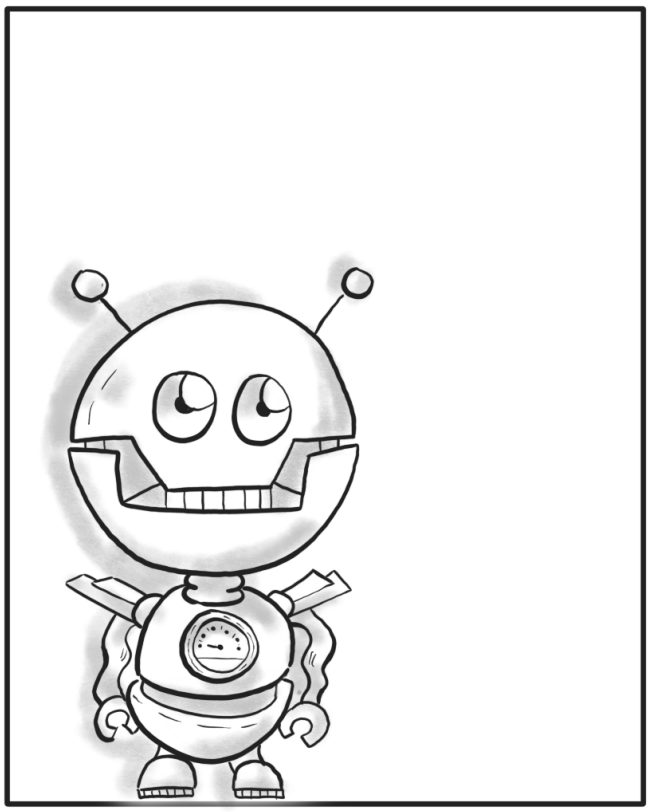

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Eat For Two: If I Didn't Have Nausea and Vomiting of Pregnancy

Clinical Question:

Is ondansetron exposure in pregnancy associated with congenital anomalies (primarily cardiac and oral clefts)?

Bottom Line:

There appears to be no overall increased risk of fetal congenital malformations in women exposed to ondansetron during their first trimester. There may be a small increased risk of oral clefts.

Guest:

Dr. Nick Papalia completed his MD at Western University. He is currently completing an Obstetrics and Gynecology residency at the University of Calgary.

Case Overview

Case:

A 24-year-old woman G2T1P1A0L1 who presents with nausea and vomiting of pregnancy at nine weeks gestational age. She has stopped her iron pills, taken ginger, used acupressure, tried vitamin B6 with doxylamine and dimenhydrinate. She is frustrated nothing is working and wants to try something else. Her friend got little wafers that dissolved under her tongue (ondansetron). She is worried because her google search said it could cause a birth defect like a cleft lip.

Background:

Many women suffer from nausea and vomiting when pregnant. These symptoms can become clinically significant in over 30% of woman. Hyperemesis gravidarum is the most common reason for hospitalization in early pregnancy and impacts a small percentage of these pregnancies.

The Society of Obstetricians and Gynecologists of Canada (SOGC) published a guideline for the management of nausea and vomiting of pregnancy in 2016 (Campbell et al 2016). They make 13 recommendations:

1. Women experiencing nausea and vomiting of pregnancy may discontinue iron-containing prenatal vitamins during the first trimester and substitute them with folic acid or adult or children's vitamins low in iron. (II-2A)
2. Women should be counselled to eat whatever pregnancy-safe food appeals to them and lifestyle changes should be liberally encouraged. (III-C)
3. Ginger may be beneficial in ameliorating the symptoms of nausea and vomiting of pregnancy. (I-A)
4. Acupressure may help some women in the management of nausea and vomiting of pregnancy. (I-B)
5. Mindfulness-based cognitive therapy as an adjunct to pyridoxine therapy may be beneficial. (I-B)
6. Pyridoxine monotherapy or doxylamine/pyridoxine combination therapy is recommended as first line in treating nausea and vom- iting of pregnancy due to their efficacy and safety. (I-A)
7. Women with high risk for nausea and vomiting of pregnancy may benefit from preemptive doxylamine/pyridoxine treatment at the onset of pregnancy. (I-A)
8. H1 receptor antagonists should be considered in the management of acute or chronic episodes of nausea and vomiting of pregnancy. (I-A)
9. Metoclopramide can be safely used as an adjuvant therapy for the management of nausea and vomiting of pregnancy. (II-2B)
10. Phenothiazines are safe and effective as an adjunctive therapy for severe nausea and vomiting of pregnancy. (I-A)
11. Despite potential safety concerns of ondansetron use in pregnancy, ondansetron can be used as an adjunctive therapy for the management of severe nausea and vomiting of pregnancy when other antiemetic combinations have failed. (II-1C)
12. Corticosteroids should be avoided during the first trimester because of possible increased risk of oral clefting and should be restricted to refractory cases. (I-B)
13. When nausea and vomiting of pregnancy is refractory to initial pharmacotherapy, investigation of other potential causes should be undertaken. (III-A)

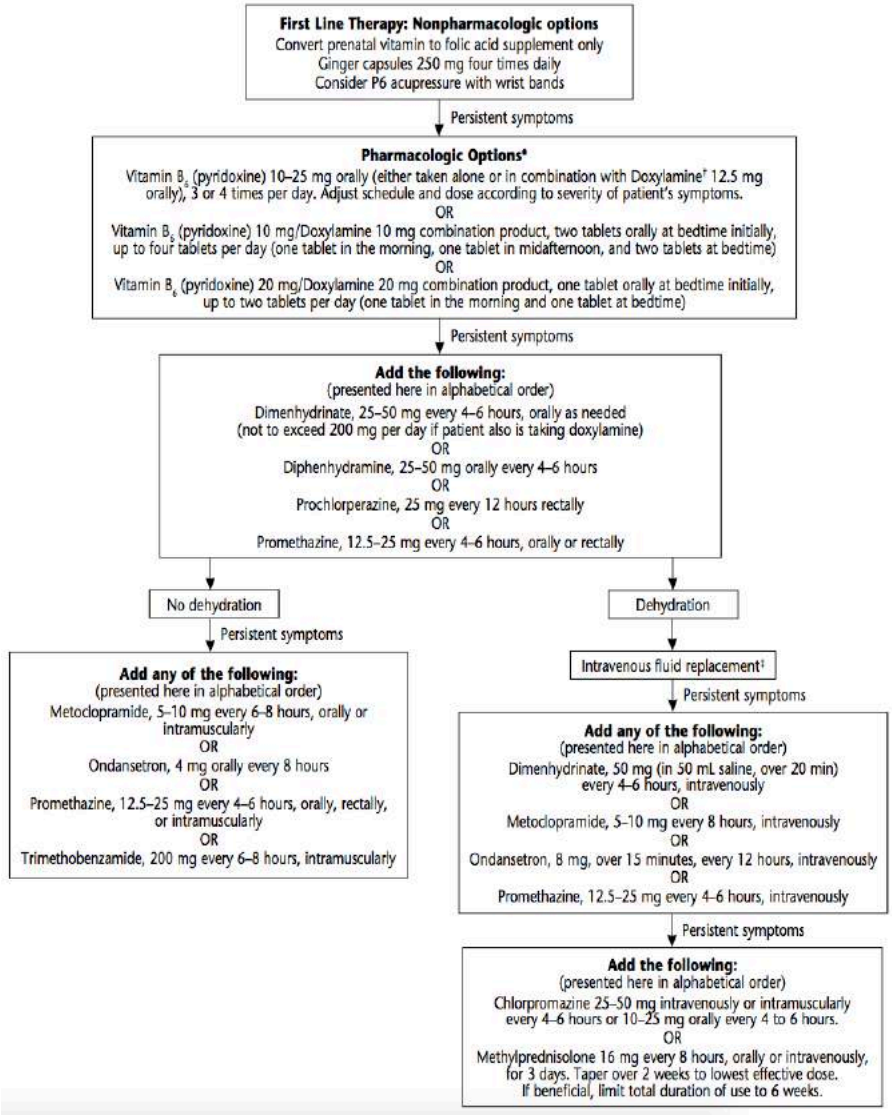
The primary literature used to support the acupressure recommendation is very weak. A review by Roscoe and Matteson 2002 showed conflicting results from seven methodologically flawed trials. The conclusion was that acupressure might (might not) be beneficial.

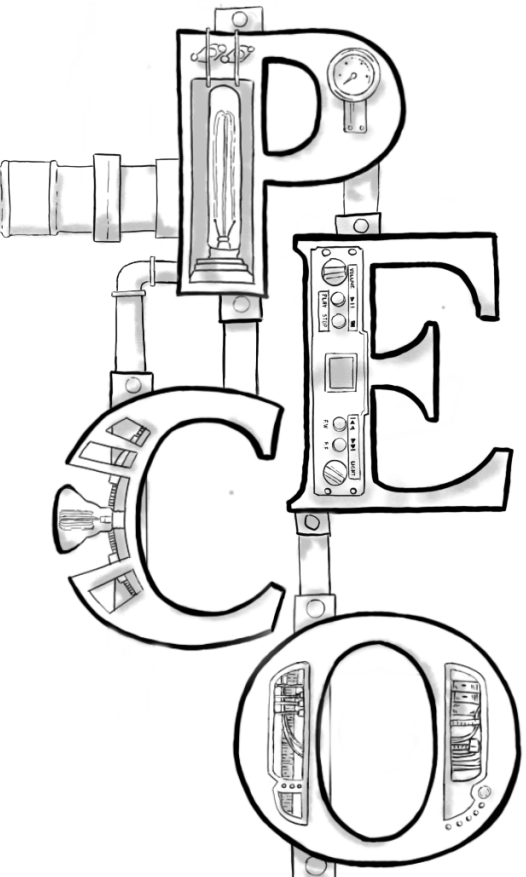
The American College of Obstetricians and Gynecologists (AGOC) has published a practice Bulletin (January 2018) on nausea and vomiting of pregnancy. It starts with non-pharmacologic options. Pharmacologic options include Vitamin B6 alone or in combination with doxylamine. The next step is adding dimenhydrinate or prochlorperazine or promethazine. The algorithm then dichotomizes into no dehydration or dehydration with persistent symptoms. It is this step when ondansetron is added as a possible treatment.

There is conflicting evidence on the fetal safety of ondansetron. An observational study concluded that ondansetron taken during pregnancy was not associated an important increased risk of fetal harm (Pasternak et al NEJM 2013).

Reference:

Huybrechts et al. Association of Maternal First-Trimester Ondansetron Use With Cardiac Malformations and Oral Clefts in Offspring. JAMA Dec 2018.





Population:
Pregnant women ages 12-55 years of age on Medicaid from three months prior to conception to one month postpartum. Infants were required to have Medicaid coverage for the first three months of life.

Exposure:
Pregnant women who filled at least one prescription for ondansetron duringthe first three months (12 weeks) of pregnancy.

- **Excluded:** Women who filled a prescription during the three months before the start of their pregnancy.

Comparison:
Pregnant women who filled a prescription for pyridoxine, promethazine, metoclopramide, or any of these alternative treatments.

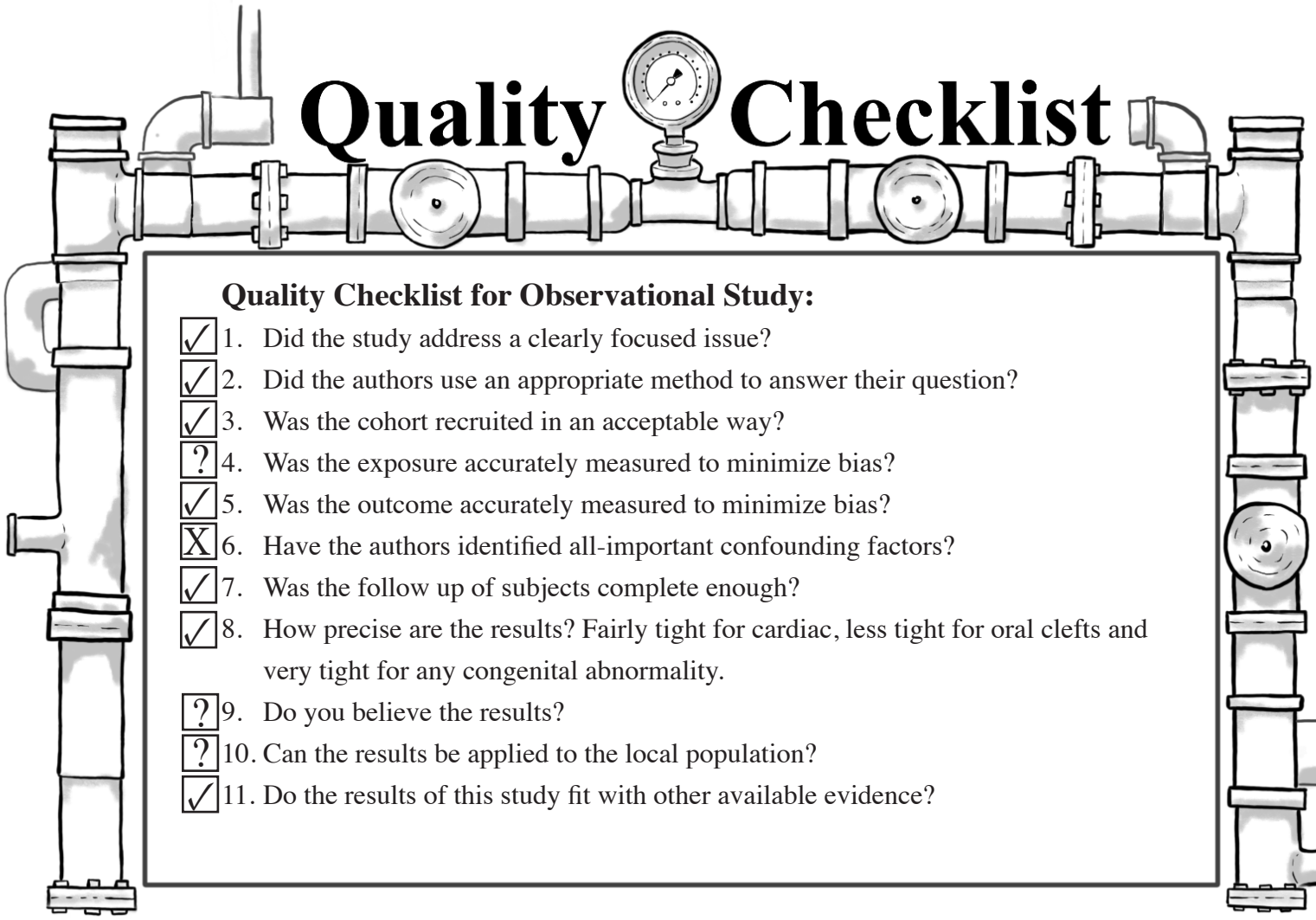
Outcomes:

- **Primary:** Presence of cardiac malformations and oral clefts diagnosed within 90 days after delivery.
- **Secondary:** Subgroups of cardiac malformations and oral clefts were evaluated along with congenital malformations overall.

Authors' Conclusion

"Among offspring of mothers enrolled in Medicaid, first-trimester exposure to ondansetron was not associated with cardiac malformations or congenital malformations overall after accounting for measured confounders but was associated with a small increased risk of oral clefts."

Quality Checklist



Quality Checklist for Observational Study:

- ☑ 1. Did the study address a clearly focused issue?
- ☑ 2. Did the authors use an appropriate method to answer their question?
- ☑ 3. Was the cohort recruited in an acceptable way?
- ? 4. Was the exposure accurately measured to minimize bias?
- ☑ 5. Was the outcome accurately measured to minimize bias?
- ☒ 6. Have the authors identified all-important confounding factors?
- ☑ 7. Was the follow up of subjects complete enough?
- ☑ 8. How precise are the results? Fairly tight for cardiac, less tight for oral clefts and very tight for any congenital abnormality.
- ? 9. Do you believe the results?
- ? 10. Can the results be applied to the local population?
- ☑ 11. Do the results of this study fit with other available evidence?

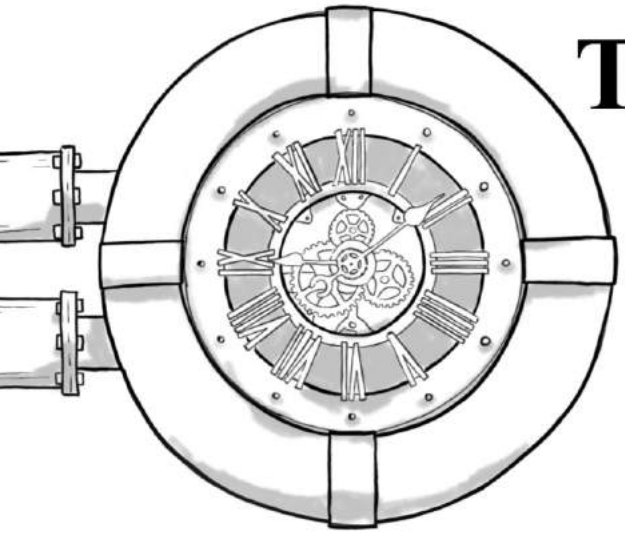
Case Outcomes

Key Results:
The data set included 1.8 million pregnancies from 1.5 million women. The mean age was 24 years and 5% were potentially exposed to ondansetron in the first trimester.

No increased risk cardiac malformation but a slight statistical increase in risk of oral clefts.

Primary Outcomes:

- Cardiac Malformation: Adjusted RR 0.99 (95% CI, 0.93 to 1.06)
- Oral Clefts: Adjusted RR 1.24 (95% CI, 1.03 to 1.48)
- Overall Malformations: Adjusted RR 1.01 (95% CI, 0.98 to 1.05)

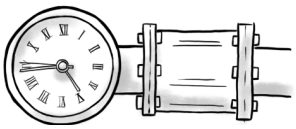


Time to Talk Nerdy

1) Observational Study:
We can only conclude an association and that some other confounders and co-variates could have been responsible for any difference observed. They did try to control for these issues with adjusted analyses and propensity scores.

2) Primary Outcomes:
There can be only one, primary outcome (Highlander). Unsure why they had three (cardiac, oral cleft and overall). Why not pick one and then have others as secondary outcomes? It makes me skeptical. I could not see where this was a pre-registered trial. Could it be that they originally set it up to demonstrate no increased risk of oral cleft and then when the data demonstrated a slight increase, they changed their primary outcome to all malformations?

3) Exposed Women:
They had different baseline characteristics than those women not exposed to ondansetron. Exposed women were more likely to smoke, have psychiatric diagnosis, neurologic condition, be white, and fill a prescription for other nausea and vomiting medication, psychotropics, steroids, and suspected teratogens.

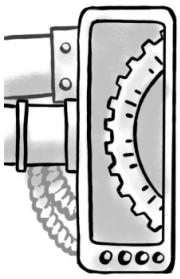


4) Conflicts of Interest:

There were multiple financial conflicts of interest declared by the authors. This does not make the data wrong, but it does make us more skeptical of their interpretations of the results.

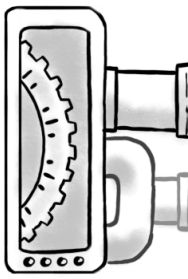
5) External Validity:

This dataset captured 1.8 million pregnancies but that was only 50% of all the pregnancies in the USA. They were Medicaid patients who may be different than those with other insurance. It also may not be representative of Canada and other countries with different healthcare systems.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' that there was a lack of association any congenital malformations or with cardiac malformations. They did observe a small increased risk of oral clefts associated with ondansetron exposure.



Clinical Application:

This study did show an association between oral clefts and the ondansetron exposed population in the 6 week to 12 week window. There is biologic plausibility, but I can't get past the fact that if oral clefts are more likely with no increased risk of ANY anomaly, is something then decreased? This doesn't make sense and would suggest these results occurred due to random chance or perhaps *p-hacking* in exploratory analyses.

Practically, nausea and vomiting in pregnancy is most prominent from 8-12 weeks gestational age and generally improves in the second trimester. Ondansetron may have a slightly increased risk of an oral cleft but if uncontrolled with first or second line treatments, it is reasonable to prescribe a short course of as needed or scheduled ondansetron. I advise my patients of the limited literature associating the oral clefts with ondansetron but also that unmanaged nausea, vomiting can lead to weight loss, electrolyte disturbances, and increased cortisol release which may have its own adverse effect on the pregnancy.

Case Resolution:

Your patient requested if any other medications are available that are safer and you advised her that metaclopromide is recommended to be utilized first. She responds well to an oral dose of 5mg so you discharge her with a prescription and advise her to return if her nausea and vomiting does not improve and she is unable to tolerate oral intake or is losing weight.

What Do I Tell the Patient?

Nausea and vomiting in pregnancy is common and can be difficult to treat. You need to be able to eat to grow a healthy baby. There are a few other options besides using ondansetron. We can try those first

Episode End Notes

If suffering from nausea and vomiting of pregnancy would you take ondansetron given the data on fetal malformations? #FOAMed #EBM

thesgem.com/2019/06/sgem25...

@DrJenGunter @feminemtweets @CAEP_Docs @ACEPNow @SOGCorg @acog @DFTBubbles @TREKKca @acemonline

57% Yes

23% No

20% Unsure

112 votes • Final results

Ondansetron and congenital anomaly

Pregnant women 12-55 y on Medicaid

Excl: exposure to known teratogen in 1st trimester, chromosomal abnormality

#paperinapic
@kirstychallen

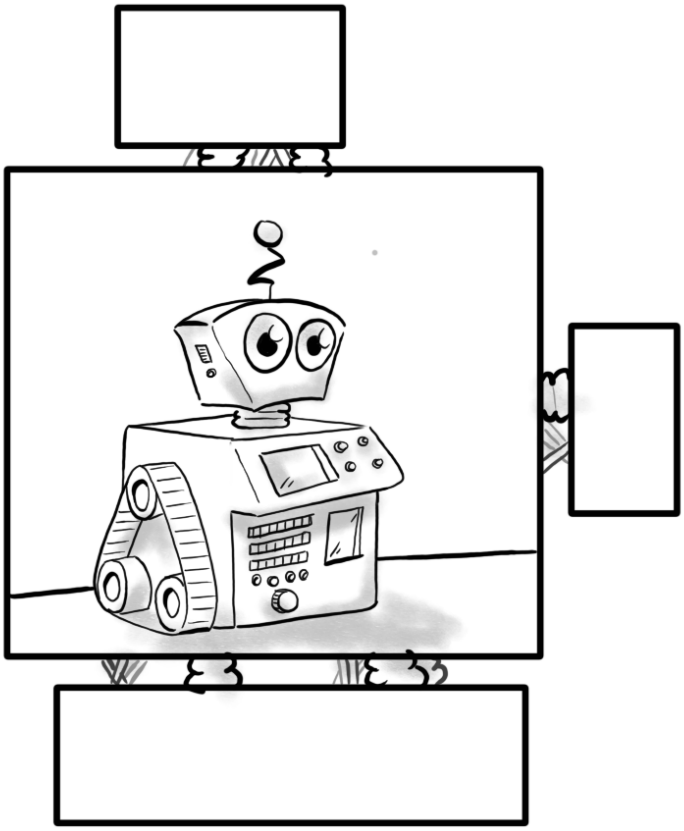
Ondansetron exposure n=88467 Prescription filled in first trimester		Comparison n=1727947
835 (0.9%)	**Cardiac malformations** Adjusted RR 0.99 (95% CI, 0.93 to 1.06)	14557 (0.8%)
124 (0.14%)	**Oral cleft** Adjusted RR 1.24 (95% CI, 1.03 to 1.48)	1921 (0.11%)
3277 (3.7%)	**Any congenital malformation** Adjusted RR 1.01 (95% CI, 0.98 to 1.05)	54174 (3.1%)

Huybrechts JAMA 2018;320:2429

SGEM #259

SGEM#

260



Quit Playing Game With My Heart:

Early Or Delayed Cardioversion For Recent Onset Atrial Fibrillation?

Clinical Question:

In adult patients who present with hemodynamically stable, symptomatic, recent-onset atrial fibrillation without signs of myocardial ischemia, is a wait-and-see approach, inferior to an immediate cardioversion strategy.

Bottom Line:

Both delayed and early cardioversion of acute onset atrial fibrillation achieve high rates of sinus rhythm in their patients at the time of a 4-week follow up.

Guest:

Dr. David Glaser, emergency physician from a community teaching hospital in Denver and faculty member for the annual Emergency Medicine and Acute Care course series. Dave is also residency-trained and boarded in internal medicine.

Case Overview

Case:

A 62-year-old woman with a history of hypertension presents with four hours of palpitations, described as a racing heart. Her vital signs: BP 148/90, HR 135, RR 16, T 37oC, O2 Sat 96%. Lungs are clear and cardiac exam shows a tachycardic and irregularly irregular rhythm without murmur. The ECG shows atrial fibrillation without ischemic changes. How do you proceed?

Background:

New-onset atrial fibrillation is a common occurrence in the emergency department, and practitioners differ on whether to take a primary rate-control approach versus a rhythm-control approach utilizing either electrical or pharmacological cardioversion. We are not going to settle this debate on this podcast.

In the United States especially, these patients are often admitted to the hospital with rate control and cardiology decides on cardioversion.

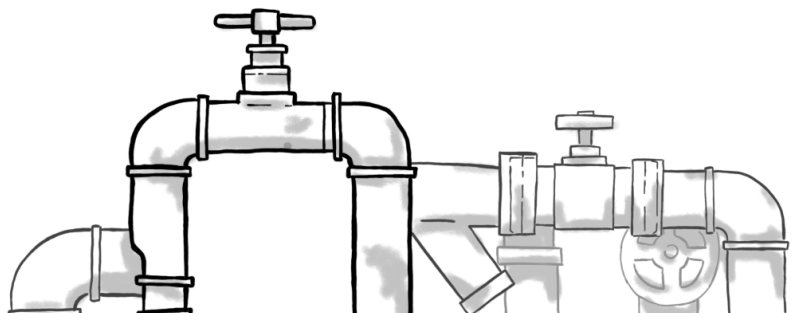
In Canada, these patients are often cardioverted and discharged home. We covered the Ottawa Aggressive Protocol on SGEM#88. That episode reviewed a 2010 cohort study done by the Legend of Emergency Medicine, Dr. Ian Stiell. The results from this observational study was 92% of patients were electrically cardioverted, 97% discharged home with 93% in sinus rhythm at discharge.

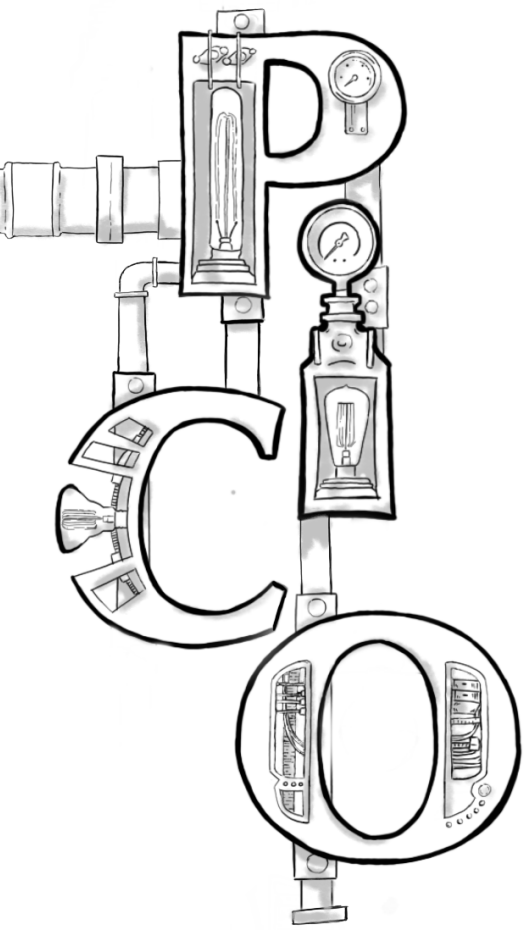
Things are starting to change in the US. A study published in AEM showed that implementing a new atrial fibrillation algorithm decreased hospital admissions from 80% to 67% and cardioversion increased from 17% to 21% (SGEM#222).

Clearly there is a difference in the management of patients with recent onset of rapid atrial fibrillation depending on your practice location.

Reference:

Pluymaeker et al. Early or Delayed Cardioversion in Recent-Onset Atrial Fibrillation. NEJM 2019





Population:
Population: Adults(18 years and older) who presented to the emergency department of 15 hospitals in the Netherlands (3 academic, 8 non-academic teaching, and 4 non-teaching hospitals) with hemodynamically stable, symptomatic, recent-onset (< 36 hours), first-detected or recurrent atrial fibrillation, without signs of myocardial ischemia or a history of persistent atrial fibrillation (defined as lasting > 48 hours).

- **Exclusions:** Signs of myocardial infarction on ECG, hemodynamically unstable, presence of pre-excitation syndrome, history of sick sinus syndrome, history of unexplained syncope, history of persistent AF (episode of AF lasting more than 48 hours), acute heart failure or deemed unsuitable for participation by attending physician.

Intervention:
Delayed cardioversion (*"wait-and-see"* approach). This was defined as administration of a rate-control medication, including intravenous or oral beta-blockers, nondihydropyridine calcium-channel blockers, or digoxin, given in increasing doses to obtain relief of symptoms and a HR of 110 BPM or less. Patients were discharged when their condition was judged to be clinically stable. A cardiology out-patient clinic visit was planned for the next day, as close as possible to 48 hours after the onset of symptoms. If atrial fibrillation was still present at this visit, patients were referred back to the emergency department for delayed cardioversion.

Comparison:
Early cardioversion. This was performed at the initial emergency department visit, either pharmacologically (and preferentially with flecainide) or electrically in those with contraindications to pharmacologic cardioversion and in patients with previous or current unsuccessful pharmacologic cardioversion. Patients were discharged when their condition was determined to be clinically stable.

- Patients with a high risk of stroke not already on anticoagulation had anticoagulation initiated before or immediately after cardioversion. Long-term anticoagulation was continued in accordance with current guidelines based on the patient's CHA2DS2-VASc score.

Outcomes:

- **Primary:** The presence of sinus rhythm on ECG recorded at the four week cardiology out-patient visit.
- **Secondary:** There were some differences between those in the publication and those listed on ClinicalTrials.gov (NCT02248753). Specifically, they did not mention duration of the index emergency department visit (which included a next-day visit as needed in the wait-and-see patients) in the trial registry, but it was mentioned the supplemental index. Here are the ones listed on the trial registry website:
  - Time to conversion to sinus rhythm (Holter monitor) in the intervention group only.
  - Quality of life (SF-36) measured at baseline, 4 weeks, 6 months, and 12 months
  - One-year follow-up of Major Adverse Cerebrovascular or Cardiovascular Events
  - Time to first recurrence of Atrial Fibrillation within 1 month
  - Total health care and societal costs within 1 year
  - Quality of Life (AFEQT) at baseline, 4 weeks, 6 months, and 12 months

Authors' Conclusion

"In patients presenting to the emergency department with recent-onset, symptomatic atrial fibrillation, a wait-and-see approach was noninferior to early cardioversion in achieving a return to sinus rhythm at 4 weeks."

Quality Checklist

Quality Checklist for Randomized Clinical Trials:

- [✓] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [?] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [?] 6. The teams in both groups were similar with respect to prognostic factors.
- [X] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [X] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All (team) patient-important outcomes were considered.
- [X] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:
There were 437 patients included in the study. The mean age was 65 years and 40% were female.

Sinus rhythm 91% in delayed vs. 94% In early cardioversion

Primary Outcomes:

The presence of sinus rhythm at four weeks occurred in 193 of 212 patients (91%) in the delayed-cardioversion group and in 202 of 215 (94%) in the early-cardioversion group (between-group difference, –2.9% (95% CI –8.2 to 2.2; P=0.005 for non inferiority.

Secondary Outcomes:

- **Time to conversion to sinus rhythm (Holter monitor) in the intervention group only:** In the wait-and-see cardioversion group, spontaneous conversion to sinus rhythm occurred in 150 of 218 patients (69%) within 48 hours of symptom onset.

- **Quality of life (SF-36) measured at baseline, 4 weeks, 6 months, and 12 months:** No data provided in document or supplemental material. However, they do provide AFEQT data at 4 weeks (see below).

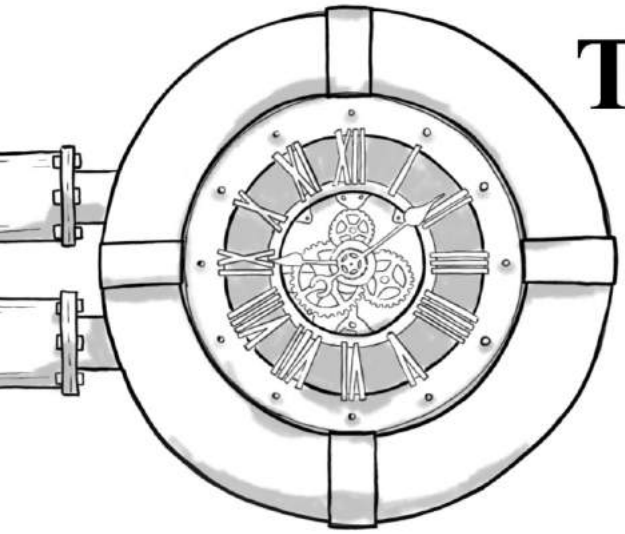
- **One-year follow-up of Major Adverse Cerebrovascular or Cardiovascular Events:** Cardiovascular complications were reported within four weeks after randomization (including during the index visit), 10 cardiovascular complications occurred in the delayed-cardioversion group (including one patient with ischemic stroke and three with acute coronary syndrome or unstable angina) and eight in the early-cardioversion group (including one patient with transient ischemic attack and three with acute coronary syndrome or unstable angina). There were no deaths during follow-up. One-year data is to be reported after one-year follow-up is completed. Both patients with a cerebral ischemic event were on anticoagulation at the time (one occurred 5d after spontaneous cardioversion having had dabigatran started on the index visit, and the other 10d after early electrical cardioversion, having started rivaroxaban on the index visit.)

- **Time to first recurrence of Atrial Fibrillation within 1 month:** Median time was 12 days (range, 3 to 18) in the delayed group and 8 days (range, 2 to 18) in the early group.

- **Total health care and societal costs within 1 year:** To be reported later.

- **Quality of Life (AFEQT) at baseline, 4 weeks, 6 months, and 12 months:** The mean AFEQT global scores were 72±19 in the delayed-cardioversion group and 73±19 in the early-cardioversion group (difference, –1 point; 95% CI, –5.3 to 4.0). The other data was not reported and it is unclear if it will be reported based on the supplemental information.

- **Total time at the emergency department:** The total median duration of the index visit (including delayed cardioversion if necessary) was 120 minutes (range, 60 to 253) in the delayed-cardioversion group and 158 minutes (range, 110 to 228) in the early-cardioversion group.The Hodges–Lehmann estimate for the difference in medians between the two groups was 30 minutes (95% CI, 6 to 51).



Time to Talk Nerdy

1) Selection Bias:

They don't explicitly state it in the manuscript that consecutive patients were recruited. Their published methods said; *"all eligible patients"*. However, two sites had 1,125 eligible patients with 954 not enrolled (366 declined, 361 had administrative reasons and 227 had spontaneous conversion). The other 13 sites had 266 patients added with no systematic screening process. Physicians could also exclude anyone they *"deemed unsuitable for participation"*. This call into question whether or not these were truly consecutive patients and could have introduced selection bias.

2) Unbalanced groups:

The delayed cardioversion group had nearly twice as many patients with a previous MI than the early cardioversion group (24% vs. 13%). It is unsure if this would have an impact on the results.

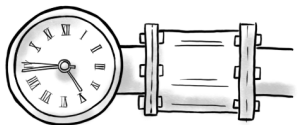
3) Power Calculation:

It seemed somewhat arbitrary having the difference being set at 10%. Is this what patients or clinicians would consider non-inferior?

> **"A difference of 10% is considered acceptable, given the natural variation in presence or durability of sinus rhythm, the generally low impact of the absence of sinus rhythm on the wellbeing of the patient and the availability of good treatment options should treatment be necessary."**

4) Secondary Outcomes:

There seemed to be some changes in the secondary outcomes. There were some differences than those listed on www.ClinicalTrials.gov (NCT02248753). Specifically, the originally published study design posted to the trial registry does not mention duration of index emergency visit duration but the supplemental index does mention this as a pre-specified secondary outcome.



Nearly everyone was discharged home following their initial emergency department visit (only 3 of 218 in the delayed-cardioversion group and 5 of 219 in the early cardioversion group were admitted).

Of the 335 patients who underwent telemetry monitoring, ~ 30 % had a documented recurrence of atrial fibrillation within 4 weeks of the index visit

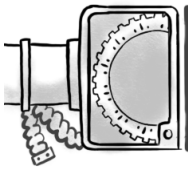
The other thing to recognize is that this secondary outcome, the prolonged LOS in the ED observed in the immediate cardioversion group might have been due either to their preference to perform pharmacologic cardioversion or to their local practice of having cardioversion performed by cardiology and anesthesiology rather than the emergency physician.

5) Intention-To-Treat (ITT) Analysis:

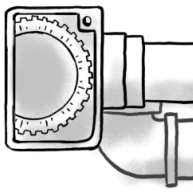
They performed an ITT analysis in this study. Normally we look for the authors to perform an ITT analysis as a quality indicator. That is because we are often reviewing a superiority trial.

The ITT principle is to include all randomized patients irrespective of post-randomization occurrences. This will tend to bias the results towards having no effect (accepting the null hypothesis) and is a more conservative approach. Using a per-protocol (PP) analysis can increase the effect size and bias the results to rejecting the null hypothesis.

Things are flipped around in a non-inferiority trial. Because ITT analyses bias towards the null this would more likely result in falsely accepting the null hypothesis and supporting the conclusion of non-inferiority. It is a quality indicator in non-inferiority studies to do a PP analysis to mitigate this potential bias.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the authors' conclusions.



Case Resolution:

The patient chooses immediate cardioversion, which is successfully performed using electrical cardioversion. Given her CHA2DS2-VASc score of 2, you begin a DOAC and discharge her from the ED 1.5 hours after arrival.

Clinical Application:

New-onset atrial fibrillation is a common occurrence. Patients can be managed either with immediate cardioversion or with rate-control and a recheck the next day and cardioversion at that time if they are in the minority who remain in atrial fibrillation. Immediate cardioversion obviates the need for a visit the next day, which may be unavailable in many systems and inconvenient for patients. A wait-and-see approach, however, obviates the need for many cardioversions.

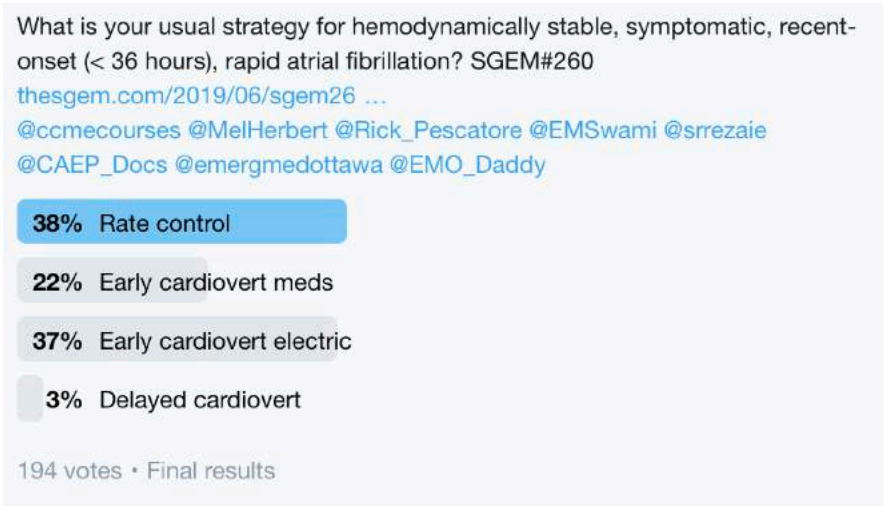
What Do I Tell the Patient?:

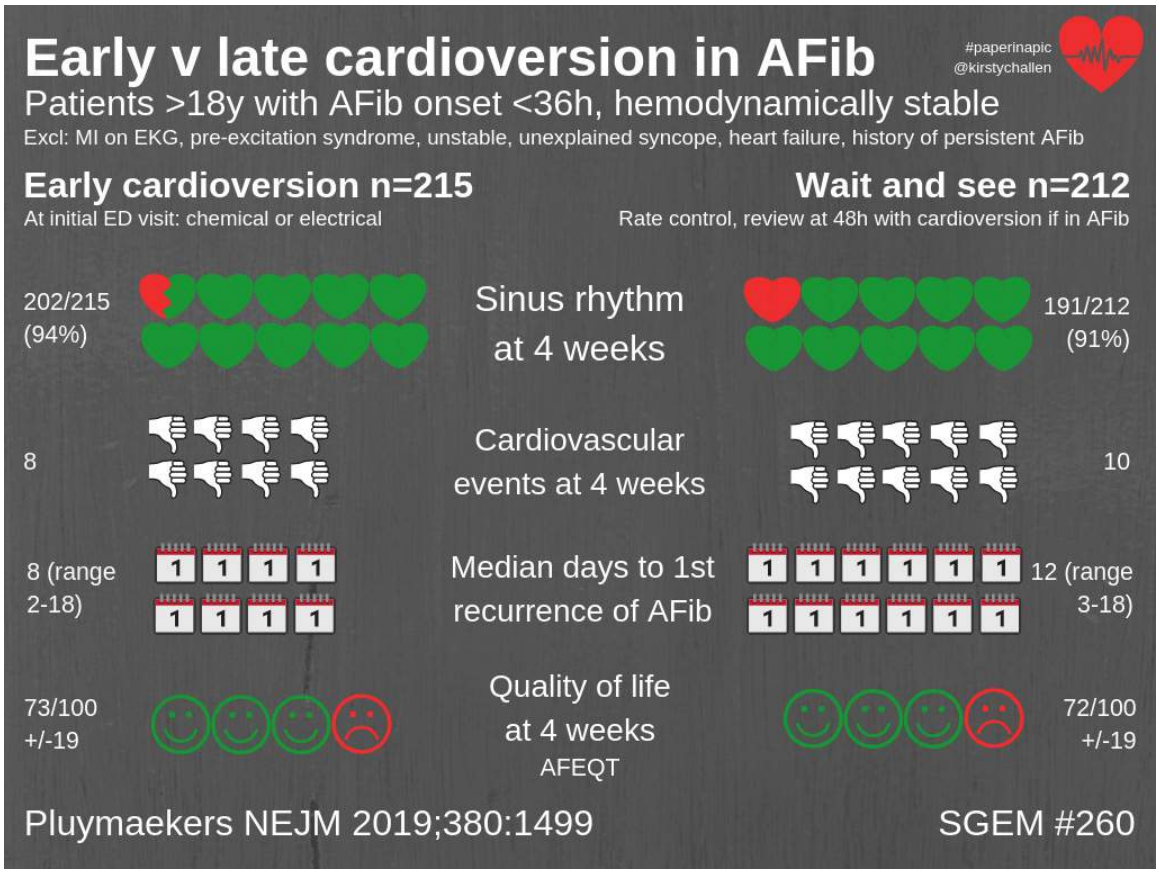
Because both approaches are reasonable you do some shared decision making. You tell your patient that returning them to normal heart rhythm is appropriate and could be achieved either with immediate cardioversion or during a next-day visit—if one can be arranged—and the latter approach would also give them the chance to spontaneously convert to a normal rhythm, which likely happens about two-thirds of the time. If they choose this approach, they will need to stay for a time to get their symptoms and heart rate controlled. Either way, for patients at high risk of stroke based on a CHA2DS2-VASc score >2, you begin anticoagulation. You tell your patient that regardless of the approach chosen, there's no need to admit them to the hospital.

Episode End Notes

Other FOAMed:

- EM Nerd: The Case of the Irregular Irregularity Continues
- REBEL EM: Wait-and-See or Early Cardioversion to Obtain Normal Sinus Rhythm?
- St. Emlyn's: Should we Rapidly Cardiovert AF in the ED?
- The Breach: Should We Cardiovert Everyone with Recent-Onset Fast AF?





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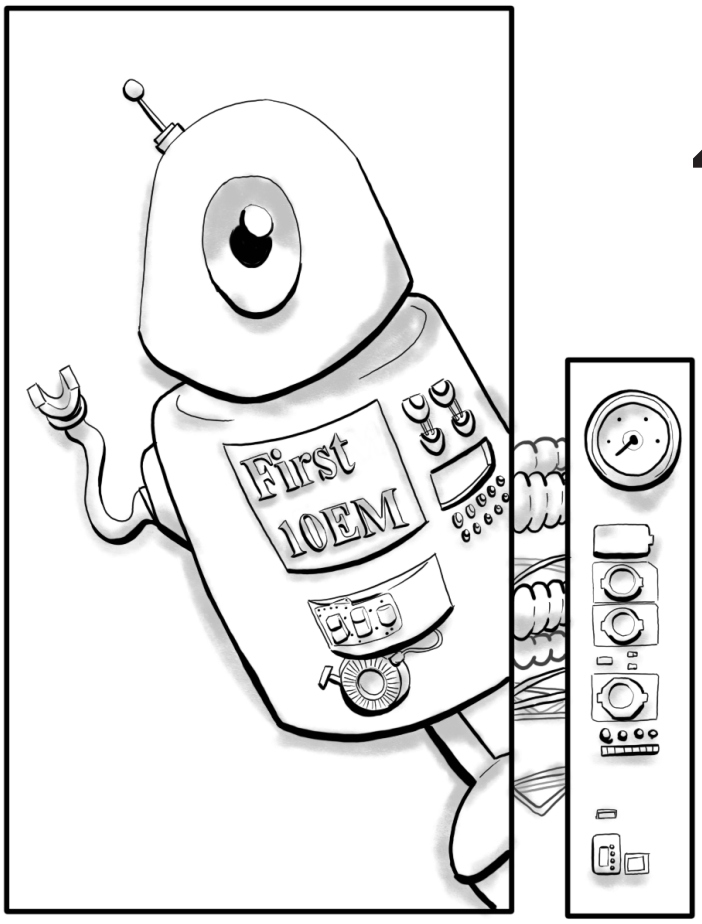


Cristal Ball to Assess Older Patients in the Emergency Department

Clinical Question:

To establish the predictive ability of individual and combined parameters in the cristal tool to predict short-term post-discharge death in an elderly population.

Bottom Line:

Accurate prognosis is an important component of medical advice, especially in elderly populations. The cristal tool, or its components, may help physicians open an important end of life discussion.

Guest:

Dr. Justin Morgenstern is an emergency physician and the Director of Simulation Education at Markham Stouffville Hospital in Ontario. He is the creator of the excellent #FOAMed project called First10EM.com

Case Overview

Case:

An 83-year-old man with early dementia, congestive heart failure (CHF), prior myocardial infarction (MI) with three stents, chronic obstructive pulmonary disease (COPD), and atrial fibrillation is transferred to the hospital because the nursing home thinks he might have a urinary tract infection (UTI). On arrival he is febrile, confused, with an alternating level of consciousness, tachycardia, and a rapid respiratory rate. According to the family with him, he had never had an end of life conversation with his physicians. You think such a conversation is important to guide your care in the next few hours, but you wonder if there is a tool to help you predict this gentleman's chance of dying during this visit or shortly after.

Background:

Discussion about goals of care at the end of life are an essential component of emergency medicine. Such discussions are aided by accurate prognosis, so that life-saving interventions can be provided to those in need, but hopefully without providing overly aggressive management in patients with little hope of recovering.

Such prognosis is difficult, especially in the chaotic and time-limited environment of an emergency department. An accurate decision tool would be welcomed. Unfortunately, available tools are only modestly accurate and have not been rigorously validated.1,2 Basic demographic data alone are insufficient to predict individual patient risk.3

Table 3 Proposed components of the Criteria for Screening and Triaging to Appropriate aLternative care tool to identify *end-of-life* status before hospital admission

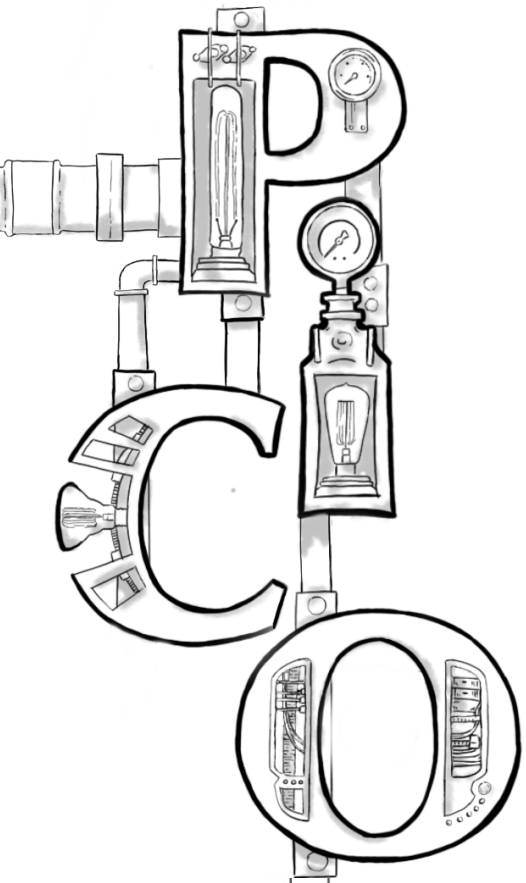
☐	Age ≥65[42 63 85 86] **AND**
☐	Being admitted via emergency this hospitalisation[96] (associated with 25% mortality within 1 year)
☐	**OR** Meets *2 or more of the following deterioration criteria on admission* [30 32 98]
☐	1. Decreased LOC: Glasgow Coma Score change >2 or AVPU=P or U
☐	2. Systolic blood pressure <90 mm Hg
☐	3. Respiratory rate <5 or >30
☐	4. Pulse rate <40 or >140
☐	5. Need for oxygen therapy or known oxygen saturation <90%[33]
☐	6. Hypoglycaemia: BGL[99]
☐	7. Repeat or prolonged seizures[99]
☐	8. Low urinary output (<15 mL/h or <0.5 mL/kg/h)[100]
☐	**OR** MEW or SEWS score >4 [46 79]
AND	**OTHER RISK FACTORS /PREDICTORS OF SHORT-MEDIUM-TERM DEATH**
☐	Personal history of active disease (at least one of): [18 25 42 46 63 101 102]
☐	Advanced malignancy
☐	Chronic kidney disease
☐	Chronic heart failure
☐	Chronic obstructive pulmonary disease
☐	New cerebrovascular disease
☐	Myocardial infarction
☐	Moderate/severe liver disease
☐	Evidence of cognitive impairment (eg, long term mental disorders, dementia, behavioural alterations or disability from stroke) [25 42 63 73 83]
☐	Previous hospitalisation in past year[10]
☐	Repeat ICU admission at previous hospitalisation[95] (associated with a fourfold increase in mortality)
☐	Evidence of **frailty**: *2 or more of these*: [42 46 63 85 89 98]
☐	Unintentional or unexplained weight loss (10 lbs in past year)[18 83 85]
☐	Self-reported exhaustion (felt that everything was an effort or felt could not get going at least 3 days in the past week)[85]
☐	Weakness (low grip strength for writing or handling small objects, difficulty or inability to lift heavy objects >=4.5Kg)[63]
☐	Slow walking speed (walks 4.5 m in ≥7 s)
☐	Inability for physical activity or new inability to stand[46 98]
☐	Nursing home resident/in supported accommodation[33 46]
☐	Proteinuria on a spot urine sample: positive marker for chronic kidney disease & predictor of mortality: >30 mg albumin/g creatinine[56 103]
☐	Abnormal ECG (Atrial fibrillation, tachycardia, any other abnormal rhythm or ≥5 ectopics/min, Changes to Q or ST waves[18 42 97]

ICU, intensive care unit; MEW, modified early warning.

Therefore, the purpose of this study was to validate a personalized risk score – the Criteria for Screening and Triaging to Appropriate Alternative Care (CriSTAL) – in older patients presenting to the emergency department.4

Reference:

Cardona et al. Prospective Validation of a Checklist to Predict Short-term Death in Older Patients After Emergency Department Admission in Australia and Ireland. AEM June 2019.



Population:
Patients over the age of 65 who stayed overnight in the emergency department or were admitted to hospital. The derivation population was from five hospitals in Australia, while the validation population was from a single hospital in Ireland.

- **Exclusions:** Patients with severe cognitive impairment, the critically ill, or those unable to communicate in English were all declared ineligible to participate unless they had a surrogate.

Intervention:
The CriSTAL score, and its various components.

Comparison:
None

Outcomes:

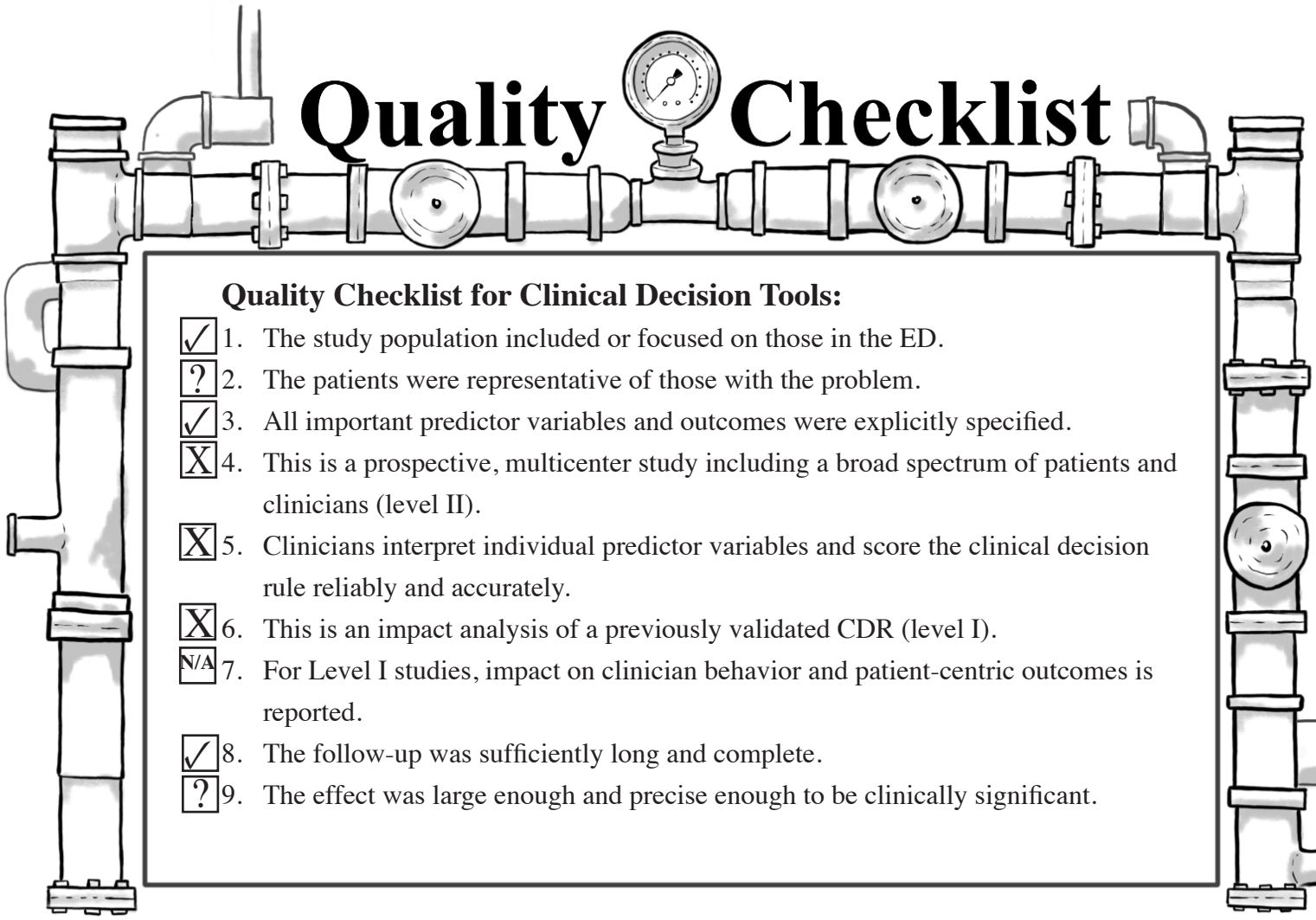
- **Primary:** Death within three months and CriSTAL's predictive ability.
- **Secondary:** Predictive ability for in-hospital death

This is an SGEMHOP episode and usually we have the lead author on the show. Unfortunately, we were not able to coordinate the recording times with being in three different countries. Our hope is the authors can respond to our nerdy questions on the blog.

Authors' Conclusion

"The modified CriSTAL tool (with CFS instead of Fried's frailty instrument) had good discriminant power to improve certainty of short-term mortality prediction in both health systems. The predictive ability of models is anticipated to help clinicians gain confidence in initiating earlier end-of-life discussions. The practicalities of embedding screening for risk of death in routine practice warrant further investigation."

Quality Checklist



Quality Checklist for Clinical Decision Tools:

- [✓] 1. The study population included or focused on those in the ED.
- [?] 2. The patients were representative of those with the problem.
- [✓] 3. All important predictor variables and outcomes were explicitly specified.
- [X] 4. This is a prospective, multicenter study including a broad spectrum of patients and clinicians (level II).
- [X] 5. Clinicians interpret individual predictor variables and score the clinical decision rule reliably and accurately.
- [X] 6. This is an impact analysis of a previously validated CDR (level I).
- [N/A] 7. For Level I studies, impact on clinician behavior and patient-centric outcomes is reported.
- [✓] 8. The follow-up was sufficiently long and complete.
- [?] 9. The effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:

The derivation cohort consisted of 1,143 patients, while the validation cohort was 349 patients. The mean age was in the late 70s and there was about a 50/50 split between males and females in both groups. About 5% of both groups had DNR orders or advanced directives.

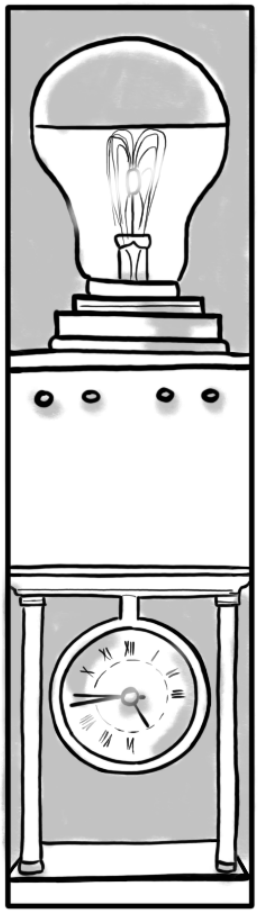
Three-month mortality was 10.1% in the Australian cohort and 12.9% in the Irish cohort.

Primary Outcomes:

CriSTAL tool predictive ability showed a statistical difference between deceased and survivors.

- **Australia:** 8.1 (95% CI = 7.7–8.6) vs. 5.7 (95% CI = 5.1–6.2)
- **Ireland:** 7.7 (95% CI = 6.9–8.5) vs. 5.7 (95% CI = 5.5–6.0)

Based on the area under the curve (AUC) statistics, an ideal cut-off of seven is suggested based on the Australian data, although six is suggested based on the Irish data.



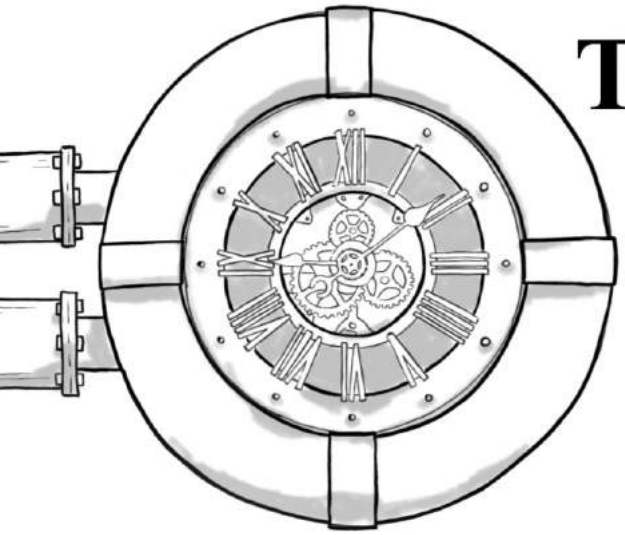
Data Supplement S1. Supplemental material.

Table S1. Accuracy of CriSTAL short-term death predictions: sample cut-off probabilities for both Australian and Irish final models including frailty as CFS (Rockwood)

Predictive probability cut-off Australia (short-term death)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
0.74*	4.9	99.8	66.7	91.9
0.50	14.8	99.4	70.6	92.7
0.25	32.1	95.8	41.3	93.3
0.10	66.7	80.3	23.8	96.3
0.05	84.0	56.2	15.0	97.4
Predictive probability cut-off Ireland (short-term death)	**Sensitivity (%)**	**Specificity (%)**	**PPV (%)**	**NPV (%)**
0.62*	2.2	100.0	1000.0	87.4
0.50	4.4	100.0	100.0	87.6
0.25	42.2	89.1	36.5	91.2
0.10	84.4	54.6	21.6	96.0
0.05	91.1	33.6	16.9	96.2

** available probability closest to 75% in this patient sample*

Individual components of the score with significant odds ratios for death from the derivation and validation cohort with both frailty scales included: advanced malignancy, nursing home residence, abnormal oxygen saturation (<90%), and frailty.



Time to Talk Nerdy

1) Exclusions:

Three key groups of elderly patients were eliminated from this study. Those with severe cognitive impairment and no available surrogate, critically ill patients, as well as those patients discharged the same day from the emergency department. This represented more than 60% of patients from the Australian cohort (Figure 1). This may have impacted the study results.

2) Inter-Rater Reliability:

There was no measure of inter-rater reliability done in this trial. Given that the difference in the average score between those who died and those who didn't was only about two points, a small error in scoring could have big implications.

3) Nurses vs. Medical Students:

Two different groups who were purpose-trained for doing the assessments. It was not emergency medicine residents or attending (staff) physicians. No data was given comparing the scores by nurses to the scoring by the medical students.

4) Overfit:

There was a different cut-off for the score in the Australian and Irish populations. Also, the authors used two different frailty scores and suggest two different cut-offs for the score. Given this increase in the researcher degrees of freedom this might lead to the data being over-fit for the specific populations.

5) Derivation and Validation:

The derivation study was performed in Australia while the validation was done in Ireland. This was explained in the method section that an Irish group expressed interest in the utility of the tool in their health system after seeing the original publication. We are unsure if it would be valid in any other health care system.

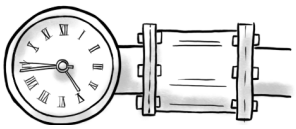
6) Sensitivity/Specificity:

It was suggested to have a cut-off of seven in the Australian group, statistics we are used to, like sensitivity and specificity were not presented in the results section. Some of the data can be found in the supplemental material and in the discussion. We were curious as to why this was not presented in the result section?

7) Lower Accuracy:

A sentence in the methods section got both of our attention and we need help understanding.

> ***"During the internal validation in Australia using logistic regression directly with CriSTAL score as a summary measure yielded an AUROC of lower accuracy than the model using all the explanatory variables that make up the tool. In the external validation on Irish data, rather than using the summary score we modeled only the association of the CriSTAL components with the outcome, which enhances the utility for clinicians."***



8) Clinical Significant vs. Statistical Significance:

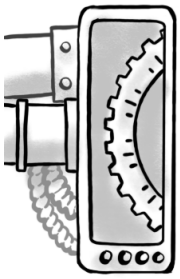
Although there was clearly a statistical significance in the mean score between those who died and those who didn't, looking at figure 2, there seems to be a very large overlap between the two groups. Does this score actually discriminate well enough to be helpful clinically?

9) Clinician Gestalt:

In order to be helpful clinically, we like to see decision tools that improve on the accuracy of clinician gestalt. It would have been great to have data on this tool as compared to physician judgement or gestalt.

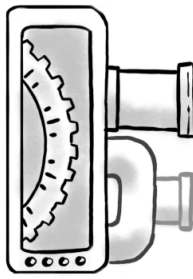
10) External Validity:

The tool was derived in five Australia sites and validated in one site in Ireland. We are unsure of the external validity to other health care systems like Canada and the USA.



Comment on Authors' Conclusion Compared to SGEM Conclusion:

Although we agree that the modified CriSTAL tool (with CFS instead of Fried's frailty instrument) was statistically able to distinguish between elderly patients who survived or died by 30 days, we are not sure whether this tool will help clinically.



Clinical Application:
We are unable to apply the CriSTAL tool at this time We would like to see further trials looking at its validation, implementation, and comparing it to clinician gestalt.

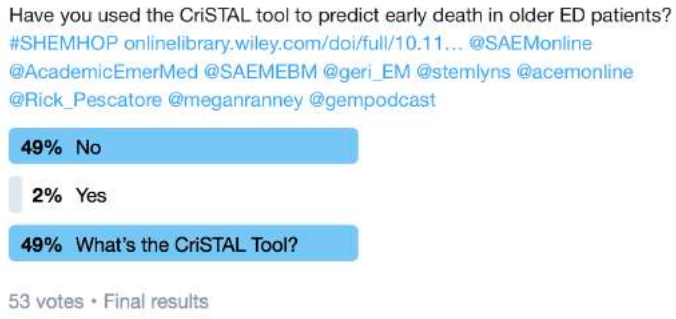
Case Resolution:
You open up a conversation about end of life care with the patient and their family. It is the first time they have been approached about the topic.

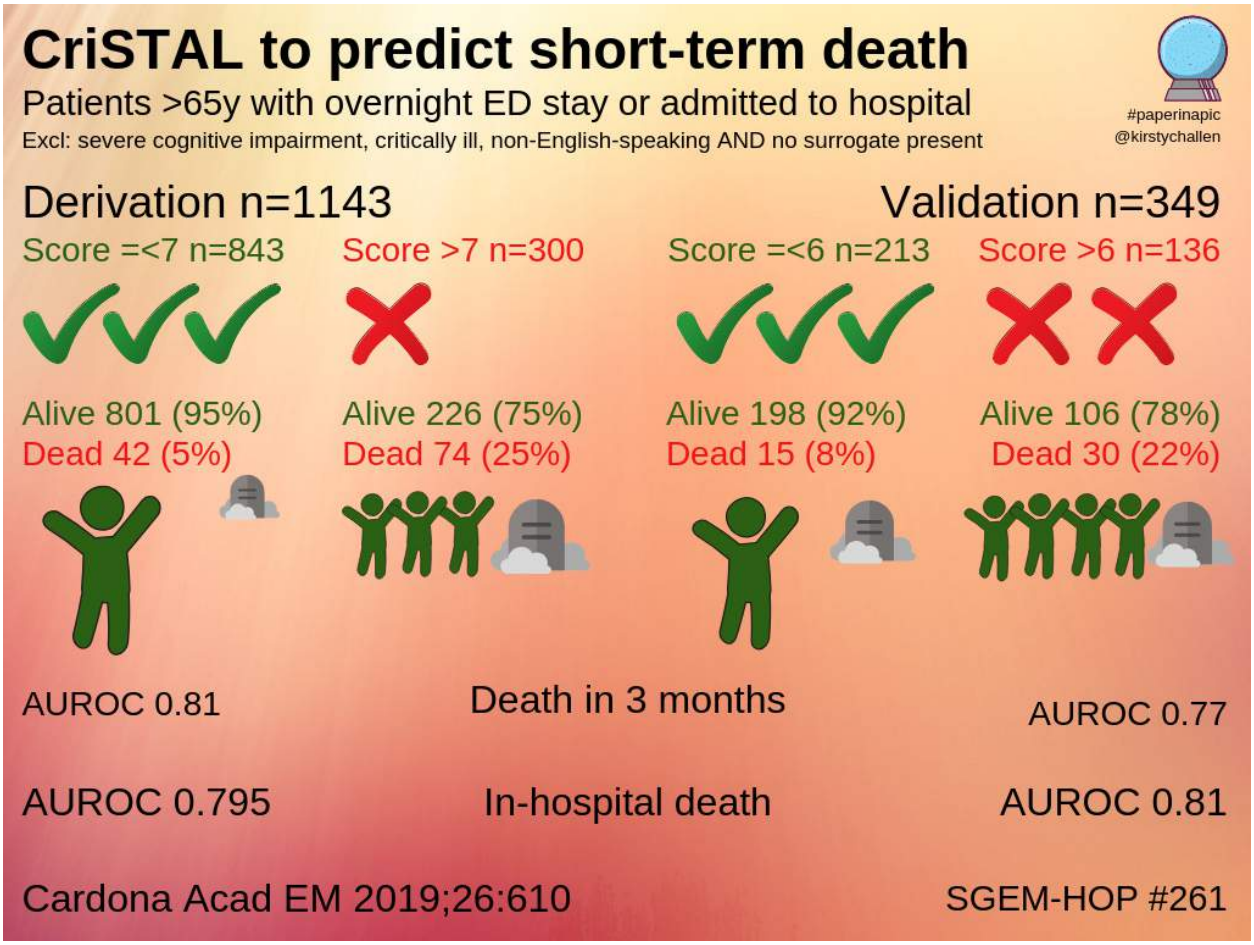
What Do I Tell My Patient?
You probably have an infection in your urine. Given your age and all of your other medical conditions it could be serious. By serious I mean you could die from the infection. Have you ever thought about or talked about end of life care? We want to make sure we respect your wishes. If your heart or lungs stopped would you like to do CPR, put a tube down your throat to help you breathe, shock your heart if necessary and admit you to an intensive care unit? Or would you like us to allow a natural death?

Episode End Notes

References:

1. Lamba S, Nagurka R, Murano T, Zalenski RJ, Compton S. Early identification of dying trajectories in emergency department patients: potential impact on hospital care. J Palliat Med 2012;15:392–5.
2. McCabe JJ, Kennelly SP. Acute care of older patients in the emergency department: strategies to improve patient outcomes. Open Access Emerg Med 2015;7:45–54.
3. Kennedy C, Brooks-Young P, Brunton Gray C, et al. Diag- nosing dying: an integrative literature review. BMJ Support Palliat Care 2014;4:263–70.
4. Yourman LC, Lee SJ, Schonberg MA, Widera EW, Smith AK. Prognostic indices for older adults: a systematic review. JAMA 2012;307:182–92.





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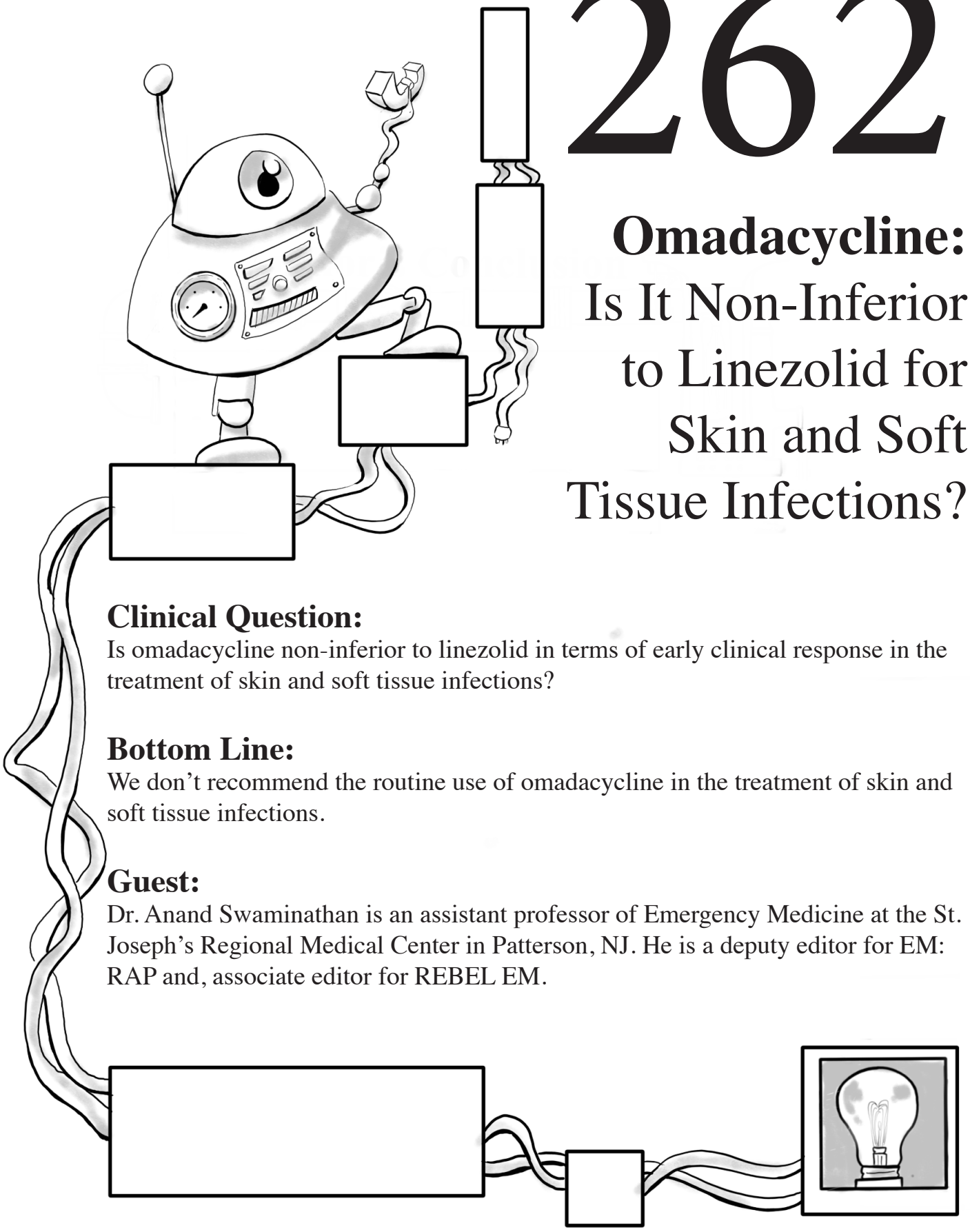
Omadacycline: Is It Non-Inferior to Linezolid for Skin and Soft Tissue Infections?



Clinical Question:

Is omadacycline non-inferior to linezolid in terms of early clinical response in the treatment of skin and soft tissue infections?

Bottom Line:

We don't recommend the routine use of omadacycline in the treatment of skin and soft tissue infections.

Guest:

Dr. Anand Swaminathan is an assistant professor of Emergency Medicine at the St. Joseph's Regional Medical Center in Patterson, NJ. He is a deputy editor for EM: RAP and, associate editor for REBEL EM.

Case Overview

Case:

A 22-year-old woman presents with redness and swelling of her left lower leg from the top of the ankle to about midway up the calf on the medial surface of the leg. Her skin is warm with mild tenderness, no fluctuance and no crepitus. She is well appearing without a fever and she has no prior medical history or allergies. You are about to write her a prescription for cephalexin when you suddenly remember reading about a new antibiotic that recently became available for skin and soft tissue infections called omadacycline

Background:

We have covered cellulitis and abscesses a number of times on the SGEM (SGEM 13, 131, 156, 164, 209). Often the guest skeptic on these shows is the amazing Physician Assistant, Chip Lange from TOTAL_EM Podcast and the Practical POCUS course.

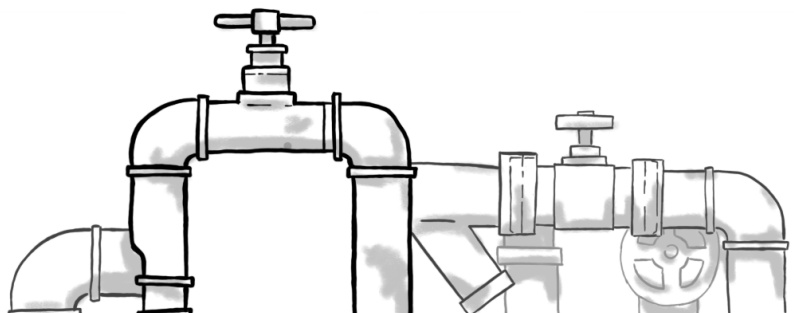
The production and release of new antibiotics is rare and should be celebrated by clinicians. As antibiotic resistance continues to mount, our options narrow and, in turn, our patients suffer.

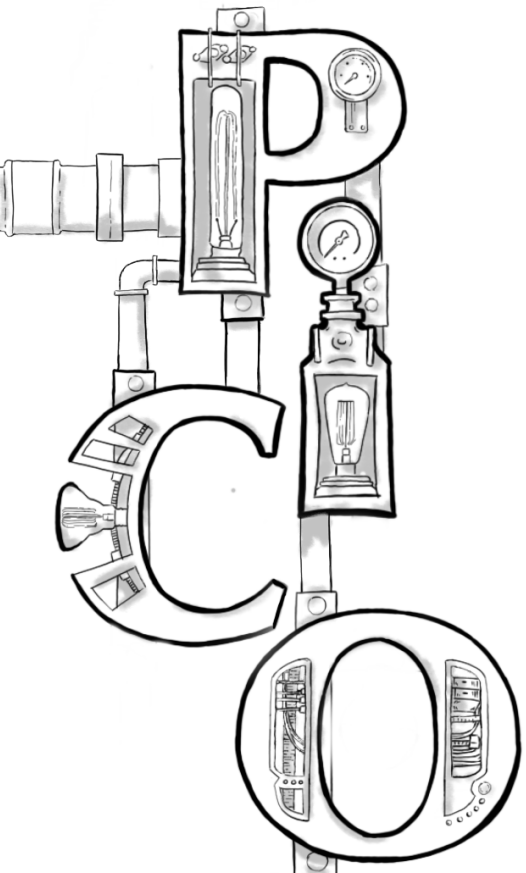
Recently, the NEJM published two articles on a new antibiotic that was recently FDA approved, omadacycline. The articles compared omadacycline to moxifloxacin in the treatment of community acquired pneumonia (CAP) and to linezolid in the treatment of skin and soft tissue infections. Both studies yielded promising results for the new drug which should be cause for excitement.

However, significant biases, methodological flaws and poor selection of comparator treatments should temper our excitement.

Reference:

O'Riordan W et al. Omadacycline for Acute Bacterial Skin and Skin-Structure Infections. NEJM Feb 2019





Population:
Patients older than 17 years with a skin infection (cellulitis, erysipelas or major abscess)

- **Exclusions:** Patients with one or more doses of systemic antibiotics prior to presentation, topical antibacterial agent within 72 hours, infections that would require more than 14 days of treatment, chronic skin lesions, ulcers or wounds and patients with any liver or renal insufficiency or immunocompromise

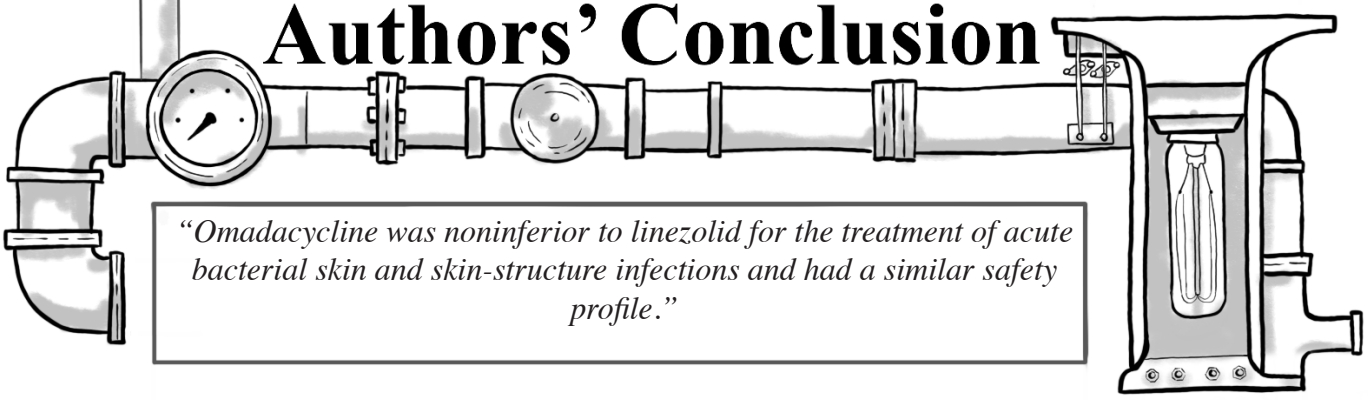
Intervention:
Omadacycline 100 mg IV Q12 for two doses then 100 mg Q24 for at least two more days with the option to transition to 300 mg Q24 for 7-14 days total

Comparison:
Linezolid 600 mg IV Q12 with the option to transition to 600 mg Q12 orally for 7-14 days after at least three days of IV

Outcomes:

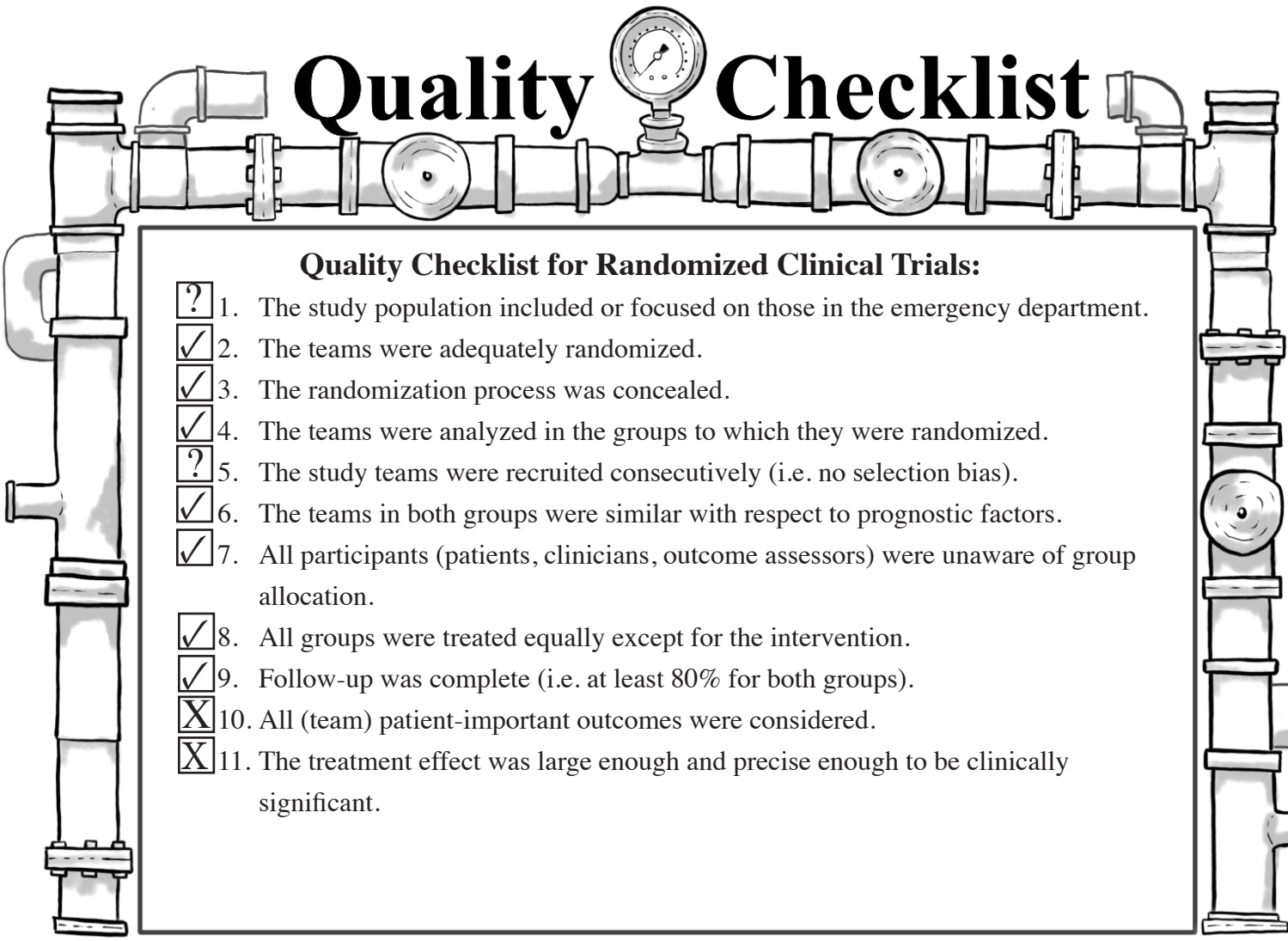
- **Primary:** Early clinical response defined as survival with a reduction in lesion size of at least 20% at 48-72 hours after the first dose
- **Secondary:** Clinical response post-treatment(at 7-14 days)

Authors' Conclusion



"Omadacycline was noninferior to linezolid for the treatment of acute bacterial skin and skin-structure infections and had a similar safety profile."

Quality Checklist



Quality Checklist for Randomized Clinical Trials:

- [?] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The teams were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The teams were analyzed in the groups to which they were randomized.
- [?] 5. The study teams were recruited consecutively (i.e. no selection bias).
- [✓] 6. The teams in both groups were similar with respect to prognostic factors.
- [✓] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
- [✓] 8. All groups were treated equally except for the intervention.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [X] 10. All (team) patient-important outcomes were considered.
- [X] 11. The treatment effect was large enough and precise enough to be clinically significant.

Case Outcomes

Key Results:

They enrolled 655 patients from 55 sites in the US, Peru, South Africa and multiple countries in Europe. The median age was 47 years old and 2/3 were men. It was about 33% wound infection, 38% cellulitis or erysipelas and 29% major abscess.

Omadacycline was non-inferior to linezolid

Subgroup	Omadacycline	Linezolid	Percentage-Point Difference (95% CI)
	no. of events/total no. (%)		
Modified ITT population			
Early clinical response	268/316 (84.8)	266/311 (85.5)	−0.7 (−6.3 to 4.9)
Investigator-assessed clinical response at EOT	281/316 (88.9)	272/311 (87.5)	1.5 (−3.6 to 6.6)
Investigator-assessed clinical response at PTE	272/316 (86.1)	260/311 (83.6)	2.5 (−3.2 to 8.2)
Clinical per-protocol population			
Early clinical response	276/298 (92.6)	278/294 (94.6)	−1.9 (−6.1 to 2.1)
Investigator-assessed clinical response at EOT	271/278 (97.5)	264/273 (96.7)	0.8 (−2.2 to 3.9)
Investigator-assessed clinical response at PTE	259/269 (96.3)	243/260 (93.5)	2.8 (−1.0 to 6.9)
Patients with cellulitis or erysipelas in the modified ITT population			
Early clinical response	97/123 (78.9)	99/118 (83.9)	−5.0 (−14.9 to 4.9)
Investigator-assessed clinical response at PTE	112/123 (91.1)	100/118 (84.7)	6.3 (−2.0 to 15.0)
Patients with wound infection in the modified ITT population			
Early clinical response	91/102 (89.2)	92/104 (88.5)	0.8 (−8.2 to 9.7)
Investigator-assessed clinical response at PTE	83/102 (81.4)	84/104 (80.8)	0.6 (−10.3 to 11.4)
Patients with major abscess in the modified ITT population			
Early clinical response	80/91 (87.9)	75/89 (84.3)	3.6 (−6.7 to 14.2)
Investigator-assessed clinical response at PTE	77/91 (84.6)	76/89 (85.4)	−0.8 (−11.5 to 10.0)

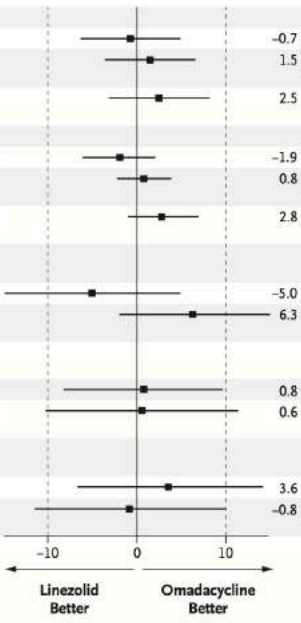


Figure 2. Forest Plot of Primary and Secondary End Points.

The percentage-point difference is for omadacycline minus linezolid. The 95% confidence interval (CI) is based on the Miettinen and Nurminen method without stratification. EOT denotes end of treatment, ITT intention to treat, and PTE post-treatment evaluation.

Primary Outcomes:

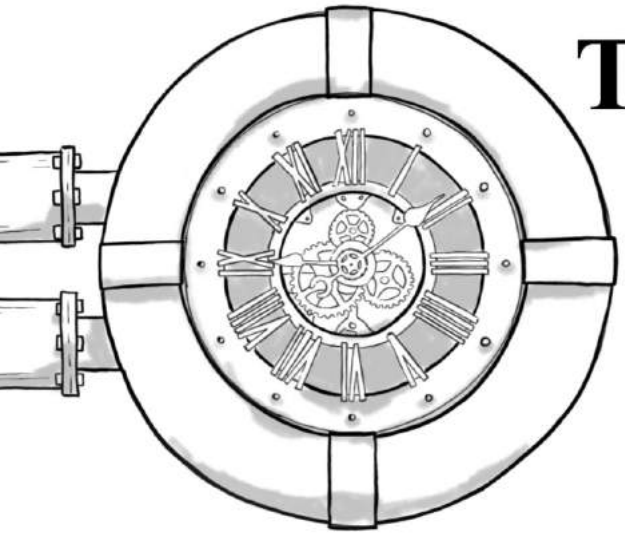
Early clinical response defined as survival with a reduction in lesion size of at least 20% at 48-72 hours after the first dose

- mITT 84.8% in omadacycline vs 85.5% in linezolid. Diff 0.7% 95% CI -6.3 to 4.9
- Noninferiority of omadacycline

Secondary Outcomes:

Clinical response post-treatment (at 7-14 days)

- mITT 86.1% vs 83.6% Diff 2.5% (95% CI -3.2 to 8.2)
- Noninferiority of omadacycline



Time to Talk Nerdy

1) Funding:

Our current research paradigm involves funding from pharma. Just because a study is funded by industry does not make the results invalid, but it should make us more skeptical. Here is what they said in the methods section: *"Paratek Pharmaceuticals designed and conducted the trial and prepared the statistical analysis plan. Analyses were performed and data interpreted by Paratek Pharmaceuticals in conjunction with the authors. "*

They went on to say: *"All the authors vouch for the integrity, completeness, and accuracy of the data and analyses and assume responsibility for the fidelity of the trial to the protocol and statistical analysis plan, which are available at NEJM.org."*

However, the next sentence was "*A medical writer who was supported by the sponsor assisted with preparation of a first draft of the manuscript."* Where do you think their loyalties lie, to science or their employer?

2) Selection Bias:

There may have been selection bias in this and the CAP study. They did not state that patients were enrolled consecutively in either study. It's unclear how many patients met criteria but were not approached.

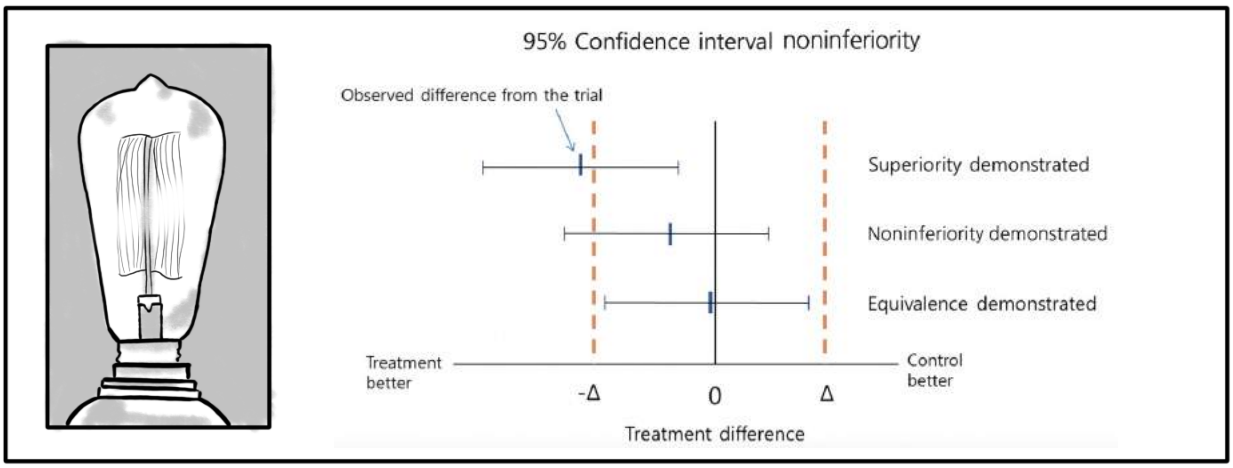
This is obvious when you see that in the CAP study, only 774 patients were enrolled over 14 months across 86 sites (< 1 patient/site/month) and only 627 patients enrolled in the SSTI study over 12 months across 55 sites (1.2 patients/site/month).

The average ED sees far more of these presentations per week and, thus, many patients were never approached, i.e. the study group seems to have been cherry-picked. Additionally, in the CAP study, there was a 1% absolute difference in mortality. I would be reluctant to prescribe a drug that was no worse than a standard treatment if it had any increase in mortality.

3) Non-Inferiority Trials:

There are a few things we wanted to mention regarding this type of trial design. Most people understand that a superiority trial is attempting to demonstrate some treatment is better than another by some pre-determined margin.

A non-inferiority trial does not mean something is equal or equivalent. It is impossible to show something is equal because there will always be small changes between two groups if sample sizes are large enough. But there are equivalent trial designs to say things are within a pre-specified range.



Non-inferiority trials are designed to show that some treatment is not worse than another treatment. Researchers can choose a non-inferiority trial design for a number of reasons including ethical (unethical to expose patient to a placebo), cost (less expensive due to smaller sample size) and safety.

Pharmaceutical companies have used the non-inferiority trial design to sell their new (usually more expensive drug) not based on efficacy but rather on something like ease of use. Here is what we could find on the cost of antibiotics:

- **Cephalexin** (500mg) is $10 for 40 tabs = $1.60/day
- **Linezolid** (600mg) is $50 for 20 tabs = $5/day
- **Omadacycline** (150mg) is $1,245.65 for 6 tabs (taking 300mg/day) = $415.22/day

One of the key elements of a non-inferiority trial is setting the margin considered *"non-inferior"*. In this trial looking at omadacycline they set the margin at 10% based on historical data from controlled trials comparing antibacterial drugs with non-antibacterial treatments.

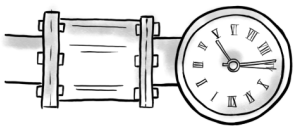
Why not set the margin at antibiotic treatment vs. antibiotic treatment? If they had set their non-inferiority margin at say 5% would that change the results and interpretation?

4) ITT vs. PP Analysis:

A quality indicator for most RCTs is to look and see if the authors did an ITT. Remember that an ITT looks at all the patients immediately post randomization regardless of the treatment they received. There can be cross over after randomization, but the patients always get analyzed into their original group allocation. This is a conservative way to view the results of in a superiority trial design.

In contrast, PP analysis looks at the actual treatment the patient got. This analysis can over-estimate the point estimate of any effect and could lead to falsely rejecting the null hypothesis of no difference. Again, this is for superiority trials.

However, it is exactly the opposite in non-inferiority trials. You want to see a PP analysis because it would be the conservative approach. It maximizes the differences while the ITT would move you

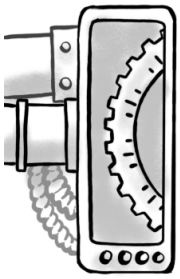


towards less effect and accepting the null and therefore concluding non-inferiority. This can be a tricky concept to get your head around and there is a great video by SketchyEBM you can watch on YouTube.

In this trial they did twelve kind of analysis of various subgroups using mITT and various PP analyses. Nine out of the twelve analyses showed non-inferiority while three did not. Again, if they changed their non-inferiority margin to 5% it looks like only five out of twelve subgroups would be considered non-inferior.

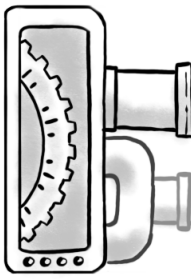
5) Why Linezolid?:

This is not my go to drug in skin and soft tissue infections. Why did they go with linezolid? Was it because of cost comparison or availability in all countries? It just seems like a strange choice. Why not cephalexin, Bactrim, Clindamycin or Doxycycline?



Comment on Authors' Conclusion Compared to SGEM Conclusion:

The authors found that omadacycline is non-inferior to linezolid for the treatment of SSTI in terms of early clinical response at 48-72 hours. However, the study's design has numerous flaws and, omadacycline is not cheaper, easier to use or has less side effects than standard treatment.



Clinical Application:

The usual first line treatment for skin and soft tissue infections should continue to be cephalexin plus or minus trimethoprim-sulfamethoxazole (TMP-SMX) for patients at risk for methicillin-resistant staphylococcus aureus (MRSA).

Case Resolution:

You decide to go with your first thoughts and prescribe the patient cephalexin 500mg four times a day for seven days and schedule a return visit in three days to check out how the patient is doing.

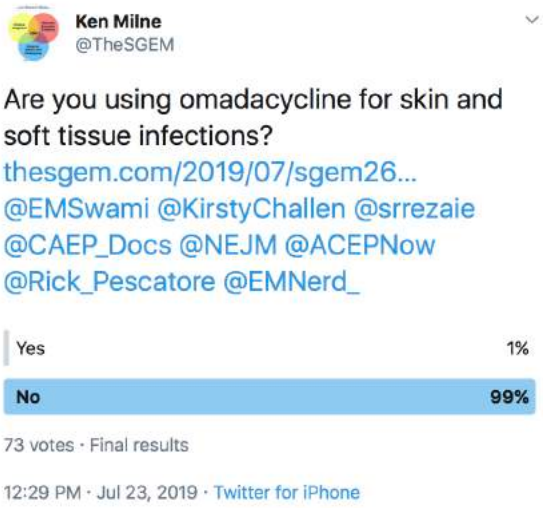
What Do I Tell My Patient?

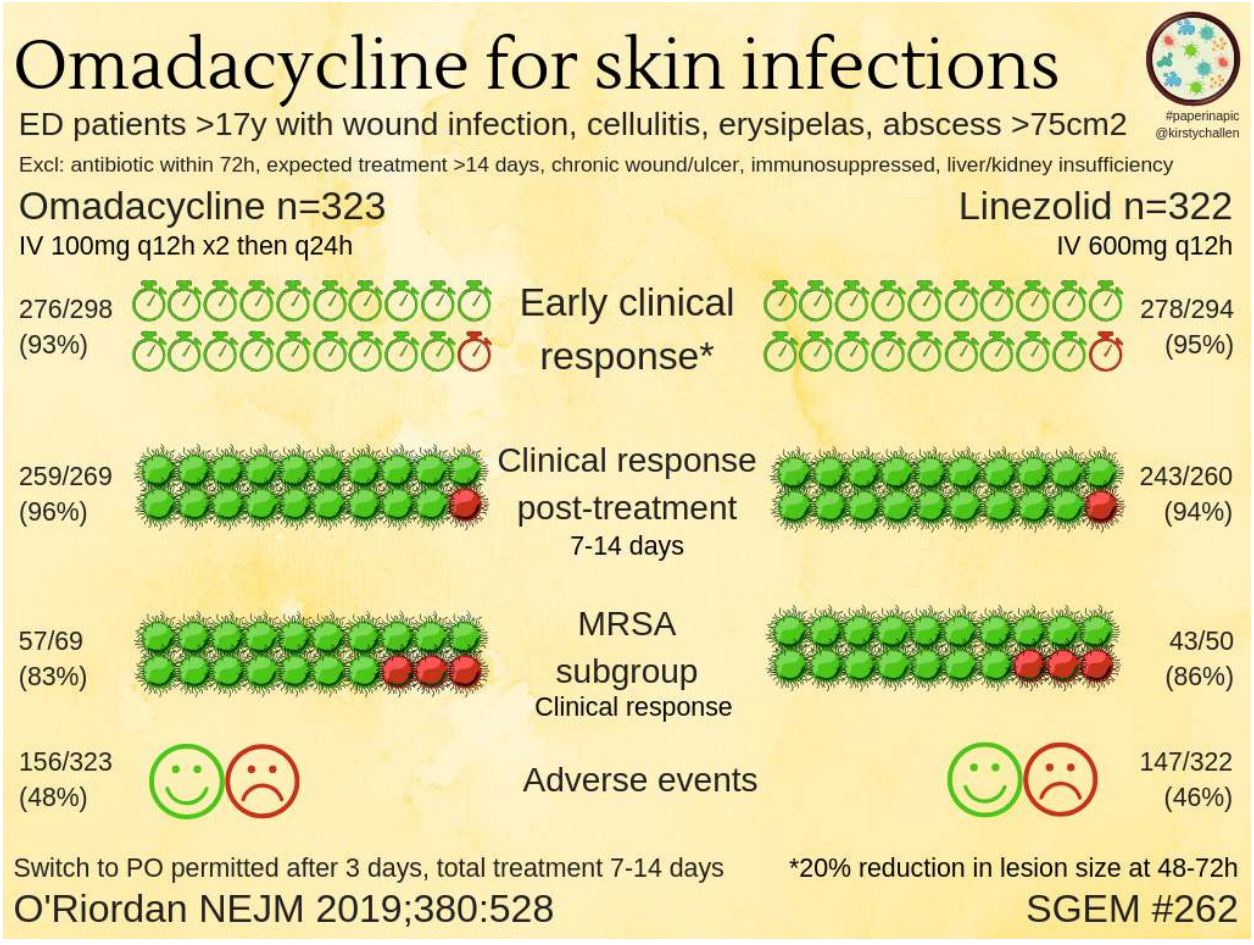
There are lots of antibiotics that are effective in the treatment of cellulitis. Cephalexin is a tried and true antibiotic and most patients will improve with this antibiotic. You can expect that there may be some mild expansion of the redness over the next 24-48 hours but after that time, it should recede. Come back here or see your doctor in 3-4 days to check out how it's progressing. If you develop a fever, have vomiting and can't take your pills or are worried we are happy to see you any time.

Episode End Notes

Other FOAMed:

- REBEL EM: Omadacycline, the NEJM and Non-Inferiority Studies
- EM Nerd: The Case of the Scientific Ruse





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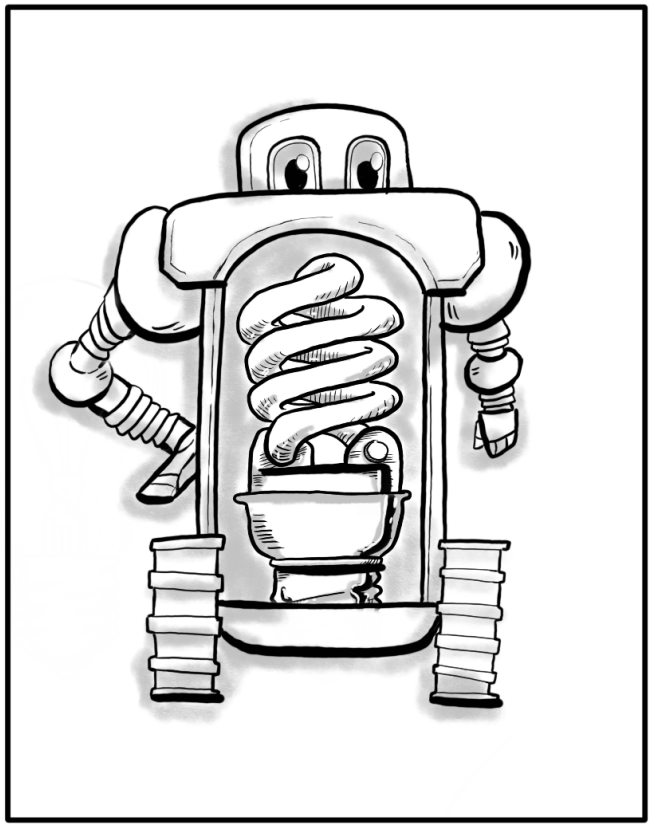


Please Stop, Prescribing: Antibiotics for Viral Acute Respiratory Infections

Clinical Question:

Is an enhanced intervention using audit and feedback, peer comparisons, and nudges more effective than a standard intervention in reducing inappropriate antibiotic prescribing for acute respiratory infections by clinicians in an ED/UCC setting?

Bottom Line:

Consider implementing strategies to reduce inappropriate antibiotic prescribing in your ED or UCC.

Guest:

Dr. Chris Bond is an emergency medicine physician and clinical lecturer in Calgary. He is also an avid FOAM supporter/producer through various online outlets including TheSGEM.

Case Overview

Case:

A 25-year-old female presents to the urgent care with two days of cough, purulent sputum, fever and myalgias. Vitals signs are within normal limits and her exam is unremarkable. She asks for a prescription for antibiotics to help treat her infection.

Background:

Inappropriate antibiotic use exposes patients to opportunistic infections, accelerates the development of antibiotic resistant bacteria and leads to adverse drug events [1]. Acute respiratory infections (ARIs) are a major cause of unnecessary antibiotic use. Emergency departments (EDs) in the United States write 10 million antibiotic prescriptions each year, approximately half of which are inappropriate [2, 3, 4]. Given these risks, strategies to reduce inappropriate antibiotic use in the ED and urgent care centers (UCCs) are needed.

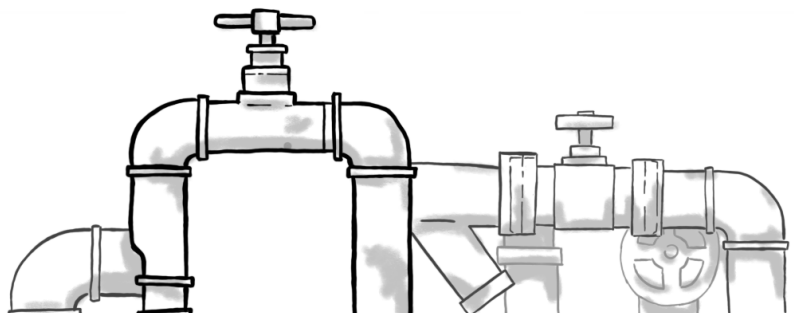
Despite recognizing the need for antibiotic stewardship by EDs and emergency providers, this has not led to practice change [5, 6]. Providers in the ED and UCC setting are faced with numerous challenges that may limit change, including: Frequent interruptions, boarding and overcrowding, frequent patient handoffs, and the need to see high volumes of patients [7, 8, 9].

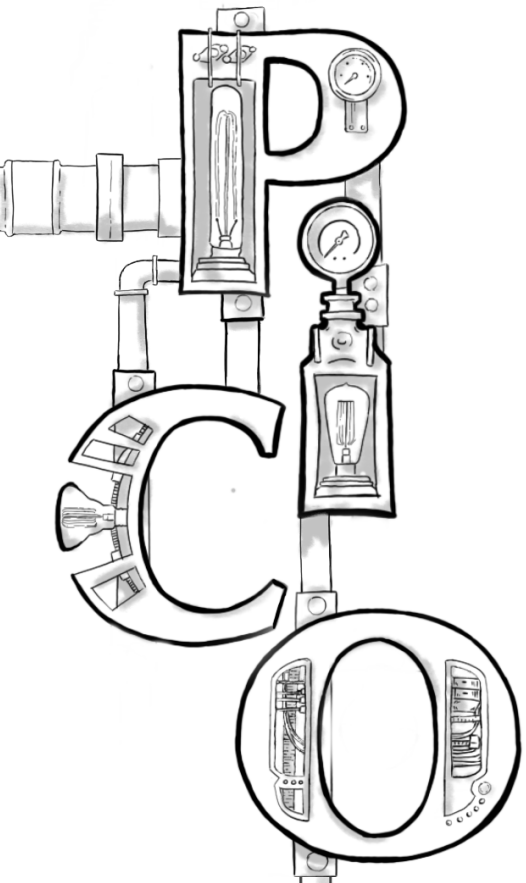
There is evidence in both the medical literature and economic theory to support using a package of feedback, nudges and peer comparisons to improve prescribing outcomes. This has been shown to reduce unnecessary antibiotic prescribing in primary care, and in one study of peer comparisons in outpatient clinics and doctor's offices, these improvements were sustained for at least 12 months after the interventions were completed [10, 11, 12].

Richard Thaler and Cass Sunstein wrote a book on the nudge theory. The book is called *Nudge: Improving Decisions about Health, Wealth, and Happiness*. The authors discuss psychologic and behavioral economics research to support active engineering of choice architecture. It's a great book to put on your reading list.

Reference:

Yadav et al. A Multifaceted Intervention Improves Prescribing for Acute Respiratory Infection for Adults and Children in Emergency Department and Urgent Care Settings. AEM July 2019





Population:
Clinicians (general ED physicians, pediatric ED physicians, advanced care practitioners, internists and pediatricians) at five EDs and four UCCs in three academic health systems who prescribed antibiotics for ARIs.

- **Excluded:** Resident physicians

Intervention:
Enhanced intervention: This used all the elements of the adapted intervention, but also included peer comparison feedback via email, comparison to top performing peers, and additional locally tailored public posters demonstrating commitment to judicious antibiotic use.

Comparison:
Adapted intervention: This incorporated strategies from the Centre for Disease Control and Prevention's C*ore Elements for Outpatient Antibiotic Stewardship*, including provider and patient education, a physician champion and departmental feedback. This used adapted brochures and other campaign messages for acute care providers.

Outcomes:

- **Primary:** Rate of inappropriate outpatient antibiotic prescribing for acute respiratory infections diagnosis that were deemed antibiotic-nonresponsive.
- **Secondary:** Difference between the enhanced and adapted intervention groups in antibiotic prescribing.

SGEM HOP

This is an SGEMHOP episode which means we have the lead author on the show. Dr. Kabir Yadav is an Associate Professor and the Vice Chair for Academic Affairs at Harbor-UCLA Medical Center.

We also have the senior author on this HOP publication, Dr. Larissa May. She is a Professor of Emergency Medicine at the University of California Davis and Directs the UC Davis Health Emergency Department and Outpatient Antibiotic Stewardship Program.

Authors' Conclusion

"Implementation of antibiotic stewardship for ARI is feasible and effective in the ED and UCC settings. More intensive behavioral nudging methods were not more effective in high-performance settings."

Quality Checklist

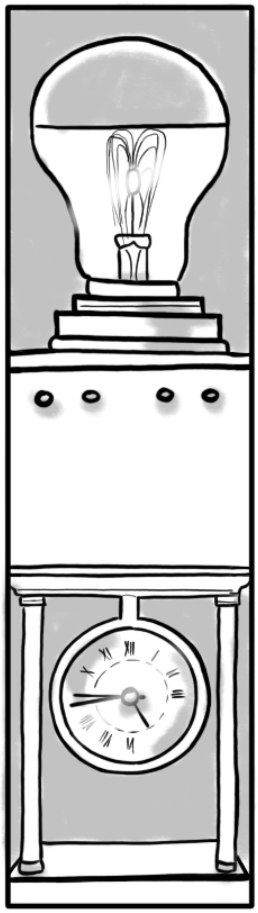
Quality Checklist for Randomized Clinical Trials:

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

Case Outcomes

Key Results:
They identified 44,820 ARI visits to the emergency department or Urgent Care Center among 292 clinicians across the nine sites.

Both adaptive and enhanced interventions worked to reduce inappropriate antibiotic prescribing viral acute respiratory illnesses.



Primary Outcomes:

Inappropriate antibiotic prescribing for ARI

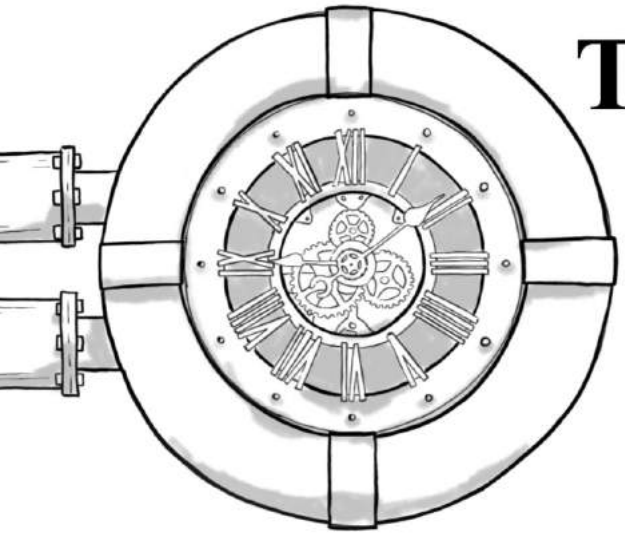
- Decrease from 6.2% (95%CI 4.5%-7.9%) to 2.4% (95%CI 1.3% -3.4%)
- After adjusting for provider, seasonal and institutional fixed effects, there was a significant year over year reduction from baseline to intervention period (OR 0.67, 95% CI 0.54-0.82) with an absolute effect size of 0.7% (0.2-1.2%)

The baseline antibiotic prescribing rate for antibiotic-inappropriate ARIs during flu season of 2016-2017 was 4.3% across all sites but varied between 2.1-7.4% depending on site.

Secondary Outcomes:

Difference between the enhanced and adapted intervention groups in antibiotic prescribing.

- There was a non-significant (p=0.06) difference in differences between the reduction in inappropriate antibiotic prescribing between the enhance and adapted groups.



Time to Talk Nerdy

1) Cluster Randomization:

You selected a cluster-randomized design for this trial which can decrease the power and the precision of the study. Why did you select this method of randomization? Why not just randomize all the clinicians to adapted or enhanced intervention?

A key challenge to a practice change intervention is contamination, wherein individual providers randomized to different arms may influence each other in unpredictable ways. To address this, we chose to randomize each physically distinct study site to one study arm, with the goal of minimizing providers in different study arms influencing each other.

2) Lack of Control Group:

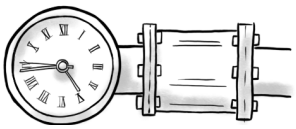
How can we really conclude this intervention resulted in a reduction in antibiotic prescribing without a control group where there was no intervention at all? Inappropriate antibiotic prescribing for ARI could be going done because of external factors beyond the adapted and enhanced intervention.

Lack of a contemporaneous controls is a valid concern. Given the participating institutions had incentives to rapidly deploy antibiotic stewardship, it was impossible to get buy-in to be a control site for the duration of the study. While we did look back at the prior year's data to look for seasonally-adjusted trends, contemporaneous influences could not be easily accounted for. We could have designed a stepped-wedge cluster randomized design such that each site gets the intervention in a prescribed order, and sites not yet receiving the intervention act as contemporaneous controls. This is the design we are using for an ongoing scale-and-spread study currently underway.

3) Wrong Sites:

Were you studying the wrong EDs and UCCs? These sites performed extremely well at baseline with very low inappropriate prescribing rates (2.1-7.4%). Should you be looking at community hospitals and UCCs not associated with academic centers?

This was surprising to us as well. According to National Quality Forum acute bronchitis quality metric used for pay-for-performance at two of the participating sites, inappropriate prescribing was in the 60-70% range, justifying a need for stewardship. It turns out that it may be the metric we used, which we believe is closer to the true rate of inappropriate prescribing rate (conservative), may be driving it down. We did note that the pediatric sites were low prescribers overall, and that the adult urgent care site in Los Angeles County did start much higher. National data from children's hospital EDs suggests very low rate of prescribing at 2.5%.



4) Hawthorne Effect:

This study is at significant risk of both a Hawthorne effect and altered coding of discharge diagnoses (eg. saying more pneumonias rather than upper respiratory track infections and then giving antibiotics). How can this risk be mitigated?

Insofar as the Hawthorne effect is considered to be the self-corrective behavior of participants when they know they are being observed; one could argue this is actually part any antibiotic stewardship intervention! I think the real question is that is such an effect sustainable, especially when providers are inundated with quality measure after quality measure that they are supposed to pay "special attention" to?

5) ICD-10 Coding:

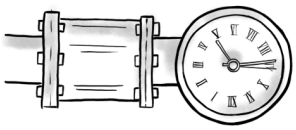
Has the method of identifying antibiotic-nonresponsive ARI diagnoses with ICD-10 been validated to be accurate?

We adapted the outcome measure used in the Meeker et al study done in primary care settings to the ED/UCC setting. That schema was based on ICD-9 codes, as was the National Quality Forum acute bronchitis metric. Other studies such as by Gerber et al have used their own codes for an outcome. Our outcome was based on a complete review of the ICD-10 codebook through consensus of the physician investigators and reviewed by the Centre for Disease Control and Prevention. It is publicly available on the MITIGATE toolkit for people to review and refine if they feel it is necessary. While it may not be perfect, we do believe it is a conservative outcome of inappropriate antibiotic prescribing that would be acceptable to providers receiving feedback. As such, it may not compare to other measures such as Choosing Wisely that may show higher rates as they include things that can be potentially appropriate to treatment with antibiotics like acute sinusitis. Limitations of ICD codes etc.—only as good as being coded.

6) Contamination:

Some clinicians worked at multiple sites but were assigned to the intervention of the site where they spent at least 80% of their time. This threshold was lowered to >50% at the six CHCO sites. Would this not contaminate the results and make them more difficult to interpret?

Unlike the participating adult and mixed populations sites, the Children's Hospital of Colorado sites often had providers that worked at more than one site, which potentially explains both the downward trend overall and potentially smaller effect size of their sites. However, as noted before, pediatric sites had lower prescribing from the outset, matching national trends. The potential for contamination is well taken, however, and to address it, a subgroup analysis simulating bounds of contamination effects could be undertaken as part of a battery of post hoc hypothesis-generating subgroup analyses consolidated in a manuscript that explores secondary analyses of the data.



7) Variety of Clinicians:

You had a variety of clinicians providing care. This included general EM physicians, pediatric EM physicians,advanced care practitioners, internists and pediatricians). Did you perform any subgroup analyses for hypothesis generating purposes?

As noted above, we are considering a number of secondary analysis in a post hoc manner for exploratory purposes. Unfortunately, we are limited in the ability to analyze individual provider type in this study as we were prohibited from collecting provider demographic data by the Internal Review Board (IRB). We do, however, intend to analyze the performance of sites when sub-grouped by type of site. Moreover, follow-up studies at other clinical sites will collect demographic data, so hopefully this question can be addressed then.

8) Demographics:

The IRB did not allow you to collect demographics on the clinicians. Were you interested in whether or not the different interventions were more or less effective based on gender, age or years of practice?

Prior studies on knowledge translation have suggested that there may be differences in uptake of new evidence based on demographic differences. Initially more focused on age/years of practice but now a more critical eye toward gender. We do intend to explore these differences in follow-up studies where we collect demographic data and clinician type and years of practice.

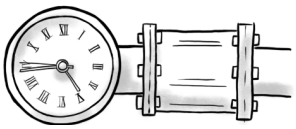
9) Feedback Nudge:

How positive was the feedback of *"top performer vs. not top-performer"* It seems the email just says: *"you are not a top performer"*. Would a more encouraging message be more helpful? What about listing the top performers at each physicians site? Could there be the opposite effect where the person would take pride in being the worst (Bart Simpson – Underachiever and proud of it man)

I felt the same way. Jason Doctor, an expert in cognitive psychology, suggests that the worst reaction is indifference, stating "upsetting and motivating are not mutually exclusive". This wording is meant to challenge their self image as a top performer, and immediately follow-up with how they can improve. We also developed frequently asked questions (FAQs) meant to be transparent and objective about how we determined the outcome, and what was needed to be a top performer. It is important to note that everyone could become a top performer. There was little pushback and hurt feelings and mostly humorous responses.

10) What's the Right Amount:

Is getting to zero inappropriate antibiotic use a realistic goal? Would we not be at risk of causing more harm at that point by missed prescriptions in serious bacterial illnesses that should get an antibiotic? We are not perfect diagnosticians. What is the right amount of inappropriate antibiotic prescribing?



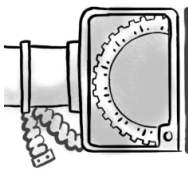
I think yes, assuming metric is true and coding is correct. Many of our physicians had rates of zero. It may be truer for some conditions such as nonspecific URI and acute bronchitis vs pharyngitis (where the outcome specification may not be able to parse out the viral pharyngitis from bacterial).

Those are the ten nerdy questions. Is there anything else you want to say about your SGEM Hot Off the Press publication?

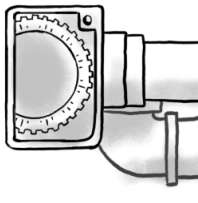
This project was guided by implementation science, which is a rigorous, theory-driven approach to practice improvement. It relies on careful deliberation of the local conditions when preparing for an intervention (which may modify what you do), followed by a mixed-methods approach to conducting the intervention and measuring several outcomes related to implementation processes. I think it holds great promise for elevated local quality improvement projects to interventions worthy of knowledge translation. Chris Carpenter, who the SGEM listeners may be familiar with, is a national/international expert on implementation science and has helped lead several initiatives on both the conduct and reporting of implementation science projects.

There is one more thing I would like to ask you about. Your study was featured on the Skeptics Guide to the Universe Podcast (Episode#728). They used your publication in their Science or Fiction section. One thing that bothered me was they representation that your intervention decreased inappropriate antibiotic prescribing by over 30%. This information seems to have come from a press release. While there was an odds ratio of 0.67 from baseline the absolute effect size was a reduction of 0.7%. I found the press release claiming the intervention reduced the overuse of antibiotics by one-third misleading and wondered if you would comment.

We absolutely agree with you that absolute effects rather than relative effects are the preferred way to report scientific findings. It is, however, challenging to make scientific findings accessible an interesting to the general public, and university media relations would, like the press in general, like to draw the reader to click on the article. The impact of science shouldn't be guided by press release, Tweet or even this podcast. On a related note, there have been interesting articles written recently about this around the reporting of use of Vitamin C for sepsis. You should be skeptical of press releases and always go to the original study.



Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree that implementation of strategies to reduced inappropriate antibiotic prescribing for acute respiratory infections is feasible and likely effective.



Clinical Application:
This study provides strategies that could be tried to reduce unnecessary antibiotics for acute respiratory infections in the ED and UCC.

Case Resolution:
After completing your history and physical examination, you conclude that this patient has a viral illness and do not prescribe an antibiotic.

What Do I Tell My Patient?
Your history, reassuring vital signs and examination do not show any evidence of an infection requiring antibiotics. If anything, they may lead to harm, such as diarrhea, stomach upset, rashes and even nasty intestinal infections are possible. At this point you are likely to improve with fluids, rest and ibuprofen/acetaminophen for your fever and muscle aches. If you are developing significantly worsening shortness of breath or your fever is persistent after another few days, you should be re-assessed.

Episode End Notes

How's your emergency department's use of antibiotics for acute respiratory infections?
ncbi.nlm.nih.gov/m/pubmed/31215... @SAEMonline @AliRaja_MD @Rick_Pescatore #sgemhop

Just right	37%
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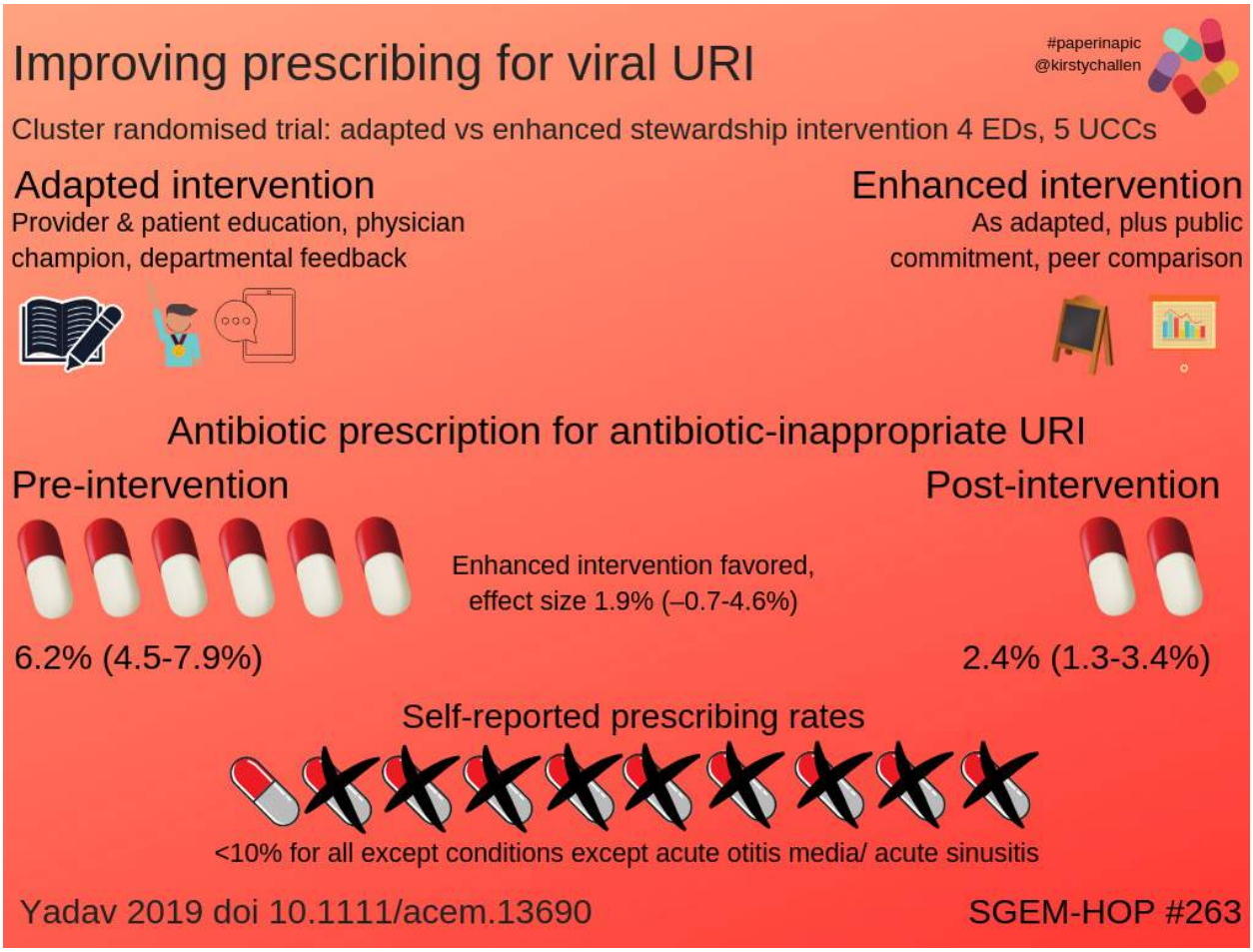

References:

1. Presidential Advisory Council on Combating Antibiotic- resistant Bacteria. National Action Plan for Combating Antibiotic-resistant Bacteria. Washington (DC): The White House, 2015.
2. Donnelly JP, Baddley JW, Wang HE. Antibiotic utilization for acute respiratory tract infections in U.S. emergency departments. Antimicrob Agents Chemother 2014;58: 1451–7.
3. Centers for Disease Control and Prevention. FastStats: Emergency Department Visits. Available from: http:// www.cdc.gov/nchs/fastats/emergency-department.htm. Accessed October 30, 2015.
4. Fleming-Dutra KE, Hersh AL, Shapiro DJ, et al. Preva- lence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010–2011. JAMA 2016;315: 1864–73.
5. May L, Gudger G, Armstrong P, et al. Multisite explo- ration of clinical decision making for antibiotic use by emergency medicine providers using quantitative and qual- itative methods. Infect Control Hosp Epidemiol 2014;35:1114–25.
6. Linder JA, Doctor JN, Friedberg MW, et al. Time of day and the decision to prescribe antibiotics. JAMA Intern Med 2014;174:2029–31.
7. Chisholm CD, Collison EK, Nelson DR, Cordell WH. Emergency department workplace interruptions: are emer- gency physicians "interrupt-driven" and "multitasking"? Acad Emerg Med 2000;7:1239–43.
8. Bernstein SL, Bernstein E, Boudreaux ED, et al. Public health considerations in knowledge translation in the emergency department. Acad Emerg Med 2007;14:1036– 41.
9. Schafermeyer RW, Asplin BR. Hospital and emergency department crowding in the United States. Emerg Med Australas 2003;15:22–7.
10. Persell SD, Doctor JN, Friedberg MW, et al. Behavioral interventions to reduce inappropriate antibiotic prescrib- ing: a randomized pilot trial. BMC Infect Dis 2016;16: 373.
11. Meeker D, Linder JA, Fox CR, et al. Effect of behavioral interventions on inappropriate antibiotic prescribing among primary care practices: a randomized clinical trial. JAMA 2016;315:562–70.
12. Linder JA, Meeker D, Fox CR, et al. Effects of behavioral interventions on inappropriate antibiotic prescribing in primary care 12 months after stopping interventions. JAMA 2017;318:1391–2.

SGEM#

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Hooked on a Feeling?: Opioid Use and Misuse 3 Months after Emergency Department Visit for Acute Pain

Clinical Question:

What is the incidence of opioid use three months after an initial prescription, and what are the reasons for consumption?

Bottom Line:

Only a small percent of patients who received an opioid prescription in the ED will still be using opioids months later and even less will be misusing opioids.

Guest:

Dr. Corey Heitz is an emergency physician in Roanoke, Virginia. He is also the CME editor for Academic Emergency Medicine.

Case Overview

Case:

You are taking care of a 56-year-old woman who presented to the emergency department with a Jones fracture. During your discharge discussion, you offer her a prescription for oxycodone/acetaminophen and she gets a worried look on her face and says: *"I try to stay away from those medications…what if I get hooked?"* You realize you are unsure what to tell her about the chances of continued opiate use after an initial prescription.

Background:

Opioid use and misuse have increased greatly in the past 15 years, but opioids remain a mainstay of treatment for acute pain. Some have identified the 2001 Joint Commission making pain the fifth vital sign in an attempt to address the oligoanalgesia issue as part of the opioid misuse problem.

ED physicians are among the most frequent prescribers of opioids. (Volkow et al. JAMA 2011). Attempting to decrease a patient's pain to zero is certainly well-intentioned but you have to ask yourself how many patients are being harmed by such a goal?

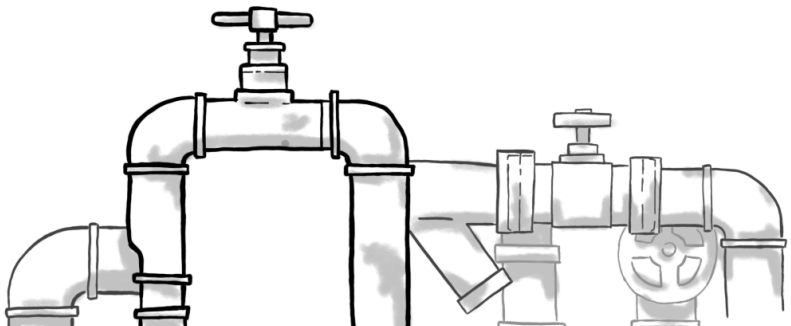
Another question you need to ask is: Do patients want their pain to be eliminated at the expense of their level of awareness and understanding why they are in pain? We have all had patients who express concern about opioid use like the case presented. The literature has shown that more educated patients would rather receive less opioids and live with some pain compared to less educated patients. (Platts-Mills TF, et al. Pain 2012).

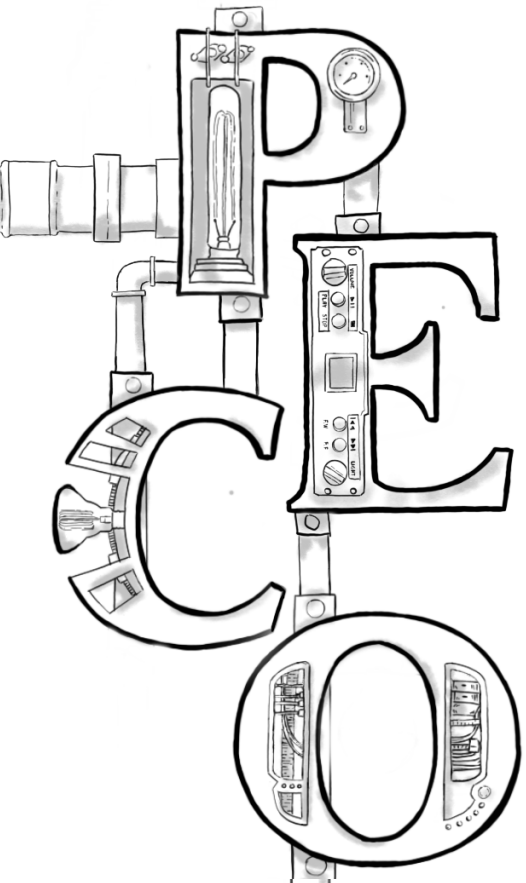
Several studies have looked at opioid use after an initial prescription, but many of them included a large number of patients with prior substance abuse or used prescribing databases to extrapolate recurrent use as a surrogate for misuse.

ACEP has a clinical policy regarding prescribing of opioids for adult ED patients that was published in 2012 (Cantrill et al). They suggest that opioid use be carefully individualized and time-limited; that opioids are best left for patients with severe or refractory acute pain; and that exacerbations of chronic pain not be treated with opioids.

Reference

Daoust et al. Opioid Use and Misuse Three Months After Emergency Department Visit for Acute Pain. AEM August 2019





Population:
Patients 18 years or older with a painful condition less than two weeks without recent (less than two weeks) opioid use

- **Excluded:** Patients who did not speak French or English, were using opioid medication in the past two weeks prior to the ED visit, stayed in the ED for more than 48 hours before discharge home, and patients with cancer pain or who were being treated for chronic pain.

Exposure:
Discharged from the ED with an opioid prescription.

Comparison:
None.

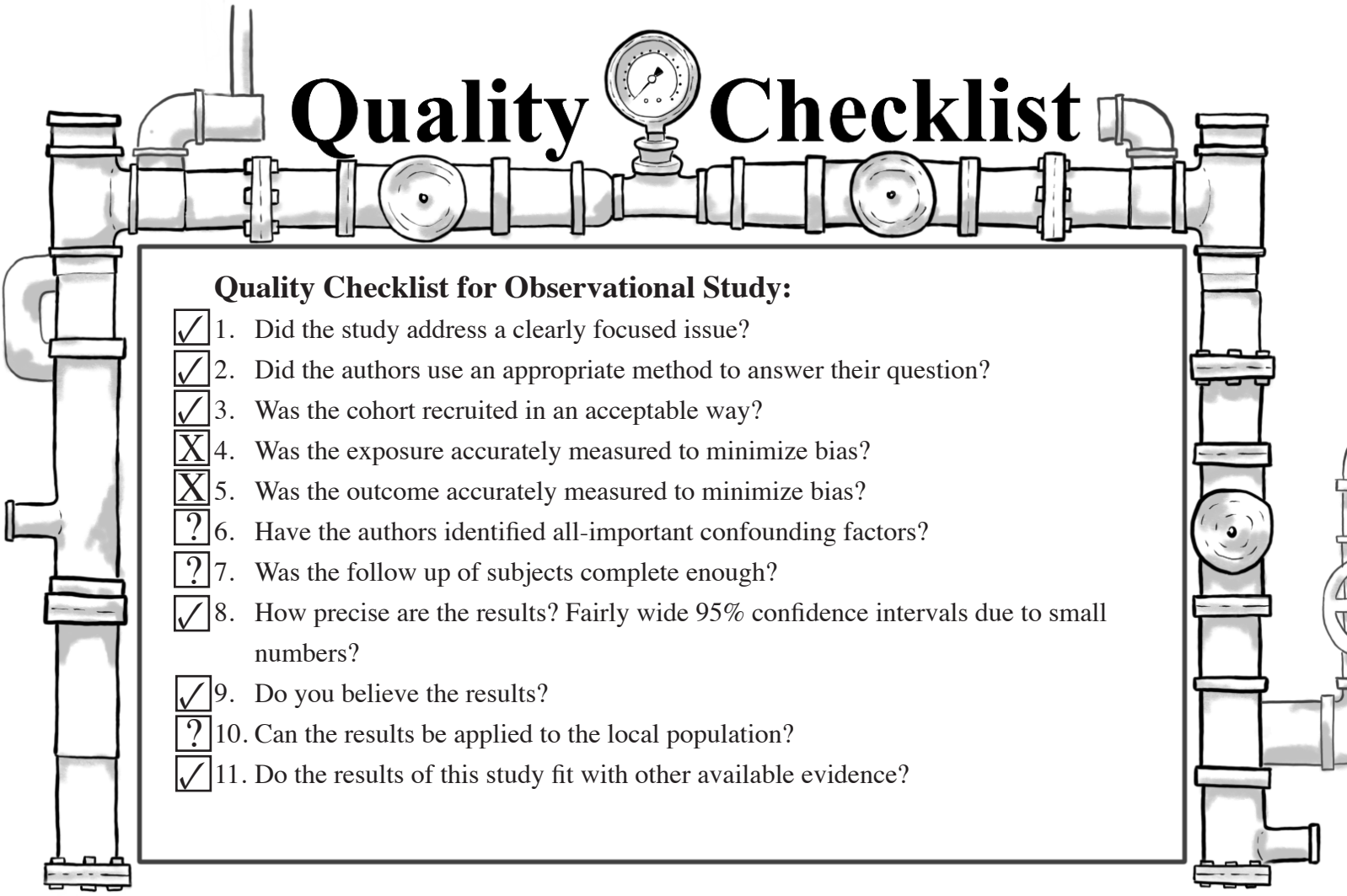
Outcomes:
Opioid use/misuse at three months.

This is an SGEMHOP episode which means we have the lead author on the show. Dr. Raoul Daoust is a Professor, Université de Montréal Emergency physician Hôpital Sacré-Cœur de Montréal.

Authors' Conclusion

"Opioid use at the 3-month follow-up in ED patients discharged with an opioid prescription for an acute pain condition is not necessarily associated with opioid misuse; 91% of those patients consumed opioids to treat pain. Of the whole cohort, less than 1% reported using opioids for reasons other than pain. The rate of long-term opioid use reported by prescription-filling database studies should not be viewed as a proxy for incidence of opioid misuse."

Quality Checklist



Quality Checklist for Observational Study:

- ☑ 1. Did the study address a clearly focused issue?
- ☑ 2. Did the authors use an appropriate method to answer their question?
- ☑ 3. Was the cohort recruited in an acceptable way?
- ☒ 4. Was the exposure accurately measured to minimize bias?
- ☒ 5. Was the outcome accurately measured to minimize bias?
- ? 6. Have the authors identified all-important confounding factors?
- ? 7. Was the follow up of subjects complete enough?
- ☑ 8. How precise are the results? Fairly wide 95% confidence intervals due to small numbers?
- ☑ 9. Do you believe the results?
- ? 10. Can the results be applied to the local population?
- ☑ 11. Do the results of this study fit with other available evidence?

Case Outcomes

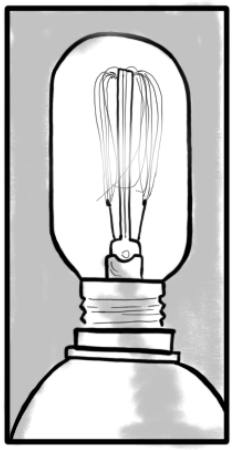
Key Results:
They had 3-month follow-up data on 524 participants. The mean age was 51 years and 47% were female. The most common type of pain conditions was musculoskeletal (~40%), followed by fractures (~19%), renal colic (~18%), abdominal pain (~6%) and the rest *"other"*. Patients received a prescription for a median of 30 tablets of 5mg of morphine (or equivalent). Patients filled the prescriptions 94% of the time and 79% reported consuming opioids during the first two weeks after the index ED visit.

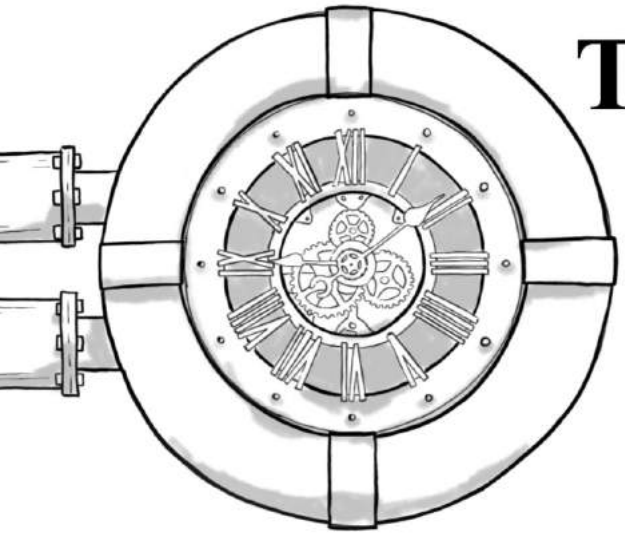
9% (47/524) Patients were consuming opioids at three months

Primary Outcomes:
Opioid use/misuse at three months

- 47 patients (9%, 95% CI = 7%–12%) had consumed opioids in the prior two weeks:
  - 34 (72%) for their initial painful complaint.
  - 9 (19%) for new unrelated pain.
  - 4 (9%) for another reason (misuse) or less than 1% (4/524).
  - All had consumed opioids within two weeks of the index visit.

Patients who consumed opioids within two weeks of the index visit were 3.8 (95% CI = 1.2– 12.7) times more likely to consume opioids at three months than those who did not.





Time to Talk Nerdy

You can listen to the podcast on iTunes or Google Play to hear Raoul's answers to our five nerdy questions.

1) Convenience Sample:

You comment that this was a convenience sample and there is no way to determine the number of patients not identified. Can you discuss how this might have affected your results?

2) Refusal to Participate:

A significant number of potential patients refused to participate. No data is presented regarding prior use of opioids in these patients. Is it possible that these patients were more likely to have prior use/misuse, and how would that have affected the interpretation of the results?

3) Lost to Follow-up:

Another issue is the *"lost to follow-up"*. We usually like to see less than 20% and you had 18%. I learned from Dr. Heather Murray that when the effect size is smaller than the lost to follow-up, we should be more skeptical of the results. Do you have any information on the characteristics of those lost to follow-up compared to those who completed the study?

4) Recall Bias:

This is a form of cognitive bias. It has been defined as *"a* systematic error *caused by differences in the accuracy or completeness of the recollections retrieved ("recalled") by study participants regarding events or experiences from the past"* (Wikipedia). Is there any concern that the results are limited by recall bias?

5) External Validity:

This as a prospective cohort study conducted in the ED of a Canadian academic Level I trauma center. The joke is that a Canadian is just an unarmed American with access to universal health care. Do you think this study has external validity to our American friends south of the boarder?

Here is a link on state-by-state opioid prescribing guidelines and one for the state of Virginia specifically.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions.

Clinical Application:

When discharging patients with painful complaints, be aware that the risks of future use and misuse is small but not zero and consider whether opioids are the most appropriate treatment for their pain.

Case Resolution:

Your patient agrees to have a prescription written and tells you that she may only fill it if her pain is severe.

What Do I Tell My Patient?

There does seem to be a correlation with opioid use for a painful complaint and opioid use/misuse three months later. The majority is for the same painful complaint. It seems more likely if you use the opioids in the first two weeks of getting the prescription. If this concerns you, you can try to avoid use in the short term and use alternatives to opioids.

Episode End Notes

What percentage of opioid naive patients will be using (misusing) opioids for something other than pain 3 months after ER visit with Rx for an opioid?

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1-5%	26%
5-10%	34%
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