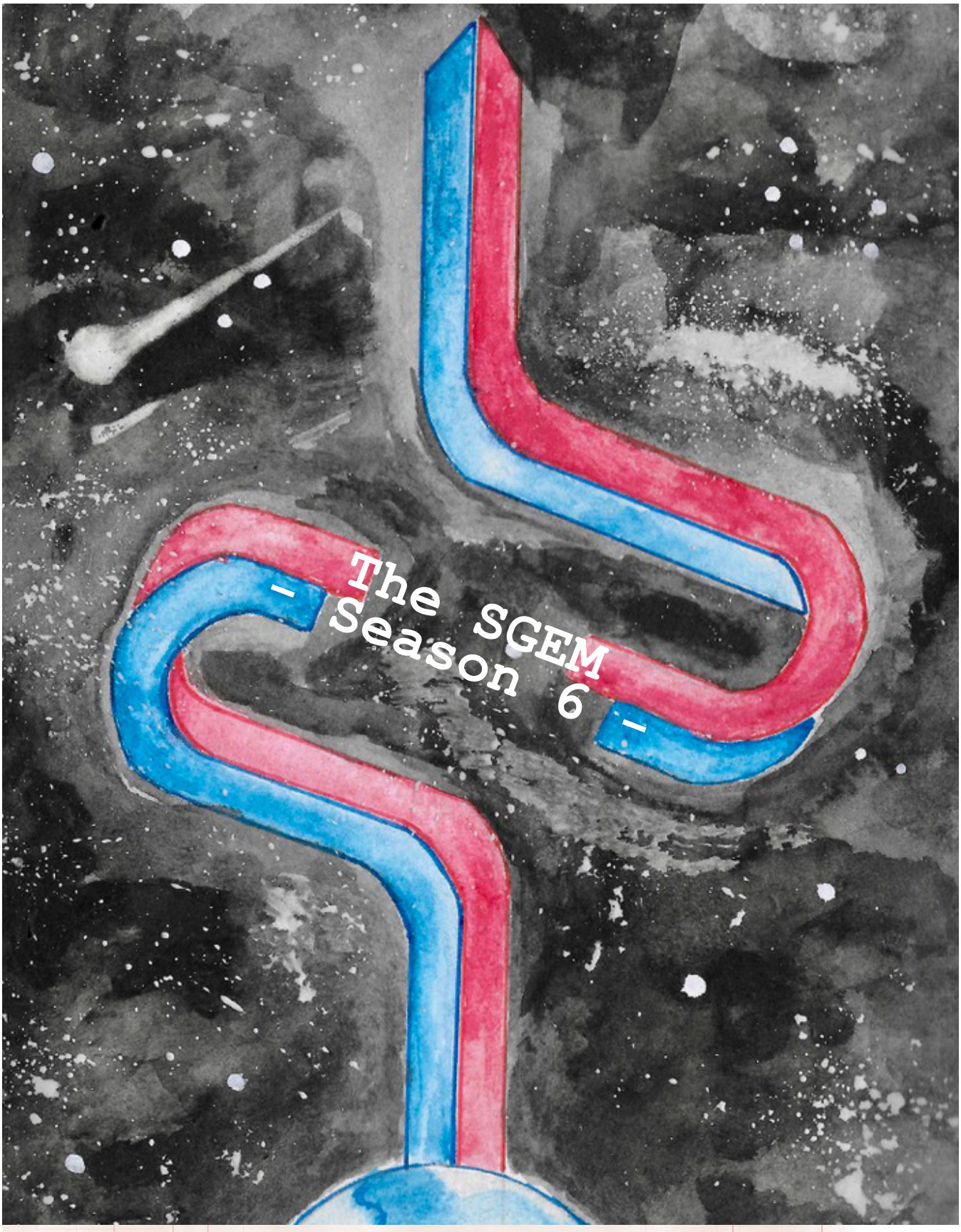

The Skeptics' Guide to Emergency Medicine

Season 6

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Foreword by: Dr. Chris Carpenter
Designed by: Sage Milne and Rhiannon 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.

To Access the SGEM:

- Email (TheSGEM@gmail.com)
- Blog (www.TheSGEM.com)
- Twitter (@TheSGEM),
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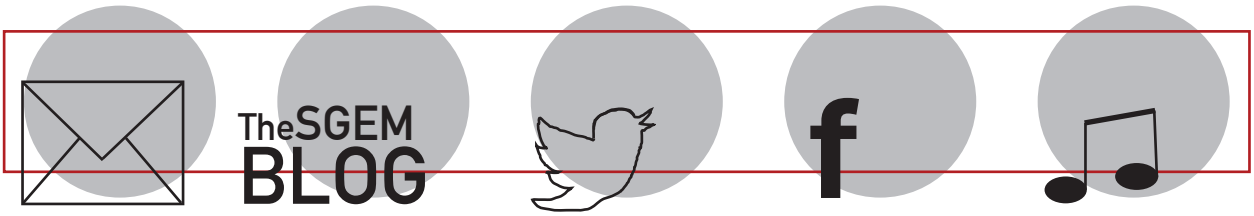

Disclaimer

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

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

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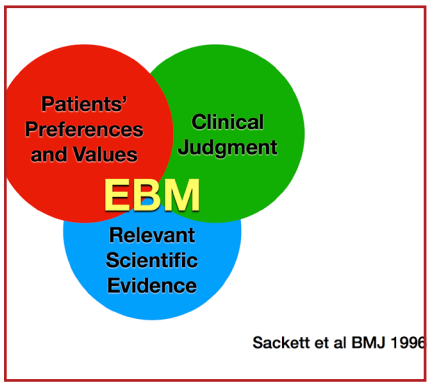
The SGEM makes a reasonable effort to supply accurate information but does not assume any liability for errors or omissions. Because of the nature of the program and its format, it is not recommended that they serve as the sole basis for patient evaluation and treatment.

REMEMBER TO BE SKEPTICAL OF ANYTHING YOU LEARN, EVEN IF YOU LEARNED IT FROM THE SKEPTICS' GUIDE TO EMERGENCY MEDICINE.

Evidence Based Medicine

Dr. David Sackett's mentee Dr. Gordon Guyatt coined the term "Evidence Based Medicine"(EBM)[1] and a new philosophy of transforming clinical care was born. As with most paradigm shifts, opponents argued that EBM was neither novel nor a panacea for the imperfections of medical science, particularly since EBM was inherently contradictory lacking any evidence of effectiveness compared with centuries of medical 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)

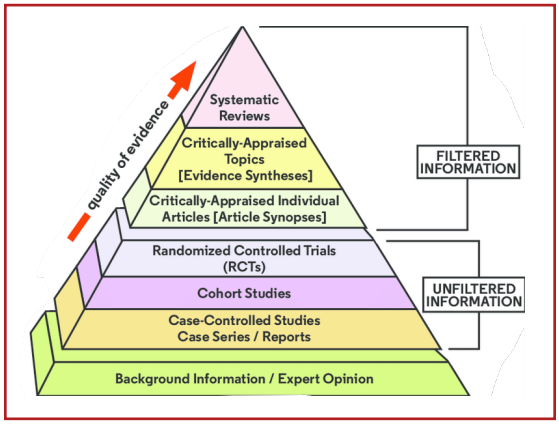
The PICOT question focuses subsequent steps to achieve the most pertinent results for the patients typically encountered.

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]



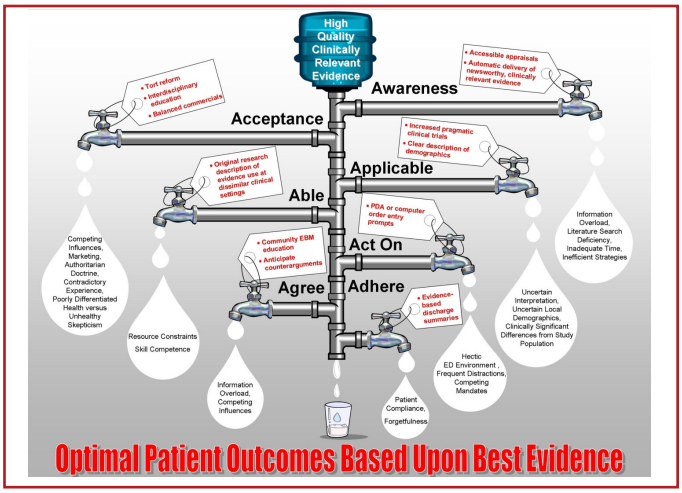
Step 4: Critically Appraise the Study

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 6 is an invaluable resource for physicians, nurses, and students aspiring to implement new knowledge and de-implement outdated dogma in an increasingly time and resource-constrained clinical context. These pages include humor, tears, personal strife, occasional disagreement, and a steady stream of empathy for our patients and clinical colleagues. Enjoy – and carpe diem.

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Best Evidence in Emergency Medicine

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

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

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

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

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

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

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

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.

Table of Contents

186 - Apneic And The O, O, O2 For Rapid Sequence Intubation

187 - Pin Cushion: Acupuncture In The Emergency Department

188 - Icatibant Bites The Dust: For Ace-I Induced Angioedema

189 - Bring Me To Life In OHCA

190 - Wee Are The Champions Of Pediatric Urine Samples

191- No Time For Physio: Roll With It

192 - Sometimes, All You Need Is The Air That You Breathe

193 - Stop, In The Name Of Love

194 - Highway To The Dexamethasone: For Pediatric Asthma Exacerbations

195 - Some Like It Hot: ED Temperature and ICU Survival

196 - Gastroparesis: I Feel Like Throwing Up

197 - Die Trying: Intubation Of In-Hospital Cardiac Arrests

198 - Better Slow Down: Push Vs. Short Infusion Of Low Dose Ketamine For Pain In The Emergency Department

199 - Therapeutic Hypothermia: What Is It Good For?

200 - Dr. Alexander Hamilton And Bloodletting For Camp Fever

201 - It's In The Way That You Use It: Ottawa SAH Tool

202 - Lidocaine For Renal Colic?

203 - Let Me Clear My Sore Throat With A Corticosteroid

204 - Hold The Line: IVs Aren't Always Required

205 - Twist & Shout: Testicular Torsion

206 - I'm Wheezy Like a Pre-schooler: Prednisolone for Wheezy Children

207 - Ahh (Don't) Push It: Pre-Hospital IV Antibiotics for Sepsis

208 - It Makes No Difference: Glucocorticoids for the Treatment of Septic Shock

209 - Cephalexin: You Are My Only One for Uncomplicated Cellulitis

210 - (Don't) Let It Bleed: TXA for Epistaxis in Patients on Anti-Platelet Drugs

211- Pins and Needles: Acupuncture for Migraine Prophylaxis

212 - Holding Back The Years: Risk Factors for Adverse Outcomes In Older Adults With Blunt Chest Trauma

213 - Upside Down You Convert Me Out Of SVT?

214 - Woman: The Txa Trial For Post-Partum Hemorrhage

215 - Love Will Tear Us Apart: Diagnostic Challenges Of Aortic Dissection

216 - Pump It Up: Corticosteroids For Patients With Pneumonia Admitted To Hospital

217 - The Batman Effect On Improving Perseverance

218 - Excited Delirium Syndrome

219- Shout, Shout, PERC Rule Them Out

220 - Acupuncture Vs. Morphine for Renal Colic

221 - Smells Like Isopropyl: Alcohol For Nausea

222 - Rhythm Is Gonna Get You: Into an Atrial Fibrillation Pathway

223 - Haven't Got Time For The Pain: What About IV Lidocaine?

224 - Battlefield Acupuncture: Don't Do Me Like That

225 - Nexus II: Validation of the Pediatric Head CT Decision Instrument

226 - I Want A New Drug: One That Doesn't Cause an Adverse Drug Event

SGEM XTRA - EBM Made Easy

SGEM XTRA - Sketch EBM

SGEM#
186

Apneic And The O, O, O2 For Rapid Sequence Intubation

Question
Does the use of apneic oxygenation in emergency department during rapid sequence intubation decreases the rate of clinically important desaturation, leading to a decrease in peri-intubation complications and death?

Case
A 68-year-old female presents with shortness of breath. She has experienced fever, chills and a productive cough worsening over the past five days. Chest X-ray demonstrated bilateral infiltrates consistent with multifocal pneumonia.

Over her emergency department course the patients starts to decompensate despite highflow nasal cannula and broad-spectrum antibiotics. The decision is made to intubate the patient. The question arises whether apneic oxygenation should be used during the rapid sequence intubation.

Bottom Line
Apneic oxygenation may still have a role during rapid sequence intubation of emergency department patients but it likely adds little when proper pre-oxygenation strategies are used.

Guest Skeptic: Dr. Rory Spiegel he is a clinical instructor at University of Maryland and a recent graduate of Stony Brook's Resuscitation Fellowship. He writes an excellent blog called EM Nerd, which he describes as nihilistic ramblings.

Date: September 2, 2017

Reference: Caputo et al. EmergeNcy Department use of Apneic Oxygenation versus usual care during rapid sequence intubation: A randomized controlled trial (The ENDAO Trial). AEM 2017.

Episode 186 Overview

Case:

A 68-year-old female presents with shortness of breath. She has experienced fever, chills and a productive cough worsening over the past five days. Chest X-ray demonstrated bilateral infiltrates consistent with multifocal pneumonia.

Over her emergency department course the patients starts to decompensate despite highflow nasal cannula and broad-spectrum antibiotics. The decision is made to intubate the patient. The question arises whether apneic oxygenation should be used during the rapid sequence intubation.

Background:

Much has been written regarding the benefits of apneic oxygenation (1,2). Its physiological underpinnings are sound and its logistical and resource based costs are minimal.

As such it has enjoyed widespread adoption throughout the Emergency Medicine and Critical Care world. Despite its popularity the evidence supporting its use has been less inspirational.

There have been some studies in various clinical settings (operating room, critical care and pre-hospital) that have demonstration benefit of apneic oxygenation. There are two observational studies from the emergency department showing an association between apneic oxygenation and an increased first pass success without hypoxemia and reduction in the incidence of hypoxemia during the rapid sequence intubation of patients with intracranial hemorrhage (3, 4).

The FELLOW (Facilitating EndotracheaL intubation by Laryngoscopy technique and apneic Oxygenation Within the intensive care unit) Trial was a randomized controlled trial demonstrating no difference in desaturation rates with apneic oxygenation vs. usual care.

However, this study was performed in the intensive care unit and not in the emergency department setting (5).

Clinical Question

Does the use of apneic oxygenation in emergency department during rapid sequence intubation decreases the rate of clinically important desaturation, leading to a decrease in peri-intubation complications and death?

Population: Emergency department patients greater than 18 years old requiring rapid sequence intubation.

Exclusions: Patients in cardiac or traumatic arrest or if pre-oxygenation was not performed. Intervention: Apneic oxygenation group received standard pre-oxygenation plus 15 L/min of flow using a standard nasal cannula as well as a ETCO2 nasal cannula set at 15 L/min, both of which were started during the pre-oxygenation phase and continued throughout the apneic phase.

Intervention: Apneic oxygenation group received standard pre-oxygenation plus 15 L/min of flow using a standard nasal cannula as well as a ETCO2 nasal cannula set at 15 L/min, both of which were started during the pre-oxygenation phase and continued throughout the apneic phase.

Comparison: No apneic oxygenation but standard pre-oxygenation (either flush-rate oxygen via an non-rebreather-mask, a bag valve mask with PEEP valve, or a BiPAP circuit with an FiO2 of 100%)

Outcome:

Primary: The mean lowest oxygenation saturation between the two groups.

Secondary: Rate of first pass success, desaturation below SpO2 90%, desaturation below SpO2 80% and average time to desaturation between the two groups.

Authors' Conclusions:

"There was no difference in lowest mean oxygen saturation between the two groups. The application of AO during RSI did not prevent desaturation of patients in this study population."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department
- ☑ 2. The patients were adequately randomized
- ☑ 3. The randomization process was concealed
- ☑ 4. The patients were analyzed in the groups to which they were randomized
- ☑ 5. The study patients were recruited consecutively (i.e. no selection bias)
- ☑ 6. The patients 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 patient-important outcomes were considered
- ☒ 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

They screened 262 patients and included a total of 200. The mean age was mid 50's with the most common indication for intubation being pulmonary issues.

Outcome

No difference between mean lowest oxygenation saturation between the two groups (92% vs 93% p=0.08).

Secondary Outcomes (apneic oxygenation vs. usual care):

- Desaturation <90%: no difference (17% vs. 15%)
- Desaturation <80%: no difference (3% vs. 4%)
- Total Mortality: no difference (14/100 vs. 16/100)
- Mortality within 24hrs: no difference (4/100 vs. 2/100)
- First pass success rate 89%: no difference
- Average time to desaturation: no difference

Talk Nerdy to Me

Overall this was a very well-done trial. The authors went to great length to ensure proper randomization and that proper pre-oxygenation techniques were utilized is both groups. However, we are going to go through five things that threaten the validity of the results.

1) Statistical Validity:

The lowest arterial oxygen saturation during intubation is a continuous variable, in contrast to a discrete variable such as rate of clinically significant desaturations (<80%).The major advantage of continuous parametric testing is the statistical power it provides, allowing researchers to demonstrate statistical significant results with even small sample sizes.

Typical we use a standard t-test to analyze continuous variables. This is basically a comparison of the two groups mean values. In order for such testing to be valid, a number of assumptions must be met. The data surrounding a sample's mean must fall in a symmetrical distribution. It is not uncommon, especially in cohorts with an undersized sample size, that the resultant sample will not exhibit a normal distribution.

This is especially true when looking at variables like SO2 were the majority of results cluster around one tail. In cases where the resulting data is asymmetrically distributed, a comparison of means may fail to accurately describe the differences between the two populations of interest. You can imagine to populations where the mean values are fairly similar but in one group the values cluster fairly close to the mean and another where there is much more variation around this mean value. These two groups are obviously very different populations but their means appear quite similar.

In such instances, non-parametric testing is required. Non-parametric testing eliminates the need for symmetric distribution by listing each data point in rank order. As such, the quantitative differences between measurements become inconsequential. This allows for the performance of statistical analyses without the assumption of normal
distribution.

Despite these advantages with this type of statistical manipulation, the ability to quantify the specific magnitude of each data point is lost. Rather non-parametric testing is only capable of locating the position of each data point as it relates to the remainder of the cohort. With this loss of granularity comes a significant reduction in the statistical power.

And so, when you power your study to assess the lowest mean SO2 and power it to assume a normal distribution and then perform and analysis using non-parametric methodology you have statistical limited your ability to find a difference.

2) Clinical Validity:

Is the lowest oxygen saturation observed during intubation truly a clinically important measurement?

Such an endpoint inherently places value on higher oxygen saturation levels, making the assumption that oxygen saturation of 52% is clinically preferable to a saturation of 35%. We know the accuracy of waveform pulse oximetry suffers once the oxygenation
saturation drops below 90%.

In these cases, the value of the patient's true PaO2 can vary wildly from what is recorded on the monitor. As such it is hard to place a hierarchical value to the pulse oximetry at levels less than 90%.

To say that an oxygen saturation of 53% holds a greater clinical value than a value of 35% is inaccurate. To then further distill these data points into a rank order renders this data unusable.

A more clinically meaningful endpoint would be the rate of oxygen desaturation below a specific threshold that is associated with an increased likelihood of negative sequelae. Take for example the incidence of oxygen saturation less than 80% or 90%. In this case a continuous scale, oxygen saturation, is converted into a discrete dichotomous outcome. The entirety of the data can now only fall above or below a specified cutoff.

And while likely more clinically meaningful this divide leads to a significant loss of granularity, as the value of an oxygen saturation of 75% becomes no different than one of 32%, as both fall below the 80% threshold. The conversion of a continuous variable to discrete data comes at the cost of statistical power. And so once again because the study was powered to demonstrate a difference in a continuous outcome it is now incapable of detecting a difference dichotomous variables of importance. So, we have an inherently underpowered study.

3) Patient Oriented Outcome:

I do not think the patient really cares about what their SpO2 was while they were being intubated. A patient has never asked me for this number and it is a disease oriented outcome.

Mortality is a much more patient oriented outcome and very easy to measure and define. In this study, the mortality was not different at 24hrs or for total mortality.

However, we do not know about the neurologic function of the survivors. This would be the most patient oriented outcome. How many patients survived neurologically intact?

4) External Validity:

This study was conducted in a single urban centre teaching hospital. They had a highly effective protocol for pre-oxygenation and demonstrated a high level of competency. Most of their patients were intubated in less than 60 seconds. As such there was minimal opportunity for patients to experience desaturation. In fact, only 16% of patients desaturated below 90% and only 3% desaturated below 80%.

Greater than 80% of patients were pre-oxygenated with bag valve mask. There was about 50/50 split between direct and video laryngoscopy. More than 95% of the patients were intubated by residents and less than 5% by attendings. So how will this apply to your community or rural hospital with the intubation being done by a respiratory therapist, non-board-certified emergency physician or physician assistant?

We have reasonable evidence that apneic oxygen works on a physiological level. So are we not seeing benefit in this study because it doesn't work or because we tested it on a whole bunch of patients that were going to do just fine no matter what we did.

This is where we each have to decide whether the evidence for or against apneic oxygenation is strong enough to incorporate it into our rapid sequence intubation strategy. And balance this with the cost of a nasal cannula and the logistical complexity its use adds to your rapid sequence intubation.

5) Burden of Proof:

The scientific method puts the burden of proof on those making the positive claim. In this situation, the positive claim would be that apneic oxygenation provides a patient oriented benefit in undifferentiated emergency department patients requiring rapid sequence intubation. This study does not provide evidence to reject the null hypothesis.

Absence of evidence is not the same as absence of benefit. In this case to find a difference when so few events happen a far more statistically robust study is required.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
The authors conclusions are reasonable, the use of apneic oxygenation is likely to add little to the majority of rapid sequence intubations in an unselected emergency department population.

Bottom Line

Apneic oxygenation may still have a role during rapid sequence intubation of emergency department patients but it likely adds little when proper pre-oxygenation strategies are used.

Case Resolution

Case Resolution (Rory):

The patient was pre-oxygenated using a nasal cannula underneath a BiPAP circuit and the cannula at 15 L/min was maintained during the apneic period. The patient was intubated on first pass without hypoxia and was resuscitated and transferred to the intensive care unit.

Case Resolution (Ken):

The patient was pre-oxygenated using a bag valve mask and was successfully intubated on first pass without hypoxia and was resuscitated and transferred to the intensive care unit.

Clinical Application:

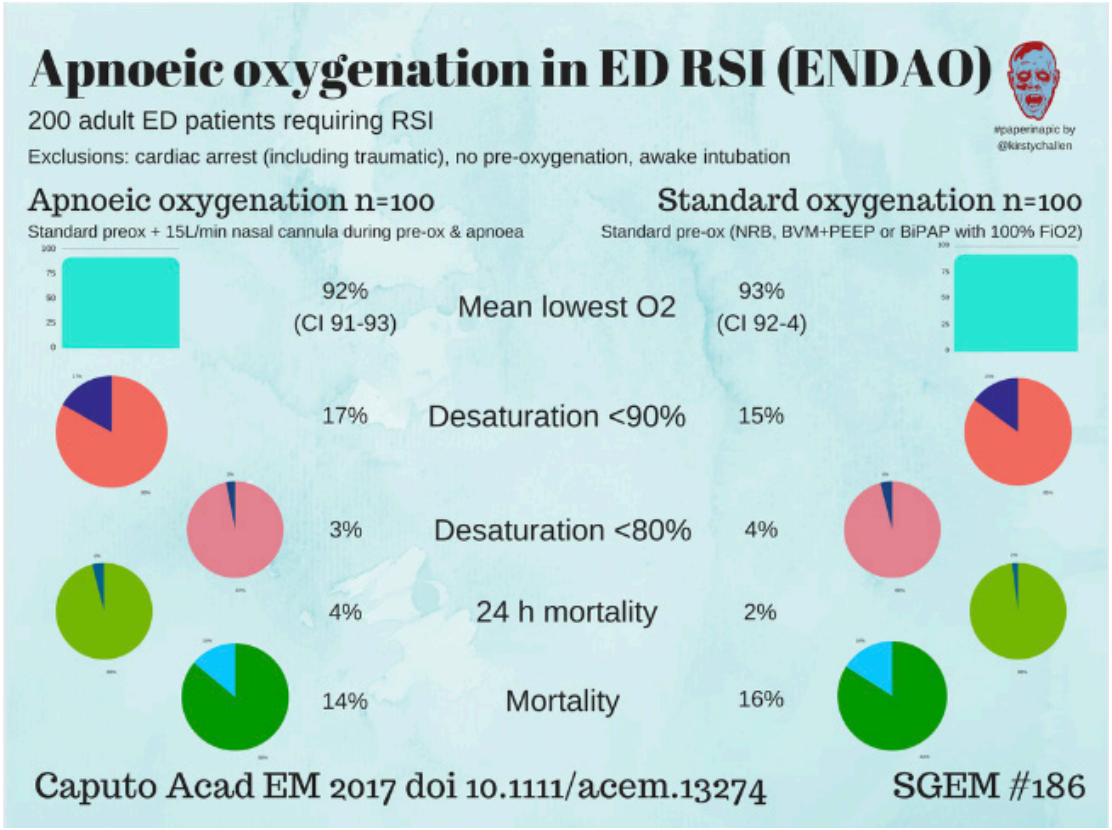
If we were guaranteed successful endotracheal intubation with minimal delay in all our patients, then the majority of our preparation would be rendered superfluous. However, we have an undifferentiated cohort presenting to the emergency department. As with much of our preparation, apneic oxygenation is employed universally in the event of the rare case of unexpected difficulty. And while its utility in these patients is unknown, an underpowered trial, in which so few patients experienced the outcome in question, does not disprove the potential benefits of apneic oxygenation.

What Do You Tell the Patient's Family?

Your mother has a severe pneumonia and has already got antibiotics. She also needed extra oxygen to help with her breathing. Despite all this treatment her oxygen levels were falling and we needed to put a tube down her throat to deliver more oxygen. Everything went well and she is doing better now. We will transfer your mother to the intensive care unit to continue her treatment.

Episode End Notes

Infographic:



Twitter Poll:

Do you routinely use ApOx for RSI?
onlinelibrary.wiley.com/doi/10.1111/ac...
thesgem.com/2017/09/sgem18...
@emcrit @stemlyns @srrezaie @airwaycam
@SAEMonline #EBM

54% Yes
28% No
18% What is ApOx

Other FOAMed:

- **EM Nerd:** The Case of the Elemental Truancy
- **EMCrit Podcast 206**: ApOx, ENDAO, & PreOx Update
- **REBEL EM:** Apneic Oxygenation (ApOx) – A Review of the Evidence in Critical Care & Emergency Medicine
- **St. Emlyns JC:** Apnoeic Oxygenation (again)
- **EMBlog Mayo Clinic:** Apneic Oxygenation actually works (for some things)

References:

1. Weingart SD. Preoxygenation, reoxygenation, and delayed sequence intubation in the emergency department. J Emerg Med. 2011 Jun;40(6):661-7.
2. Weingart SD, Levitan RM. Preoxygenation and prevention of desaturation during emergency airway management. Ann. Emerg. Med. 2012;59(3):165-175.e1.
3. Sakles JC, Mosier JM, Patanwala AE, et al. First Pass Success Without Hypoxemia Is Increased With the Use of Apneic Oxygenation During Rapid Sequence Intubation in the Emergency Department. Acad Emerg Med. 2016 Jun;23(6):703-10.
4. Sakles JC, Mosier JM, Patanwala AE, et al. Apneic oxygenation is associated with a reduction in the incidence of hypoxemia during the RSI of patients with intracranial hemorrhage in the emergency department. Intern Emerg Med. 2016 Oct;11(7):983-92.
5. Semler MW et al. Randomized Trial of Apneic Oxygenation During Endotracheal Intubation of the Critically Ill. Am J Respir Crit Care Med 2015

SGEM#
187

Pin Cushion:

Acupuncture In The Emergency Department

Question
Can acupuncture provide pain relief equivalent to pharmacologic treatment in the emergency department?

Case
A 41-year-old man presents to the emergency department with an acute onset of back pain. He was putting some groceries into the car and felt something pull in his lower back. He has no *"red flags"* on your history and physical examination. He is worried about taking pain pills and wants to know if acupuncture would work?

Bottom Line
There is no high-quality evidence that acupuncture works for patients presenting to the emergency department with back pain, ankle sprains or migraines.

Guest Skeptic: Dr. Alfred Sacchetti is a full time practicing Emergency Physician, who is also the Chief of Emergency Medicine at Our Lady of Lourdes Medical Center in Camden, New Jersey, USA, an Assistant Clinical Professor of Emergency Medicine and an Active Researcher. In addition, Dr. Sacchetti is one of the few individuals to have lectured on the same panel with Dr. Milne and survived with his sanity and reputation intact.

Date: September 7, 2017

Reference: Cohen et al. Acupuncture for analgesia in the emergency department: a multicentre, randomised, equivalence and non-inferiority trial. MJA 2017

Episode 187 Overview

Case:

A 41-year-old man presents to the emergency department with an acute onset of back pain. He was putting some groceries into the car and felt something pull in his lower back. He has no "red flags" on your history and physical examination. He is worried about taking pain pills and wants to know if acupuncture would work?

Background:

One of the most common reasons to visit an emergency department is for pain. Unfortunately, pain is often poorly controlled. Inadequate pain control is called oligoanalgesia and has been recognized as a problem for years (Wilson et al).

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

Many different treatment modalities have been tried to treat low back pain with limited success.

- Acetaminophen Williams et al (Lancet 2014)
- Muscle relaxants Friedman et al (JAMA 2015)
- NSAIDs Machado et al (Ann Rheum Dis 2017)
- Benzodiazepines Friedman et al (Ann Emerg Med 2017)

Opioids are very effective at reducing pain. However, they come with many side effects and concerns about addiction and diversion.

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

In the face of what is being called the opioid epidemic, acupuncture has been suggested as a possible treatment modality.

Acupuncture is part of Traditional Chinese Medicine that has been around for thousands of years. It is based on the idea that the body has a life force flowing through meridians that is called chi/Qi. Disease and illness are result of chi/qi being blocked. Acupuncture is a method of placing needles into the skin to unblock the flow of chi/qi through the meridians to restore balance to the body.

There has been a great deal of research done on acupuncture to treat a variety of conditions. No convincing/high-quality evidence has been published demonstrating its efficacy. Placebo control studies using sham acupuncture have demonstrated it does not matter where you put the needles and suggests a strong placebo component.

Clinical Question

Can acupuncture provide pain relief equivalent to pharmacologic treatment in the emergency department?

Population: Patients presenting to one of four emergency departments, at least 18 years old with low back pain, migraine or ankle sprain when an acupuncturist was present.

Exclusions: If the treating physician felt it was inappropriate to include the patient due to signs of illness or had a temperature above 37.7 C, major trauma, used anticoagulation medication or had a mechanical heart valve,skin infections precluding the use of certain acupuncture points, refused or unable to consent, used any form of analgesia one hour prior to presenting to the emergency department or presented to an emergency department for the same condition more than four times in the previous three months.

Intervention: Acupuncture or acupuncture + pharmacotherapy

Comparison: Pharmacotherapy

Outcomes:

Primary: Reduction in Verbal Numerical Rating Scale (VNRS) at one hour. Clinical significance is VNRS less than 4 and statistical significance is a VNRS decrease of more than 2.

Secondary: Functionality at 48 hours, adverse events, use of rescue medication, acceptability of treatment and health resource use.

Authors' Conclusions:

"The effectiveness of acupuncture in providing acute analgesia for patients with back pain and ankle sprain was comparable with that of pharmacotherapy. Acupuncture is a safe and acceptable form of analgesia, but none of the examined therapies provided optimal acute analgesia. More effective options are needed."

Quality Checklist for Randomized Clinical Trials

- [✓] 1. The study population included or focused on those in the emergency department
- [✓] 2. The patients were adequately randomized
- [✓] 3. The randomization process was concealed
- [✓] 4. The patients were analyzed in the groups to which they were randomized
- [?] 5. The study patients were recruited consecutively (i.e. no selection bias)
- [✓] 6. The patients in both groups were similar with respect to prognostic factors
- [✓] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation
  This was a single blinded study with the participants and acupuncturists not being blinded to the intervention but outcome assessors were blinded to treatment allocation and acupuncturists to pharmacotherapy use.
- [X] 8. All groups were treated equally except for the intervention
  Pharmacologic therapy was at discretion of the treating physician)
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups)
- [✓] 10. All patient-important outcomes were considered
- [X] 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

There were 528 patients included in this study with a mean age of 41 years and about 50/50 male/female split. Just over half had low back pain with 17% having a migraine and 31% with an ankle sprain.

OUTCOME

No difference in clinical or statistical relevant reduction of pain at one hour between groups.

All three groups had terrible reduction in pain (acupuncture only, acupuncture-pharmacotherapy combo or pharmacotherapy alone). Less than 20% had a clinical reduction (<4) and less than 40% had a statistical reduction of pain (>2 point drop).

	All Patients	Acupuncture Only	Acupuncture + Pharm	Pharma Only	P
Clinically Relevant	16%	13%	17%	17%	0.56
Statistical Relevant	36.9%	33%	38%	39%	0.49

Secondary Outcomes (acupuncture vs. pharmacotherapy):

- Rescue Medication – 25% vs. 15%
- Adverse Events – 51% vs. 54%
- Functionality at 48 hours, acceptability of treatment and health resource use (see manuscript)

Talk Nerdy to Me

There were a number of concerns we had with this study. Instead of my usual five issues I have expanded it so Al and I both get to discuss five issues.

I did reach out to the lead author Dr. Marc Cohen who put me in touch with one of his co-authors Dr. Michael Ben-Meir. Michael is a full time emergency physician, Director of his Emergency Department and researcher. He was away and we could only record his segment after Al and I recorded the episode. However, Michael has been added in post-production to respond to each of our concerns. You can hear his responses listening to the episode on iTunes.

1) Blinding:

One of the major issues with this study design was lack of blinding. It was only a single blinded study. The patients knew they were getting acupuncture. Acupuncture is a very hands on intervention that can introduce a strong placebo effect. This placebo effect would bias the study in favor of acupuncture.

2) Control Group:

The lack of a sham control group to minimize the placebo effect is another major problem with this study. It would have been a much stronger study if there was a sham acupuncture group. A previous study using tooth picks as sham acupuncture showed no difference between real acupuncture and sham acupuncture.

3) Straw Man

Another problem with this study design was a straw man comparison. Comparing multiple non-effective therapies provides little to no valuable information to clinicians. The primary outcome of pain at one hour showed no difference between groups with less than 40% getting a pain reduction of 2 points or more. About 85% of patients still had a pain rating above 4 on the VNRS in all groups.

4) Opiod Sparing

The use of rescue medication was 10% higher in the acupuncture only group. Rescue medicine for all three groups was morphine 2.5mg IV bolus. This is not exactly opioid sparing if more opioids are needed in the acupuncture only group. However, the dose of morphine was also a straw man rescue dose with 0.05-0.1mg/kg IV being a more reasonable dose.

5) Consecutive Patients

We are unsure if these were consecutive patients presenting to the emergency department. Patients were included only when an acupuncturist was present. We are not sure if the acupuncturist worked night, weekends and holidays? Patients presenting at different days of the week and times of days could represent a different population.

6) Selection Bias

They excluded patients if the treating physician felt inclusion was inappropriate because of the signs of illness, or if the patient had one of a number of other exclusions that were listed in the PICO. This could have introduced selection bias.

7) Delay in Publication

This trial was conducted in 2010-11 but was published only in 2017. What was the reason for the delay?

8) Disease Entities Chosen:

They chose to look at low back pain, migraines and ankle sprains. There can be considerable variability in subjective perception of pain and degree of pain with these types of medical condition.

9) Length of Stay (LOS):

The use of acupuncture did not increase ED LOS. However, it would take the ED physician additional time to perform acupuncture. What about all the other patients in the ED? Time spent doing acupuncture would delay the ED physician from managing other patients. This could impact the ED LOS for the other patients. If someone else is doing the acupuncture their could be delays in them coming to the ED to provide the service.

10) Safety

They claim that acupuncture is safe. Only 355 patients received acupuncture. This study is too small to detect a rare complication and there have been reports of serious complications with acupuncture treatment including death.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We agree with the authors that more options are needed for patients with pain presenting to the emergency department. However, we disagree with the authors that acupuncture is effective. This unblinded, pragmatic non-inferiority trial only provides more evidence that acupuncture has a placebo effect. In addition, there is not enough evidence to claim safety.

Bottom Line
There is no high-quality evidence that acupuncture works for patients presenting to the emergency department with back pain, ankle sprains or migraines.

Case Resolution

Case Resolution:

You offer him acetaminophen to treat his back pain but set his expectations. He is encouraged to keep active and told the benefit observed with acupuncture is most likely a placebo effect. If he develops any red flag signs or symptoms he should return to the emergency department.

Clinical Application:

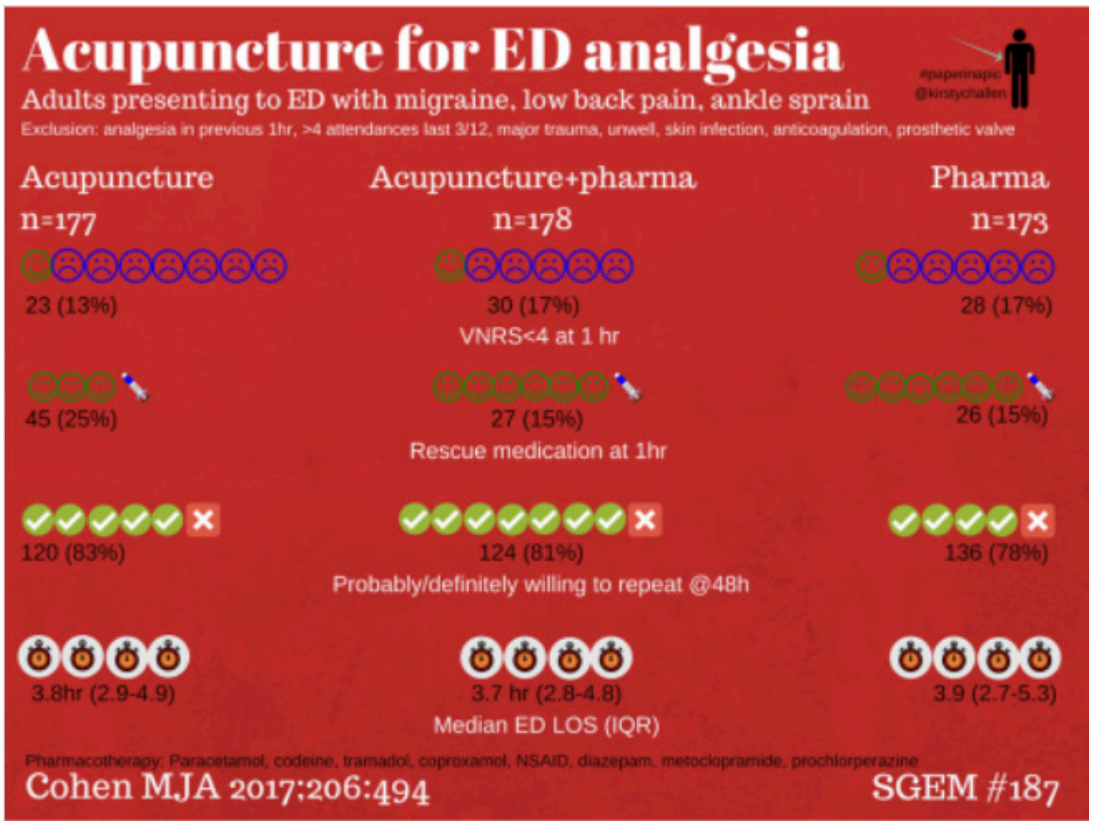
There is still no high-quality evidence that acupuncture is effective for any medical condition.

What Do You Tell the Patient?

There are no great treatments for back pain. A short course of opioids can work, but can have serious problems (side effects and risk of addition).

Episode End Notes

Infographic:



Twitter Poll:

Should acupuncture be used to treat acute pain in the ED?
thesgem.com/2017/09/sgem18…
@EMSwami @ketaminh @stemlyns
@WeAreCanadiEM @umanamd

17% Yes
58% No
25% I don't know

179 votes • Final results

Other FOAMed:

-
- The NESS: Acupuncture in the ED
- Science Based Medicine: Emergency Acupuncture
- Science Blog: Emergency acupuncture! (2017 edition)
- Friends of Science in Medicine: Is there any place for acupuncture in 21st century medical practice?
- Pain Science: Acupuncture for Pain
- Science Based Medicine: Acupuncture and Endorphins: Not all that Impressive
- Science Based Medicine: On the pointlessness of acupuncture in the emergency room…or anywhere else
- Coyne of the Realm: A skeptical look at a study of acupuncture delivered in emergency rooms [updated]

SGEM#
188

Icatibant Bites The Dust:

For Ace-I Induced Angioedema

Question

Does the administration of Icatibant to patients with ACE-I induced angioedema improve outcomes?

Case

As you walk in to your shift, the nurses grab you and bring you in to bed four where a patient has just presented with tongue swelling. In the room is a 53-year-old woman who, though, not in any particular distress, has got a swollen tongue and lower lip. After a bit of history, you find out that she is taking lisinopril and you determine that this is likely angiotensin converting enzyme inhibitor (ACE-I) induced angioedema. The patient's swelling started about three hours ago and hasn't changed much. You place her on a monitor in a high acuity area and bring your airway equipment to the bedside and then return to your computer to take sign out. You discuss with the resident a bit on ACE-I induced angioedema and settle on a plan to observe the patient. Your resident tells you that they recently read an article in the NEJM that argued for the administration of icatibant to usher along resolution of symptoms in ACE-I induced angioedema and asks whether you should consider this treatment.

Bottom Line

We do not have good evidence that icatibant improves outcomes in patients with ACE-I induced angioedema.

Guest Skeptic: Dr. Anand Swaninathan is an Assistant Professor of Emergency Medicine at NYU/Bellevue Hospital in the Department of Emergency Medicine. He is also part of REBEL EM, The Teaching Course, EMRAP and CoreEM.

Date: September 12, 2017

Reference: Sinert et al. Randomized Trial of Icatibant for Angiotensin-Converting Enzyme Inhibitor-Induced Upper Airway Angioedema. J Allergy Clin Immunol Pract 2017.

Episode 188 Overview

Case:

As you walk in to your shift, the nurses grab you and bring you in to bed four where a patient has just presented with tongue swelling. In the room is a 53-year-old woman who, though, not in any particular distress, has got a swollen tongue and lower lip. After a bit of history, you find out that she is taking lisinopril and you determine that this is likely angiotensin converting enzyme inhibitor (ACE-I) induced angioedema.

The patient's swelling started about three hours ago and hasn't changed much. You place her on a monitor in a high acuity area and bring your airway equipment to the bedside and then return to your computer to take sign out. You discuss with the resident a bit on ACE-I induced angioedema and settle on a plan to observe the patient. Your resident tells you that they recently read an article in the NEJM that argued for the administration of icatibant to usher along resolution of symptoms in ACE-I induced angioedema and asks whether you should consider this treatment.

Background:

ACE-I are prescribed to millions of patients in the US. Though they are relatively safe, upper airway angioedema is one of the life-threatening adverse effects that we see frequently in the Emergency Department. Though this disorder is routinely treated with medications for anaphylaxis (i.e. epinephrine, histamine blockers, corticosteroids) the underlying mechanism of action predicts that these medications will not work.

There is no well-established treatment algorithm other than airway control if the angioedema is severe and appears to be causing a mechanical obstruction and cessation of the medication.

A 2015 phase 2 study published in the NEJM (Bas et al) touted the role for icatibant in the treatment of these patients. Icatibant is a selective bradykinin B2 receptor antagonist so it acts by blocking the production of bradykinin.

Despite being heralded as "the cure," the data set in this article was small (n=27) questioning the validity of the findings.

We covered ACE-I induced angioedema and reviewed the 2015 icatibant study on SGEM#110. Our bottom line at that time was that icatibant was an expensive drug that appears to work well for the off-label use of ACE-I induced angioedema but should be reserved for those rare cases of impending airway compromise.

Enter the CAMEO study which attempts to further elucidate whether there are going to be benefits or not of this medication.

Clinical Question

Does the administration of icatibant to patients with ACE-I induced angioedema improve outcomes?

Population: Patients 18 years of age or older who were being treated with an ACE-I and presenting with ACE-I induced angioedema of the head and/or neck within 12 hours of symptom onset.

Intervention: Conventional treatment plus icatibant 30 mg subcutaneously

Comparison: Conventional treatment plus placebo subcutaneously

Outcome(s):

Primary: Time to meeting discharge criteria *"defined as time from study drug administration to earliest time that difficulty breathing and difficulty swallowing were absent and voice change and tongue swelling were mild or absent."*

Secondary: Occurrence of airway intervention, admission to hospital, use of corticosteroids, antihistamines or epinephrine and number/proportion of subjects meeting the primary endpoint at 4, 6 and 8 hours post-drug administration.

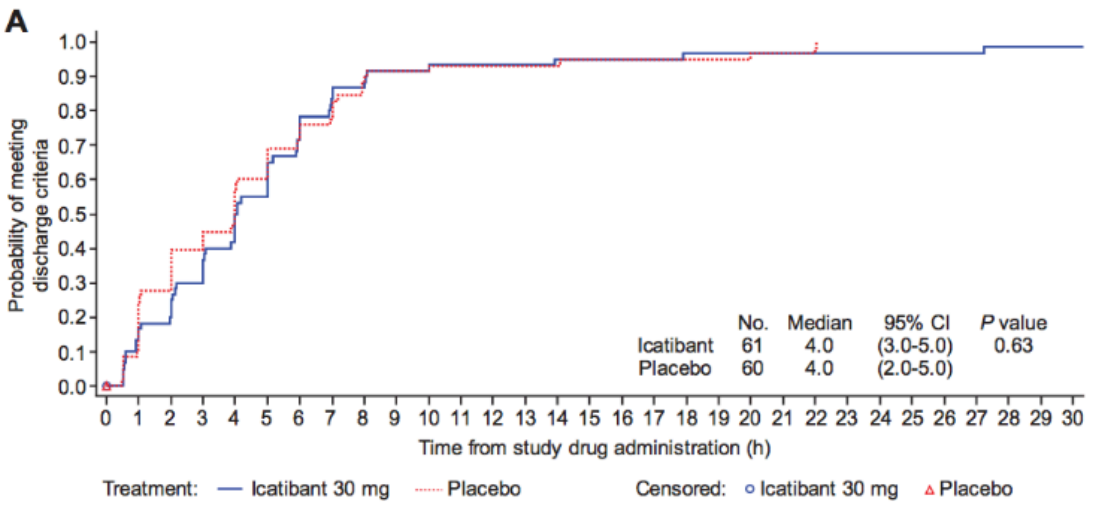
Authors' Conclusions:

"Icatibant was no more efficacious than placebo in at least moderately severe ACE-I induced angioedema of the upper airway"

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department
- ☑ 2. The patients were adequately randomized (computer generated randomization was performed)
- ☑ 3. The randomization process was concealed
- ☑ 4. The patients were analyzed in the groups to which they were randomized - The analysis was done on intention to treat
- ? 5. The study patients were recruited consecutively (i.e. no selection bias)
- ☑ 6. The patients 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
  Standard anaphylaxis/allergy treatment was at discretion of MD but were fairly equal across groups.
- ☑ 9. Follow-up was complete (i.e. at least 80% for both groups)
  100% for primary outcome and only 1 patient did not complete 3-day follow up.
- ☑ 10. All patient-important outcomes were considered
- ☒ 11. The treatment effect was large enough and precise enough to be clinically significant
  There was no treatment effect

Key Results



There were 147 patients screened and 121 patients included in the study with a mean age of about 60 and more than 2/3 were black or African American. Greater than 90% of patients received conventional treatment medications (corticosteroids, antihistamines, or epinephrine) an average of 3.5 hours before the study drug. There were 118 patients who received treatment a median of 7.8 hours from symptom onset.

Outcome

Time to meeting discharge criteria – no signifigant statistical difference

Primary Outcome:

Median time to discharge in both groups was 4.0 hours

Secondary Outcome(s):

Airway Intervention: No significant difference between treatment arms. One patient in icatibant arm required an airway intervention (none in placebo arm).

Hospitalization: No significant difference between treatment arms (45.8% vs. 45.8%)

Use of Adjunct Medications: No significant difference between treatment arms (58.3% vs. 60.3%)

Stratified Time to Discharge: No significant difference between treatment arms at any point (4, 6 or 8 hours)

Talk Nerdy to Me

1) Exclusions:

There were 147 patients screened but only 121 were randomized. What happened to the other 26 patients? They excluded patients needing immediate airway intervention as they could not consent. We will talk about this group more in point number two. Patients with hereditary angioedema were also excluded. In this group, icatibant is an accepted treatment. Another excluded group was patients who responded to allergic reaction/anaphylaxis medications. The rationale was that these medications should not help in ACE-I angioedema and thus, response calls the diagnosis into question. A final point to make is the diagnosis of ACE-I angioedema is subjective.

2) External Validity:

As mentioned, the study excluded patients who required immediate airway management as this group could not consent. Does this represent a group in whom we should consider administering the drug? This is possible and is a major critique from the icatibant supporters. In many cases, interventions show the greatest benefit in those at greatest risk of adverse outcomes. Hence, by excluding the population with the most to benefit, one reduces the chance of detecting an effect. Also, there's really no evidence to support the use of the drug in these circumstances. A much larger study of this group of severely ill patients would be required to get a recommendation for this indication. This is unlikely to happen as angioedema patients requiring airway control are rare (this study collected just 121 patients over 1.5 years at 59 sites). Of note, in the Bas article published in 2015, there were 3 patients in the control arm who were decompensating and were then given icatibant. One of these three progressed after icatibant and needed a tracheostomy.

3) Blinding:

We answered *"yes"* but we could have also answered *"unsure"* What's the deal? Their approach to blinding was excellent and clinicians, assessors and patients were blinded to group allocation. However, icatibant is two times more likely to cause a local reaction at the injection site. This may have caused some unblinding, but you would think that any unblinding would have favored the intervention.

4) Publication Bias:

The study by Bas and colleagues was published in the NEJM while this article is in the Journal of Allergy and Clinical Immunology Practice. Doesn't the fact that the article touting the utility of this drug appeared in a high impact factor journal mean I should take those recommendations over the ones from this author group? No. The Bas article was a very small (n = 27) phase II RCT performed in a homogenous patient group which limits external validity. Because the study was small, the confidence intervals around the point estimates are wide so it's hard to know what the actual benefit is. Despite these issues, the high impact journal NEJM agreed to publish the trial. In contrast, the CAMEO study was a much more robust study with superior methodology and a negative outcome. It too was submitted to the NEJM but rejected. Dr. Rick Body was one of the authors on the CAMEO study. He has agreed to provide some more insight into the study. Listen to the SGEM podcast on iTunes to hear Rick's comments.

5) Conflicts of Interest:

Both studies were funded by industry. We have repeatedly stated that just because a study is funded does not make the results wrong. However, there is data to suggest that industry funded studies more often have a positive interpretation of the results. Because this better study did not find efficacy in using icatibant for patients with ACE-I angioedema it makes us believe these results more than the other earlier study.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' conclusions. This well done, RDCT shows no benefit to the addition of icatibant in the treatment of ACE-I-induced angioedema. There may be a role for the drug in patients with severe, immediately airway-threatening angioedema but we have no data on that issue and further high-quality studies looking at this population would be required.

Bottom Line

We do not have good evidence that icatibant improves outcomes in patients with ACI-I induced angioedema.

Case Resolution

Case Resolution (Rory):

After discussing the NEJM article as well as the recent CAMEO study, you and your resident decide not to administer icatibant and, instead, to admit the patient for observation overnight.

Clinical Application:

The excitement of some for the purported benefits of icatibant for this indication based on the small NEJM study was unfounded. Currently, there is no reason to add icatibant in the treatment of ACE-I induced angioedema.

If we are not going to give icatibant, how should we manage these patients with angioedema Swami?

- Airway control if indicated
- Observe and reassess
- Anaphylaxis meds aren't helpful unless the patient has utricaria or hives with their angioedema. In these cases, epinephrine is likely to help
- I used to tout FFP as the treatment of choice but it's really not. FFP does have ACE so you can see how theoretically it can help but FFP also contains bradykinin and kininogen which can worsen symptoms
- Cessation of the drug is critical to make sure this doesn't happen again

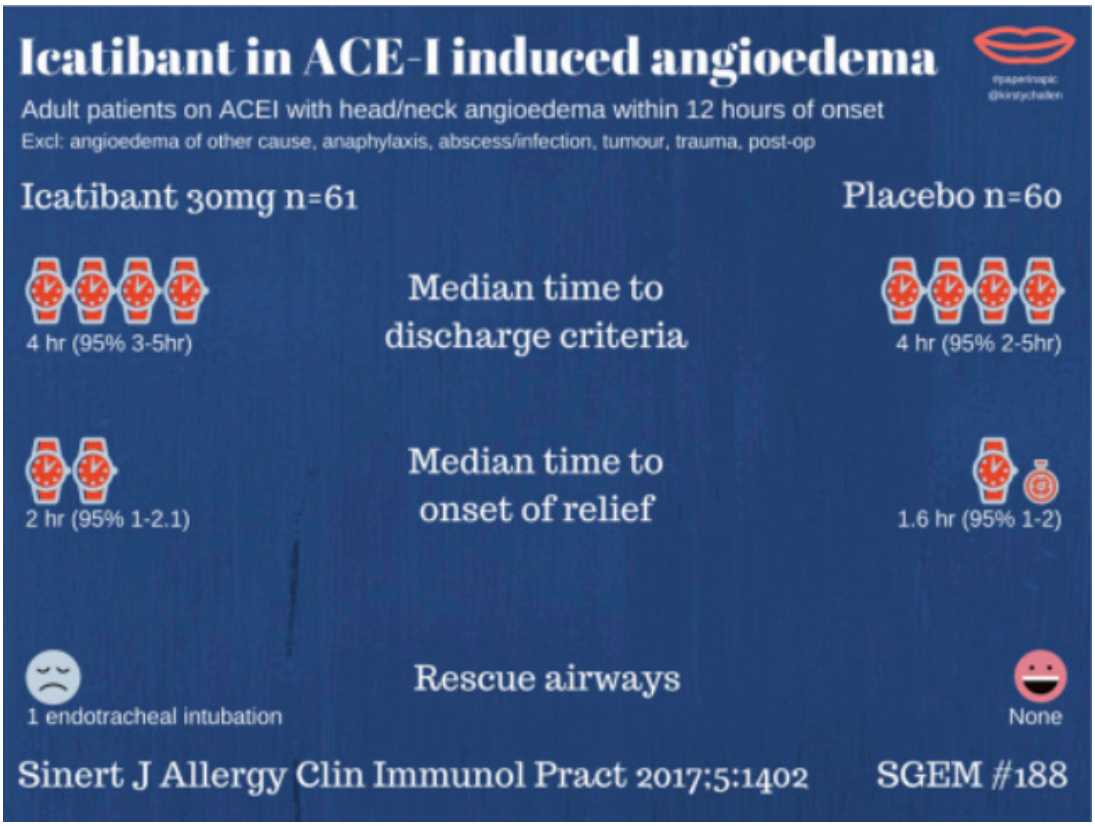
ACE-I induced angioedema remains a disorder without a viable treatment modality for reduction of symptoms. For now, the primary therapeutic interventions remain the same – airway management when indicated, observe and removal of the offending agent.

What Do You Tell My Patient?

You are currently suffering from angioedema which is a swelling of the skin and it's likely due to a medication you're taking. We don't currently have a medication that fixes this problem but, for most people, the swelling stabilizes and recedes without any complications. Because you have swelling of the mouth and the tongue, we're going watch you in the hospital and make sure this doesn't progress. We'll also be taking you off the medication that caused this swelling.

Episode End Notes

Infographic:



Twitter Poll:

> Will you use icatibant for ACE-I induced angioedema?
> thesgem.com/2017/09/sgem18…
> @EMSwami @WeAreCanadiEM @stemlyns @ketaminh @richardbody
>
> 6% Yes
> 67% No
> 27% Only in most severe cases
>
> 132 votes • Final results

Other FOAMed:

- EM Lit of Note: Icatibant . . . Can't?
- Pharm ER Tox Guy: No Icatibant for ACE-I Induced Angioedema
- St. Emlyn's: Icatibant for ACE Inhibitor Induced Angio-Oedema
- EM: RAP: The Inside Scoop on Icatibant

SGEM#
189

Bring Me To Life In OHCA

Question
In patients with OHCA that are candidates for E-CPR, does acls in the pre-hospital setting improve rates of ROSC, survival to hospital discharge and survival with good neurological outcome?

Case
You are the medical director of an EMS system in a large city deciding on whether to respond to all out of hospital cardiac arrests (OHCA) with ACLS capabilities, or if resources should be directed to those candidates for extracorporeal CPR.

Bottom Line
Even in E-CPR candidate patients, there is no evidence that ACLS provides a patient oriented benefit.

Guest Skeptic: Dr. Corey Heitz is an emergency physician in Roanoke, Virginia. He is also the CME editor for Academic Emergency Medicine and the associate editor for emergency medicine simulation at the AAEM MedEdPORTAL.

Date: September 19, 2017

Reference: Cournoyer et al. Prehospital advanced cardiac life support for out-of-hospital cardiac arrest: a cohort study. AEM September 2017.

Episode 189 Overview

Case:

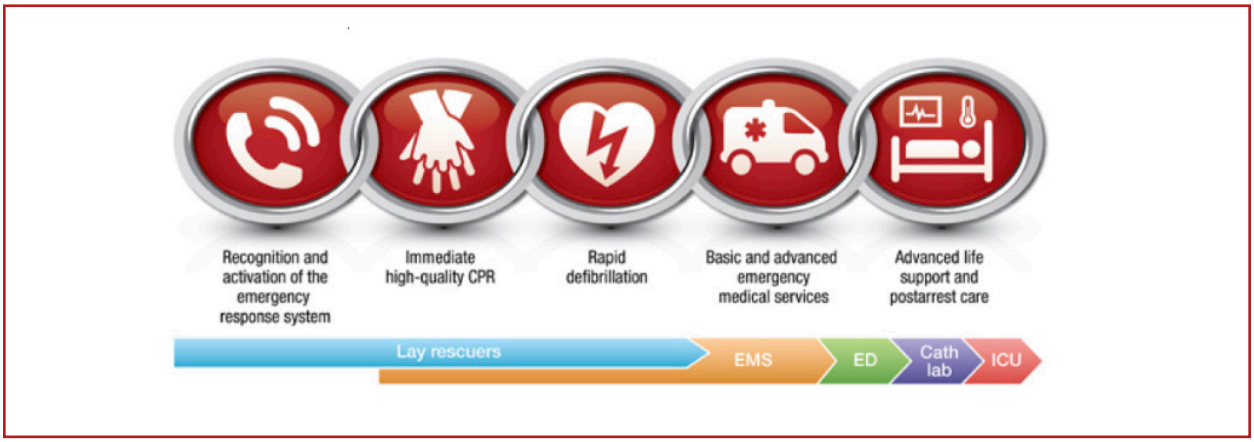
You are the medical director of an EMS system in a large city deciding on whether to respond to all out of hospital cardiac arrests (OHCA) with ACLS capabilities, or if resources should be directed to those candidates for extracorporeal CPR.

Background:

There are about ½ million sudden cardiac arrests in the USA each year. About half of these cardiac arrests are OHCA and the survival rate is pretty poor. We have covered the topic of OHCA on the SGEM a number of times:

- SGEM#143: Call Me Maybe for Bystander CPR
- SGEM#152: Movin' on Up – Higher Floors, Lower Survival for OHCA
- SGEM#162: Not Stayin' Alive More Often with Amiodarone or Lidocaine in OHCA

The American Heart Association came out with updated CPR & ECC Guidelines in 2015 that included its *"Chain-of-Survival"*. There are five steps in the Chain-of-Survival for OHCA:



Most of us can agree with the first three steps. You need to recognize an arrest and activate your EMS system. Bystander high-quality CPR can buy you some time until defibrillation. We know that rapid application of electricity to defibrillate shockable arrhythmias save lives.

It is the fourth step in the chain that is slightly more controversial; early advanced care. This basically means rapid access to ACLS type resuscitation skills (intubation and intravenous drug therapy). The classic paper on ACLS drugs is called OPALS (Ontario Pre-hospital Advanced Life Support) study and was done by Dr. Ian Stiell and team. Ian is a #LegendofEM and we covered his classic paper on SGEM#64.

OPALS was a before and after observational study, which showed the addition of ACLS was associated with more return of spontaneous circulation (12.9% vs. 18.0%, p<0.001) and improved survival to hospital admission (10.9% vs. 14.6%, p<0.001). However, adding ACLS to the pre-hospital system did not demonstrate an improvement in survival to hospital discharge (5.0% vs. 5.1%, p=0.83). It also did not show an increase in good neurologic outcome in the survivors (78.3% vs. 66.8%, p=0.73).

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. Intravenous drug administration during out-of-hospital cardiac arrest: A randomized trial. JAMA 2009
- Jacobs et al. Effects of adrenaline on survival in out-of-hospital cardiact arrest: A randomized double-blind placebo-controlled trial. Resuscitation 2011
- Hagihara et al. Prehospital epinephrine use and survival among patients with out-of-hospital cardiac arrest. JAMA 2012

In recent years there has been an interest in the use of extracorporeal cardiopulmonary resuscitation (E-CPR) in selected patients suffering from refractory OHCA.

- Sakamoto et al. Extracorporeal cardiopulmonary resuscitation versus conventional cardiopulmonary resuscitation in adults with out-of-hospital cardiac arrest: A prospective observational study. Resuscitation 2014
- Johnson et al. Extracorporeal life support as rescue strategy for out-of-hospital and emergency department cardiac arrest. Resuscitation 2014
- Pozzi et al. Extracorporeal life support for refractory out-of-hospital cardiac arrest: should we still fight for? A single-centre, 5-year experience. Internat J Cardiol 2016

Clinical Question

In patients with OHCA that are candidates for E-CPR, does ACLS in the pre-hospital setting improve rates of ROSC, survival to hospital discharge and survival with good neurological outcome?

Population: Patients 18 years of age or older with prehospital cardiac arrest.

Exclusions: Traumatic arrests, deaths from obvious causes (decapitation, advanced putrefaction) or advanced do not resuscitate directive.

Intervention: ACLS provider on scene during resuscitation.

Comparison: No ACLS provider on scene during resuscitation.

Outcomes:

Primary: Survival to hospital discharge.
Secondary: Prehospital ROSC and delay from call to hospital arrival.
Subgroup Analysis: Same metrics but for patients who were candidates for E-CPR

Lead Author:

Dr. Alexis Cournoyer is an emergency physician at the Hôpital du Sacré-Coeur de Montréal and a resident in the clinician-scientist program at the Université de Montréal. He is also currently doing a PhD at the Université de Montréal in pre-hospitals resuscitation.

Authors' Conclusions:

"In a tiered-response urban emergency medical service setting, prehospital ACLS is not associated with an improvement in survival to hospital discharge in patients suffering from OHCA and in potential E-CPR candidates, but with an improvement in prehospital ROSC and with longer delay to hospital arrival."

Quality Checklist for Randomized Clinical Trials

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

Key Results

A total of 7,134 patients were included in the study with 71.5% getting BLS and 28.5% receiving ACLS. The mean age was in the mid 60's and 2/3 were male. Only 3.4% (246) were considered potential E-CPR candidates.

Outcome

No signifigant statistical difference in survival to hospital discharge

Primary Outcome: Survival to hospital discharge (ACLS 10.9% vs BLS 10.6%, p=0.67)

Secondary Outcomes:

- Prehospital ROSC (ACLS 37.5% vs. BLS 18.5%)
- Delay from call to hospital arrival was 16 minutes longer in the ACLS group than in the BCLS group (95% CI = 15–16 minutes, $p < 0.001$).
- E-CPR candidates: 51.2% got ROSC and 36.6% survived to discharge. No significant difference associated with ACLS

Talk Nerdy to Me

We asked Alexis five questions about his research. The issue of it being an observations study was not one of the questions. This is because SGEMers are sophisticated enough to know with an observational design we can only conclude associations. Listen to the SGEM Podcast on iTunes to hear Alexis' answers to our nerdy questions.

1) Selection Bias:

How were ACLS units assigned during the period included and can you discuss the medical priority dispatch system card? It says the ACLS crews were not always available. Could they have self-selected not to go to calls they thought would probably be futile? Just because ACLS crews were there does not tell us what interventions were performed – can you comment on that?

2) Primary Outcome:

The primary outcome was survival to hospital discharge. A more patient oriented outcome would have been survival with good neurologic function. Did you measure this important outcome and if not, why not?

3) Rural vs Urban:

This study was done in a large, urban centre. How do you think these results should be applied, if at all, to a rural setting?

4) External Validity:

The SGEM has an international audience. Your EMS model has BLS and ACLS paramedics but not physicians in the ambulance. Other EMS systems do have a physician on board. Do you think this would have changed your outcome?

5) Subgroup Analysis:

Results from subgroup analyses should be viewed as hypothesis generating. ACLS was not associated with an increase or decrease in survival in the subgroup population of E-CPR candidates. Can you comment on your next steps based on this data?

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

Bottom Line

Even in E-CPR candidate patients, there is no evidence that ACLS provides a patient oriented benefit.

Case Resolution

Case Resolution:

You decide to conserve resources and not to dispatch ACLS units to all cardiac arrests. You will however keep an eye on the literature to see if future results will change this decision.

Clinical Application:

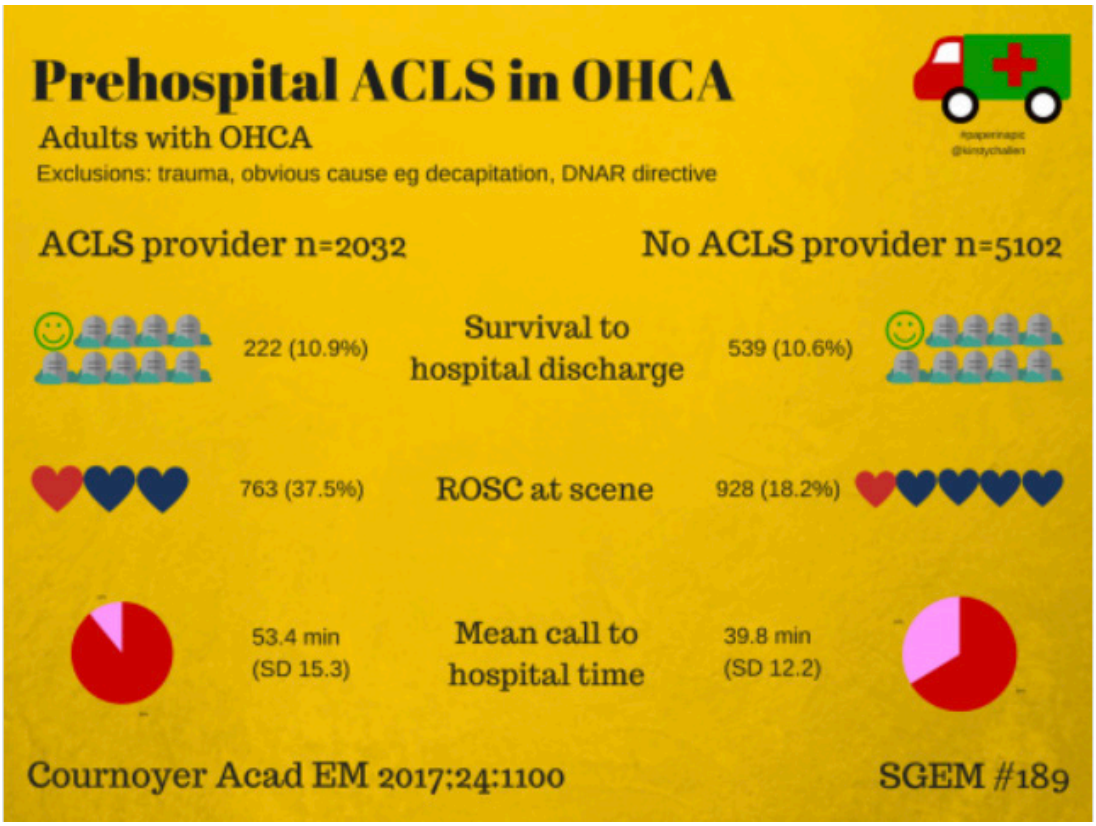
Patients undergoing OHCA arrest do not benefit from ACLS during transport. Efforts should be focused on increasing bystander CPR, decreasing EMS response times and decreasing time to defibrillation.

What Do You Tell the Patient ?

Not applicable

Episode End Notes

Infographic:



Twitter Poll:

ACLS can save lives in OHCA? #SGEMHOP
onlinelibrary.wiley.com/doi/10.1111/ac…
thesgem.com/2017/09/sgem18…
@SAEMonline @srrezaie @stemlyns
@WeAreCanadiEM

53% Yes: Definitely

47% No: Not make a difference

80 votes • Final results

Other FOAMed:

The Brown University Emergency Medicine Blog as part of AEM Early Access initiative also covered this publication. Consider it spaced repetition. Dr. Gita Pensa and I will try to coordinate better next time in selecting our articles.

SGEM#
190

Wee Are The Champions Of Pediatric Urine Samples

Question
Does the quick-wee method increase the success rate of getting a clean catch urine collection in infants suspected of having a UTI?

Case
You are working the afternoon shift in the paediatric emergency department. It has been the usual busy after-school, after-work time. Your shift is almost over and the department finally seems to be under control. The next patient you see is a five-month old girl who has been brought by her parents with a history of fever and vomiting in the last 24 hours. She has not had any diarrhoea and her parents have noticed she seems particularly miserable when she is producing wet nappies (diapers), which she is doing more frequently than often. You wonder whether it might be a urinary tract infection (UTI) causing her symptoms and you explain to the parents the importance of a clean catch urine sample. They look at you in despair – all three of them are tired and they really want to go home. You know that it can take some time to get a urine sample in this age-group and wonder, is there a quicker way to get the wee?

Bottom Line
If you have five minutes to spare, you can increase the proportion of infants in whom a clean catch urine sample can be obtained using the quick-wee method.

Guest Skeptic: Dr. Natalie May trained as an emergency physician with subspecialty paediatric emergency medicine in the UK and worked in Manchester and Oxford before moving to Australia in 2015 to work for Sydney HEMS. She's been there for the last 18 months working in prehospital and retrieval medicine and then in Emergency Medicine. She is a medical education enthusiast and has been an editor and regular contributor to the St. Emlyn's blog and podcast since 2012. We appeared on stage at SMACC Chicago doing a parody of Jimmy Fallon's Tight Pants skit.

Date: September 26, 2017

Reference: Kaufman, et al. Faster clean catch urine collection (Quick-Wee method) from infants: randomised controlled trial. BMJ April 17.

Episode 190 Overview

Case:

You are working the afternoon shift in the paediatric emergency department. It has been the usual busy after-school, after-work time. Your shift is almost over and the department finally seems to be under control. The next patient you see is a five-month old girl who has been brought by her parents with a history of fever and vomiting in the last 24 hours. She has not had any diarrhoea and her parents have noticed she seems particularly miserable when she is producing wet nappies (diapers), which she is doing more frequently than often.

You wonder whether it might be a urinary tract infection (UTI) causing her symptoms and you explain to the parents the importance of a clean catch urine sample. They look at you in despair – all three of them are tired and they really want to go home. You know that it can take some time to get a urine sample in this age-group and wonder, is there a quicker way to get the wee?

Background:

Urine samples are frequently obtained in the paediatric emergency department to rule in or rule out UTIs in those children with vomiting, fever, abdominal pain or non-specific illness.

In 2016, the American Academy of Pediatrics (AAP) reaffirmed their clinical practice guidelines for the diagnosis and management of UTIs. They state that the diagnosis of a UTI requires a urinalysis and a urine culture.

Obtaining the sample can be particularly tricky and potentially messy in children who are not yet continent. The rationale for definitive diagnosis included ensuring good antibiotic stewardship, missed UTIs can lead to renal scarring and other delayed pathology and a presumptive diagnosis can result in expensive and unnecessary imaging.

The decision to obtain an invasive sample is a clinical one. If the child looks sick and requires antimicrobial therapy then immediate collection of a urine sample through urethral catheterization or supra-pubic aspiration is recommended strongly by the AAP.

However, if the child is looks well, but the clinician determines that the febrile infant is not in the low risk group for a UTI, the AAP recommends two options. One option is to obtain the urine sample using an invasive method.

The second option is a two-step approach to identification of a UTI. This two-step process can decrease the rate of catheterization by over 30% without missing UTIs or increasing length of stay in the pediatric emergency department (Lavelle et al Pediatrics 2016).

The first step is to screen using a non-invasive collection method like a bagged urine specimen. If the sample is negative (no evidence of a UTI) then cultures may be omitted. A second step is needed if the bagged sample result is positive or shows evidence of a UTI.

Non-invasive methods are preferable for all but those at risk of neonatal sepsis or the ill appearing infant. However, catching a fresh sample is time consuming.

Just for completeness, the AAP does make a strong recommendation that if the clinician determines the febrile infant to have a low likelihood of a UTI, then no urine testing is necessary as long as there is clinical follow-up monitoring.

An open-access study published this year in the BMJ suggests a new method called the Quick-Wee could speeded up collection of clean catch urine samples in patients for whom we are considering a diagnosis of UTI.

Clinical Question

Does the quick-wee method increase the success rate of getting a clean catch urine collection in infants suspected of having a UTI?

Population: Pre-continent infants age 1-12 months where a urine sample was required and the clinician felt the appropriate method of collection was a clean catch urine.

Exclusions: Neonates (age less than one month) and infants with neurological or anatomical abnormalities affecting sensation or voiding.

Intervention: Quick-Wee method – Genital area was cleaned for 10 seconds with sterile water at room temperature. This was followed by continued rubbing of the suprapubic area in a circular pattern with gauze (soaked in cold saline of kept in fridge at 2.8C) held by forceps. This was done for until clean catch urine was obtained up to five minutes. A parent/care-giver/clinician stood by ready to catch the urine sample.

Comparison: Usual Care – Genital area was cleaned for ten seconds with sterile water at room temperature. A parent/care-giver/clinician stood by ready to catch the urine sample.

Outcome:

Primary: Proportion of subjects voiding urine within five minutes (binary outcome)

Secondary: Voiding with successful catch of urine sample, rates of contamination, and parental and clinician satisfaction with technique on a 5-point Likert scale (1- very satisfied and 5- very unsatisfied).

Authors' Conclusions:

"Quick-Wee is a simple cutaneous stimulation method that significantly increases the five minute voiding and success rate of clean catch urine collection."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department
- ☑ 2. The patients were adequately randomized
  A 1:1 ratio using random permuted blocks of different sizes, envelopes taken sequentially.
- ☑ 3. The randomization process was concealed
  They used opaque envelopes.
- ☑ 4. The patients were analyzed in the groups to which they were randomized
  They performed an intention-to-treat analysis.
- ? 5. The study patients were recruited consecutively (i.e. no selection bias)
- ☑ 6. The patients in both groups were similar with respect to prognostic factors
  However, no P values are given but values in Table 1 appear similar.
- ☒ 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation
  This was not a blinded study.
- ☑ 8. All groups were treated equally except for the intervention
  The study intervention was very quick with a binary outcome so there's little opportunity to add in any potential confounders.
- ☑ 9. Follow-up was complete (i.e. at least 80% for both groups)
  21 out of 24 in both groups .
- ☑ 10. All patient-important outcomes were considered
- ☑ 11. The treatment effect was large enough and precise enough to be clinically significant
  Patients pain was reduced equally in both groups

Key Results

354 subjects were recruited of whom 344 participated in the analysis. There were 170 in the control group and 174 in the intervention group. The mean age was 5.4 months with a 50/50 male/female split. The most common clinical indication for urine collection being fever (42%) followed by unsettled baby (38%). Only 17% of infants had urine collected because a UTI was specifically suspected.

Outcome

Voiding within 5 minutes: 31% quick-wee vs. 12% with usual care

This gives an absolute difference of 19% (95% CI of 11% to 28%) or a NNT of

Secondary Outcomes: They had higher success rate with QuickWee overall, no difference in contamination and greater parent/clinician satisfaction and we will put the details in the blog post.

- Voiding with successful catch of urine sample (30% QuickWee vs. 9% Usual Care, p<0.001)
- Rates of contamination (27% QuickWee vs. 45% Usual Care, p=0.29)
- Median Parent/Care Giver Satisfaction (2 QuickWee vs. 3 Usual Care, p<0.001)
- Median Clinician Satisfaction (2 QuickWee vs. 3 Usual Care, p<0.001)

Talk Nerdy to Me

1) Selection Bias and External Validity:

There are some question marks over the integrity of the selection procedure as patients were identified and recruited by emergency depargtment staff, which is great, because it's very practical, but it looks as though those same staff may have then undertaken the intervention. This creates potential for bias if the recruiting staff are also undertaking the intervention. The published study protocol does not offer any further clarity here so we have to assume there was a lack of independence.

It is also important to point out this was a single center, large, tertiary pediatric hospital in Australia. The population may not reflect the same pediatric population you have presenting to your community or rural emergency department. They also excluded neonates and those over 12 months of age and so the results can not be applied to these age groups.

2) Lack of Blinding:

There was no blinding in the study, which the authors tell us was because of the nature of the intervention. That seems fair as the observer will naturally be aware of which method of obtaining the sample was used; however, there were missed opportunities to use blinding in this study. The person starting the timer could have been independent, standing outside the cubicle and measuring five minutes or until the observer produced a sample.

In addition, the researchers assessing the data could have been blinded to which intervention group each data set came from. This is the simplest way of introducing blinding into a study but it is rarely utilised in isolation – and perhaps it should be used more.

3) Statistical Significance and Clinical Significance:

The sample size was calculated with 80% power to detect a difference of 15% between groups in the primary outcome and the sample size was achieved. The difference in proportions was 19% with a 95% confidence interval that went from 11% to 28%. This gives which gives an NNT of 5 to successfully obtain one additional sample within five minutes.

With regards to clinical significance, they interviewed 20 experts (Paediatric Emergency Medicine Specialists and Paediatricians) and based on their expert opinion they felt it would need a difference of 15% to be clinically significant to their clinical practice. What about asking the parents/caregivers what they think would be clinically significant? We know that clinicians and patients (parents/care-givers) can have different levels of what they would consider "significant".

4) Adverse Events and Contamination:

There are no adverse events in either group, excluding crying and mild distress, which was thought to be standard for children in whom you are trying to obtain a urine sample – I'm inclined to agree.

There also seemed to be lower rates of contamination in the Quick-Wee method. However, the study was not designed or powered for this secondary outcome. The authors hypothesize this might be because the sample is obtained *"faster and more forceful voiding"* and that could reduce contamination.

In any case, contamination rates were low in both groups. It should be noted that culture results were only available for 55 patients in total (12/44 samples sent for culture in the Quick-Wee group grew contaminants compared with 5/11 in the control group). There was no robustness around this measure since the sending of the sample for culture was apparently at clinician's discretion.

If the method really does reduce the proportion of contaminants then that would make it a bit of a game changer. But based on the available evidence from this study we cannot draw that conclusion about the Quick-Wee method.

5) Satisfaction Scores:

This was pretty crudely measured too. They used the five-point Likert scale. However, it was a little counterintuitive in the paper because they have used 1 to mean "very satisfied" and 5 to mean "very unsatisfied". So, a higher score does not suggest higher satisfaction. Median satisfaction scores for parents and clinicians were 2 for Quick-Wee and 3 for the standard clean catch urine, suggesting they were more satisfied with the Quick-Wee method.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the authors' conclusion. Children aged 1-12 months do seem more likely to pass urine within five minutes if the Quick-Wee Method is used.

Bottom Line

If you have five minutes to spare, you can increase the proportion of infants in whom a clean catch urine sample can be obtained using the quick-wee method.

Case Resolution

Case Resolution:

You suggest to the parents that, now that the department is a little less busy, you could try the Quick-Wee method to make their infant pass urine a little bit faster. After a brief explanation of what's involved they agree. After about 90 seconds of cold saline suprapubic stimulation you successful have a clean catch urine sample.

Clinical Application:

This certainly seems like a relatively quick and reasonably effective way of increasing your chances of obtaining a clean catch urine within five minutes. If you have staff to spare to spend five minutes rubbing the suprapubic area of your patients with cold-saline-soaked gauze them great. However, we might not get to five minutes of uninterrupted stimulation in the emergency department before something more urgent comes through the door.

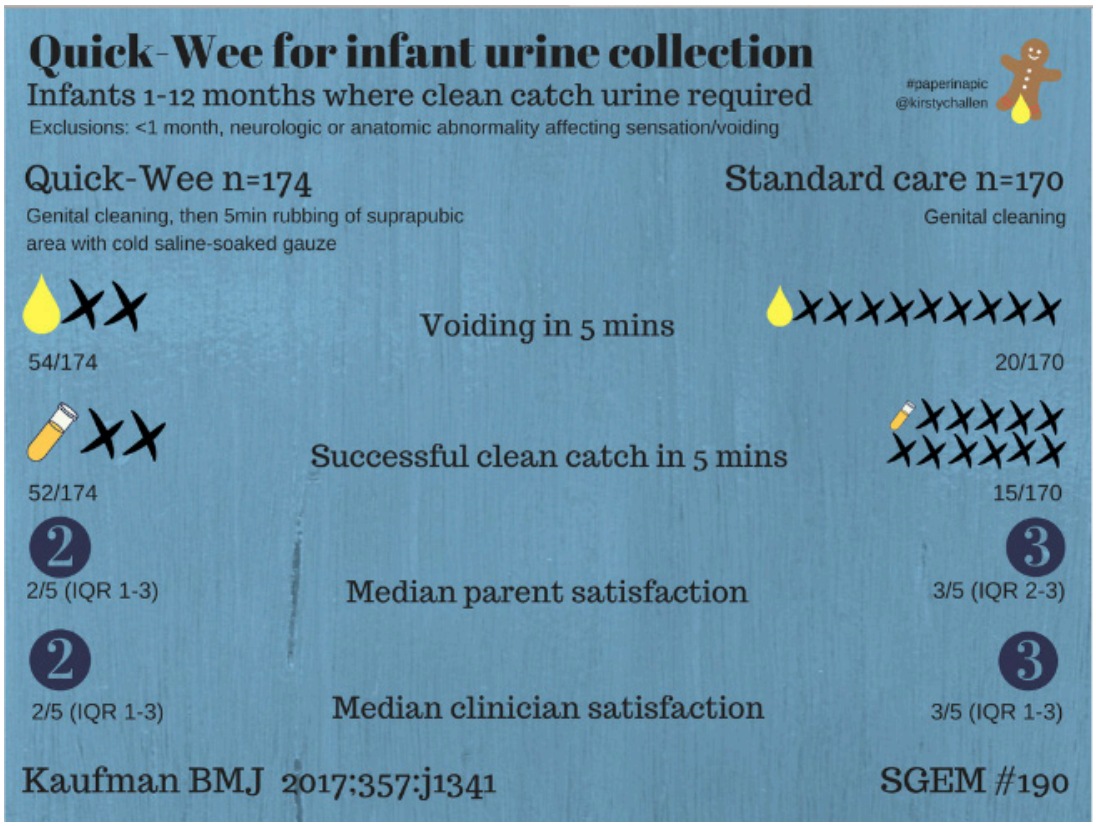
What Do I Tell the Patient (Parent/Care Giver)?

It's very important that we get a clean catch urine sample from your infant. We want to make sure the urine we get does not have any contamination from the skin. This means if we get a sample with no signs of infection we know the fever is most likely not due to a UTI. If there are signs of infection in the sample we will need to put a catheter inside your infant's bladder to get a better sample of urine. This can be uncomfortable for your infant. This is why we really like to try to get a clean catch sample.

However, waiting to get a clean catch sample can be a long process. But there is a new method called the Quick-Wee method that can increase the chance we get some urine in less than five minutes. It involves rubbing over their bladder area with a cold gauze pad. There is no harm to your infant other than they might get fussy and cry. So, if you are happy with this we can give it a wee go!

Episode End Notes

Infographic:



Twitter Poll:

Would you use the Quick-Wee method to get a urine sample?
thesgem.com/2017/10/sgem19… @stemlyns @WeAreCanadiEM @andrewjtagg @EMtogether #FOAMped

44% Yes
3% No
53% What is Quick-Wee method?

112 votes • Final results

Other FOAMed:

St. Emlyn's: JC: The Quick-Wee Method for Faster Clean Catch Urine Collection
PEMLit: What are WEE Waiting for? The Quick-Wee Method for Faster Clean Catch Urine Collection
PEMPlaybook: Urine Trouble

SGEM#
191

No Time For Physio:

Roll With It

Question

Does a supervised physiotherapy program result in improved recovery from acute ankle sprains compared to usual care in adult patients presenting to an emergency department or urgent care clinic.

Case

A 43-year-old male presents to your local rural emergency department Monday morning after rolling his ankle during his usual weekend pickup basketball game. He is Ottawa Ankle Rule positive but the x-ray shows no fracture.

Bottom Line

A 43-year-old male presents to your local rural emergency department Monday morning after rolling his ankle during his usual weekend pickup basketball game. He is Ottawa Ankle Rule positive but the x-ray shows no fracture.

Guest Skeptic: Dr. Steve Joseph. Steve completed his Sport Medicine fellowship training with the Fowler Kennedy Sport Medicine Clinic in 2017. He served with the Canadian Forces as a Medical Officer and Flight Surgeon. Steve is currently an Assistant Professor in the Department of Family Medicine at Western University working at the Fowler Clinic and the Roth McFarlane Hand and Upper Limb Centre.

Date: October 5, 2017

Reference: Brison et al. Effect of early supervised physiotherapy on recovery from acute ankle sprain: randomised controlled trial. BMJ Nov 2016.

Episode 191 Overview

Case:

A 43-year-old male presents to your local rural emergency department Monday morning after rolling his ankle during his usual weekend pickup basketball game. He is Ottawa Ankle Rule positive but the x-ray shows no fracture.

Background:

We have covered the Ottawa Ankle Rules (tools) early in Season#1 (SGEM#3). The Ottawa Ankle Rules are probably the most validated clinical decision instrument that have ever been published.

The Ottawa Ankle Rules have been validated down to five years of age and can be used to safely rule out ankle fractures.

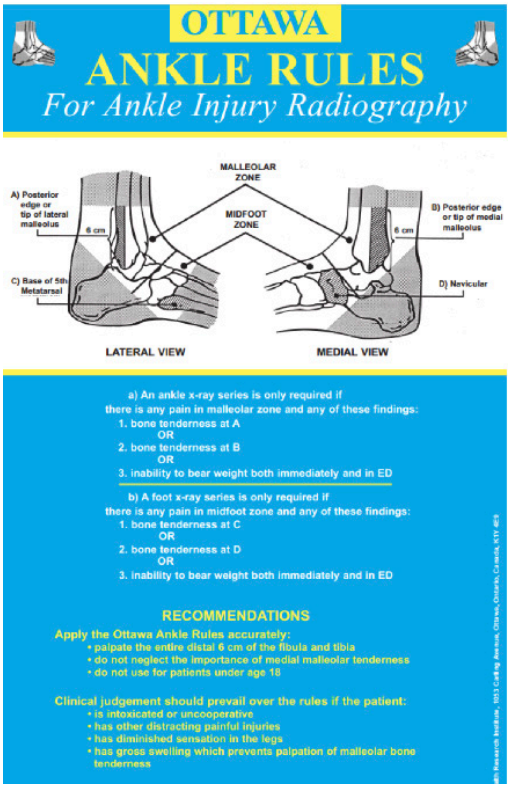
These rules were created by the team in Ottawa lead by Dr. Ian Stiell who is a Legend of Emergency Medicine. You know what they say, those who published the clinical decision instruments get to make the rules.

Ankle sprains are one of the most common and burdensome injuries and are associated with a high rate of visits to an emergency department. Current evidence and clinical standards for acute management of simple sprains (Grade I and II) is limited and not well defined. This includes the role of supervised physiotherapy acutely.

There are some smaller studies in the past that have shown elements of physiotherapy to be of benefit in athlete populations.

- Hupperets et al. Effect of unsupervised home based proprioceptive training on recurrences of ankle sprain: randomised controlled trial. BMJ 2009
- Janssen et al. Bracing superior to neuromuscular training for the prevention of self-reported recurrent ankle sprains: a three-arm randomised controlled trial. Br J Sports Med.

However, these studies deal with ankle sprains in a specific group as compared to a generalized emergency department population.



Clinical Question

Does a supervised physiotherapy program result in improved recovery from acute ankle sprains compared to usual care in adult patients presenting to an emergency department or urgent care clinic.

Population: Patient 16 years of age or older with a clinical diagnosis of a Grade I/II ankle sprain presenting to the emergency department or urgent care clinic within 72 hours of injury.

Exclusion: Injury mechanisms that were inconsistent with a ligamentous sprain; the attending emergency physician determining the need for immobilization of the injured ankle or surgery based on clinical findings; presentation with concomitant injuries; other mobility limiting conditions; inability to accommodate the time intensive study protocol; and a declared plan to seek physiotherapy for treatment outside the study protocol.

Intervention: Early supervised physiotherapy and usual care

Comparison: Usual care (medical assessment, one page written summary of instruction for basic management of the injury at home, including ankle protection, R.I.C.E., pain medication as needed, graduated weight bearing activities, and set expectation for recovery. No physiotherapy was discussed).

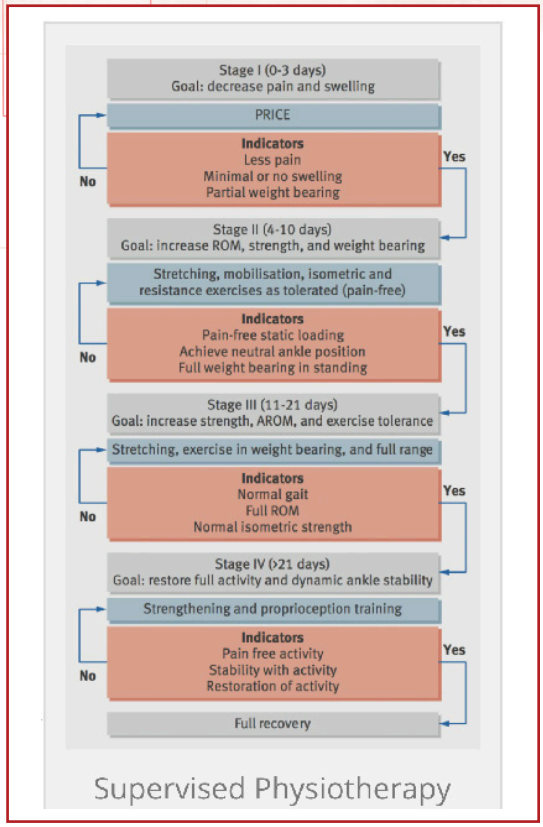
Outcome:

Primary: Absolute proportion of patients achieving excellent recovery at three months (defined as greater than or equal to 450/500 on foot and ankle outcome score – FAOS)

Secondary: FAOS at one and six months

Authors' Conclusions:

"In a general population of patients seeking hospital based acute care for simple ankle sprains, there is no evidence to support a clinically important improvement in outcome with the addition of supervised physiotherapy in addition to usual care, as provided in this protocol.



Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department
- ☑ 2. The patients were adequately randomized
- ☑ 3. The randomization process was concealed
- ☑ 4. The patients were analyzed in the groups to which they were randomized
- ? 5. The study patients were recruited consecutively (i.e. no selection bias)
- ☑ 6. The patients 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 patient-important outcomes were considered
- ☒ 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

A total of 504 patients were recruited for the study (254 physiotherapy group and 250 usual care group). The mean age was about 31 years, slightly more women and about 70% were considered Grade II sprains.

Outcome

No statistically or clinically significant difference between groups.

Primary Outcome: Excellent Recovery at Three Months

- 43% physiotherapy group vs. 37% usual care group
- Absolute difference of 6% (95% CI -3% to 15%, p=0.26)

Secondary Outcomes: No difference at one or six months

- **One Month:** 11% vs. 15% (95% CI -9% to 3%, p=27)
- **Six Months:** 57% vs. 62% (95% CI -5% to 5%, p=26)
- **Subgroup Analysis:** One small subgroup analysis by age (age under 30 at 3 months) has statistical significance for intervention. Subgroup analysis should be considered hypothesis generating only because the study was not powered for these outcomes.

Talk Nerdy to Me

1) Selection Bias:

Only about 1/3 (504/1,566) of eligible patients presenting with a simple ankle sprain were ultimately included in the study for a variety of reasons. Clinical judgement was used for both inclusion and exclusion of patients. This could have introduced selection bias. Given the hypothesis that physiotherapy would provide benefit, you would think the bias would have been in favor of the intervention, however that was not demonstrated.

2) Blinding:

The patients were not blinded to the treatment allocation. Patients were also not to reveal the allocation to blinded research staff. However, blinding may have been broken. Even if blinding was broken the bias should have favored the physiotherapy group.

3) Power:

They powered the study to find a 15% difference because that is what was considered clinically significant. For the primary outcome, they only found a 6% absolute difference in the intention-to- treat analysis. However, the 95% CI did go up to 15% in favor of the intervention. When they did their per-protocol analysis the effect size went down to only 2% (95% CI -8% to 13%, p=42).

4) Selection of Instruments:

The FAOS is a self-reporting scale. Self-reporting scales have their own inherent weaknesses. The FAOS has been considered to have content validity, construct validity and reliability. However, it is lacking in evidence for responsiveness. Responsiveness is ability of the tool to detect changes in a patient's status over time. There are other instruments available to assess ankle sprains but they too have limitations (Martin and Irrgang 2007 and Shultz et el 2013).

5) Standardized Physiotherapy:

It is good to have a standardized protocol to follow for the intervention. However, their standardized physiotherapy program did not allow the use of bracing, taping, or manual therapies. These are often part of a physiotherapy program for sprained ankles. In addition, the true optimal dose, timing and intensity of ankle sprain rehabilitation is not known.

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

Bottom Line
The current evidence does not support the referral of adult patients presenting to the emergency department or urgent care clinic with a simple ankle sprain for physiotherapy.

Case Resolution

Case Resolution:

The weekend warrior is diagnosed with a Grade I sprain and is given instructions for usual ankle sprain care.

Clinical Application:

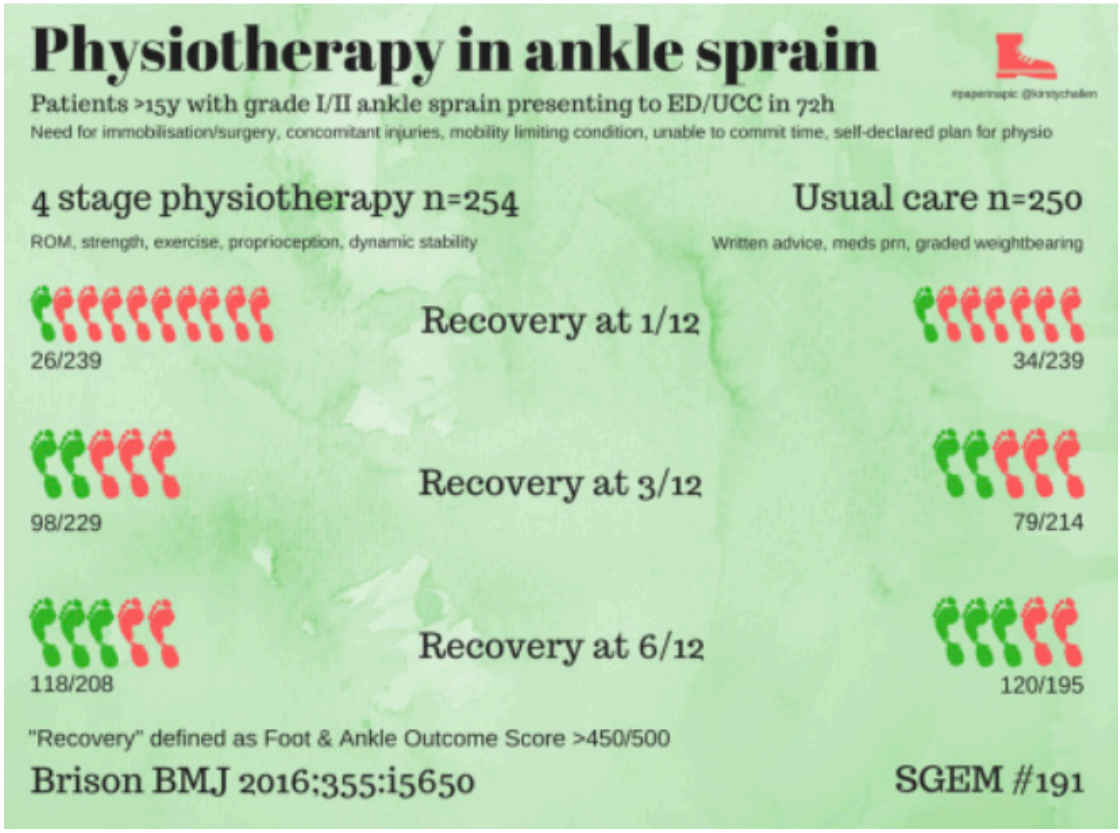
This is a good study to suggest that for the general population presenting to the emergency department or urgent care centre, outpatient physiotherapy is unlikely to provide benefit. However, we do have some evidence of benefit demonstrated in other studies looking at athletes. So, it all depends. In some cases further assessment by a sports medicine physician and referral to physiotherapy may be reasonable.

What Do I Tell My Patient?

Just roll with it…you have sprained your ankle. This should heal over time. It might take you a little longer than when you were a teenager. Get some rest, we will put on a tensor bandage to remind you to behave yourself and you can take some over-the-counter pain medicine if you want. Most people have an excellent recovery but it can take months. We do not have any evidence that physiotherapy can speed up your recovery. However, if you pain is getting worse, your function is going down or you are concerned then get in to see your family physician.

Episode End Notes

Infographic:



Twitter Poll:

Do you routinely refer adult patients with Grade I/II ankle sprains for physiotherapy. thesgem.com/2017/10/sgem19… #FOAMed @srrezaie @EMSwami

15% Yes

85% No

131 votes • Final results

SGEM#
192

Sometimes, All You Need Is The Air That You Breathe

Question
Does routine administration of supplemental oxygen in patients with suspected or confirmed acute myocardial infarction who are not hypoxic provide a patient oriented benefit?

Case
A 68-year-old man with a history of hypertension and dyslipidemia develops chest pain while grocery shopping. Emergency medical services are called, arrive quickly and find a man with 7/10 chest pain. His vitals are: heart rate of 72 beats per minute, blood pressure of 150/90, respiratory rate of 14 breaths per minute and oxygen saturation of 93%. The ECG shows an inferior ST-Elevated Myocardial Infarction (STEMI). They give him 180mg of ASA to chew and package him for transportation to the hospital. While preparing to depart, they wonder if they should provide him with supplemental oxygen?

Bottom Line
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?

Guest Skeptic: Marcus Prescott is a nurse in Norway. He is also now a first-year medical student.

Date: October 19, 2017

Reference: Hofmann et al. Oxygen Therapy in Suspected Acute Myocardial Infarction. NEJM Sept 2017.

Episode 192 Overview

Case:

A 68-year-old man with a history of hypertension and dyslipidemia develops chest pain while grocery shopping. Emergency medical services are called, arrive quickly and find a man with 7/10 chest pain. His vitals are: heart rate of 72 beats per minute, blood pressure of 150/90, respiratory rate of 14 breaths per minute and oxygen saturation of 93%. The ECG shows an inferior ST-Elevated Myocardial Infarction (STEMI). They give him 180mg of ASA to chew and package him for transportation to the hospital. While preparing to depart, they wonder if they should provide him with supplemental oxygen?

Background:

Oxygen is a drug and like all drugs can have potential benefits and potential harms depending on how and when it is used. Studies have shown that oxygen can cause vasoconstriction, increase blood pressure and decrease coronary artery blood flow (Kones et al AM J Med 2011).

A systematic review by Wijesinge et al from 2009 found only two randomized control trials looking at supplemental oxygen. One study of 200 patients demonstrated increased mortality (4% in controls vs. 11% in oxygen treatment group).

A second smaller study of 50 patients did not look at mortality but showed less ventricular tachycardia (VT) with supplemental oxygen (23% vs. 25%). However, this difference between the two groups was not statistically significant (relative risk 0.9; 0.3 to 2.7, p = 0.86). What would you rather have, more death or less VT?

Oxygen supplementation in non-hypoxemic patients with acute myocardial infarction has been a hot topic since the publication of the AVOID-trial (Stub et al Circulation 2014). The AVOID trial showed no benefit, and possible harm, to patients with an oxygen saturation over 94% when given supplemental high-flow oxygen. Their conclusion was: "Supplemental oxygen therapy in patients with ST-elevation–myocardial infarction but without hypoxia may increase early myocardial injury and was associated with larger myocardial infarct size assessed at 6 months."

A 2016 Cochrane review by Cabello et al found five RCTs in patients with suspected or confirmed acute myocardial infarction. They found "There is no evidence from randomised controlled trials to support the routine use of inhaled oxygen in people with AMI, and we cannot rule out a harmful effect."

The Cochrane authors said that a well-designed RCT is needed due to the uncertainty of routinely using supplemental oxygen in patients with acute myocardial infarctions. They felt this would help inform guideline writers on making recommendations in this area.

The American Heart Association (AHA) Guidelines were updated in 2015 and did not provide a strong recommendation on the issue. The say supplemental oxygen may be withheld in normoxic patients with suspected or confirmed acute coronary syndrome

- *The usefulness of supplementary oxygen therapy has not been established in normoxic patients. In the prehospital, ED, and hospital settings, the withholding of supplementary oxygen therapy in normoxic patients with suspected or confirmed acute coronary syndrome may be considered. (Class IIb, LOE C-LD)*

Clinical Question

Does routine administration of supplemental oxygen in patients with suspected or confirmed acute myocardial infarction who are not hypoxic provide a patient oriented benefit?

Population: Patients 30 years and older with symptoms suggestive of myocardial infarction for less than six hours, oxygen saturation greater than 89%, and either evidence of ischemia on ECG or elevated cardiac troponin on admission.

Exclusion: Patients in cardiac arrest, oxygen saturation less than 90% or who were receiving ongoing oxygen therapy.

Intervention: Supplemental oxygen at 6L/min for 6-12 hours through open face mask

Comparison: Ambient air

Outcome:

Primary: Death from any cause within one year

Secondary: Death for any causes within 30 days, rehospitalisation with myocardial infarction or heart failure and cardiovascular death and composite endpoints at 30 days and one year.

Authors' Conclusions:

"Routine use of supplemental oxygen in patients with suspected myocardial infarction who did not have hypoxemia was not found to reduce 1-year all-cause mortality."

Quality Checklist for Randomized Clinical Trials

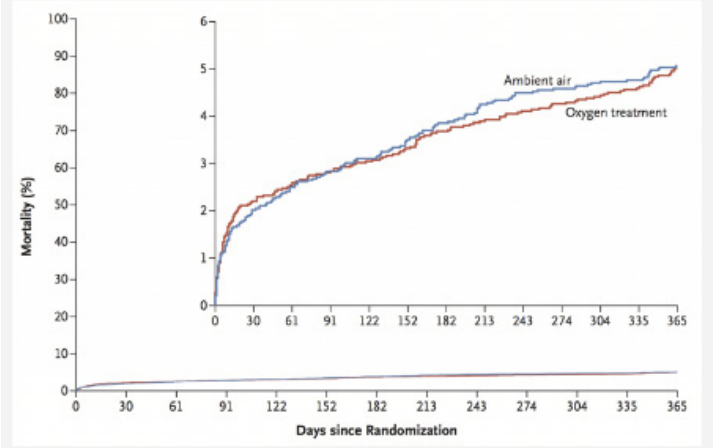
☒	1.	The study population included or focused on those in the emergency department
☑	2.	The patients were adequately randomized
☑	3.	The randomization process was concealed
☑	4.	The patients were analyzed in the groups to which they were randomized
?	5.	The study patients were recruited consecutively (i.e. no selection bias)
☑	6.	The patients 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 patient-important outcomes were considered
☒	11.	The treatment effect was large enough and precise enough to be clinically significant

Key Results

There were 6,629 patients included in the study for the intention-to-treat analysis. Around 2/3 arrived via ambulance, the median age was 68 years and slightly more than 2/3 of the patients were male. Patients were on oxygen therapy for a median duration of almost 12 hours. In addition, the supplemental oxygen did result in a statistically significant increase in oxygen saturation (99% vs. 97%, p<0.001).

Outcome

No difference in death from any cause within one year



Kaplan-Meier Curve Death Any Cause

Primary Outcome: Death any cause at one year was 5.1% vs 5.0%, CI 0.79-1.21, p=0.80

Per-protocol: Mortality was no difference 4.75% vs. 5.1%, CI 0.72-1.14, p=0.40. Consistent over all subgroups

Secondary Outcomes: Consistent over all subgroups

- Death from any cause at 30 days was 2.2% vs 2.0%, CI 0.77-1.50, p=0.67
- Rehospitalization with acute myocardial infarction at 30 days was 1.4% vs 0.9%, CI 0.92-2.31, p=0.11
- Rehospitalization with acute myocardial infarction at one year was 3.8% vs. 3.3%, CI 0.88-1.46, p=0.33
- Heart failure data has a 12-month lag time and thus was not included

Talk Nerdy to Me

1) Consecutive Emergency Department Patients:

We are unsure if these were consecutive patients because it was not explicitly stated. This has the potential to introduce selection bias. They also recruited patients from the ambulance services, emergency departments, coronary care units, or catheterization laboratories. However, more than 2/3 of the patients arrived at the hospital by ambulance suggesting this would represent a similar population to what we see. This broad inclusion criteria would also increase the validity of these results other clinical settings.

2) Blinding:

This was an open label trial not a double-blinded trial. They said it was not feasible or ethical to have a sham comparison group. However, this lack of blinding should have favoured the treatment group. This strengthens our confidence in the results not demonstrating benefit of supplemental oxygen.

3) Treated Equally:

We were unsure whether the patients were treated equally. This is because of the pragmatic study design, physicians decided any treatments to use outside of the protocol. Table 2 reports the management was the same except for inotropes being used more often in the oxygen group. There could have also been unmeasured cofounders. In addition, the physician could provide supplemental oxygen to patients based clinically necessary. This happened more often in the ambient-air group (8%) vs. the oxygen group (2%) making the data a little harder to interpret.

4) Under Powered:

This study ended up being underpowered for the primary outcome. They had based their power calculation on estimated one year total mortality of 14.4% among patients with myocardial infarctions. Death from any cause at one year was only 5%. They provide three possible explanations for the lower observed mortality. Sicker patients were excluded (hypoxic and those with altered mental status) and healthier patients were included (¼ had a diagnosis other than acute myocardial infarction). This means that there still could be a statistical difference between the two groups if the study had enough patients enrolled. In other words, a Type II error could be made by concluding that there is no difference between the two groups when in fact there is a difference.

5) Clinical vs. Statistical Significance:

Even if there was a statistical difference, they did not report one important clinical: outcome, survival with good neurologic function. We would not want to have more patients survive with poor neurologic status.

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

Bottom Line

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?

Case Resolution

Case Resolution:

This patient is not hypoxic with an oxygen saturation of 93%. The paramedics load him up and head to the hospital notifying them that an inferior STEMI is on the way.

Clinical Application:

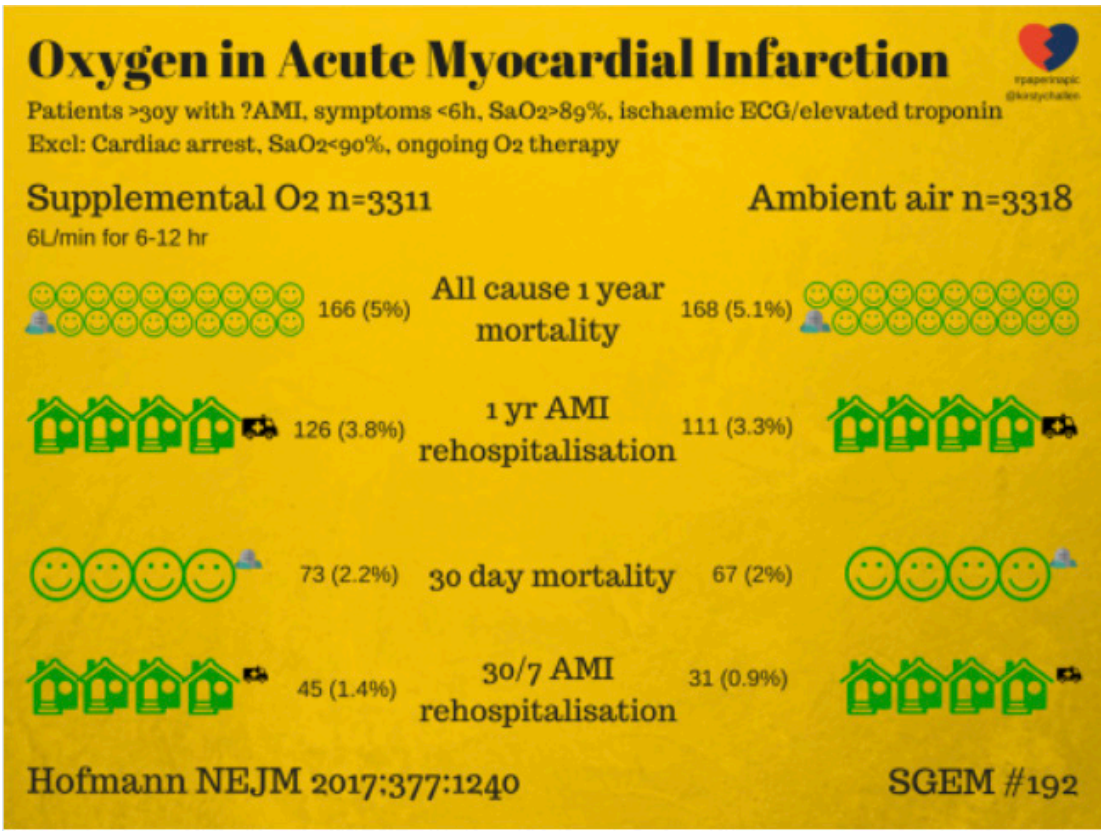
This study agrees with the Cochrane review of five RCTs failing to demonstrate benefit of supplemental oxygen in these patients. As such, I will not provide oxygen to these patients routinely. I also plan to talk with my EMS director about changing their protocol to only administer oxygen to patients with suspected or confirmed acute myocardial infarctions who are hypoxic.

What Do I Tell My Patient?

It looks like you are having a heart attack. We have given you ASA and will take you quickly and safely to a hospital that can treat your heart attack. Your vital signs are good right now. We will monitor them on the way to the hospital. Specifically, your oxygen level is fine and we do not need to give you any extra oxygen.

Episode End Notes

Infographic:



Twitter Poll:

Would you provide supplemental oxygen to STEMI patient with O2 sat of 92%? @srrezaie @stemlyns @emcrit #FOAMed thesgem.com/2017/09/sgem18…

56% Yes

44% No

465 votes • Final results

11:47 AM - 24 Oct 2017

Other FOAMed:

- **EM Literature of Note:** Neither Benefit Nor Harm Seen With Oxygen in Myocardial Infarction
- **EM Nerd (EMCrit):** The Case of the Liberated Radicals
- **ScanCrit:** O2 Not Needed in Myocardial Infarction
- **The Bottom Line:** DETO2X-AMI – Oxygen Therapy in Suspected Acute Myocardial Infarction
- **St. Emlyn's:** JC – Oxygen in ACS. A Fuss About Nothing? The DETO2X Trial
- **REBEL EM – The DETO2X Trial:** Do Patients with AMI Need Supplemental O2?

SGEM#
193

Stop, In The Name Of Love

Question

1. What is the current evidence for the use of sucrose in neonatal infants undergoing painful procedures?
2. Using a cumulative meta-analysis (cma), when did the evidence for the use of sucrose become statistically significant?

Case

A 12-day old girl presents with fever and is otherwise well. You are planning to begin a full septic workup including some painful procedures including bloodwork. You wonder whether there is a way to mitigate the painful experience for the child.

Bottom Line

When performing painful procedures on newborns use a sweet solution to minimize the pain experience. If you are doing research on sweet solutions, please do not have your comparison group get placebo or no treatment, it's unethical at this point.

Guest Skeptic: Dr. Anthony 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. Anthony is also the creator of SketchyEBM.

Date: October 24, 2017

Reference: Harrison et al. Sweet Solutions to Reduce Procedural Pain in Neonates: A Meta-analysis. Pediatrics 2017

Episode 193 Overview

Case:

A 12-day old girl presents with fever and is otherwise well. You are planning to begin a full septic workup including some painful procedures including bloodwork. You wonder whether there is a way to mitigate the painful experience for the child.

Background:

Painful procedures are common in the neonatal period, including bloodwork, lumbar punctures and bladder catheterization. There is evolving evidence to the long-term neuro-developmental harms associated with pain in the preterm infants (Field T. Infant Behavior and Development 2017)

We have covered pain a number of times on the SGEM including the following episodes:

- SGEM#78: Sunny Days (Pediatric Pain Control)
- SGEM#149: Share Decision Making for Pain Control in Older ED Patients
- SGEM#173: Diazepam Won't Get Back Pain Down
- SGEM#175: Dancing on the Ceiling with Ketorolac for Pain
- SGEM#187: Pin Cushion – Acupuncture in the Emergency Department

One aspect is the lack of pain control referred to as oligoanalgesia. There are certain patient populations who are at risk for in adequate pain management.

The pediatric age group represents one of the populations at risk for oligoanalgesia. There are many ways to address pain in pediatric patients with both pharmacologic and non-pharmacologic treatments. One medication that should not be use in children under 12 years of age is codeine.

There is a RANThony on pediatric pain control and one of the interesting treatments was sucrose. That rant relied upon a Cochrane SRMA by Stevens B et al 2013 and a randomized clinical trail published in Pediatrics by Gray L et al 2015. Stevens and colleagues updated their review in 2016 and concluded *"sucrose is effective for reducing procedural pain" and "no serious side effects or harms have been documented with this intervention".*

Clinical Question

1. What is the current evidence for the use of sucrose in neonatal infants undergoing painful procedures?
2. Using a cumulative meta-analysis (CMA), when did the evidence for the use of sucrose become statistically significant?

Population: Randomized or quasi-randomized controlled trials of neonates

Exclusions: Non-neonatal patients, inability to extract data from study or from author, untranslatable data.

Intervention: Sucrose, glucose, or other sweet solutions orally.

Comparison: *"No treatment, water, pacifier, swaddling/positioning, skin-to-skin care, formula feeding, expressed breast milk, breastfeeding, sensorial saturation, or topical anesthetics"*

Outcome: Unclear if they really had a primary and secondary outcome. What they said was that the aim of the article was to: *"review what is known about the mechanisms of sucrose-induced analgesia; highlight existing evidence, knowledge gaps, and current controversies; and provide directions for future research and practice."*

Authors' Conclusions:

"Evidence of sweet taste analgesia in neonates has existed since the first published trials, yet placebo/no-treatment, controlled trials have continued to be conducted. Future neonatal pain studies need to select more ethically responsible control groups."

Quality Checklist for Randomized Clinical Trials

- ☑ 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.

Key Results

They found over 150 published studies looking into the topic of using sweet tasting solutions for analgesia and inducing calm in neonates.

- **What did they find?** Almost all of the studies found reported less pain in infants up to 12 months using sweet solutions.
- **How does it work?** No one really knows exactly how these sweet solutions work.
- **Who knew?** Almost everyone knows that they work and it is routinely recommended.
- **When did they know?** The CMA shows that from the early 2000's that sweet solutions work and high-quality SR of sucrose had been done and recommendations incorporated into international consensus statements (2001). Despite the established science demonstrating the benefits of using sucrose for painful procedures, 125 of the 168 studies included in this review were from 2002 and later.
- **What needs to happen now?** Stop doing unethical trials using placebo or no treatment.

Talk Nerdy to Me

1) Search Strategy:

The search strategy used in this systematic review was to include all the articles found in two other systematic reviews performed previously then search the literature from those dates forward. This assumes that the searches done in the two other systematic reviews were exhaustive. As well, the authors do not describe how the 'grey' literature was searched.

2) Risk of Bias (RoB):

Although the authors of this study stated: *"RoB bias was overall low for most studies"* they are in fact only referring to the new studies they found from 2011-2015 and not all the studies included in their narrative or CMA analysis. Upon reviewing the RoB from the Steven's systematic review, the studies they included did in fact have significant RoB. The data from the other included review by Bueno et al had only 6/38 studies described as low-risk for bias.

3) Heterogeneity:

The statistical heterogeneity was variable depending on the comparisons examined. This is not clear from the current study, but requires reviewing the other two systematic reviews' data.

4) Cumulative Meta-Analysis (CMA):

There is great value in thinking about what the CMA in this case means. Since 2000, a statistically significant benefit to sucrose for painful procedures in newborns has been shown. Given that absence of equipoise between sucrose and placebo/no treatment, it has been arguably unethical since 2000 to perform further studies on sucrose where the control group has been placebo or no treatment. Equipoise in study groups is essential to ensure ethical research. It appears in this case, given that there have been ongoing studies on this topic, knowledge translation on equipoise, ethics and sucrose has been compromised.

5) Outcomes:

It appears in this case that the primary purpose of this paper was to establish a timeline around the understanding of the utility of sweet solutions for pain in newborns. The authors state their primary aim was to update the previously published reviews. If this were in fact the case, I would have expected more details on the methodology of this process (i.e. what outcome measures were they looking to include), a search independent of the previous systematic reivews' work, a grey literature search, and a comprehensive review of all the included papers, not just the newly found ones.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
Although the authors cut some corners on their methodology, their conclusions are sound. Newborns undergoing painful procedures should have their pain minimized with sweet solutions. Further research should focus on optimizing this therapy. Any further research using placebo or no treatment is unethical.

Bottom Line

When performing painful procedures on newborns use a sweet solution to minimize the pain experience. If you are doing research on sweet solutions, please do not have your comparison group get placebo or no treatment, it's unethical at this point.

Case Resolution

Case Resolution:

In this case, prior to performing the bloodwork, catheter urine and lumbar puncture, the child is given sucrose. Although there is some crying noted, the child appears mostly comfortable during the process.

Clinical Application:

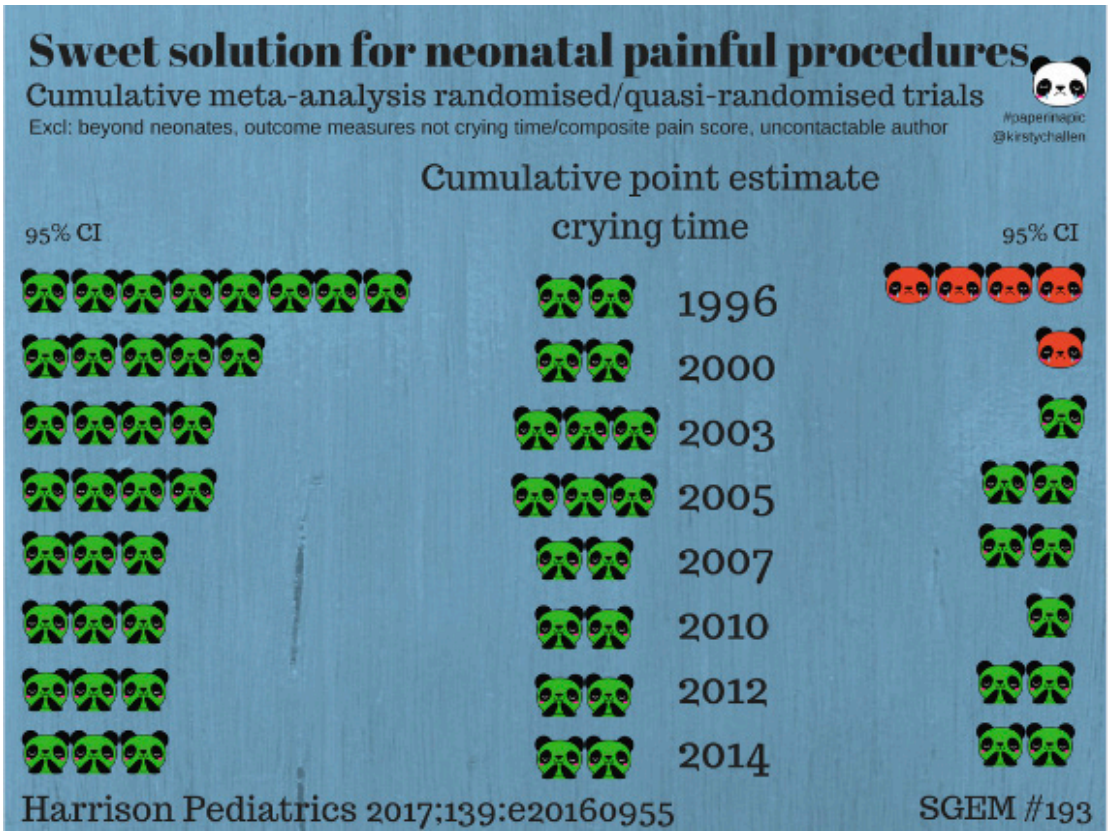
In newborns experiencing painful procedures sweet solutions, like sucrose, should be given to minimize the pain experience.

What Do You Tell the Patient ?

I tell the families that we use sucrose to minimize the pain their baby will experience. I often tell them it's like giving them the world's best piece of chocolate before poking them with a needle. They might be so distracted by the chocolate that they won't feel the pain as much.

Episode End Notes

Infographic:



Twitter Poll:

Approximately when was there enough data to know sweet solutions work for paediatric pain? thesgem.com/2017/10/sgem19… @stemlyns @EMtogether

41% 1990
24% 2000
22% 2010
13% It works for pain?

37 votes • Final results

Other FOAMed:

-
- St. Emlyn's: Paediatric Pain and Sedation
- St. Emlyn's: Pain Scales in the Paediatric Emergency Department
- PEM Playbook: Pediatric Pain
- Science Based Medicine: A Rational Approach to Managing Acute Pain in Children

SGEM#
194

Highway To The Dexamethasone:

For Pediatric Asthma Exacerbations

Question

Is a single oral dose of dexamethasone non-inferior to three days of prednisolone in treating children who present to the emergency department with an acute exacerbation of asthma?

Case

A four-year old male who is a known asthmatic presents to the emergency department with an asthma exacerbation. He has been sick with an upper respiratory infection for the last two days. He is getting worse despite his mother giving albuterol every four hours. You order three treatments with albuterol and atrovent and you ask the medical student who is with you, which would be the best steroid to give to this patient by mouth and why?

Bottom Line

A single dose of dexamethasone is non-inferior to a three-day course of oral prednisolone in the treatment of children with an acute asthma exacerbation presenting to the emergency department.

Guest Skeptic: Dr. Michael Falk is a Pediatric Emergency Medicine provider who works at Harlem Hospital Center in New York and Children's National Medical Center in Washington, DC. He was Director of Emergency Department Simulation and the Co-Fellowship Director at ST Luke's-Roosevelt Hospital in New York and is a Best Evidence in Emergency Medicine (BEEM) presenter and author. This episode is based upon a BEEM critical review.

Date: November 9, 2017

Reference: Cronin JJ et al. A Randomized Trial of Single-Dose Oral Dexamethasone Versus Multidose Prednisolone for Acute Exacerbations of Asthma in Children Who Attend the Emergency Department. Ann Emerg Med 2016

Episode 194 Overview

Case:

A four-year old male who is a known asthmatic presents to the emergency department with an asthma exacerbation. He has been sick with an upper respiratory infection for the last two days. He is getting worse despite his mother giving albuterol every four hours. You order three treatments with albuterol and atrovent and you ask the medical student who is with you, which would be the best steroid to give to this patient by mouth and why?

Background:

Untill recently prednisolone have been the standard of care for oral steroids used in the treatment of an asthma exacerbation. But this medication has a bitter taste which can make it very hard to administer to a younger child. Also, it is associated with a significant amount of vomiting and this is one of the leading reasons for treatment failure for outpatient asthma [1].

Dexamethasone has been wildly used for a number of pediatric conditions including croup [2], has a longer half-life [3] and is much better tolerated than prednisolone.

There have been a number of recent studies that have compared prednisolone to dexamethasone for outpatient treatment of asthma. A systematic review and meta-analysis demonstrated a single or two-dose regimen of dexamethasone is as effective as a 5-day course of prednisone/prednisolone with less vomiting in the dexamethasone group [4].

Table 1. The Pediatric Respiratory Assessment Measure (PRAM).[18]

	Score			
Signs	**0**	**1**	**2**	**3**
Suprasternal muscle contraction	Absent		Present	
Scalene muscle contraction	Absent		Present	
Air entry*	Normal	Decreased at bases	Widespread decrease	Absent/minimal
Wheezing*	Absent	Expiratory only	Inspiratory and expiratory	Audible without stethoscope/ silent chest with minimal air entry
SaO_2, %	≥95	92–94	<92	

*In case of asymmetry, the worst lung is rated. Mild exacerbation=1 to 3; moderate, 4 to 7; and severe, 8 to 12.

The Canadian Guidelines now include the option of giving oral prednisolone or dexamethasone for moderate asthma [5].

While all these studies have shown that dexamethasone was as good as prednisolone for the treatment of asthma, of the seven randomized control trials that have been done, they all have issues with methodology and utilizing different dose of steroids.

This study was designed to address these issues and look at a single dose of dexamethasone compared to three days of prednisolone and all the patients were assessed using the Pediatric Respiratory Assessment

Clinical Question

Is a single oral dose of dexamethasone non-inferior to three days of prednisolone in treating children who present to the emergency department with an acute exacerbation of asthma?

Population: All patients between the ages of 2 to 16 with history of asthma presenting to the emergency department with an acute asthma exacerbation.

Excluded: Anyone with critical or life-threatening exacerbation; varicella of HSV infection; TB exposure; fevers > 39.5C; steroid use with in the last 4 weeks; those with metabolic disease; or any comorbid condition.

Intervention: Dexamethasone (DEX) 0.3 mg/kg (max. 12 mg) orally once.

Comparison: Prednisolone (PRED) 1 mg/kg per day (max. 40 mg/day) orally for three days.

Outcome:

Primary: Pediatric Respiratory Assessment Measure (PRAM; range 0 to 12) at day four of treatment.

Secondary: Change in PRAM score, PRAM score at emergency department discharge, hospital admission on day one, emergency department length of stay, unscheduled visit to health care provider for respiratory symptoms, readmission to the hospital or additional systemic cortico steroids ≤14 days of study enrollment, vomiting within 30 minutes of study medication, school days and parental workdays missed and days of restricted activity.

Authors' Conclusions:

"In children with acute exacerbations of asthma, a single dose of oral dexamethasone (0.3 mg/kg) is noninferior to a 3-day course of oral prednisolone (1 mg/kg per day) as measured by the mean PRAM score on day 4."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department
- ☑ 2. The patients were adequately randomized
- ☑ 3. The randomization process was concealed
- ☑ 4. The patients were analyzed in the groups to which they were randomized
- ? 5. The study patients were recruited consecutively (i.e. no selection bias)
- ? 6. The patients 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 patient-important outcomes were considered
- ☑ 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

There were 226 children included in this study with more boys than girls. The mean age was around 6 years.

Outcome

There was no difference in mean pram scores at day four between the dexamethasone and prednisolone groups.

Primary outcome: Mean PRAM 0.91 DEX vs. 0.91 PRED (95% CI -0.35 to 0.34)

Secondary Outcomes:

- Mean PRAM scores at Discharge – No difference between groups
- Length of Stay in the Emergency Department – No difference between groups (~ four hours)
- Admission to Hospital – No difference between groups (14.6% vs. 13.1%)
- Length of Admission – No difference between groups (2.33 days vs. 2.69 days)
- Return Visits to Health Care Provider – No difference between groups (13.9% vs. 14.2%)
- Missed School and Missed Work – No differences between groups
- Further Systemic Steroids – Difference (13.1% vs. 4.2%)
- Vomiting – Fourteen patients in the prednisolone group vomited (Seven within 30 minutes of the first dose, seven on day two and six on day three). No patients in the dexamethasone group vomited.

Talk Nerdy to Me

1) Blinding:

This was an open label study. The lack of blinding could have introduced some bias. It would have been better if the participants and providers did not know what treatment they were receiving.

2) Selection Bias:

They do not explicitly state patients were selected consecutively. In addition, some of the exclusion criteria were based on subjective assessment. There were significantly less boys in the dexamethasone group vs the prednisolone group (61% vs 75%). This could have been due to chance or selection bias. It is unclear if this difference in boys vs. girls would have impacted the results.

3) Prognostic Factors:

There were higher rates of an atopic dermatitis, stronger family histories for both atopic dermatitis and asthma, and higher rates of daily usage of salbutamol, in the dexamethasone group. This might have indicated that this group was sicker than the other group and could have skewed the data to make it less significant when compared to the prednisolone group.

4) Side Effects:

This study showed that the most common side effect, vomiting, was not observed in the dexamethasone group. Given that vomiting, or not being able to tolerate oral medications, is a very common reason for a patient to fail outpatient asthma care. The lack of vomiting in the dexamethasone group would bias the results away from oral prednisolone.

5) Treatment Failure:

The dexamethasone group had a higher number of treatment failures that required a second course of steroids to address this issue. But these patients were also older and based on their PRAM scores, were actually sicker than the other patients in the study (this hold true for the prednisolone group as well). One possible reason for this is that in the UK and Ireland they use a lower dose of dexamethasone (0.3 mg/kg) than we do in the US and Canada (0.6 mg/kg). But the other studies that were done in the US, using the higher dosing regime, still had similar failure rates. What has become commonly accepted clinically is for the patients who are sicker to receive a second dose of dexamethasone to take at 48 hours after discharge.

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

Bottom Line

A single dose of dexamethasone is non-inferior to a three-day course of oral prednisolone in the treatment of children with an acute asthma exacerbation presenting to the emergency department.

Case Resolution

Case Resolution:

The medical student says that he has just finished reading a paper on single dose dexamethasone and that their conclusion was it was just as effective and better tolerated than prednisolone in the pediatric population. Given that he would give dexamethasone at 0.6 mg/kg and strongly consider a second dose to be given at 48 hours after discharge since the patient is having a moderate asthma exacerbation.

Clinical Application:

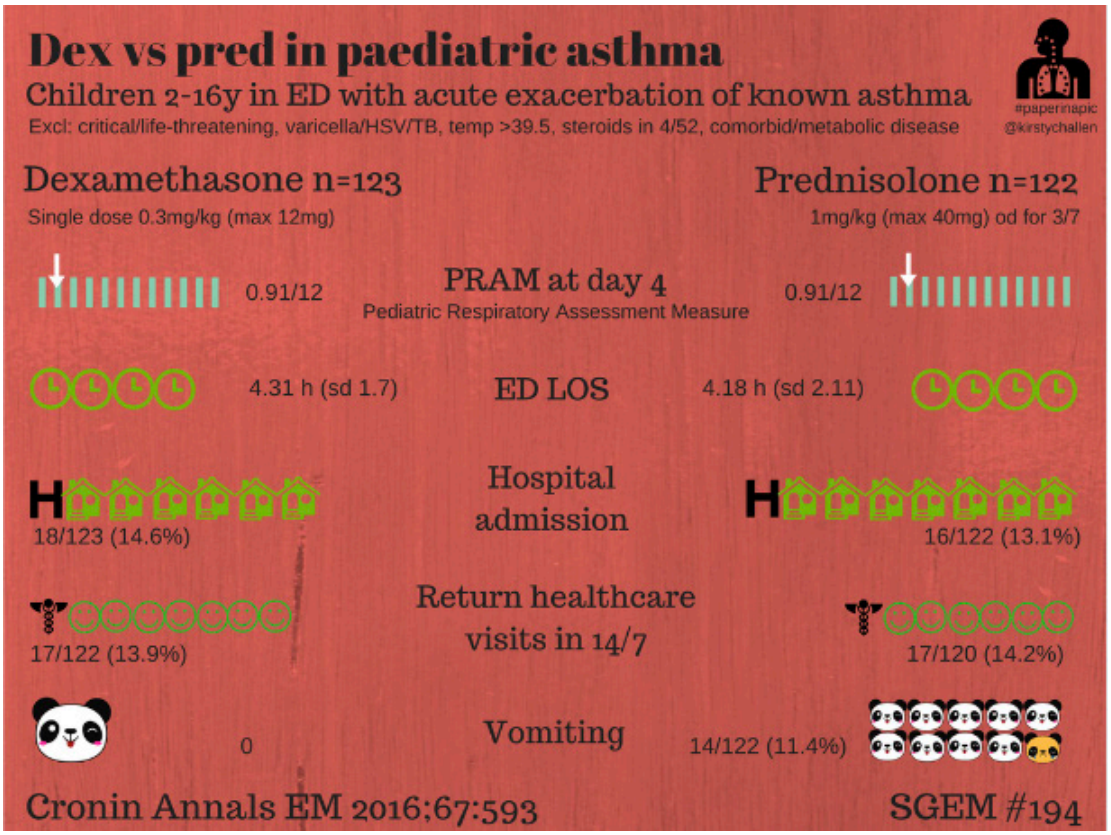
You should strongly consider using dexamethasone as either a single or two-dose regime for the treatment of asthma in the emergency department rather than the traditional three-day course of oral prednisolone. If you are giving dexamethasone, it would be wise to consider a second dose to be given at 48 hours after discharge.

What Do I You Tell the Patient ?

Your child is having an asthma attack. We used to give three-days of oral steroid medication called prednisolone. The number one side effect of this medicine is vomiting. There is another form of steroids called dexamethasone. It usually only needs to be given once and does not seem to cause vomiting. We often will give a second dose to take two days from now.

Episode End Notes

Infographic:



Twitter Poll:

What oral steroid do you usually give for paediatric #Asthma exacerbations? thesgem.com/2017/11/sgem19… #foamped @EMSwami @croninjj @SketchyEBM @WeAreCanadiEM @CAEP_Docs @ACEPNow

55% Prednisolone

45% Dexamethasone

164 votes • Final results

Other FOAMed:

- REBEL EM – Single Dose Dexamethasone or 5 Days of Prednisone in Adult Asthmatics?
- St. Emlyn's – Why don't we use dexamethasone for children's asthma?

References:

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2. Russell KF, Liang Y, O'Gorman K, et al. Glucocorticoids for croup. Cochrane Database Syst Rev. 2011;(1):CD001955.
3. Schimmer BP, Parker KL. Adrenocorticotropic hormone; adrenocortical steroids and their synthetic analogs; inhibitors of the synthesis and actions of adrenocortical hormones. In: Brunton LL, Lazo JS, Parker KL, editors. Goodman & Gilman's the pharmacological basis of therapeutics. 11th ed. New York: McGraw-Hill; 2007. p. 1587-612.
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5. O Ortiz-Alvarez, A Mikrogianakis; Canadian Paediatric Society, Acute Care Committee. Position Statement: Managing the paediatric patient with an acute asthma exacerbation. Posted: May 1 2012 | Reaffirmed: Jan 30 2017

SGEM#
195

Some Like It Hot:

ED Temperature and ICU Survival

Question

Does patient body temperature in the emergency department predict survival of adult patients with severe sepsis and septic shock admitted to the intensive care unit?

Case

You are working night shift in the emergency department. Two patients present to the front desk in close succession, brought in by concerned family members. Both are similarly hypotensive and tachypnoeic,drowsy but orientated, with hot, reddened and increasingly painful cellulitis. Following the triage sepsis pathway, recently amended to use qSOFA. The nurse triages both to beds in the acute/ resuscitation area of the department. Each patient is seen quickly and has initial vital signs and blood samples obtained. One patient has a temperature of 38.3C and the other 35.5C. Being a night shift, staff resources are tight. How do you allocate resources wisely?

Bottom Line

We should pay greater attention to patients presenting with features of severe sepsis and septic shock that do not have fever in the emergency department as they have an associated high mortality rate.

Guest Skeptic: Jesse Spurr works as a Nurse Educator in the Emergency Department at Redcliffe Hospital in Australia. Outside his family and work, Jesse pours energy into his professional hobbies: healthcare simulation podcast Simulcast, nursing practice development blog and podcast Injectable Orange and faculty and team member of The Teaching Coop. Jesse classes himself a lifelong student of teaching, learning, health and human performance.

Date: November 11, 2017

Reference: Sundén-Cullberg et al. Fever in the Emergency Department Predicts Survival of Patients With Severe Sepsis and Septic Shock Admitted to the ICU. Critical Care Medicine 2017.

Episode 195 Overview

Case:

You are working night shift in the emergency department. Two patients present to the front desk in close succession, brought in by concerned family members. Both are similarly hypotensive and tachypnoeic,drowsy but orientated, with hot, reddened and increasingly painful cellulitis. Following the triage sepsis pathway, recently amended to use qSOFA.

The nurse triages both to beds in the acute/resuscitation area of the department. Each patient is seen quickly and has initial vital signs and blood samples obtained. One patient has a temperature of 38.3C and the other 35.5C. Being a night shift, staff resources are tight. How do you allocate resources wisely?

Background:

If you work in emergency medicine, you are probably aware of the continuous debate about fever. Is it harmful? Is it helpful? Should it be treated?

There are two opposing schools of thought about the value of fever in infection. One side argues that fever causes an increased metabolic stress than might be detrimental to already sick patients. The other side points out that fever is a natural immune response designed to fight infection. So, eliminating this natural line of defense could make sick patients even sicker.

We have covered fever before on the SGEM in pediatric patients. There was the great episode on pediatric fever fear with PedEM Super Hero Anthony Crocco (SGEM#95). We also did a RANThony on pediatric fever fear that you can watch on YouTube.

The American Academy of Pediatrics Guides 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."*

There were three questions covered in that pediatric fever fear episode:

1. Should parent's combine/alternate acetaminophen and ibuprofen?
   Parents and caregivers should focus on patient comfort instead of normalizing a temperature in febrile children. Alternating therapy may be beneficial for comfort, but more research is required to address this specific question.

2. Will treating the fever make the child sicker, longer?
   Probably not. Antipyretics should be used to improve comfort during an illness.

3. Will treating with antipyretics prevent a febrile seizure?
   Antipyretics appear to offer no significant improvement in the recurrence rates of febrile seizures in children.

When looking at fever in adult patients in the intensive care unit (ICU), we did an episode with Justin Morgenstern from First10EM. The question in SGEM#146 was does regular administration of intravenous acetaminophen in febrile ICU patients being treated for a known or suspected infection impact the number of ICU-free days?

- *The routine use of IV acetaminophen for the treatment of fever in ICU patients thought to be due to infection cannot be recommended at this time.*

Clinical Question

Does patient body temperature in the emergency department predict survival of adult patients with severe sepsis and septic shock admitted to the intensive care unit?

Population: Adult patients (age > 17 years) with documented diagnosis of severe sepsis or septic shock admitted to one of 30 Swedish intensive care units within 24 hours after presentation to the emergency department.

Intervention: None

Comparison: Four stratified groups of body temperatures (<37C, 37C-38.29C, 38.3C-39.49C and >39.49C).

Primary Outcome: In hospital mortality

Authors' Conclusions:

"Contrary to common perceptions and current guidelines for care of critically ill septic patients, increased body temperature in the emergency department was strongly associated with lower mortality and shorter hospital stays in patients with severe sepsis or septic shock subsequently admitted to the ICU."

Quality Checklist for Randomized Clinical Trials

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

Key Results

A total of 2,225 patients were included in the main analysis. The median age was 68 and 56% were male.

OUTCOME

In hospital mortality was inversely correlated with body temperature.

For each one degree, increase in body temperature there was an observed 5% decrease in mortality.

Temperature	Mortality
<37C	36.3%
37C-38.29C	25.3%
38.3C – 39.49C	20.3%
>39.49C	15.5%

Talk Nerdy to Me

1) Observational Study:

We can only conclude associations and not causation due to the nature of this study. Lack of mounting a fever could just be a surrogate marker of frailty. In addition, different temperature groups had different primary focus of infection and different organisms identified. Those with fevers also were treated more aggressively. They tried to adjust for these different factors but some unmeasured cofounder could be responsible for the observed inverse correlation between body temperature and mortality.

2) Measurement Error and Antipyretics:

There was a lack of a uniform way to measure body temperature (Tympanic, Oral, Rectal). This could have resulted in could measurement errors. Information about antipyretics or immune-modifying drugs prior to arrival to emergency department was also lacking. This is important as our many emergency medical services still routinely give antipyretics for fever and common community perception is still to take antipyretics for high temperature.

3) Treatment:

This study does not provide information on whether or not antipyretics should be given to septic or septic shock patients in the intensive care unit. We mentioned in the background information the study of using IV acetaminophen in the ICU did not result in benefit.

4) Severity Score:

They did not calculate a severity score like SOFA. This makes it difficult to adjust for disease severity. However, they did adjust for age, sex, underlying comorbidity, vital signs, preliminary focus of infection and sepsis bundle achievement and the inverse correlation between body temperature and mortality remained. And pragmatically, the information required for SOFA would not available immediately to the emergency physician or nurse.

5) Missing Data:

A large proportion of patients in this study had missing data. Only 58% of patients had complete information on all variables. Nine percent did not even have a body temperature documented. Missing values were more prevalent in patients without fever (i.e. lower quality of care) – while potentially biasing the quantitative prognostic accuracy, this actually confirms the need to pay greater attention to the quality of care and documentation for the afebrile septic patient.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusion.

Bottom Line

We should pay greater attention to patients presenting with features of severe sepsis and septic shock that do not have fever in the emergency department as they have an associated high mortality rate.

Case Resolution

Case Resolution:

The senior physician and two nurses attended to the initial treatment of the patient without a fever. He required rapid fluid administration and treatment with empirical antibiotics and initiation of vasopressor via peripheral cannula until a central line could be placed. The intensive care unit was involved early and facilitated transfer.

The gentleman with a fever received further assessment via the remaining nurse and a junior resident, responded to 30ml/kg of intravenous crystalloid, empirical antibiotics and was safely admitted under internal medicine to the ward in the early hours of the morning.

Clinical Application:

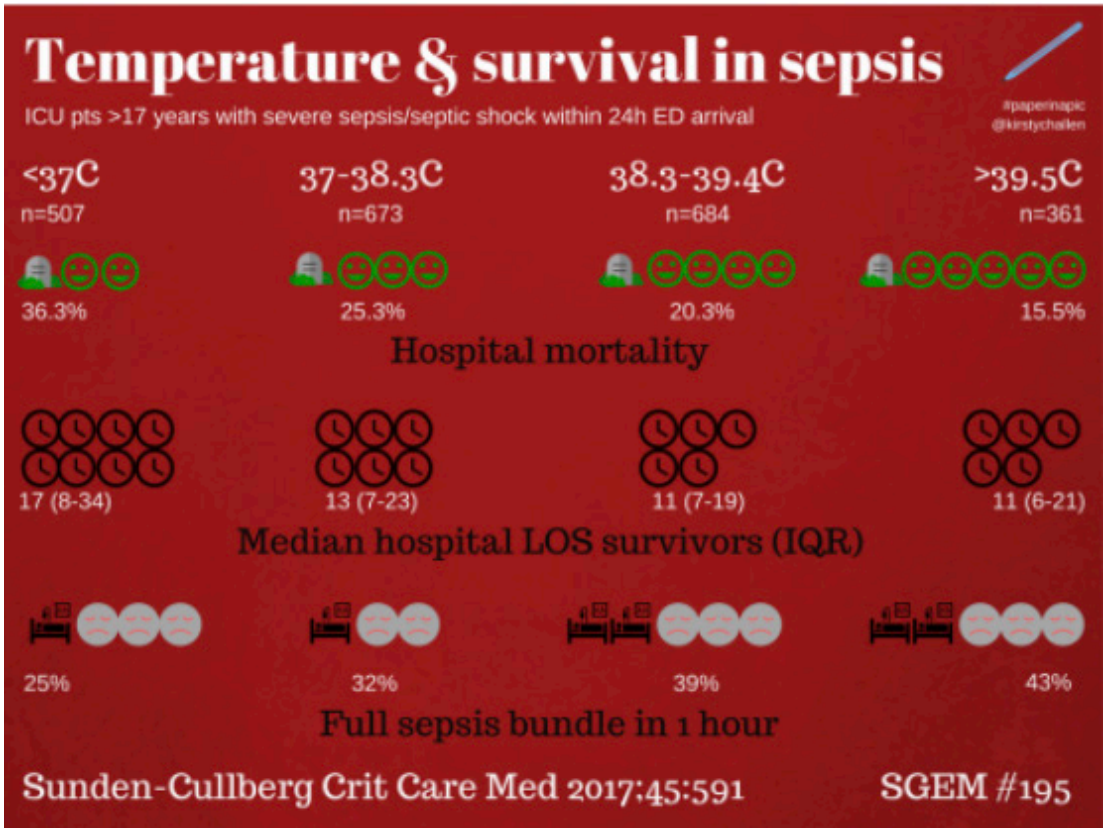
It is difficult to say what to do with this observational data. The clinical application may be to augment the triage of patients presenting with characteristics of severe sepsis or septic shock, flagging those without fever as having a greater risk of poor outcome and allocating resources/prioritizing accordingly. This could reframe the common perception that fever is a marker of acuity in sepsis.

What Do I Tell My Patients?

- **Patient Without Fever:** You are very sick with serious skin infection. However, you do not seem to have the natural response of a fever and this makes us more concerned. We would like to treat you very rapidly and there will be a lot activity in getting antibiotics, blood tests, giving you fluids and quite possibly medications to raise your blood pressure. We will be monitoring you very closely and will very likely get the Intensive Care team to come and see you.
- **Patient with a Fever:** You are very sick with a serious skin infection. Your body seems to be fighting it with a fever. Lowering your body temperature has not shown to save lives but it could make you feel better. The most important things right now are to get you intravenous antibiotics, intravenous fluids and admit you to hospital.

Episode End Notes

Infographic:



Twitter Poll:

or septic shock patients admitted to the ICU? #FOAMcc #FOAMed thesgem.com/2017/11/sgem19… @Inject_Orange @srrezaie @ScanCrit @emcrit

- 16% Directly Correlated
- 51% Inversely Correlated
- 20% Not Correlated
- 13% I Don't Know

Other FOAMed:

- ScanCrit: Is Fever the Normal Temperature of Sepsis?
- REBEL EM: Is Fever the New Hotness in Sepsis?

SGEM#
196

Gastroparesis:
I Feel Like Throwing Up

Question
Does haloperidol, when added to conventional therapy, decrease abdominal pain and nausea at one hour in patients presenting to the emergency department with known gastroparesis?

Case
You charge nurse approaches as you finish charting on the trauma patient who was just transferred out. *"Mrs. G. is back again, vomiting and screaming in pain. This is the third time this month, and nothing ever seems to help. Is there anything we can do for her?"*

Mrs. G is a 37-year-old female with gastroparesis secondary to diabetes. You know her well, and none of the usual anti-emetics seem to help her symptoms. While inwardly wishing you worked in a country where droperidol was available, you wonder whether there is any new research to guide your management.

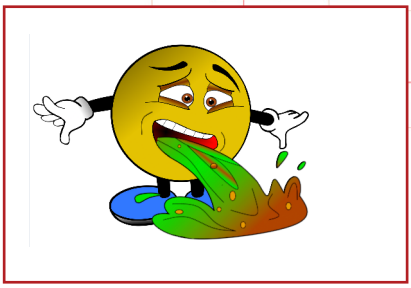
Bottom Line
Consider adding 5mg IV haloperidol as an adjunct treatment to patients presenting to the emergency department with abdominal pain and nausea from their known gastroparesis.

Guest Skeptic: 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

Date: November 24, 2017

Reference: Roldan et al. Trial Comparing Haloperidol Combined With Conventional Therapy to Conventional Therapy Alone in Patients With Symptomatic Gastroparesis. AEM November 2017

Episode 196 Overview



Case:

The nurse approaches as you finish charting on the trauma patient who was just transferred out. *"Mrs. G. is back again, vomiting and screaming in pain. This is the third time this month, and nothing ever seems to help. Is there anything we can do for her?"*

Mrs. G is a 37-year-old female with gastroparesis secondary to diabetes. You know her well, and none of the usual anti-emetics seem to help her symptoms. While inwardly wishing you worked in a country where droperidol was available, you wonder whether there is any new research to guide your management.

Background:

Gastroparesis is a challenging and frustrating condition for both patients and providers. Patients can present with abdominal pain, nausea, vomiting, early satiety and postprandial fullness. Gastroparesis has also been called delayed gastric emptying and it literally means paralysis of the stomach.

The most common cause of gastroparesis is idiopathic. However, when a cause is known it is often due to diabetes or surgery. Unfortunately, nothing really works well for this condition. The Food and Drug Administration has only approved metoclopramide for gastroparesis. It works by blocking dopamine receptors with antiemetic and prokinetic properties.

Multiple other drugs have been tried to treat gastroparesis. This includes serotonin 5-HT3 antagonists (ondansetron), histamine antagonists (meclizine and promethazine) prokinetic agents like serotonin 5-HT4 receptor agonists (cisipride) and motilin receptor agonists (erythromycin).

One drug that has been tried is haloperidol. It is an antipsychotic drug used for a number of psychiatric conditions including schizophrenia. Haloperidol blocks the dopamine receptors in the brain. It has been used for years to treat nausea and vomiting in post-operative patients and cancer patients.

A retrospective study was published earlier this year on haloperidol for the treatment of gastroparesis secondary to diabetes mellitus. It was called HUGS and showed lower hospital admissions and opioid use in patients receiving 5mg of haloperidol (Ramirez et al AJEM). You can find a good review on this paper on REBEL EM.

There has never been a randomized control trial looking at the efficacy of haloperidol on nausea and vomiting in any setting, until now.

Clinical Question

Does haloperidol, when added to conventional therapy, decrease abdominal pain and nausea at one hour in patients presenting to the emergency department with known gastroparesis?

Population: Adults 18 years and older presenting to the emergency department with abdominal pain due to their known gastroparesis.

Exclusions: Past history or current evidence of QT prolongation, hypotension (systolic blood pressure < 90 mm Hg), presence of other acute abdominal pathologic conditions, allergy to haloperidol, pregnancy, incarcerated status, or an inability to give informed consent.

Intervention: Haloperidol 5mg IV

Comparison: Placebo

Outcome:

Primary: Abdominal pain measured on a validated 10-point visual analog scale (VAS) and nausea intensity scored on a 5-point VAS at one hour.

Secondary: Disposition status, emergency department length of stay, adverse events and nausea resolution at one hour. Nausea resolution was defined as the patient not requesting additional antiemetic medication.nausea intensity scored on a 5-point VAS at one hour.

About Author: Dr. Carlos Roldan is an assistant professor of Pain Medicine and a Clinical Associate Professor of Emergency Medicine at the University of Texas MD Anderson Cancer Centernausea intensity scored on a 5-point VAS at one hour

.

Authors' Conclusions:

"Haloperidol as an adjunctive therapy is superior to placebo for acute gastroparesis symptoms."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department.
- ☑ 2. The patients were adequately randomized.
- ☑ 3. The randomization process was concealed.
- ☑ 4. The patients were analyzed in the groups to which they were randomized.
- ☑ 5. The study patients were recruited consecutively (i.e. no selection bias).
- ? 6. The patients 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 patient-important outcomes were considered.
- ☑ 11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

33 patients were included in the study (15 in the haloperidol group and 18 in the placebo group). The mean age was in the mid 40's with about 75% women.

Outcome

Haloperidol group works better than placebo for treating pain and nausea from gastroparesis.

Primary Outcomes:

- **Pain:** Decreased from a mean of 8.5 to 3.1 with haloperidol (p<0.001). Decreased from a mean of 8.3 to 7.2 with placebo (p=0.11).
- **Nausea:** Decreased from a mean of 4.5 to 1.8 with haloperidol (p<0.001). Decreased from a mean of 4.1 to 3.4 with placebo (p=0.05)

Secondary Outcomes:

- **Disposition:** Fewer patients were admitted to hospital in the haloperidol group (27% vs 72%, p=0.009).
- **Length of Stay:** Median length of stay was statistically unchanged, but the point estimate was shorter in the haloperidol group (5 vs 9 hours, p=0.77).
- **Resolution of Nausea**: This was not listed in the results?
- **Adverse Events:** No adverse events were reported.

Talk Nerdy to Me

We see a lot of patients in the emergency department with cyclic vomiting syndromes. It is great to have the first ever randomized control trial to provide some additional evidence to help us better address this issue. Listen to the SGEM Podcast on iTunes to hear Carlos' answers to our nerdy questions.

1) Population and Sample Size:

This study limited enrolment to patients with known gastroparesis. Given that the mechanism attributed to haloperidol is antagonism of dopamine receptors in the chemoreceptors trigger zone, why limit the study to only patients with gastroparesis rather than undifferentiated cyclic vomiting, which would have broader applicability in the emergency department? Your sample size calculation determined that 18 participants were needed in each group, but you only had 15 patients in the haloperidol group. Other researchers will add a buffer to increase the sample size in anticipation of losing a few patients. Did you consider doing this and how do you think the smaller sample size impacts the results/conclusions?

2) ECG:

You performed ECGs on all patients in order to exclude patients with a long QT. Is there any evidence that you are aware of the screening ECGs prevent adverse events with anti-psychotic use? Research protocols are much stricter than routine clinical practice. IF you were using haloperidol for these patients in your clinical practice would you get an ECG every time before administering this medication?

3) Statistical vs. Clinical Significance:

Although they were not statistically different, there seem to be important differences between the two groups in terms of the treatments they received. For example, 40% of the haloperidol group received morphine as compared to 28% of the placebo group. Similarly, 53% of the haloperidol group received and ondansetron as compared to only 28% of the placebo group . Do you think these imbalances might have affected your results? In addition, there was no statistical difference in emergency department length of stay. However, the five hours in the haloperidol group vs. nine hours in the placebo group might be clinically significant to the patient and the physician.

4) Outcomes:

First of all, you had two primary outcomes. Did you know that there can only be one primary outcome (Highlander)? You chose pain and nausea at one hour as your primary outcome. In terms of patient oriented outcomes, do you think choosing a longer follow up period might have been better? Pain score VAS has been validated previously. Has the 5-point nausea VAS been validated? One final thing under outcomes. Your secondary outcomes included nausea resolution at one hour defined as not requesting additional antiemetic medication. We could not find this reported in the result section?

5) Adverse Events and Safety:

Adverse events are typically under reported in studies. We really liked that you looked for adverse events and you did not claim safety. You recognized that the study was far too small to make such a positive claim. Instead, you stated that there were no adverse events reported. Would you consider doing a larger study on undifferentiated gastroparesis presentations to the emergency department and what size to you think it would take to claim safety of haloperidol?

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

Bottom Line

Consider adding 5mg IV haloperidol as an adjunct treatment to patients presenting to the emergency department with abdominal pain and nausea from their known gastroparesis.

Case Resolution

Case Resolution:

You discuss this new trial with your patient, and after a shared decision-making conversation, you decide to try haloperidol as part of their symptom control strategy.

Clinical Application:

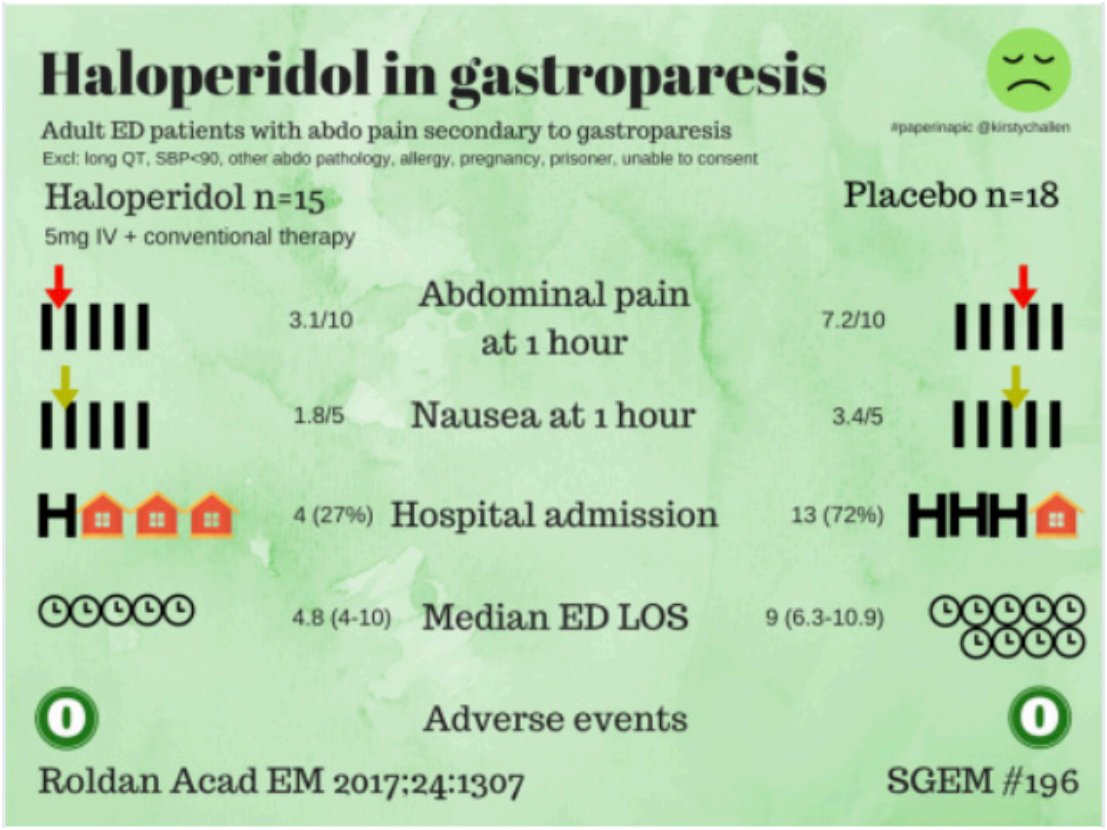
Adding this first, small randomized control trial to the large clinical experience, we think it is reasonable to consider trying haloperidol as an adjunct to treat gastroparesis.

What Do I Tell My Patients?

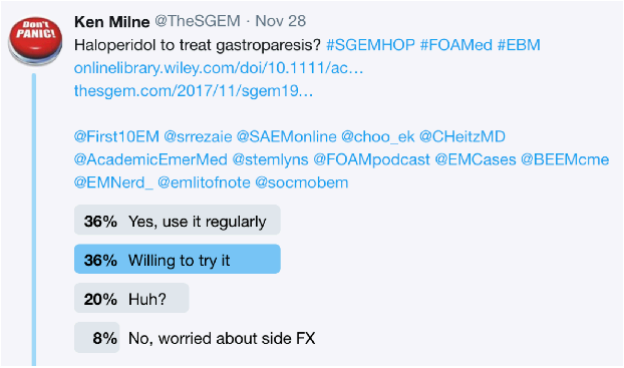
As you know, the symptoms from gastroparesis can be very difficult to manage. There is new research paper saying a medication called haloperidol could help. This medicine has been successfully used for years to treat post-operative patients and cancer patients with nausea and vomiting. I am not saying you have cancer. What I am saying is you have tried all these other medications that have not worked. This recent small study on haloperidol suggests it could work for you. I can see you are suffering and want to try something to help.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- REBEL EM: Diabetic Gastroparesis Needs HUGS
- EM in Focus: Haloperidol- One anti-emetic to rule them all
- First10EM: Articles of the Month November 2017
- FOAMCast: Episode 73 – Gastroparesis & Biliary Pathology

SGEM#
197

Die Trying:
Intubation Of In-Hospital Cardiac Arrests

Question
Does tracheal intubation during adult in-hospital cardiac arrest affect survival?

Case
You are working a regular shift in the emergency department when you hear a code blue called. You are the first physician to respond and you begin to resuscitate the patient. Your respiratory therapist is adequately ventilating the patient with a bag valve mask, and they ask you if they should prepare to intubate at the pulse and rhythm check.

Bottom Line
We should continue to use our clinical judgment and be selective with who we intubate during a cardiac arrest.

Disclaimer
The views and opinions of this podcast do not represent the united states government or the us air force.

Guest Skeptic: Dr. Bob Edmonds is an Emergency Physician in the US Air Force. He is currently deployed, practicing emergency medicine in an undisclosed location.

Date: November 24, 2017

Reference: Andersen et al. Association Between Tracheal Intubation During Adult In-Hospital Cardiac Arrest and Survival. JAMA 2017

Episode 000 Overview

Case:

You are working a regular shift in the emergency department when you hear a code blue called. You are the first physician to respond and you begin to resuscitate the patient. Your
respiratory therapist is adequately ventilating the patient with a bag valve mask, and they ask you if they should prepare to intubate at the pulse and rhythm check.

Background:

We have talked about out-of-hospital cardiac arrests (OHCA) many times on the SGEM.

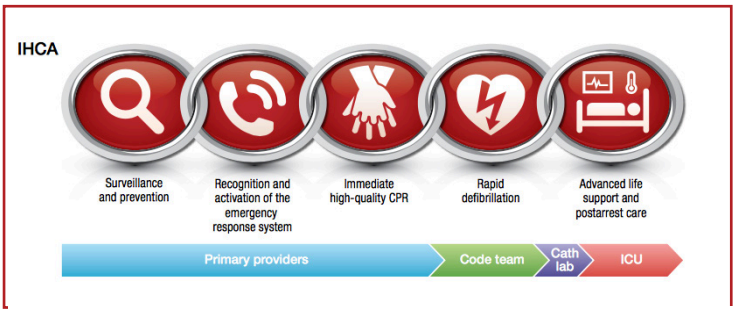
- SGEM#64: Classic EM Papers (OPALS Study)
- SGEM#136: CPR – Man or Machine?
- SGEM#143: Call Me Maybe for Bystander CPR
- SGEM#152: Movin' on Up – Higher Floors, Lower Survival for OHCA
- SGEM#162: Not Stayin' Alive More Often with Amiodarone or Lidocaine in OHCA
- SGEM#189: Bring Me To Life in OHCA

This time, as the case identifies, we are going to be talking about in-hospital cardiac arrests (IHCA) today.

The American Heart Association (AHA) reports that were 209,000 IHCA arrests in 2016. The survival rate for adults to hospital discharge is 24.8%.

The survival rate for IHCA has almost doubled from the year 2000 when it was only 13.7%. From a patient oriented outcome perspective, more than 80% of adults with IHCA who do survive end up having a favorable neurologic outcome at discharge. This is defined as a Cerebral Performance Category (CPC) score of 1 or 2.

There are five steps in the AHA IHCA Chain of Survival:



Sudden IHCA is a high stakes emergency with a high mortality rate. The decision to intubate is difficult to make and varies widely between clinicians. Due to the nature of intubation in cardiac arrest, it is difficult to study, and the studies that do exist are largely observational.

Until this paper, there were no studies of IHCA arrest intubation and survival.

Clinical Question

Does tracheal intubation during adult in-hospital cardiac arrest affect survival?

Population: Adult patients 18 years of age and older with an index cardiac arrest for which they received chest compressions.

Cardiac Arrest: Pulselessness requiring chest compressions and/or defibrillation, with a hospital wide or unit based emergency response.

Exclusions: Having a do-not resuscitate (DNR) order, already having an advanced airway in place (tracheal tube, tracheostomy, laryngeal mask airway, or other invasive airways but not including oropharyngeal or nasopharyngeal airways), or patients missing data (except for race).

Exposure: Tracheal intubation-including tracheal tube or a tracheostomy tube during the cardiac arrest.

- Unsuccessful intubation attempts were not logged as intubations in the registry.

Comparison: Patients who did not receive tracheal intubation.

Outcomes:

Primary: Survival to hospital discharge

Secondary Outcomes: return of spontaneous circulation and favorable neurologic outcome at hospital discharge (CPC score of 1 or 2).

Authors' Conclusions:

"Among adult patients with in-hospital cardiac arrest, initiation of tracheal intubation within any given minute during the first 15 minutes of resuscitation, compared with no intubation during that minute, was associated with decreased survival to hospital discharge. Although the study design does not eliminate the potential for confounding by indication, these findings do not support early tracheal intubation for adult in-hospital cardiac arrest.".

Quality Checklist for Randomized Clinical Trials

- ☑ 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 is the estimate of risk? Precise with a tight 95% confidence interval
- ☑ 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?

Key Results

The cohort included 108,079 adult patients from 668 US hospitals. Forty-two percent were female, the median age was 69 years and overall survival to hospital discharge was 22.4%.

Outcome

Less survival associated with intubation (16.3%) Compared to without intubation (19.4%).

Primary Outcome: Survival to hospital discharge was observed to be lower in patients who were intubated vs. those who were not intubated (RR of 0.84, P<0.001).

- **Note:** The overall cohort included 108,079 patients and the survival was 22.4%, but both the intubation and *"not intubated"* groups had survival less than this number. This is due to their matching process which will be discussed in the Talk Nerdy to Me section.

Secondary Outcomes (Intubated vs. Not Intubated): Less ROSC and less discharge home with good neurologic function in the intubated patients.

- **ROSC:** 8% vs. 59.3% (RR = 0.97; 95% CI, 0.96-0.99; P < .001)
- **Favorable Neurologic Outcome at Discharge:** 6% vs. 13.6% (RR = 0.78; 95% CI, 0.75-0.81; P < .001)

Talk Nerdy to Me

1) Study Design:

Given the observation cohort study design we can only conclude an inverse association between intubation and the survival to hospital discharge not causation.

2) Decision to Intubate:

The key to the entire study was the decision to intubate or not. It is difficult to ascertain what factors lead some physicians to intubate patients in cardiac arrest-for some doctors, all patients in arrest get intubated. Others decide to intubate more selectively for a myriad of reasons. The decision making for this intervention is unable to be derived from this study due to its retrospective nature.

3)Propensity-Match Cohort :

This has been referred to by my friend Dr. Mark Ebell as statistical jujitsu. Others have called it statistical gymnastics. Regardless of the term you use, it is impossible to account for all potential confounders. To their credit the authors' put this limitation right in their conclusions.

- The authors used an interesting technique to match cases-patients who were intubated were then matched with cases that *at that time in resuscitation* were not intubated. The authors specifically state that for these matched *"not intubated"* patients, many of them (68%) were later intubated. This has the potential to introduce bias as these cases for matching were sometimes *"intubated"* vs. *"at risk of being intubated later"*, rather than *"intubated"* vs. *"never intubated."*

4) Respiratory Insufficiency:

A major argument that intubation is needed in sudden cardiac arrest patients is that they suffered from respiratory insufficiency prior to arrest. In the authors' subgroup analysis, pre-existing respiratory insufficiency showed no association with survival, while the patients without pre-existing respiratory insufficiency showed lower likelihood of survival if they were intubated. However, since the comparison was *"intubated at time x"* versus *"at risk of being intubated at time x,"* this argument is muddied, since essentially you have a group of 43,314 patients who were intubated versus a group that's a combination of 32% patients that were never intubated and 68% patients who were intubated at some time later than the first group.

5) Exclusions:

One-quarter (34,731) of all eligible IHCA patients who met all inclusion criteria were excluded. This was due to missing data. They did a sensitivity analysis to account for missing data. However, with such a small effect size for the primary outcome after propensity score matching (3%) I am still skeptical of the results

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree that the findings show an association that does not support early tracheal intubation for adult IHCA patients.

Bottom Line
We should continue to use our clinical judgment and be selective with who we intubate during a cardiac arrest.

Case Resolution

Case Resolution:

You tell your respiratory therapist not to intubate and to continue to use the bag valve mask. At your pulse check, the patient is in ventricular fibrillation, you defibrillate them with 200J, and resume CPR. At the next pulse check the patient has return of spontaneous circulation and is transferred to the intensive care unit.

Clinical Application:

Given the data, it appears reasonable to continue to be selective with intubation in sudden cardiac arrest. This data is not strong enough to have an impact on my care. There may be some patients, especially those with respiratory insufficiency, that would derive benefit from intubation during their arrest.

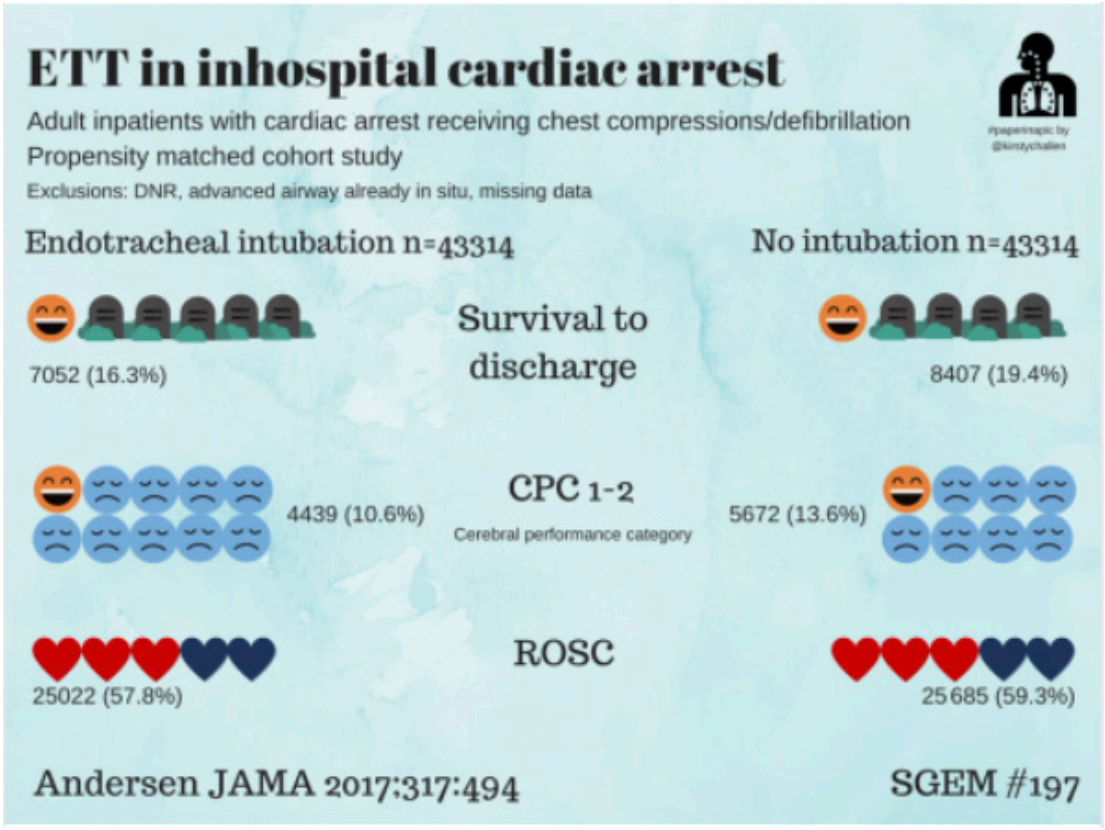
A randomized control trial is needed to answer the question *"to intubate or not to intubate in the adult IHCA patient"*. This observational cohort study suggest equipoise and could be used to request ethics approval for a randomized control trial.

What Do I Tell My Patient?

My patient is currently, actively dying so I don't tell them anything. If my staff asks while coding the patient, I will tell the m that unless the patient becomes difficult to ventilate with the bag valve mask, we will hold off on intubation for now.

Episode End Notes

Infographic:



Twitter Poll:

When running an in-hospital cardiac arrest (IHCA) code on an adult patient do you routinely intubate the patient? #FOAMed

thesgem.com/2017/12/sgem19...

@srrezaie @stemlyns @Core_EM
@WICSBottomLine @WeAreCanadiEM
@precordialthump @SAEMEBM @umanamd

51% Yes
49% No

191 votes • Final results

Other FOAMed:

- **The Bottom Line:** Association Between Tracheal Intubation During In-Hospital Cardiac Arrest and Survival
- **St. Emlyn's:** Cardiac Arrest – To Intubate or Not?
- **CORE EM:** The Role of Intubation in In-Hospital Cardiac Arrest
- **REBEL EM:** In-Hospital Cardiac Arrest: The First 15 Minutes

SGEM#
198

Better Slow Down:

Push Vs. Short Infusion Of Low Dose Ketamine For Pain In The Emergency Department

Question
Does increasing the duration of the ketamine from IV push (3 – 5 min) to a slow infusion (10 – 15 min) mitigate some of the untoward side effects, while maintaining analgesic efficacy?

Case
A 54-year old female patient with acute back pain comes to your emergency department for her forth visit in seven days for recurring pain. She was lifting something heavy and felt a *"pop"* in her back. She denies bowel or bladder issues, saddle paresthesia, lower extremity weakness, but does feel radicular pain down both of her legs. She has been given intravenous hydromorphone, diazepam, and ketorolac without relief of her symptoms. You decide to give her low dose ketamine, as this has worked in the past.

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.

Guest Skeptic: Dr. Salim Rezaie is a faculty physician at Greater San Antonio Emergency Physicians (GSEP) in San Antonio, Texas. He is the founder and creator of REBEL EM and REBEL Cast.

Date: November 28, 2017

Reference: Motov S et al. A Prospective Randomized, Double-Dummy Trial Comparing Intravenous Push Dose of Low Dose Ketamine to Short Infusion of Low Dose Ketamine for Treatment of Moderate to Severe Pain in the Emergency Department. AJEM 2017.

Episode 000 Overview

Case:

A 54-year old female patient with acute back pain comes to your emergency department for her forth visit in seven days for recurring pain. She was lifting something heavy and felt a *"pop"* in her back. She denies bowel or bladder issues, saddle paresthesia, lower extremity weakness, but does feel radicular pain down both of her legs. She has been given intravenous hydromorphone, diazepam, and ketorolac without relief of her symptoms. You decide to give her low dose ketamine, as this has worked in the past.

Background:

Low back pain is a common and challenging presentation to the emergency department. While the vast majority of presentations are benign, these cases can be time consuming and frustrating for both patients and physicians.

Physician frustrations with managing acute non-traumatic low back pain include considering rare dangerous back pain patient (epidural abscesses, osteomyelitis, pathological fractures, etc), patients demanding imaging, difficulty in relieving pain and concern about opiate abuse or diversion.

There are multiple *"Red Flag"* lists to help identify patients at risk for more serious causes of their back pain. One simple red flag list is called TUNA FISH.

Other things to consider would be immunocompromised patients besides just those on steroids (ex: patients with HIV, diabetes, alcoholics or taking biologic agents) who are at risk for spinal epidural abscess, discitis, or osteomyelitis.

When it comes to patient demands for imaging, Choose Wisely from ACEP and CAEP encourages emergency physicians to avoid ordering lumbar spine imaging in patients without serious underlying conditions (red flags).

"Red Flag" Symptoms in Back Pain = TUNA FISH
T = Trauma
U = Unexplained Weight Loss
N = Neurologic Symptoms
A = Age > 50
F = Fever
I = IVDU
S = Steroid Use
H = History of Cancer (Prostate, Renal, Breast, Lung)

As mentioned, it can be difficult to treat low back pain in the emergency department. Many different treatment modalities have been tried to treat low back pain with limited success. A systematic review was just published in the Emergency Medicine Journal looking at 43 management of acute low back pain in the ED. The conclusions…we need more evidence.

- SGEM#87: Let Your Back-Bone Slide (Paracetamol for Low-Back Pain)
- SGEM#173: Diazepam Won't Get Back Pain Down
- Muscle Relaxant Friedman et al(JAMA 2015)
- NSAIDs Machado et al (Ann Rheum Dis 2017)
- Systematic Review Ashbrook et al (Emerg Med J 2017)

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

ACEP also has a clinical policy on prescribing opioids and specifically addresses patients with acute low back pain. They give three Level C recommendation:

1. *For the patient being discharged from the ED with acute low back pain, the emergency physician should ascertain whether nonopioid analgesics and nonpharmacologic therapies will be adequate for initial pain management.*
2. *Given a lack of demonstrated evidence of superior efficacy of either opioid or nonopioid analgesics and the individual and community risks associated with opioid use, misuse, and abuse, opioids should be*

reserved for more severe pain or pain refractory to other analgesics rather than routinely prescribed.
3. *If opioids are indicated, the prescription should be for the lowest practical dose for a limited duration (eg, 1 week), and the prescriber should consider the patient's risk for opioid misuse, abuse, or diversion.*

Another thing to remember is to manage patients' expectations. We do not want to set them up for failure. They need to know their pain might not be completely relieved in the emergency department and that most patients will have persistent symptoms a week after presentation and many will have continued pain and functional impairment months after symptom onset (Itz et al 2013 , Donelson et al 2012 and Costa et al 2012).

Ketamine is a drug that is getting a lot of attention right now for acute pain. We have covered ketamine a number of times on the SGEM. This has included the use for procedural sedation and for pain control.

- SGEM#114: Ketofol – Does It Take Two to Make a Procedure Go Right?
- SGEM#111: Comfortably Numb – Low dose Ketamine as Adjunct for ED Pain Control
- SGEM#130: Low Dose Ketamine for Acute Pain Control in the Emergency Department

The clinical reasons for using ketamine for pain control are easy to understand. It is a N-Methyl-D-aspartate (NMDA) receptor antagonist that exerts sedative, amnestic, and analgesic effects as a dissociative anesthetic. Ketamine does not only reduce acute pain, but it also decreases persistent chronic and neuropathic pain as well. More importantly, use of low-dose ketamine (0.1 – 0.3 mg/kg IV) has been demonstrated to be opioid sparing.

Some of the major issues with IV push low-dose ketamine include its adverse effects, such as feelings of unreality, nausea/vomiting, and dizziness. Many emergency medical providers have anecdotally noticed a decrease in adverse effects when ketamine is given slowly.

Clinical Question

Does increasing the duration of the ketamine from iv push (3 – 5 min) to a slow infusion (10 – 15 min) mitigate some of the untoward side effects, while maintaining analgesic efficacy?

Population: Adults 18 to 65 years of age presenting to the emergency department with a primary complaint of acute abdominal, flank, back, traumatic chest or musculoskeletal pain with a pain intensity of ≥5 on the numeric pain rating scale (NRS).

Exclusions: Exclusion criteria included pregnancy, breast-feeding, altered mental status, allergy to ketamine, weight <46 kg or >115 kg, unstable vital signs (systolic blood pressure <90 or >180 mm Hg, pulse rate <50 or >150 beats/min, and respiration rate <10 or >30 breaths/min), and medical history of acute head or eye injury, seizure, intracranial hypertension, renal or hepatic insufficiency, alcohol or drug abuse, psychiatric illness, or recent (4 h before) analgesic use.

Intervention: IV ketamine 0.3mg/kg mixed in 100mL of normal saline via short infusion (over 15 minutes).

Comparison: IV ketamine 0.3mg/kg via IV push (ver 3 – 5 minutes).

Outcomes:

Primary: Rates of nine specific side effects and the severity of the side effects rated from 0-4 on the Side Effects Rating Scale for Dissociative Anesthetics (SERSDA) and severity of agitation and/or sedation on the nine point Richmond Agitation-Sedation Scale (RASS). These were measured at, 15, 30, 60, 90, and 120 minutes post administration

Secondary: Analgesic efficacy via numerical pain rating scale (NRS 0 – 10 with 0 being no pain and 10 being the most pain), changes in vital signs and need for rescue analgesia.

Authors' Conclusions:

"Low-dose ketamine given as a short infusion is associated with significantly lower rates of feeling of unreality and sedation with no difference in analgesic efficacy in comparison to intravenous push."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department.
  These were patients presenting to the emergency department at Maimonides Medical Center.
- ☑ 2. The patients were adequately randomized.
  Participants were allocated to two groups according to a predetermined randomization list which was generated using a computer software
  .
- ☑ 3. The randomization process was concealed.
  According to the paper, the preparing ED pharmacist, research manager, and statistician were the only ones with knowledge of the medication route while treating providers, participants, and the data collecting research team were blinded to the medication route received
- ☑ 4. The patients were analyzed in the groups to which they were randomized.
- ? 5. Study patients were recruited consecutively (i.e. no selection bias).
  All potentially qualifying participants were approached but only Monday to Friday from 8am to 8pm when the emergency department pharmacist was available for blinded medication preparation.
- ☑ 6. The patients in both groups were similar with respect to prognostic factors.
  Importantly the mean baseline NRS pain score was >8 in both groups.
- ☑ 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).
  21 out of 24 in both groups .
- ☑ 10. All patient-important outcomes were considered.
  Pain relief and adverse effects.
- ☑ 11. The treatment effect was large enough and precise enough to be clinically significant.
  Patients pain was reduced equally in both groups

Key Results

They enrolled 48 patients with 24 in the push group and 24 in the drip group. The mean age was in the early 40's and mean pain score was between 8 and 9 on the NRS.

Outcome

Less feeling of unreality and sedation with slow infusion of low-dose ketamine vs. IV push

Primary Outcomes:

Side Effects: Feeling of Unreality on SERSDA
- IVP: 91.7% vs. IV Infusion: 54.2% p = 0.008 NNH = 3

Rates of Sedation: RASS scale at 5 min was greater in the IVP
- Median RASS − 2.0 versus 0.0 (p = 0.01)

Secondary Outcomes (Intubated vs. Not Intubated):

- No difference in the reduction in pain scores, change in vital signs or need for rescue analgesia.

Talk Nerdy to Me

1) Convenience Sample vs. Consecutive Sample:

The two types of patient sampling are very similar, apart from convenience sampling including all accessible patients as part of the sample. This is considered the ideal non-probability sampling. Although, it is cheaper and easier to do convenience sampling, the inability to include all comers forces us to extrapolate results as some populations may be under- or over-represented (i.e. in this study no patients recruited on nights or weekend).

2) Sample Size:

No sample will ever be perfect when compared to the entirety of a population, but the latter is also not very feasible. The authors did do a sample size calculation stating they needed 24 patients per group for an 80% power to detect effect size of the SERDSA. Unfortunately, only 21 patients were evaluated in each group. Why did they not over recruit by 10-20% to anticipate people dropping out? This is often seen in other studies.

3) Single Center Study:

Although this is also a cheaper way to conduct small scale studies, many studies often recruit too few patients, carrying a significant risk of failing to demonstrate a treatment difference when one really exists. Secondly, a single center trial fails to recruit subjects from a wider population in a broader range of clinical settings, therefore making it difficult to generalize the results to all populations or clinical situations.

4) Multiple Primary Outcomes:

Just like the Highlander said…there can be only one…primary outcome. In this study, there were two primary outcomes. One of the primary outcomes look at nine side effects. Both of the primary outcomes were measured at five different times. This seemed like making a big target with multiple opportunities to find something *"significant"*.

5) External Validity:

These were patients who did not take anything prior to arrival and did not receive anything in the emergency department unless they needed rescue medication. This would narrow down the generalizability of the results.

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

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.

Case Resolution

Case Resolution:

You explain to your patient that giving ketamine over a longer period of time should decrease the feelings of unreality she may have experienced in the past while still helping to improve her pain. Your patient is given IV low-dose ketamine over 15 minutes without any of the untoward side effects and almost complete resolution of her pain.

Clinical Application:

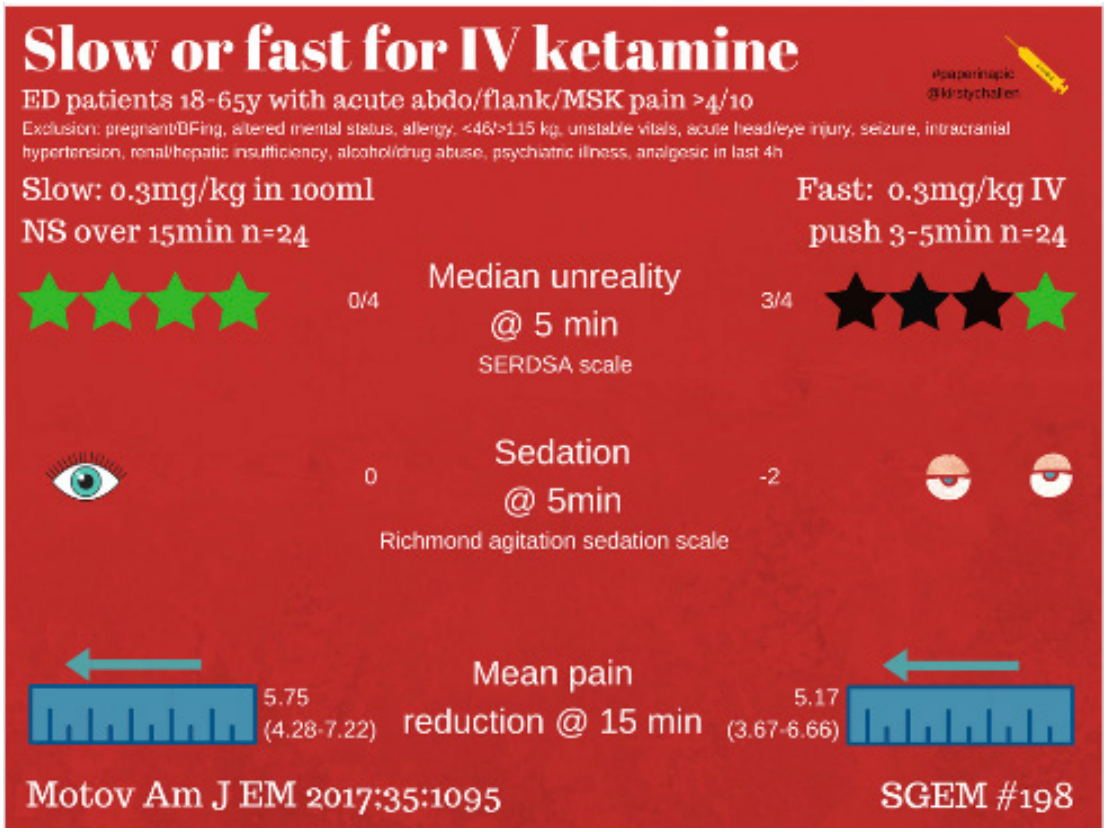
Low dose ketamine of 0.3mg/kg, mixed into 100 ml of Normal Saline given over slow infusion (15 minutes) has a decreased side effect (i.e hallucinations or dizziness) and equal analgesic profile when compared to IV push (5 minutes) low dose ketamine.

What Do I Tell My Patient?

By slowing down the infusion of ketamine we can still relieve your pain, and potentially mitigate some of the bad side effects of this medication.

Episode End Notes

Infographic:



Twitter Poll:

How do you give low-dose IV ketamine to mitigate side-effects?
thesgem.com/2017/12/sgem19…

@painfreeED @srrezaie @WeAreCanadiEM @stemlyns @ketaminh @socmobem @EMSwami @EMCases #FOAMed

7% Don't give ketamine

36% IV Push (3-5min)

57% Slow Infusion (10-15min)

Other FOAMed:

SGEM#
199

Therapeutic Hypothermia:
What Is It Good For?

Question
Does induced therapeutic hypothermia improve neurologic outcomes in patients with convulsive status epilepticus?

Case
Johnny is a 22-year-old male patient who presents to the emergency department via EMS with a seizure. He is known to have poorly controlled epilepsy. It was a witnessed clonic-tonic seizure that stopped but he did not wake up. The paramedics report another seizure on route to the hospital. He arrives with normal vital signs, normal finger stick blood glucose and a Glasgow Coma Scale of 3. He then has another seizure in the department. You quickly assess him in the resuscitation room, the team attempts intravenous (IV) access and collects labs while you give 10mg of midazolam intramuscularly and the seizures seem to stop. His oxygen saturation begins to drop and you decide to intubate and mechanically ventilate. He is now stabilized, fosphenytoin is being infused, you are getting ready to ship him to the neuro-ICU and wonder if cooling him down would help.

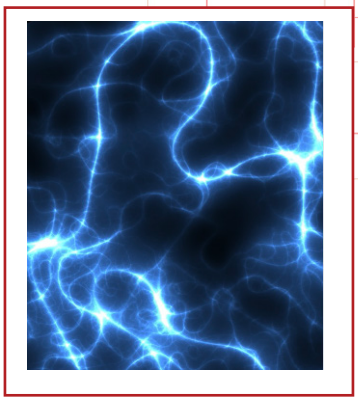
Bottom Line
Therapeutic hypothermia does not appear to have benefit for adult patients admitted to the ICU with convulsive status epilepticus.

Guest Skeptic: Dr. Neal Little is an Emergency Physician who works at Chelsea Hospital in Chelsea, Michigan. He is also a Faculty member of the Emergency Medicine and Acute Care Series 1986 to present.

Date: November 27, 2017

Reference: Legriel et al. Hypothermia for Neuroprotection in Convulsive Status Epilepticus. NEJM Dec 2016

Episode 000 Overview



Case:

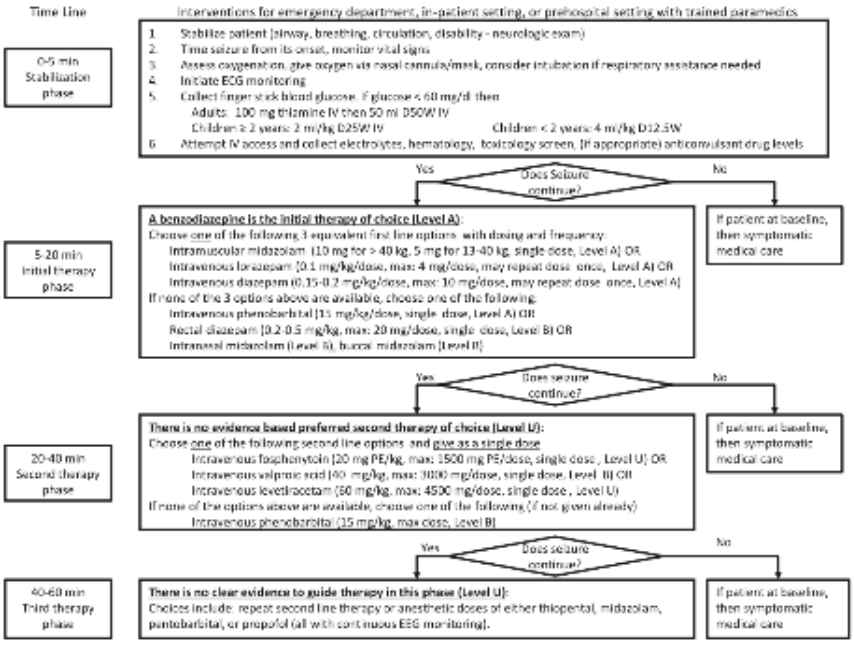
Johnny is a 22-year-old male patient who presents to the emergency department via EMS with a seizure. He is known to have poorly controlled epilepsy. It was a witnessed clonic-tonic seizure that stopped but he did not wake up. The paramedics report another seizure on route to the hospital. He arrives with normal vital signs, normal finger stick blood glucose and a Glasgow Coma Scale of 3. He then has another seizure in the department. You quickly assess him in the resuscitation room, the team attempts intravenous (IV) access and collects labs while you give 10mg of midazolam intramuscularly and the seizures seem to stop. His oxygen saturation begins to drop and you decide to intubate and mechanically ventilate. He is now stabilized, fosphenytoin is being infused, you are getting ready to ship him to the neuro-ICU and wonder if cooling him down would help.

Background:

We have covered hypothermia a number of times on the SGEM. This has been for out-of-hospital cardiac arrests (OHCA). Therapeutic hypothermia has not been demonstrated to have benefit in the pre-hospital setting (SGEM#54 and SGEM#183)

The TTM trial provided evidence that it was not necessary to drive the temperature down to 32C. There was no statistical difference in the primary outcome between 33C vs. 36C (SGEM#82).

Status epilepticus used to be defined as a seizure lasting 30 minutes or more. This definition has been changed to a single seizure lasting more than five minutes or two or more seizures within a five-minute period without the person returning to normal between them (Al-Mufti and Claassen Neurocritical Care Oct 2014).



The American Epilepsy Society has guidelines on the acute management of convulsive status epilepticus (Glauser et al Epilepsy Currents 2016). They recommend in adults without IV access to use midazolam IM. There is no significant difference in effectiveness between IV lorazepam and IV diazepam in adults. See the proposed treatment algorithm for status epilepticus from the guidelines for details.

The hypothesis would be that cooling down the seizing brain could protect it from further injury. However, there is not good evidence that therapeutic hypothermia is neuroprotective in ischemic or hemorrhagic stroke, IHCA or traumatic brain injury.

Clinical Question

Does induced therapeutic hypothermia improve neurologic outcomes in patients with convulsive status epilepticus?

Population: Critically ill adult (> 18 years of age) with convulsive status epilepticus who were receiving mechanical ventilation

Convulsive Status Epilepticus: Defined as seizing for five minutes or more continuously or more than two seizures without a return to baseline.

Excluded: Full recovery, need for emergency surgery, postanoxic status epilepticus, imminent death and do-not-resuscitate orders (Bacterial meningitis was added later)

Intervention: Therapeutic hypothermia (32-34C) via IV fluids (4C), ice packs and cold-air tunnel for 24 hours.

Comparison: Standard care

Outcome:

Primary: Good neurologic outcome at 90 days defined as a Glascow Outcome Scale (GOS) of 5 (Range 1-5 with 1 = death, 5=minimal or no neurological deficit)

Secondary: Mortality at 90 days, progression to EEG confirmed status epilepticus, refractory status epilepticus on day one, "super-refractory" status epilepticus (resistant to general anesthesia), and functional sequelae on day 90.

Glasgow Outcome Scale

Score		Functional Status
5	Good Recovery	Resumption of normal life; there may be minor neurologic and/or psychological deficits
4	Moderate Disability	Able to work in a sheltered environment and travel by public transportation
3	Severe Disability	Dependent for daily support by reason of mental or physical disability or both
2	Persistent Vegetative State	Unresponsive for weeks or months or until death
1	Death	Death

Authors' Conclusions:

"In this trial, induced hypothermia added to standard care was not associated with significantly better 90-day outcomes than standard care alone in patients with convulsive status epilepticus."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department.
These were patients recruited from the intensive care unit.
- [✓] 2. The patients were adequately randomized.
1:1 ratio, computer generated stratified by location, age (<=65 or >65) and seizure duration <= 60 min or > 60 min)
.
- [✓] 3. The randomization process was concealed.
According to the paper, the preparing ED pharmacist, research manager, and statistician were the only ones with knowledge of the medication route while treating providers, participants, and the data collecting research team were blinded to the medication route received
- [✓] 4. The patients were analyzed in the groups to which they were randomized.
- [✓] 5. Study patients were recruited consecutively (i.e. no selection bias).
- [✓] 6. The patients in both groups were similar with respect to prognostic factors.
- [x] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation.
Treaters would know temperature, but physicians assessing outcomes, trial administrators and statisticians were not aware of group allocation.
- [x] 8. All groups were treated equally except for the intervention.
Some hypothermia patients required neuromuscular blockade.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [?] 10. All patient-important outcomes were considered.
- [x] 11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

The study included 268 patients with 138 in the hypothermia group and 130 in the control group. The median age was 57 years with about 2/3 being male.

OUTCOME

No statistical difference in the Glasgow Outcome Scale at 90 days

Primary Outcome: GOS of 5 at 90 days

- 67/138 (49%) hypothermia vs. 56/130 (43%) control
- Odds Ratio, 1.22; 95% CI: 0.75 to 1.99; P=0.43

Secondary Outcomes:

- Mortality at 90 Days – No Difference
- Refractory Status Epilepticus on Day 1 – No Difference
- Super Refractory Status Epilepticus – No Difference
- Progression of EEG to Confirmed Status Epilepticus – 11% vs. 22% (odds ratio, 0.40; 95% CI, 0.20 to 0.79; P=0.009)
- Functional Sequelae on Day 90 – No Difference
- Adverse Events – 85% hypothermia vs. 77% control (pneumonia 51% vs. 45%)

Talk Nerdy to Me

1) Blinding:

This was an open label trial. The treating physician knew the group allocation, while outcome assessors, administrators and statisticians did not. The hypothesis was that therapeutic hypothermia has a neuroprotective effect. Therefore, you would think any bias from lack of blinding would have been in favour of the intervention. The lack of significant difference between the two groups despite being an open label trial strengthens our confidence in the results.

2) Patients:

These were patients from the intensive care unit and not emergency department patients. We have good evidence from the OHCA literature that cooling in the pre-hospital setting does not make a difference. We do not know if cooling started in the emergency department for patients with status epilepticus would make a difference. However, until we have evidence of benefit we must accept the null hypothesis of no benefit to cooling.

3) Power:

They powered the study to find a 20% difference (NNT of 5). This might have been setting the bar too high. There was an observed difference of 6% in favour of the hypothermia group but it was not statistically significant. A larger sample would be needed to confirm if this was a true difference.

4) Outcome:

The primary outcome was a GOS of 5 (good recovery). If you considered GOS 4 or 5 as a positive outcome the absolute difference was 9.1% better with therapeutic hypothermia (65.3% vs. 56.2%). This would give a NNT of 11. This result could be a significant patient oriented outcome if it was demonstrated to be statistically significant with a larger sample size. In addition, the GOS scale may also have not been granular enough to pick up important clinical differences. There is an extended version of the GOS that subdivides each of the three conscious levels into an upper and lower level of disability. This increases the total number of categories to eight. It is possible that therapeutic hypothermia could improve outcomes at 90 days on the extended GOS.

5) ClinicalTrials.Gov:

We had to include looking at the website to see if any of the outcomes were changed. The primary outcome did not change but they did add a number of new secondary outcomes from what was originally posted.

1	Death	D
2	Vegetative state	VS
3	Lower severe disability	SD -
4	Upper severe disability	SD +
5	Lower moderate disability	MD -
6	Upper moderate disability	MD +
7	Lower good recovery	GR -
8	Upper good recovery	GR +

Original Secondary Outcomes:

- Mortality [Time Frame: hospital discharge]
- Incidence of functional sequelae [Time Frame: 3 months]
  Judged on the frequency of seizures, the recurrence of status epilepticus after hospitalization, the number of anti-epileptic drug, MMS score.

- Length of ICU stay [Time Frame: 3 months]
- Length of hospital stay [Time Frame: 3 months]

Current Secondary Outcomes:

- Mortality [Time Frame: hospital discharge]
- Mortality [Time Frame: ICU discharge]
- Mortality [Time Frame: 90 days]
- Incidence of functional sequelae [Time Frame: 3 months]
  Judged on the frequency of seizures, the recurrence of epileptic status after hospitalization, the number of anti-epileptic drug, mini mental score (MMS)

- Length of ICU stay [Time Frame: 3 months]
- length of hospital stay [Time Frame: 3 months]
- Percentages of convulsive and non-convulsive seizure recurrences [Time Frame: 6 to 12 hours]
  Progression to status epilepticus

- Seizure duration in minutes [Time Frame: 3 days]
- Percentage of refractory status epilepticus cases [Time Frame: 3 days]
  Judged on the frequency of seizures within 24 hours after status epilepticus onset (re fractory status epilepticus on day 1) and on the frequency of seizures within 48 hours after anesthetic treatment withdrawal super refractory status epilepticus

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We agree with the authors' conclusions.

Bottom Line

Therapeutic hypothermia does not appear to have benefit for adult patients admitted to the ICU with convulsive status epilepticus.

Case Resolution

Case Resolution:

The patient is intubated, sedated and has been stabilized. Your works is done and the patient is transferred to the Neuro-ICU for further management.

Clinical Application:

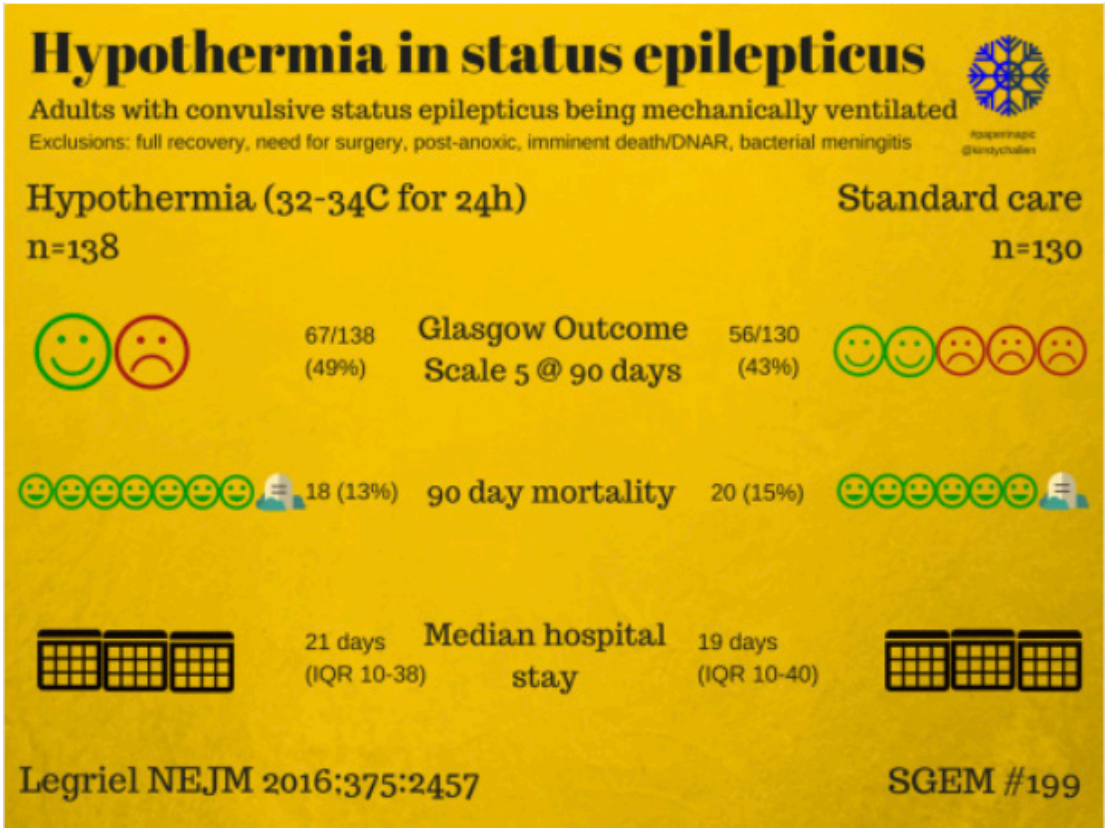
This is another study failing to demonstrate a patient important benefit with therapeutic hypothermia.

What Do I Tell My Patient?

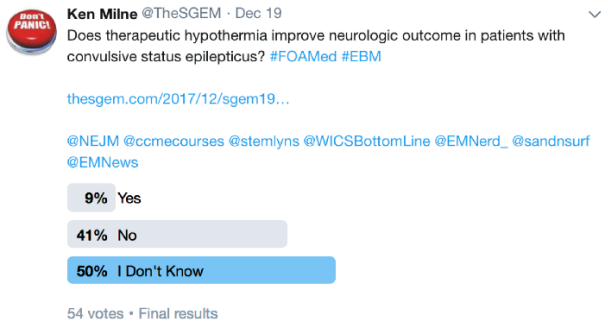
You can't talk to these patients because they are intubated. I would however, tell the family that Johnny had a bad seizure and needed to be sedated and intubated. Cooling down the body has been tried to help protect the brain from more damage. Unfortunately, it has not shown to help. Johnny is going to be transferred to the Neuro-ICU where they will take good care of him.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **Life in the Fast Lane:** Status Epilepticus
- **The Bottom Line:** Hypothermia for Neuroprotection in Convulsive Status Epilepticus
- **St. Emlyn's:** Hypothermia in Status Epilepticus
- **EM Nerd:** The Case of the Uncertain Surrogate

SGEM#
200

Dr. Alexander Hamilton And Bloodletting For Camp Fever

Question
Does bloodletting a soldier with camp fever increase chances of survival?

Case
23-year-old soldier presents to the medical tent with camp fever. On examination, *"the pulse is frequently, full and soft. Respirations somewhat affected. Heat increased. Anorexia. Thirst. Tongue furred. Urine high coloured. Constipation."*

Bottom Line
Bloodletting is harmful for soldiers with camp fever and cannot be recommended.

Guest Skeptic: 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.

Date: December 19, 2017

Reference: Lesassier Hamilton A. Dissertatio Medica Inauguralis De Synocho Castrensi [Inaugural medical dissertation on camp fever]. Edinburgh: J Ballantyne, 1816.

Episode 200 Overview

This is the 200th episode of the SGEM and it is the 2017 holiday edition:

The idea for this episode came after seeing a twitter photo on Halloween of Dr. Leeper (@Rob_Leeper) doing rounds dressed up as Alexander Hamilton.

To be clear, Dr. Alexander Lesassier Hamilton was a Scottish physician who lived around the early 1800s. He is a completely different person than one of the founding fathers of the United States.

The American Alexander Hamilton family was Scottish but he was born out of wedlock in Charlestown, Nevis. He was abandoned by his father and became an orphan when his mother died.

Despite his challenging start to his life, Alexander Hamilton became the first Secretary of the Treasury, established a national bank and contributed greatly to the early years of the United States of America.

However, he was a very controversial figure for a number of reasons. One reason was his embroilment in the first major sex scandal involving an American politician. He was also mortally wounded in a duel with Aaron Burr. Many people know about the American Alexander Hamilton because of the amazing Broadway musical written by Lin-Manuel Miranda.

Dr. Alexander Hamilton will be the focus of this SGEM holiday episode. He too was a controversial figure. Dr. Hamilton was reported to have been self-absorbed, shameless opportunist, scoundrel, seducer and at times a failed physician.

Dr. Hamilton published his medical thesis in 1816 called Inaugural Medical Dissertation on Camp Fever. It is a study that highlights the importance of randomization. A copy of the paper was retrieved from the achieves at McGill University with the help of a librarian at Western University. It was a 90 page document written in Latin.

Google Translate was not able to convert the Latin to English. Western University Assistant Professor of Classics and Graduate Chair Kyle Gervais said it would take a graduate student about three months working on it full time to translate the document.

The James Lind Library were very helpful. They had English copies of Dr. Hamilton's papers. One of them was thought to have been the document given to a Latinist to produce the Latin version required by Edinburgh University for Dr. Hamilton's medical thesis. It was this hand-written document that was relied upon for this special holiday edition of the SGEM.

Case:

23-year-old soldier presents to the medical tent with camp fever. On examination, *"the pulse is frequently, full and soft. Respirations somewhat affected. Heat increased. Anorexia. Thirst. Tongue furred. Urine high coloured. Constipation."*

Background:

The Peninsular War was between the Napoleon Empire and the allied powers of the Spanish Empire from 1807 to 1814. The allies consisted of Spain, Great Britain, Ireland and Portugal. They were fighting for control of the Iberian Peninsula.

It was the Peninsular War that popularized the term guerilla warfare. Guerilla is a Spanish word that is usually translated as "little war". This is not to be confused with gorilla, the largest living primate. Guerilla warfare typically centers around a small, mobile force going up against a larger professional army.

During the Peninsular War, there was an outbreak of camp fever. Camp fever is a form of typhus called Epidemic typhus. It is caused by the Rickettsia prowazekii, and often results in epidemics following wars, hence the name. Camp fever is transmitted by the human body louse.

Typhus is an infection that causes high fever, rash, cough, myalgia, headache, hypotension, delirium and if untreated, death. So basically, it causes sepsis, septic shock and often death.

Modern treatment of typhus includes antibiotics and supportive management. We have covered sepsis many times on the SGEM (44, 69, 90, 92, 113, 168 and 174). In none of those episodes did we recommend bloodletting in the management of sepsis.

During Dr. Alexander Hamilton's time the treatment for camp fever included aromatics (camphor), essential oils, tonics, opium and ether. External measures of sponging the body with warm water and spirits were also employed.

One other treatment often used was bloodletting. This therapy goes all the way back to 5th century BCE with Hippocrates. There were four humours (blood, phlegm, black bile and yellow bile) and was associated with the four fundamental elements of air, water, earth and fire. The hypothesis was that fever could be treated with bloodletting and that would balance the humours.

There is the famous story of George Washington the first president of the United States. He developed some kind of throat infection. Part of his treatment was bloodletting. They removed 3.75 liters of blood over about ten hours before he died of the infection in 1799.

The practice of bloodletting was continued by surgeons even after the humoral system fell into disuse. Bloodletting would be recommended by physicians but it was the surgeons who carried out the tasks usually in barber shops. The red-and-white-striped pole of the barbershop came from this practice. The pole advertised bloodletting with the white symbolizing the bandage and the red symbolizing the blood.

Bloodletting was used to treat almost every disease. One British medical text recommended bloodletting for acne, asthma, cancer, cholera, coma, convulsions, diabetes, epilepsy, gangrene, gout, herpes, indigestion, insanity, jaundice, leprosy, ophthalmia, plague, pneumonia, scurvy, smallpox, stroke, tetanus, tuberculosis, and for approximately one hundred other diseases.

The practice of bloodletting persisted well into the 20th century with Dr. William Osler being a prominent supporter. It was recommended by him in his 1923 textbook called The Principles and Practice of Medicine.

This is an excellent example of the knowledge translation problem. There was evidence that bloodletting did not provide a benefit. Dr. John Hughes Bennet from Edinburgh opposed bloodletting and supported a more science-based approach in the late 1800's. Despite the evidence of harm, bloodletting persisted for another 100 years.

There are a few conditions that bloodletting (now called phlebotomy) is still used for and include polycythemia and hemochromatosis.

Clinical Question

Does bloodletting a soldier with camp fever increase chances of survival?

Population: Soldiers with camp fever.

Intervention: Usual care plus bloodletting.

Comparison: Usual care.

Outcome:

Primary: Death
Secondary: None

Authors' Conclusions:

"The hypothetical part of this essay will, no doubt, appear objectionable to many, even at present, shortly hence, probably to all. In this it will be shared the fate, which is common to every visionary opinion that pleases us for a time; but which struggles through its ephemeral existence of a day, and is forgotten.

The practical part, however, at least what relates more immediately to the care and management of the soldiers, is deduced from experience, and founded on reason.

Those who served in the late Peninsular War, under the distinguished individual who presides over the medical department of the army will not have forgotten, with what solicitude he taught us how vastly more important it is to prevent, than to cure disease.

They will ever remember Sir James McGregor with admiration and gratitude, for the ready protection and assistance his suavity of manners rendered doubly pleasing, and for the luminous information his eminent talents so well fit him to afford."

Quality Checklist for Randomized Clinical Trials

X	1.	The study population included or focused on those in the emergency department. These were soldiers presenting for medical attention in with camp fever during the Peninsular War.
✓	2.	The patients were adequately randomized. *"It had been so arranged, that this number was admitted, alternately, in such a manner that each of us had one third of the whole."*
X	3.	The randomization process was concealed.
✓	4.	The patients were analyzed in the groups to which they were randomized.
✓	5.	The study patients were recruited consecutively (i.e. no selection bias). *"The sick were indiscriminately received."*
?	6.	The patients 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. *"were attended as nearly as possible with the same care and accommodated with the same comforts."*
✓	9.	Follow-up was complete (i.e. at least 80% for both groups).
✓	10.	All patient-important outcomes were considered.
✓	11.	The treatment effect was large enough and precise enough to be clinically significant.

Key Results

366 soldiers with camp fever were enrolled in the study (122 bloodletting and 244 no bloodletting).

OUTCOME
Significant increase in death with bloodletting – NNH of 4

This gives an absolute difference of 26.2% or an Number Needed to Harm (NNH) of 4.

	Bloodletting (n=122)	No Bloodletting (n=244)
Alive	87 (71.3%)	238 (97.5%)
Dead	**35 (28.7%)**	**6 (2.5%)**

Talk Nerdy to Me

1) External Validity:

These were not emergency department patients but rather soldiers presenting with camp fever. We do not see much typhus these days. However, we do see many people with sepsis. Removing circulator volume in the form of bloodletting would not be recommended today for our patient population.

2) Baseline Characteristics:

We are unsure if the patients' baseline characteristics were equal between both groups. It was probably a fairly homogenous group of young men who were fighting in the Peninsular War. There was no documentation on basic demographics or past medical history, which could have influenced the results.

3) Usual Care:

There appears to be a protocol in Dr. Hamilton's thesis as to *"usual care"*. Treatment for camp fever, besides bloodletting, included aromatics, essential oils, tonics, opium and ether. External measures of sponging the body with warm water and spirits were also employed. Some of our current usual care for septic patients would include source control, IV fluids and early broad-spectrum antibiotics. The Surviving Sepsis Campaign has guidelines and bundles that contain all the details of current septic management.

4) Blinding:

No one was blinded to group allocation in this study. The patients knew if bloodletting was being performed. The practitioners also knew group assignment and the outcome evaluator, Alexander Hamilton, would also know. That being said, you would think the bias should have been in favour of bloodletting because that was the standard care.

An observational study could have rationalized any deaths with bloodletting as the patient did not have

enough blood removed, it was not started soon enough, it was not done long enough, it was doing with the wrong frequency, it should have been done on the right arm instead of the left arm, etc. That is why it is so important to have a randomized study with a no bloodletting group to remove some of the biases.

Even if the bias was towards not bloodletting, it would be hard to fudge the outcome (alive or dead). It is not one of those Princess Bride outcomes where they are only "mostly dead".

5) The Man:

Dr. Alexander Hamilton is reported to have been a self-absorbed, shameless opportunist, scoundrel, seducer and failed physician. People are flawed and some are seriously flawed individuals. Physicians and researchers are no exception. There are many scandalous stories about scientists behaving badly in their professional and private life. While Hamilton's short comings do not falsify his research on bloodletting, it does make us more skeptical.

Lisa Rosner is a Distinguished Professor of History from Stockton University in New Jersey. She wrote a book about Dr. Alexander Hamilton called: *The Most Beautiful Man in Existence: The Scandalous Life of Alexander Lesassier*. I reached out to her as a historian and asked her expert opinion about Dr. Hamilton's early life, the bloodletting trial and what kind of man he was. Professor Rosner was kind enough to send a 15 minute recording summarizing the life of Dr. Hamilton. Listen to the podcast and if you are further intrigued, consider buying her book like I did.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We generally agree with the Dr. Alexander Hamilton's conclusion, especially the part about preventing disease being more important than curing disease.

Bottom Line
Bloodletting is harmful for soldiers with camp fever and cannot be recommended.

Case Resolution

Case Resolution:

The solider is provided with the usual care but does not have bloodletting performed. He recovers and goes on to fight another day.

Clinical Application:

Given the mounting evidence of the potential harm of bloodletting for febrile illnesses, the lance should not be employed any longer to treat patients with camp fever or other febrile illnesses.

What Do I Tell My Patient?

It looks like you have camp fever. We are going to treat you with the best medical care possible. This used to involve bloodletting but we have found this to hasten death. Therefore, we will not be employing the lance at this time.

Episode End Notes

References/Resources:

- The James Lind Library
- **Dr. Alexander Hamilton:** Translation of an Inaugural Dissertation
- **Milne and Chalmers:** Alexander Lesassier Hamilton's 1816 report of a controlled trial of bloodletting
- **Lisa Rosner:** The Most Beautiful Man in Existence: The Scandalous Life of Alexander Lesassier.

SGEM#
201

It's In The Way That You Use It:

Ottawa SAH Tool

Question

Can the Ottawa SAH rule reduce the number of acute headache patients that require further diagnostic evaluation for subarachnoid hemorrhage without increasing missed cases of SAH?

Case

A 35-year-old female presents to your emergency department three-hours after the onset of a severe frontal headache. She describes the headache as throbbing, left retro-orbital, and associated with nausea but no vomiting. As a teenager, she had a history of frequent migraine headaches, but she cannot recall any migraine for at least ten years. The headache developed over an hour while at her desk job and was not associated with loss of consciousness, neck pain, fevers, or neurological deficits. Your physical exam is normal. Last week, your colleague missed a subarachnoid hemorrhage that was diagnosed as a ruptured cerebral aneurysm on the third emergency department visit, so you have a low cognitive threshold to initiate extensive diagnostic evaluations for any and all severe headache patients.

Bottom Line

The Ottawa SAH rule needs external validation, a meaningful impact analysis performed and patient acceptability of incorporating this rule into a shared decision-making instrument before being widely adopted.

Guest Skeptic: Dr. Chris Carpenter is from Washington University, Deputy Editor of Academic Emergency Medicine and faculty member of Emergency Medicine and Critical Care course.

Date: December 19, 2017

Reference: Perry J et al. Validation of the Ottawa Subarachnoid Hemorrhage Rule in patients with acute headache. CMAJ Nov 2017

Episode 201 Overview

Case:

A 35-year-old female presents to your emergency department three-hours after the onset of a severe frontal headache. She describes the headache as throbbing, left retro-orbital, and associated with nausea but no vomiting. As a teenager, she had a history of frequent migraine headaches, but she cannot recall any migraine for at least ten years. The headache developed over an hour while at her desk job and was not associated with loss of consciousness, neck pain, fevers, or neurological deficits. Your physical exam is normal. Last week, your colleague missed a subarachnoid hemorrhage that was diagnosed as a ruptured cerebral aneurysm on the third emergency department visit, so you have a low cognitive threshold to initiate extensive diagnostic evaluations for any and all severe headache patients.

Background:

Headaches represent about 2% of emergency department visits annually. The severe headache patient presenting with altered mental status, fever, or preceding head trauma usually generate sufficient concern to justify further diagnostic evaluations; Most other sudden onset headache cases ultimately prove to result from benign, non-life-threatening causes like migraine headache.

Causes of sudden onset headaches include cough, exertion, and post-coital, but can also include potentially life-threatening conditions like sinus thrombosis, vascular dissection, intracerebral hemorrhage, vasospasm, and aneurysmal subarachnoid hemorrhage. [Landtblom 2002, Delasobera 2012, de Bruijn 1996, Pascual 1996, Dodick 1999]

Migraine headaches are at least 50-times more common than SAH amongst emergency department headache patients, so SAH represents a needle in a haystack for a very common chief complaint. [Edlow 2003]

Missed SAH diagnosis occurs between 12%-53% of cases with emergency department providers estimated to miss 5% of them. [Edlow 2000, Vermeulen 2007] Unfortunately, one-fourth of aneurysmal SAH victims die within one-day and 50% of SAH survivors never return to work.

Identifying SAH early reduces these adverse outcomes if subsequent neurosurgical interventions (coiling or clipping) occur emergently. [Schievink 1997] Therefore, the possibility of aneurysmal SAH must be considered in emergency department patients presenting with severe headaches, but in an era of Choosing Wisely and Preventing Overdiagnosis avoiding advanced imaging while simultaneously reducing missed SAH is a tremendous challenge.

Computed tomography (CT) has become increasingly available for the evaluation of headache patients over the last 30 years ago. Early CTs were 4-slice and radiologists' interpretative learning curves were steep.

These early CTs were imperfect (sensitivity ~90%) for identifying small amounts of blood in the subarachnoid space, so textbooks, guidelines, and several generations of emergency medicine trainees advised against a CT-only approach to rule-out aneurysmal SAH.

Instead, SAH could only be ruled out when a negative CT was followed immediately by a LP demonstrating cerebrospinal fluid (CSF) without either red blood cells or (at least 12 hours post-headache onset) xanthochromia.

However, in 2017 there are three problems with that approach:

1. Contemporary CTs are far better at identifying blood in the subarachnoid space
2. Lumbar pucture frequently identify blood that is not in the subarachnoid space (traumatic LPs)
3. CSF xanthochromia is not an accurate diagnostic test for SAH

In fact, test-treatment studies based on conservative estimates of CT and liberal estimates of CSF diagnostic accuracy indicate that the vast majority of headache patients will not benefit from post-CT LP with a Number Needed to Tap (NNTap) up to 15,000 after an unremarkable CT.

Understanding the SAH diagnostic evidence available for bedside evaluation, advanced imaging, and lumbar puncture (LP) is therefore essential – and the landscape is shifting.

The topic of SAH has been covered three times on the SGEM including:

- SGEM#48: Thunderstruck – Subarachnoid Hemorrhage (with lead author Jeff Perry)
- **Bottom Line:** Ottawa SAH Tool is not ready for prime time to rule out low risk patients from investigations.

- SGEM#134: Listen, to what the British Doctors Say about LPs post CT for SAH
- **Bottom Line:** In this study, one patient would be diagnosed with SAH out of every 250 patients receiving a LP who presented to the emergency department with a headache that did not have their bleed identified on CT scan. So the NNTap 250.

- SGEM#140: CT Scans to Rule Out Subarachnoid Hemorrhages in A Non-Academic Setting
- **Bottom Line:** These community radiologists were just as good at reading CT heads as academic radiologists when looking for blood using a third-generation scanner. The NNTap was 760 but the one patient they did identify as a perimesencephalic non-aneurysmal SAH with a benign clinical course.

Clinical Question

Can the Ottawa SAH rule reduce the number of acute headache patients that require further diagnostic evaluation for subarachnoid hemorrhage without increasing missed cases of SAH?

Population: Adults with acute or subacute headaches in the emergency department with clinical concern for SAH

Exclusions: Glasgow Coma Scale <15, head trauma within seven days, headache onset >14 days prior, similar headaches on ≥3 occasions over preceding six months, referral from another hospital with diagnosed SAH, papilledema, new focal neurological deficit, or previous cerebral aneurysm, SAH, brain neoplasm, ventricular shunt, or hydrocephalus.

Intervention: Prospective, observational study with 6-month longitudinal follow-up (ie no intervention).

Comparison: No comparator

Outcome: SAH was defined by either (1) subarachnoid blood visible on unenhanced CT (based on final radiology report) or (2) visible inspection cerebrospinal fluid (CSF) xanthochromia or the presence of >1 x 106 red blood cells in the final tube of CSF with an aneurysm or arteriovenous malformation on cerebral angiography.

- This SAH definition was agreed upon by five emergency physicians and a neurosurgeon and was previously used in the derivation and validation of the Ottawa SAH Rule. Telephone follow-up for the subset of discharged patients without both a CT and a normal lumbar puncture occurred at 1- and 6-months after the initial emergency department visit by a surrogate method of identifying missed SAH that the authors previously used.

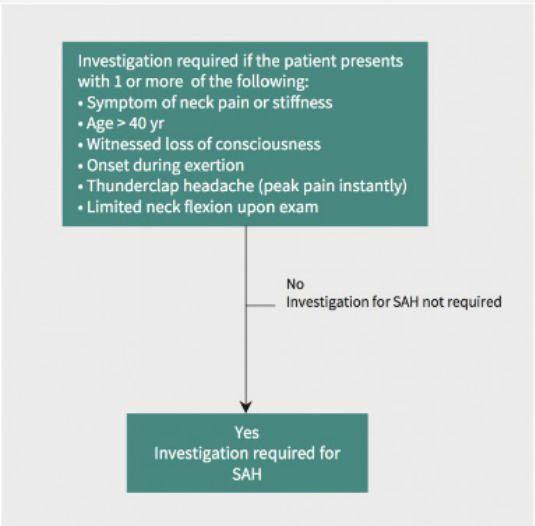


Figure 1: The Ottawa Subarachnoid Hemorrhage (SAH) Rule. Used in alert patients > 15 yr of age with new acute severe nontraumatic headache that reaches maximum intensity within 1 h of onset. Not to be used in patients with new neurological deficits, previous aneurysms, SAH or brain tumors, or a history of similar headaches (≥ 3 episodes over ≥ 6 mo).[10]

Authors' Conclusions:

"We found that the Ottawa SAH Rule was sensitive for identifying subarachnoid hemorrhage in otherwise alert and neurologically intact patients. We believe that the Ottawa SAH Rule can be used to rule out this serious diagnosis, thereby decreasing the number of cases missed while constraining rates of neuroimaging."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department. Emergency department patients were enrolled from six university-affiliated Canadian tertiary-care hospitals from January 2010 to January 2014. Although this was a convenience sampling rather than a consecutive sampling (researchers missed approximately 34% of patients because study recruitment depended upon attending or resident emergency medicine physicians), research staff reviewed emergency department logs to identify potentially eligible patients. Potentially eligible patients who were not prospectively enrolled were similar to those included in the validation analysis, but the Institutional Review Board only permitted telephone follow-up for enrolled patients discharged without both a CT scan and a normal lumbar puncture.
- ☑ 2. The patients were representative of those with the problem.
- ☑ 3. All important predictor variables and outcomes were explicitly specified. . Although one needs to refer to the original derivation studies for the definitions of subjective predictors like "thunderclap headache" or "limited neck flexion on exam".
- ☐ 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.
- ☒ 6. This is an impact analysis of a previously validated CDR (level I).
- ☒ 7. For Level I studies, impact on clinician behavior and patient-centric outcomes is reported.
- ☐ 8. The follow-up was sufficiently long and complete. (YES – Long. NO – Complete)
- ☑ 9. The effect was large enough and precise enough to be clinically significant.

Key Results

They enrolled 1,153 patients prospectively of whom 67 (5.8%) had confirmed SAH. An additional 590 potentially eligible patients were not enrolled among whom 33 (5.6%) had confirmed SAH.

OUTCOME

The Ottawa SAH rule was 100% sensitive (missed no SAH patients) and 13.6% specific.

Primary Outcome:

- 100% sensitive (95% CI 94.6%-100%)
- 13.6% specific (95% CI 13.1%-15.8%)
- Positive likelihood 1.16 (95% CI 1.13-1.19)
- Negative likelihood ratio 0.0 (95% CI 0-0.5).

pretest probability for SAH of 5.8% with a negative likelihood ratio of 0 would yield a post-test probability of 0%. However, the study was underpowered with an upper confidence interval limit of 0.5, which would bring the post-test probability to 3%. The true post-test probability for patients without any of

Talk Nerdy to Me

1) External Validity and Reproducibility:

The six enrolling sites were the same hospitals (and likely most of the same physicians) engaged in the original Ottawa SAH Rule derivation studies. Whether physicians from different geographic regions and non-academic hospitals would accept, interpret, and use this decision aid on headache patients remains unproven. Emergency providers in some countries are less likely to accept clinical decision aids or apply them indiscriminately to populations in whom the rule was never validated.

2) Precision:

The authors planned to enroll about 1,200 patients in order to identify approximately 75 SAH cases to achieve near 100% sensitivity with acceptably tight confidence intervals, but were only able to enroll 1,153 patients with 67 SAH cases. The study is therefore underpowered and the confidence intervals around the LR- of 0 extend to 0.5. Did the authors conduct a sensitivity analysis to test the impact on sensitivity and LR- of 1 or more false negative cases of SAH being identified if 75 or more patients had been enrolled?

3) Differential Verification Bias and Loss to Follow-Up:

A certain skeptic and Legend of Emergency Medicine was critical of the initial derivation and validation studies based on two aspects of the study design.

- First, not every enrolled patient had both CT and post-CT LP (if the imaging was non-diagnostic for SAH). The IRBs would not permit this ideal-world approach due to the personal risks of these
- procedures in whom the physician did not feel they were medically indicated or the patient refused, as well as the costs to the healthcare system. When different criterion standards are applied to patients, differential verification bias (also known as double gold standard bias) is likely and observed estimates of sensitivity and specificity can be falsely lowered for disease processes (like SAH) that only become detectable during follow-up.
- Second, 8/1,153 (0.6%) were lost to follow-up. How would a best-case scenario (none of the 8 had a SAH – by far the most likely scenario) compare with a worst-case scenario (all 8 of the lost patients had a SAH and were somehow not found) affect the observed sensitivity of the Ottawa SAH Rule?

4) Shared Decision Making:

Debate persists around when clinical decision aids have sufficient evidence to justify widespread uptake. Even if a decision aid demonstrates sufficient accuracy and reliability in disparate settings, there is no guarantee that providers will embrace the new clinical tools. One unmeasured obstacle to more efficient uptake of decision aids is the engagement of patients and families in the complex discussions around diagnostic evaluations. The science of developing patient decision aids is distinct from that of validating clinical decision rules and requires both a rigorous implementation strategy and sustainable funding environments. Is the Ottawa SAH Rule validated with sufficient confidence to use it as the basis for designing a patient decision aid?

5) Impact Analysis:

Diagnostic and prognostic tests are usually disseminated on the assumption that accuracy equates to patient-centric benefit, but without actual studies to quantify (or even confirm) such benefit. In an ideal world, patients would present to the emergency department with *"I have SAH"* tattooed on their forehead, negating the need for a decision aid. In the real world, patients present with constellations of symptoms that clinicians need to identify, interpret, and transform into diagnoses that inform treatment options, urgency of further evaluation/consultation, and truly informed shared decision-making with patients.

- The process of transforming signs/symptoms into clinical action occur in a fishbowl of chaos in which providers are judged by various metrics including emergency department flow, patient satisfaction, and test-ordering rates relative to a standard imposed by someone else. Deciding whether or not to order diagnostic tests must be balanced against patient anxiety and preferences as well as each physician's risk tolerance, while also considering transitions of care and the unknown risk tolerance of other
- emergency department providers to whom we may sign out or inpatient/outpatient providers.

- Therefore, evaluating whether the Ottawa SAH Rule is acceptable to providers (physician, nurse
- practitioners, physician assistants) in non-academic settings that are less aware and perhaps less accepting of decision aids is essential. So, we are going to ask you a series of five questions about impact analysis:

    - Do you think these practitioners will believe this validation study or do you think they would need more validations studies before adopting this clinical decision instrument

    - Will they apply the rule to headache patients similar to those enrolled in this study and remember all of the exclusion criteria?

    - Do you think practitioners will explain the decision-aid and what it does/does not tell us to patients and families?

    - Your study only showed a decrease of imaging by about 5%. If used and interpreted appropriately in disparate settings, do you think the Ottawa SAH Rule would increase or decrease downstream CT and LP testing?

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We generally agree with the authors' conclusions except that we are not sure if the Ottawa SAH Rule will decrease the number of cases missed while constraining rates of neuroimaging if used in other clinical settings. Whether similar physician acceptability, reliability, and diagnostic accuracy will be observed in non-academic, non-Canadian emergency departments remains to be evaluated.

Bottom Line

The Ottawa SAH rule needs external validation, a meaningful impact analysis performed and patient acceptability of incorporating this rule into a shared decision-making instrument before being widely adopted.

Case Resolution

Case Resolution:

The patient is non-high risk by the Ottawa SAH Rule. After her headache resolves with intravenous prochlorperazine, you explain the differential diagnosis of headache, including SAH. Your clinical gestalt is that the headache characteristics are atypical for SAH and more consistent with migraine. She expresses concern about *cerebral aneurysms* that she learned about from Dr. Google while awaiting headache resolution, so you explain the Ottawa SAH Rule and the fact that she has none of the high-risk criteria and her risk of SAH would be far less than 1%.

Understanding that your gestalt aligns with the new Ottawa CDR relieves the patient's anxiety and she is discharged home with migraine abortive therapy in case the headache recurs. Two days later your nurses conduct routine follow-up calls and report that she has had no headache recurrence and has an appointment with her primary care provider later that day to evaluate the indications for further evaluation or specialty referrals.

Clinical Application:

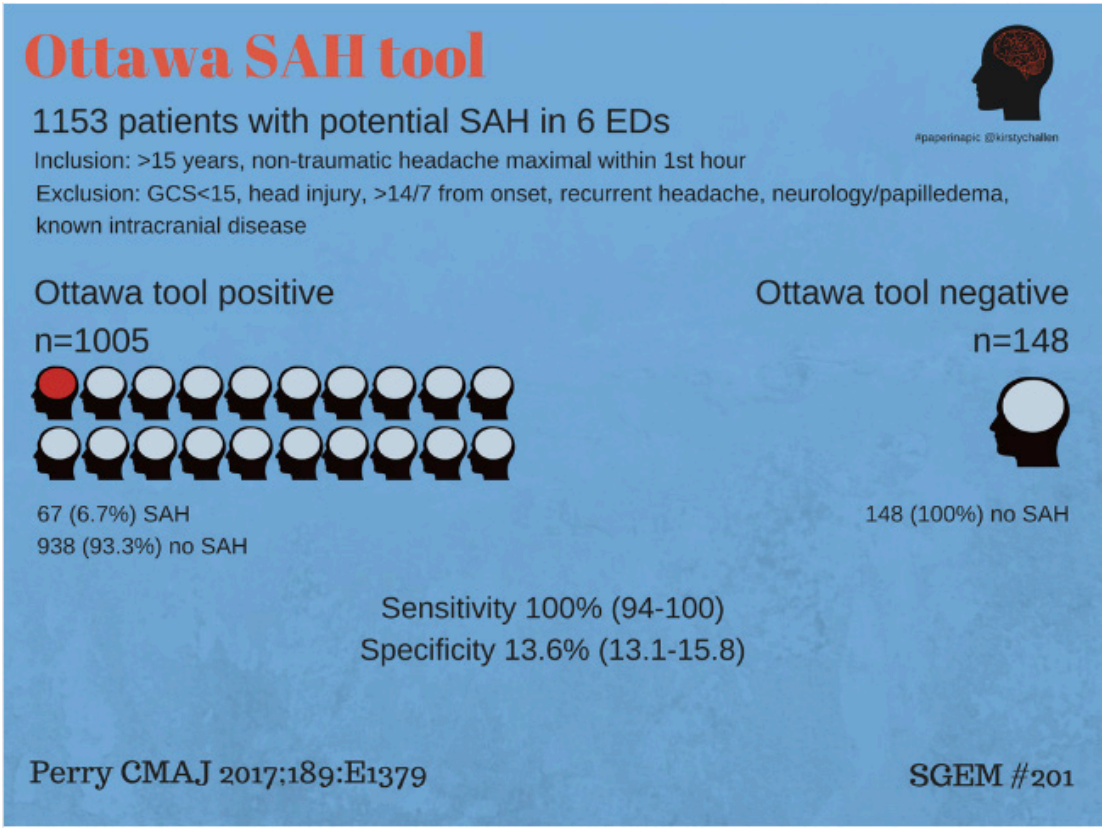
It's in the way that you use it! Decision aids are not meant to be used in cases where physicians are certain of the appropriate diagnosis or next steps. Instead, they're meant to guide us in the gray zone cases where various factors lead to significant practice variability. If physicians use the rule indiscriminately on patients who they never would have obtained CT before, perhaps it will increase CT ordering. Additional research will tell, but I think clinicians just need to use the rule for those patients in whom they have lingering uncertainty.

What Do I Tell My Patient?

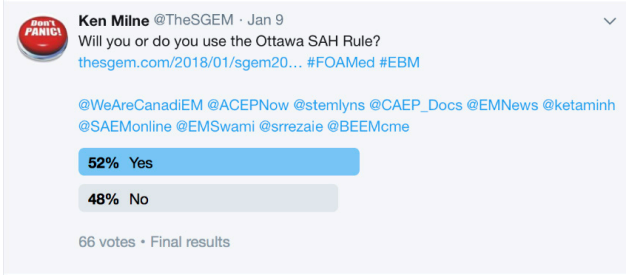
The bad news it looks like you are having a migraine headache. The good news is we can treat it. There is other good news too. We considered other serious causes of your headache besides migraine. It looks like you do not have one of those other bad headaches. One thing we always worried about is could a bleed in the brain be causing the headache. This bleeding is called a subarachnoid hemorrhage. There is a check list six things to help us decide if a subarachnoid hemorrhage is likely. You have none of the six things. This means you have a 97-99% chance the headache is not a brain bleed. Now we could do a CT scan and lumbar puncture (spinal tap) to bring that number closer to 100%. However, these tests take time, cost money and have risks. The CT involves radiation that has a small chance of causing brain cancer. The spinal tap can cause infection, bleeding, damage the spinal cord or even make the headache come back. What are your thoughts about next steps?

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- Washington University Journal Club: January 2017 – Diagnosis of Subarachnoid Hemorrhage
- St. Emlyn's: Journal Club – Ottawa SAH Rule
- Emergency Medicine Literature of Note: It's SAH Silly Season Again!

SGEM#
202

Lidocaine For Renal Colic?

Question
In emergency department patients with renal colic, is IV Lidocaine as or more effective than IV Narcotics for pain control?

Case
A 45-year-old male presents to the emergency department with sudden onset severe right-sided flank pain radiating to his groin that began one hour ago. He has also had nausea, vomiting, and difficulty urinating. He has never had anything like this before and is writhing around in pain, unable to get comfortable.

Bottom Line
Based on this study, Lidocaine cannot be recommended for the treatment of renal colic.

Guest Skeptic: Dr. Tony Seupaul is the Chairman of the Department of Emergency Medicine at the University of Arkansas. Dr. Rachel Littlefield is a PGY2 in Emergency Medicine at the University of Arkansas.

Date: January 9, 2018

Reference: Soleimanpour H et al. Effectiveness of intravenous lidocaine versus intravenous morphine for patients with renal colic in the emergency department. Urology 2012

Episode 000 Overview

Knowledge Translation Window:

A short note to point out that this paper was not published in the last year. However, it is less than ten years old so we are cutting the KT window down to less than ten years. It was selected because there has been a number of people on Facebook and Twitter talking about using lidocaine to treat renal colic. Of course we were skeptical and wanted to review the evidence.

Case:

A 45-year-old male presents to the emergency department with sudden onset severe right-sided flank pain radiating to his groin that began one hour ago. He has also had nausea, vomiting, and difficulty urinating.
He has never had anything like this before and is writhing around in pain, unable to get comfortable.

Background:

Renal colic affects 1-5% of the US population [1]. The typical acute presentation is sudden onset of pain radiating from the flank to lower abdomen accompanied by microscopic hematuria, nausea, and vomiting [2].

The issue of renal colic a number of times on the SGEM. One issue that has been to use CT or ultrasound for the diagnosis.

A study from Bindman et al. in the NEJM 2014 demonstrated: *Initial ultrasonography was associated with lower cumulative radiation exposure than initial computed tomography without significant differences in high-risk diagnosis with complications, serious adverse events, pain scores, return ED visits, or hospitalizations.*

- **SGEM#97:** Hippy Hippy Shake
- **Bottom Line:** Bedside emergency department ultrasound is safe and has several advantages over CT for the diagnosis of kidney stones.

Passing a kidney stone is very painful. Narcotics are often used for pain relief along with intravenous NSAIDs. We learned recently about the ceiling effect of ketorolac for treating moderate to severe pain in the emergency department from Sergey Motov (@PainFreeED). He showed that 10mg IV ketorolac was just as effective as 15mg IV or 30mg IV.

- **SGEM#175:** Dancing on the Ceiling with Ketorolac for Pain
- **Bottom Line:** Use 10mg IV ketorolac when treating moderate to severe pain in the emergency department.

Alpha blockers have been repeatedly tried to help with renal colic. However, there has not been high-quality evidence demonstrating efficacy.

- **SGEM#4:** Getting Un-Stoned (Renal Colic and Alpha Blockers)
- **Bottom Line:** Tamsulosin 0.4 mg OD does not seem to work for renal colic beyond the placebo effect.

- **SGEM#71:** Like a Rolling Kidney Stone (A Systematic Review of Renal Colic)
- **Bottom Line:** Tamsulosin is useless in most ED patients with ureteral colic unless their stone size exceeds at least 4mm.

- **SGEM#154:** Here I Go Again, Kidney Stone
- **Bottom Line:** Expulsive therapy is unnecessary for ureteric stones < 5mm. There is some weak evidence that tamsulosin may help passage of larger stones (5 to 10 mm).

Lidocaine may be a useful alternative as it has been used to effectively treat visceral and neuropathic pain [3]. Finding non-narcotic alternatives to treat painful conditions is timely given the heightened attention to the opioid epidemic in the US.

Clinical Question

In emergency department patients with renal colic, is IV Lidocaine as or more effective than IV Narcotics for pain control?

Population: Patients age 18-65 presenting to the emergency department with unilateral abdominal pain radiating to the genitalia associated with a positive urine analysis for hematuria

Excluded: Pregnant, allergy to lidocaine or morphine, or history of renal, hepatic, or cardiac disease

Intervention: IV Lidocaine 1.5mg/kg (max of 200mg)

Comparison: IV Morphine 0.1mg/kg (max of 10mg)

Outcome: Pain on VAS at 5, 10, 15, and 30 minutes following the intervention

Authors' Conclusions:

"Changing the smooth muscle tone and reducing the transmission of afferent sensory pathways, lidocaine causes a significant reduction in pain."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department.
- [x] 2. The patients were adequately randomized.
- [?] 3. The randomization process was concealed.
- [?] 4. The patients were analyzed in the groups to which they were randomized.
- [?] 5. The study patients were recruited consecutively (i.e. no selection bias).
- [?] 6. The patients 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 patient-important outcomes were considered.
- [ ] 11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

240 patients were enrolled in the study with 120 in each group. The mean age was in the mid 30's.

Outcome

Less pain with Lidocaine than Morphine.

Table 2 Comparison of the mean value of pain reduction between two groups

	Group I	Group II	*P*-value
primary VAS	9.65 ± 0.88	9.74 ± 0.63	0.365
VAS_5	3.18 ± 2.27	4.45 ± 2.16	0.0001
VAS_{10}	1.83 ± 1.59	2.89 ± 2.07	0.0001
VAS_{15}	1.37 ± 1.32	2.55 ± 1.52	0.0001
VAS_{30}	1.13 ± 1.15	2.23 ± 1.57	0.0001

Primary Outcome:

- 90% (108/120) patients responded to lidocaine successfully
- 70% (84/120) patients responded properly to morphine
- Number of patients experiencing side effects were similar between groups.

Note: The trial was considered "accomplished" when either the patient had a pain score of less than 3 for 30 minutes after the last analgesic dose or the 10mL of solution in the syringe (either 200mg lidocaine or 10mg morphine) was used up.

Talk Nerdy to Me

1) Randomization Concealment:

Envelopes were reportedly used for concealment but no mention is made as to whether or not the envelopes were completely opaque and unable to be seen through or if they were sealed. This method of concealment is weak at best.

2) Intention-to-Treat:

There is no explicit mention of an intent to treat analysis. The authors note that: *"Patients whose pain did not relieve using lidocaine or morphine were administered supplementary drugs. Then, method of drug administration, the reason for prescription and possible complications were explained to the patients and it was emphasized that using either lidocaine or morphine is safe."* There is the potential for cross-over in this trial.

3) Consecutive Patients:

There was no discussion made about whether the subjects were recruited consecutively, just that they used randomization.com as their randomization tool. A lack of consecutive recruitment can lead to selection bias.

4) Similar at Baseline:

We are unsure if patients were similar at baseline. More patients in the lidocaine group presented with a first stone and less with a recurrent stone.

5) Renal Colic:

We are also not even sure if the study participants truly had renal colic. They were included based on history and hematuria. Follow-up studies included a kidney-ureter-bladder (KUB) X-ray and/or sonography. Neither of these diagnostic modalities are gold standard methods for diagnosing renal colic. There is the potential for substantial diagnostic bias.

6) Blinding of Patients:

It is unclear whether or not all participants were unaware of group allocation. Certainly, morphine can produce side effects that could have unmasked the blinding. It would have been simple to ask the participants which group they felt they were allocated. We do not know if this potential bias would favour the morphine or the lidocaine group.

7) Blinding of Providers:

The providers may have been unblinded introducing bias into the study. This is because differences in weight based dosing would result in different volume administrations of medications (ie a 100kg patient would be dosed 150mg [7.5mL of lidocaine] but would be dosed 10mg [the full 10m of morphine]). In addition, study medications were not distributed by a research pharmacist to ensure similarities between lidocaine and morphine.

8) Equal Treatment:

It appears groups were treated equally aside from being administered lidocaine vs morphine. However, there is ambiguity in what additional interventions were performed when pain was not adequately controlled. Also, the authors do not address whether or not the subjects who required additional medications were excluded from data analysis in the end.

9) Follow-Up:

This is not addressed in the article. It is likely that follow up was complete due to the short study interval.

10) Statistical vs. Clinical Significance:

This is a key point. Although the results obtained statistically significant, the standard deviations of the means in every group at each measured time interval overlap and do not appear to have clinical significance.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
The authors have a strong recommendation to use IV lidocaine for renal colic. While lidocaine MAY work, this trial certainly does not support the strength of their recommendation. This trial suffers from substantial methodologic flaws.

Bottom Line

Based on this study, Lidocaine cannot be recommended for the treatment of renal colic.

Case Resolution

Case Resolution:

The patient has a bedside ultrasound performed by the emergency department physician. It demonstrates mild right hydronephrosis. He is provided with ketorolac 10mg IV and his pain is resolved. The patient is discharged home with pain control, expectant management and good instructions on when to return to the emergency department.

Clinical Application:

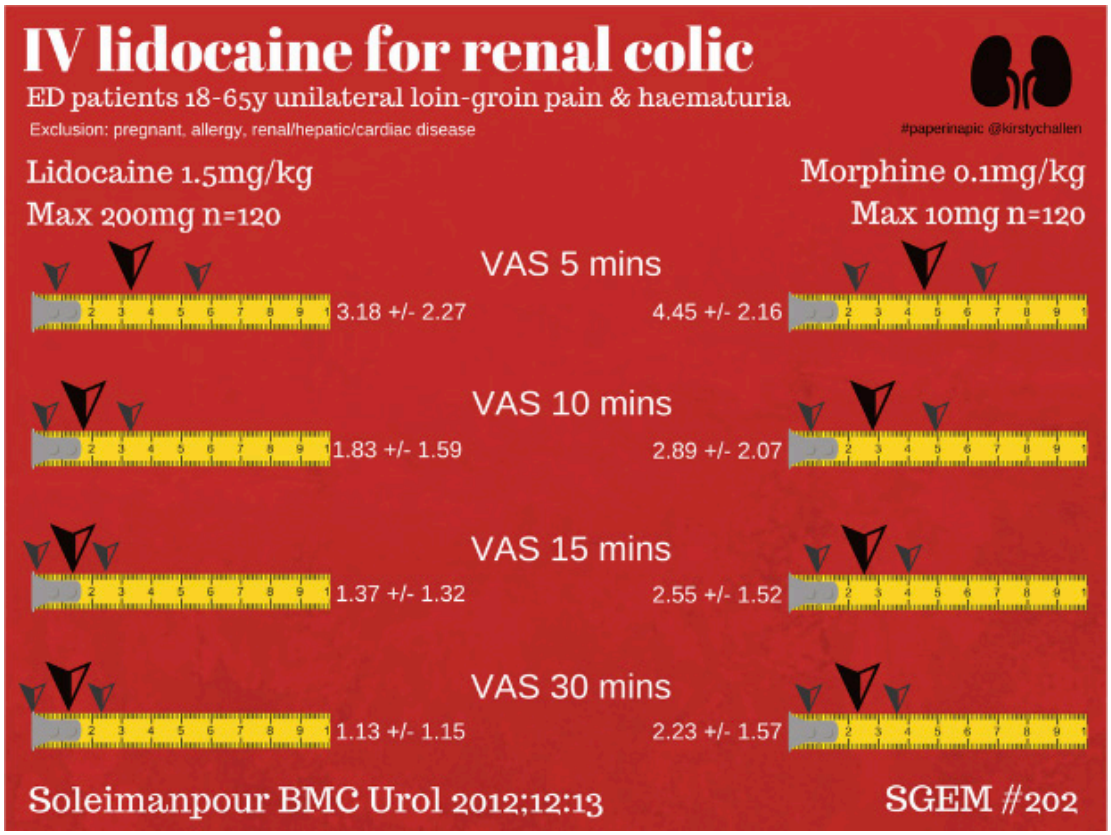
This article did not provide convince that lidocaine works. I am not even sure that this treatment would be defensible if it was given for renal colic and someone had a bad outcome. People have reported cases of it working beautifully. There has been a smaller RCT by Firouzian et al in Am J Emerg Medicine [4]. It looked at IV morphine +/- IV lidocaine and found no statistically significant differences were observed between groups for the primary outcome of pain on the VAS. It too had some methodological issues. It would be interesting to perform a methodologically rigorous multicenter randomized control trial to tease this thing out.

What Do I Tell My Patient?

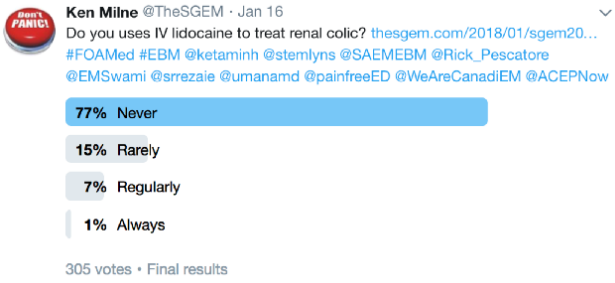
You have a kidney stone that causing some mild swelling in your kidney. There does not appear to be any infection. Most kidney stones will pass on their own in about 1-2 weeks and it can be painful. We can treat your pain with some anti-inflammatories drugs. If that does not work you can also use some opioid pain pills as a back-up plan. We will also give you some anti-nausea medications. If your pain is not controlled, you are vomiting, develop a fever or are otherwise worried please come back to the emergency department. Otherwise, we will set up an outpatient appointment with a urologist for follow-up.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- REBEL EM: IV Lidocaine for Renal Colic: Another Opioid Sparing Option?
- WashU: IV Lidocaine for analgesia in the Emergency Department
- EM Literature of Note: Lidocaine for Renal Colic

References:

1. O'Connor A, A'Schug S, Cardwell A: A comparison of the efficacy and safety of morphine and pethidine as analgesia for suspected renal colic in the emergency setting. Emerg Med J 2000, 17:261–264.
2. Leslie SW: Nephrolithiasis: Acute Renal Colic. 2005, [http://www. emedicine.com/med/topic3437. Htm] (Updated: May 3,2007).
3. Ferrini RA, Paice J: How to Initiate and Monitor Infusional Lidocaine for Severe and/or Neuropathic Pain. J Supportive Oncol 2004, 2:90–94.
4. Firouzian A et al. Does Lidocaine as an Adjuvant to Morphine Improve Pain Relief in Patients Presenting to the ED with Acute Renal Colic? A Double-Blind, Randomized Controlled Trial. Am J Emerg Med 2016

SGEM#
203

Let Me Clear My Sore Throat With A Corticosteroid

Question
Are corticosteroids effective and safe as an adjunct treatment for sore throat in addition to standard care compared with standard care alone?

Case
50-year-old man presents with a one day history of sore throat, cough and low-grade fever. He is otherwise healthy with only sports related injuries. The ibuprofen did not help and he is requesting antibiotics so he can get back to work sooner.

Bottom Line
Steroids appear to provide a modest benefit to patients presenting to the emergency department with a sore throat.

Guest Skeptic: Meghan Groth is an Emergency Medicine Pharmacist at the UMass Memorial Medical Center in Worcester, Massachusetts. She has contributed to the Academic Life in Emergency Medicine and EM PharmD blogs, and is a part of the ALiEM Capsules Team.

Date: January 15, 2018

Reference: Sadeghirad B, et al. Corticosteroids for treatment of sore throat: systematic review and meta-analysis of randomised trials. BMJ 2017

Episode 203 Overview

Case:

50-year-old man presents with a one day history of sore throat, cough and low-grade fever. He is otherwise healthy with only sports related injuries. The ibuprofen did not help and he is requesting antibiotics so he can get back to work sooner.

Background:

Patients present commonly to their primary care providers (PCPs) and to the emergency department (ED) with complaints of a sore throat. In the US, adults accounted for 6.6 million visits annually to PCPs and EDs for sore throat.

Along with this can come unnecessary prescriptions for antibiotics (a topic in itself), even though national guidelines recommend against routine antibiotics (NICE and ESCMID).

As more and more attention is paid to strategies for reducing the overutilization of antibiotics and the subsequent trends in antimicrobial resistance, there is a need for other strategies to provide symptomatic relief for these patients.

Acetaminophen and NSAIDs are often used to treat sore throats. While providing symptomatic relief they can also cause harm. Several studies have looked at corticosteroids and demonstrated some moderate benefit.

Corticosteroids exert an anti-inflammatory effect by inhibiting transcription of pro-inflammatory mediators in airway endothelial cells. However, previous systematic review and meta-analyses have been c onfounded by co-administration of antibiotics and analgesics, as well as variability in measures of efficacy among studies.

Clinical Question

Are corticosteroids effective and safe as an adjunct treatment for sore throat in addition to standard care compared with standard care alone?

Population: Adults and or children aged five and over presenting to the emergency department or primary care settings with a clinical syndrome of sore throat (painful throat, odynophagia, or pharyngitis)

Exclusions: Participants admitted to the hospital, immunocompromised, those with infectious mononucleosis, sore throat after surgery/intubation, GERD, croup, peritonsillar abscess, or subjects under five years of age.

Intervention: At least one dose of corticosteroid therapy.

Comparison: *"Standard of care"* or placebo.

Outcomes:

- Complete resolution of symptoms at 24 hours and at 48 hours
- Mean time to onset of pain relief and to complete resolution of pain
- Absolute reduction of pain at 24 hours
- Duration of bad/non-tolerable symptoms
- Recurrence/relapse of symptoms
- Days missed from school/work
- Need for antibiotics
- Rate of adverse events related to treatment

Authors' Conclusions:

"Single low dose corticosteroids can provide pain relief in patients with sore throat, with no increase in serious adverse effects. Included trials did not assess the potential risks of larger cumulative doses in patients with recurrent episodes of acute sore throat."

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.

Key Results

The authors ended up including ten randomized controled trials with 1,426 patients in the analysis. Eight of these enrolled ED patients, and two enrolled patients from the primary care setting. Three studies evaluated children, six focused on adults, and one study enrolled both children and adults. Dexamethasone was the most common corticosteroid used in the trials, however, the doses and routes (both oral and IM) varied.

OUTCOME
Corticosteroids provided significant benefit

	Studies	Difference (95% CI)	Quality of Evidence
Resolution at 24hrs	5	RR 2.24 (1.17-4.26) I2=69%	Moderate
Resolution at 48hrs	4	RR 1.48 (1.26-1.75) I2=3%	High
Time to Onset Relief	8	4.8hr less (7.8-1.9) I2=78%	Moderate
Time to Complete Relief	6	11.1hr less (21.8-0.4) I2=85%	Low
Reduction of Pain at 24hrs	8	1.3 higher (0.7-1.9) I2=65%	Moderate
Recurrence/Relapse	3	31 fewer (55 fewer to 47 more)	Moderate
Days Missed School/Work	1	RR 0.8 (0.6-1.1)	Moderate
Need for Antibiotics	1	RR 0.83 (0.61-1.13)	Moderate

Missed Work: The trial was considered "accomplished" when either the patient had a pain score of less than 3 for 30 minutes after the last analgesic dose or the 10mL of solution in the syringe (either 200mg lidocaine or 10mg morphine) was used up.

Adverse Events: There was no reported increase in the incidence of adverse effects with steroid administration versus placebo.

Talk Nerdy to Me

1) Relationship Between *"Standard of Care"* and Steroids:

One study included in this meta-analysis did not report whether or not subjects received adjunct antibiotics and/or analgesics. For a meta-analysis focusing on the clinical question stated, it's difficult to understand why this study was included when the standard of care is so ill-defined.

For all the discussion on the confounding effects of antibiotics, and the rationale for the prescribing of corticosteroids to potentially decrease the overutilization of antibiotics in pharyngitis, I wish these points could have been addressed in a more rigorous manner in this meta-analysis. The authors mentioned that the impetus for performing this study was the TOAST trial (Hayward et al. Effect of oral dexamethasone without immediate antibiotics vs placebo on acute sore throat in adults. JAMA 2017;317:1535-43), as a few systematic reviews on this topic have already been published, with varying conclusions.

The TOAST trial was supposed to address the issue of effectiveness and safety of steroid monotherapy for sore throat, but nearly 40% of all patients in that trial received a prescription for antibiotics. It wasn't reported how many patients actually ended up taking the treatment course of those antibiotics. What would be really nice is to have a full data set from all of these trials regarding who got antibiotics and who didn't, and to do a subgroup analysis on the pooled data to see what effects steroids by themselves had.

The last piece to mention about this point is the relationship between the decision to prescribe antibiotics and the decision to prescribe corticosteroids. The TOAST trial, included in this meta-analysis, attempted to get at this, but it's a bit complicated. Do you give a patient a corticosteroid as an alternative to antibiotics because you feel like they're expecting you to do something more than tell them to stay hydrated and take over the counter analgesics? Or, if you feel really bad for the patient, do you prescribe both? Is your decision to prescribe corticosteroids independent or your decision to prescribe antibiotics? If not, how are they related? I'm interested in your thoughts on this. Please leave comments on the blog or twitter with what you think.

2) Patient Oriented Outcome:

What is the most important thing to patients? Is it onset of pain relief, time to complete relief, pain relief at 24hrs, etc? From my perspective, I want to be better sooner, with enough improvement to resume normal activities and have a shortened duration of illness. Other people might value other outcomes. I do not think we should be pushing a complete resolution in 24-48hrs as a goal. We can cause some serious harm in overtreatment in trying to achieve such a goal. In addition, just because it was statistically significant does not mean clinical significance. Does it matter if the onset of pain relief is 5hrs sooner or the time to complete resolution is 11hrs shorter?

3) Steroid Dosing Equivalents:

The authors referred to a single, low dose of corticosteroids in their conclusion, but is this really reflective of the studies they included? Two of the ten studies used steroids for a two-day duration, the remainder used a single dose. Most studies used dexamethasone, but some used oral and some used the intramuscular route. It's helpful to take a step back and compare some of these doses though, because I don't think they're all apples and apples.

The three studies that focused on children used oral dexamethasone at a dose of 0.6 mg/kg, with a max of 10 mg. Let's think about that for a second. An 18kg kid in this study would get 10 mg of oral decadron, that's the same *"low dose"* that's referred to for two of the adult studies where *"grown-ups"* were also given 10 mg of oral dexamethasone.

It's important to note that there's wide variability in what some practitioners refer to as low dose and high dose steroid regimens, but a publication in the Annals of Rheumatologic Diseases in 2002 from an expert panel of rheumatologists (Ann Rheum Dis 2002;61:718–722) seeking to clear up the nomenclature around steroid regimens defined low dose as 7.5 mg per day of prednisone equivalents (that's just over 1 mg per day of dexamethasone). The 10 mg of dexamethasone used in many of the trials in this meta-analysis equates to about 67 mg daily prednisone equivalent, or well into the high dose steroid classification. You may say it's only a single dose, so you could also refer to it as pulse therapy. But it's hard to figure out how the authors determined these steroid regimens could be called *"low-dose."*

4) Difference in Pain Scores:

In the authors' conclusion, they state that corticosteroids can provide pain relief in sore throat. It's interesting to look back at the previous evaluations that have evaluated this intervention and how each has chosen their primary intervention. In 2010 Wing and colleagues chose to focus on the time to *"clinically meaningful"* pain relief, and found a 4.5 hour difference between steroids and control. We'll come back to that phrase *"clinically meaningful"* in a second.

The Cochrane review published in 2012 concluded that steroids were beneficial by instead focusing on the time to complete pain relief, which resulted in a 14.4 hour difference between steroids and the control group. The present analysis arrives to their conclusion through a few different measures. Five trials reported complete resolution of symptoms at 24 hours, with the evidence favoring corticosteroids, and four trials reported resolution of pain at 48 hours, which again favored steroids. However, of the eight studies that reported time to onset of pain relief, there was only a 4.8 hour difference between groups. Time to complete resolution in this meta-analysis resulted in an 11 hour advantage of corticosteroids over control. And finally, when the VAS was measured at baseline and 24 hours, those patients who received steroids showed a 1.3 point lower pain score than those treated with placebo at 24 hours – keep in mind that 1.3 points on a VAS ranging from 0 to 10 is the absolute minimum difference you need in order to claim a clinically significant difference or reduction in pain. This seems like a whole bunch of different ways to measure the effectiveness of the same intervention.

5) Comments on Safety:

The authors stated in their conclusion that single *"low dose"* corticosteroids can provide pain relief in sore throat with no increase in serious adverse effects. We already talked about what they've referred to as *"low dose,"* but I'm not confident in this meta-analysis being able to comment as strongly on the safety of the intervention as the authors apparently seem to be. There were two of the ten studies they included that didn't report evaluating adverse effects, and so they were documented as *"none reported."* If they weren't explicitly evaluated, I'm not sure it's appropriate to assume the intervention was safe. Furthermore, the studies included had primary outcomes to determine efficacy, and likely weren't powered to detect differences in what I would surmise are the uncommon occurrences of adverse events.

Comment on Authors' Conclusion Compared to SGEM Conclusion:

It appears that a short course of steroids may help with some measurements of pain relief in patients with sore throat – depending on how you're evaluating this, though it's unclear whether these effects are due to steroids or other interventions (e.g. analgesics, antibiotics). Additionally, the studies weren't rigorous enough to definitively comment on safety. The authors conclusion may have overstepped a bit in their claims that a single, low dose provides pain relief without increasing adverse effects.

Bottom Line

Steroids appear to provide a modest benefit to patients presenting to the emergency department with a sore throat.

Case Resolution

Case Resolution:

Using some shared decision making you discuss the evidence for different treatments. This include over the counter analgesics and NSAIDs, not needing antibiotics and considering corticosteroids. He decides to try 10mg of dexamethasone.

Clinical Application:

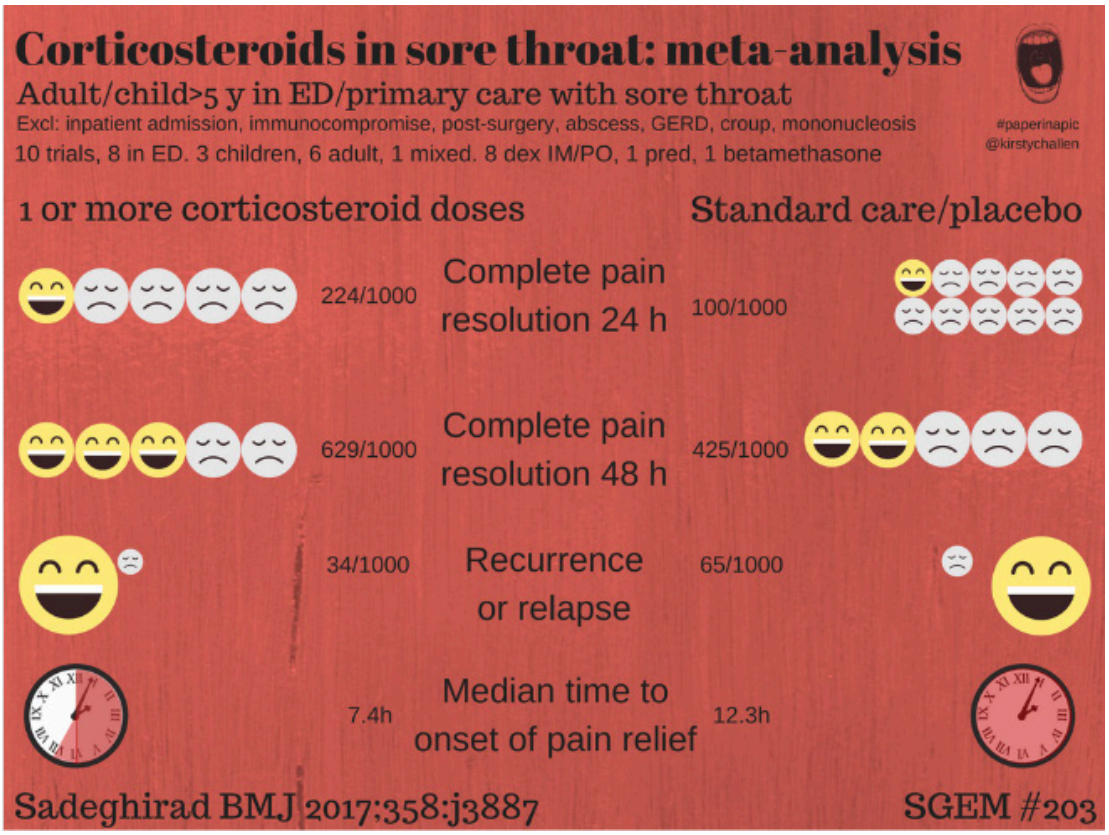
I am concerned that corticosteroids are going to be used indiscriminately for sore throats. Given the potential side effects, cumulative doses and the use in children, I am going to be cautious. This means I will not be routinely giving corticosteroids for sore throats.

What Do I Tell My Patients?

You have a sore throat and it is most likely from a virus. Taking acetaminophen or ibuprofen can help. Antibiotics do not treat viruses and can lead to diarrhea and an allergic reaction. We could try one dose of a steroid medication. There is some evidence it can shorten your illness and get you feeling better quicker.

Episode End Notes

Infographic:



Other FOAMed:

- EMPharmD: Steroids and Strep Throat
- The NNT: Steroids for Pharyngitis
- REBEL Cast: The TOAST Trial – Dexamethasone for Acute Pharyngitis
- Total EM: Oral Dexamethasone for Sore Throats
- EM Literature of Note: Dexamethasone Dilemma

SGEM#
204

Hold The Line:

IVs Aren't Always Required

Question

Can an educational intervention on the appropriate use and placement of PIVCs reduce the number of unnecessary IV placed?

Case

You are caring for a patient with a fever in the emergency department and the nurse asks if you want to start an intravenous (IV) line or just draw blood. You think for a minute…your patient is not tachycardic, not vomiting, and the likelihood of discharge is very high.

Bottom Line

Educational interventions can reduce the number of PIVCs placed in the emergency department setting and increased the proportion of PIVCs that are ultimately used but the longevity of such an intervention and the patient oriented benefit is not clear.

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

Date: January 25, 2018

Reference: Hawkins et al. Peripheral Intravenous Cannula Insertion and Use in the Emergency Department: An Intervention Study. AEM Jan 2018

Episode 204 Overview

Case:

You are caring for a patient with a fever in the emergency department and the nurse asks if you want to start an intravenous (IV) line or just draw blood. You think for a minute…your patient is not tachycardic, not vomiting, and the likelihood of discharge is very high.

Background:

Emergency department patients often have peripheral IV cannula (PIVC) placed at triage for initial blood draws or *"just in case"* they are used during the emergency department stay or hospitalization. It is one of the most commonly performed procedures in the emergency department.

PIVC placement can lead to discomfort, infection, and use of time and other emergency department resources (Rickard et al and Stuart et al). Some studies report that up to half of these are never used (Limm et al).

Clinical Question

Can an educational intervention on the appropriate use and placement of PIVCs reduce the number of unnecessary IV placed?

Population: Emergency department patients greater than17-years-old.
Excluded: Triage category 1, PIVC insertion by EMS, or transfers from another hospital

Intervention: Ten-week educational training, change champions, advertising, surveillance and feedback.

Comparison: Pre-intervention data was collected for 12 days before, and 12.5 days after, the intervention. Post-intervention data was collected one month after the intervention.

Outcome:
Primary: Reduction in peripheral IV catheters placed post-intervention and usage.
Secondary: PIVC insertion cost (staff and consumables).

This is an SGEMHOP episode, so we have the lead author on the show. Tracey Hawkins is a Clinical Nurse and Researcher in the Emergency and Trauma Centre at the Royal Brisbane and Women's Hospital, Queensland, Australia. Since 2008, she has been undertaking research into innovative models of cardiovascular care, peripheral intravenous cannulation and emergency care.

Authors' Conclusions:

"The intervention reduced PIVC placement in the ED and increased the percentage of PIVC placed that were used. This program benefits patients and health services alike, with potential for large cost savings."

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?
  It is hard to tell how many staff were trained/exposed (although most likely all staff would see the signs/shirts)
- [x] 5. Was the outcome accurately measured to minimize bias?
- [?] 6. Have the authors identified all-important confounding factors?
- [x] 7. Was the follow up of subjects complete enough?
- [x] 8. How precise are the results?
  Fairly tight confidence intervals around the point estimate (range 3-5%)
- [x] 9. Do you believe the results?
- [?] 10. Can the results be applied to the local population?
- [x] 11. Do the results of this study fit with other available evidence?

Key Results

4,173 patients we included in the study with a median age of 37 with close to a 50/50 male/female split. More than 2/3 of the PIVC were for administration of IV fluids or drugs.

Outcome

The education intervention decreased the number of PIVC and increased the utilization of those inserted.

Primary Outcome:

- PIVC Placement: 42.1% Before vs. 32.4% After (difference -9.8%; 95% CI -12.7% to -6.8%) NNT of 10 (This multimodal intervention would prevent 1 PIVC in every 10 patients)
- PIVC Utilization:
  - Within the Emergency Department: 67.4% Before vs. 79.4% After (difference 12%; 95% CI 8.7% to 17.0%) NNT of 8 (This multimodal intervention would increase utilization of the PIVC in the ED in one in 8 patients)
  - Within 24 Hours of Admission: 70.4% Before vs. 83.4% After (difference 12.9%; 95% CI 8.7% to 17.0%) NNT of 8 (This multimodal intervention would increase utilization of the PIVC within 24hrs of admission in one in 8 patients)

Secondary Outcome: It cost less if you did not put in a PIVC. It was quantified as A$4,718 over two weeks (~$3,790 USD or ~$4,689 Can).

Talk Nerdy to Me

1) Hawthorne Effect:

A challenge with studies using this methodology is the risk of a Hawthorne effect. You used interrupted time-series analysis (or segmented regression analyses) to determine if such an effect was present (Taljaard et al). Can you explain this technique, why it is used and what you found?

2) The Right Number of PIVC:

You clearly state there are no accepted guideline on when to place a PIVC in emergency department patients. You used a target of 80% from data coming out of Monash University. The reference for this is a letter to the editor describing a survey that was conducted. The majority of respondents were nurses (58%) and only 24% were emergency physicians. We reached out to the author of the letter to the editor and this survey was not published in a peer reviewed journal. So, we do not know how many PIVC starts are the right number of starts or how much utilization is the right amount of utilization.

Another important detail would be why the PIVC was placed. Having an IV "just in case" in 25 patients who might have hyperkalemia and therefore need urgent management, or who are bradycardic, seems reasonable even if none of them are used. On the other hand, having an IV in place because the cellulitis might be given antibiotics seems avoidable. Do you have the granular details on reasons for PIVC placement?

3) Cost, Time and Failure Rate:

You looked at cost savings of PIVC and estimated a savings of about A$2,500/week. With a per-IV staff time of $16, and average insertion time of 15 minutes, that's $60/hour, which seems high. Can you comment on nurse pay in Australia?

You had an intervention that included education and training, change champions, advertising and surveillance and feedback. How much did this cost (including the special shirts) and would it offset any financial gains?

We also wondered about the insertion time of fifteen minutes. This seems like a fairly long time to start an IV and what about the 30% failure on the first attempt? This time is a lot higher than we see. Are experienced nurses placing these IVs, or trainees? We understand that in Australia, cannulas are often done by trainees, whereas they are exclusively done by nurses where we work – did that affect their results?

4) External Validity:

This was a single center, tertiary care emergency department in Australia. Different countries have different health care systems with different expectations of patients. Do you think this has external validity to non-tertiary centers and/or emergency departments outside of Australia?

5) Longevity of the Intervention:

You measured the outcome one-month after the 10-week intervention. Do you think the 10% improvement you observed will be maintained long term? If not, what would be the cost of an on-going intervention to decrease unnecessary PIVC?

6) Shifting the PIVC to the Ward:

You did not measure starting an IV on the ward. Could you have been just shifting the procedure to the in-patient unit?

7) Surrogate Outcome:

You did not measure actual harms of PIVC. Are you assuming the 10% net decrease in PIVC would translate into a decrease in clinically important harms? It appears patients were being poked for blood work anyway. What is the real harm of an IV placed for two hours in the emergency department and then removed?

8) Gestalt:

Did you consider measuring clinical gestalt? Perhaps there were some clinicians that were starting IVs all the time and others on the opposite end of the spectrum. It would have been interesting to know the individual clinicians' ability to predict PIVC utilization. This could identify a potential knowledge gap and could you focus interventions on those individuals rather than everyone?

9) Power Calculation:

You powered your study based on an estimated prevalence of 65% based on a local audit. Your actual pre-intervention prevalence was 23% lower at only 42%. Could it have leaked out you were doing this study and clinicians started fewer PIVC? That would have been a very cost-effective strategy with announcing a study had more than double the impact (23% vs. 10%).

How did the lower prevalence and higher utilization impact your sample size calculation and was the study still adequately powered?

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

Bottom Line

Educational interventions can reduce the number of PIVCs placed in the emergency department setting and increased the proportion of PIVCs that are ultimately used but the longevity of such an intervention and the patient oriented benefit is not clear.

Case Resolution

Case Resolution:

You tell the nurse not to start an IV at this point, as your prediction of it being used is significantly less than 80%. You will reassess later during the patient visit.

Clinical Application:

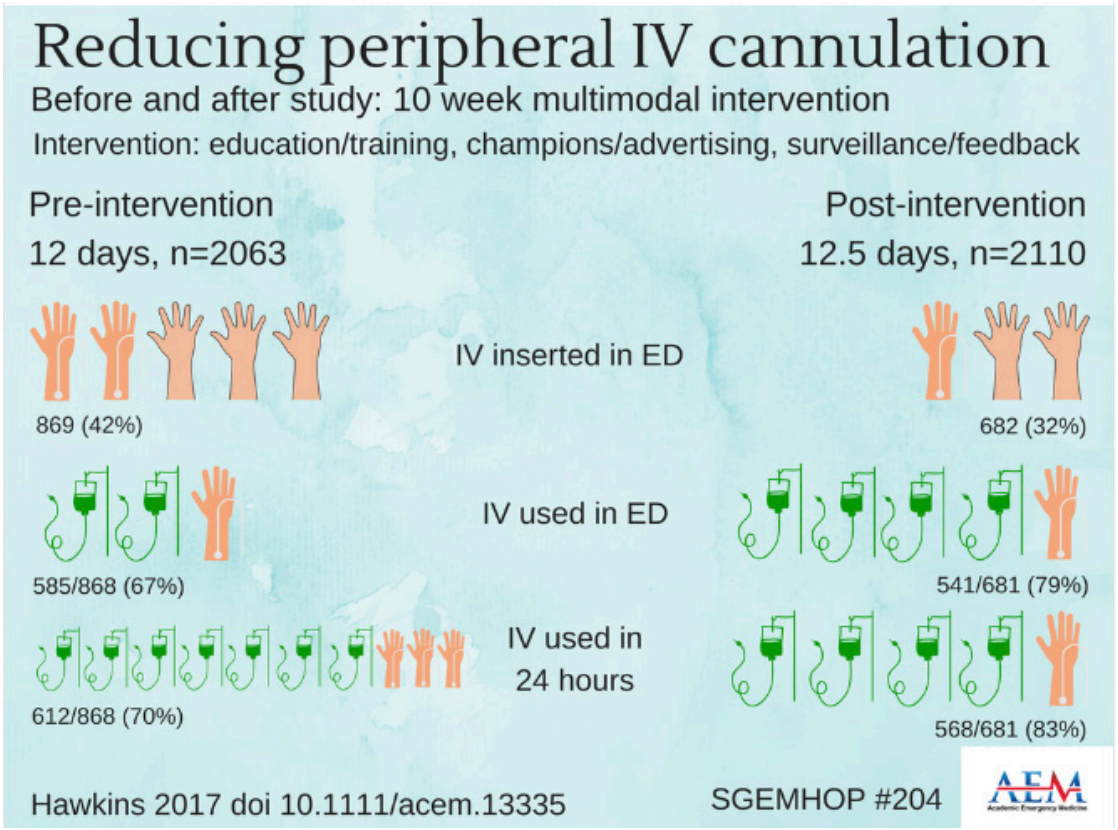
Reducing unnecessary PIVC insertion can potentially increase patient comfort, reduce infections, and reduce costs.

What Do I Tell My Patient?

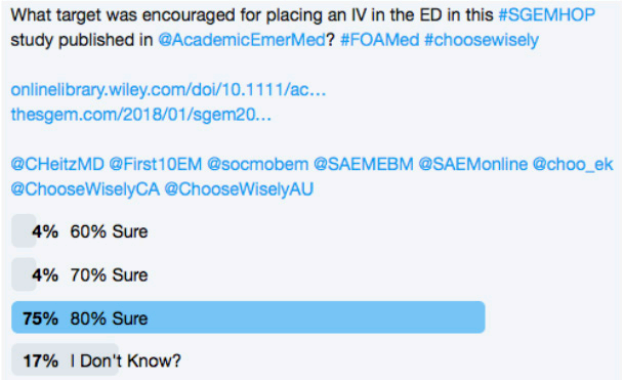
You say that for now, you won't have an IV started but if the clinical picture changes, your decision may change.

Episode End Notes

Infographic:



Twitter Poll:



SGEM#
205

Twist & Shout:
Testicular Torsion

Question
Can the TWIST score risk stratify pediatric patients presenting with acute scrotal pain and reduce the time to surgical intervention by eliminating the need for ultrasound diagnosis?

Case
Brian is a 14-year-old male who presents to the emergency department (ED) complaining of acute onset testicular pain. He has vomited twice, but there is no history of any fever or trauma. On examination, you find a firm, swollen right testicle, and the cremasteric reflex is notably absent on that side. Your index of suspicion for testicular torsion is high. Might his examination be enough to convince the urologists to take him straight to the operating room without a preceding diagnostic ultrasound?

Bottom Line
The TWIST score needs further multi-center validation among emergency department patients presenting with acute testicular pain and swelling before implementation into a protocol.

Guest Skeptic: Dr. Melissa Langhan is an Associate Professor of Pediatric Emergency Medicine at Yale University in New Haven, CT. Melissa is passionate about clinical and translational research and focuses most of her work on the use of capnography or end-tidal carbon dioxide monitoring. In her spare time, Melissa also enjoys being the fellowship director to an amazing group of PEM trainees.

Date: January 31, 2018

Reference: Frohlich LC, et al. Prospective validation of clinical score for males presenting with an acute scrotum. AEM Dec 2017.

Episode 205 Overview

Case:

Brian is a 14-year-old male who presents to the emergency department (ED) complaining of acute onset testicular pain. He has vomited twice, but there is no history of any fever or trauma. On examination, you find a firm, swollen right testicle, and the cremasteric reflex is notably absent on that side. Your index of suspicion for testicular torsion is high. Might his examination be enough to convince the urologists to take him straight to the operating room without a preceding diagnostic ultrasound?

Background:

Acute onset testicular pain can be caused by a variety of etiologies from testicular torsion to epididymitis to traumatic hematomas. Among these, testicular torsion is a time-sensitive diagnosis as this involves loss of or reduced blood supply to the testicle, which can lead to ischemia. Prompt surgical intervention greatly increases the rate of testicular salvage. Time is testis.

Clinical signs of torsion are not always straight forward or specific for this diagnosis. Ultrasound imaging of the scrotum is the gold standard for diagnosis of testicular torsion, however can lead to delays in definitive care.

The Testicular Workup for Ischemia and Suspected Torsion score, or TWIST score, was developed to risk stratify patients under the age of 18 years with an acute scrotum.

The TWIST score ranges from 0-7 and is comprised of 5 components from the history and physical examination:

- Testicular swelling (2 points)
- Hard testicle (2 point)
- Absent cremasteric reflex (1 points)
- Nausea or vomiting (1 point)
- High riding testicle (1 point).

While it has been previously validated by urologists and emergency medical personnel, it has not been validated among Emergency Department physicians.

Clinical Question

Can the TWIST score risk stratify pediatric patients presenting with acute scrotal pain and reduce the time to surgical intervention by eliminating the need for ultrasound diagnosis?

Population: Patients aged 3 months to 18 years-of-age presenting to the ED with a chief complaint of testicular pain or swelling.

Exclusions: Pain due to trauma, symptoms for greater than one-week, previous diagnosis of testicular torsion or testicular disease, imaging already obtained.

Predictors: TWIST Score.

Criterion Standard: A final diagnosis of testicular torsion confirmed by surgical exploration, including patients diagnosed with intermittent testicular torsion.

Outcome: Diagnostic performance of the TWIST Score.

Authors' Conclusions:

"In this prospective validation of the TWIST score among pediatric emergency providers, the high-risk score demonstrated strong test characteristics for testicular torsion. The TWIST score could be used as part of a standardized approach for evaluation of the pediatric acute scrotum to provide more efficient and effective care."

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.
- ☒ 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.
- ☒ 6. This is an impact analysis of a previously validated CDR (level I).
- NA 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.

Key Results

778 patients presented to the ED with acute testicular/scrotal pain or swelling. 258 patients were enrolled in the study with a mean age of 10 years. The diagnosis of testicular torsion was made in and 19 (7.4%) patients. Ultrasound identified 16 out of the 19 patients.

Outcome

The higher the TWIST score the higher the risk of testicular torsion.

Primary Outcome:

- Patients with testicular torsion had a statistically significantly higher mean TWIST score than those without torsion, 4.2 compared to 1.6, respectively.
- A TWIST score of 7 had a specificity and PPV of 100% for testicular torsion, and a sensitivity of 21%.
- There were a few patients with low TWIST scores that also had testicular torsion.

Test Performance of TWIST Score to Predict Testicular Torsion* (*n* = 258)

TWIST Cut Point	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Positive LR	Negative LR
5	47 (24 to 71)	97 (94 to 99)	56 (30 to 80)	96 (92 to 98)	16.17	0.54
6	32 (13 to 56)	99 (96 to 99)	67 (30 to 92)	95 (91 to 97)	25.06	0.69
7	21 (6 to 45)	100 (98 to 100)	100 (40 to 100)	94 (90 to 97)	0.00	0.79

Talk Nerdy to Me

1) Convenience Sample:

Patients were only enrolled when a research assistant was available. 233 patients with testicular pain were missed, and of those 36 (15%) had a diagnosis of testicular torsion, which was over twice the rate of torsion as the enrolled patients (7%).

2) Double-Gold Standard:

Patients with a positive index test are more likely to receive an immediate, invasive gold standard, whereas patients with a negative index test are more likely to receive clinical follow-up for development of disease. (Kohn et al 2013). Every patient in this study had an ultrasound but only those with a positive ultrasound went on to surgery. Those with a negative ultrasound were followed clinically. Ultrasound is not a perfect test and there could have been false negatives that were not identified in their follow-up strategy.

3) Prevalence:

The prevalence in this study was lower than they expected (7%). This results in wider confidence intervals around the point estimates for the test characteristics of the cut points for the TWIST score.

4) Inter-Rater Reliability:

The overall TWIST score had only fair agreement between providers with a kappa value of 0.39 (95% CI .22-.46). History of nausea and scrotal swelling had the highest kappa values at 0.75 and 0.74, respectively. Absent cremasteric reflex had a kappa of 0.52 and a hard testicular mass had the lowest kappa at 0.25.

Value of Kappa	Level of Agreement
0–.20	None
.21–.39	Minimal
.40–.59	Weak
.60–.79	Moderate
.80–.90	Strong
Above.90	Almost Perfect

5) External Validity:

This study was conducted in a pediatric ED at a tertiary care pediatric hospital. We are unsure how the TWIST score would perform in a community ED that sees children.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
Given that agreement on the TWIST score was fair, the large proportion of missed patients, and that a high-risk score was considered >5 in the original study as compared to 7 in this study, it may not be wise to eliminate ultrasound examination in these patients just yet.

Bottom Line

The twist score needs further multi-center validation among emergency department patients presenting with acute testicular pain and swelling before implementation into a protocol.

Case Resolution

Case Resolution:

Our patient has a TWIST score of 4, receiving 2 points for testicular swelling, 1 point for absent cremasteric reflex, and 1 point for vomiting. Despite your high level of suspicion, you are going to send your patient for an ultrasound examination to confirm the diagnosis of torsion before committing him to surgical intervention.

Clinical Application:

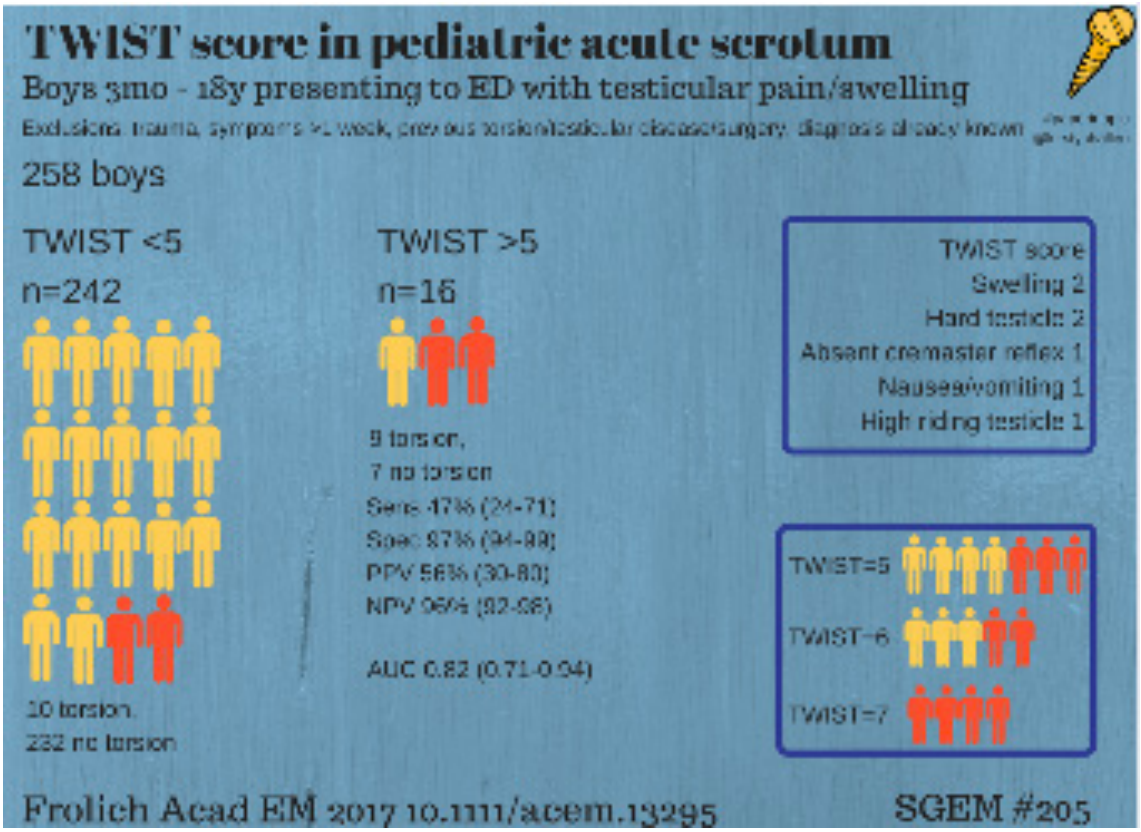
Unless your patient is hitting a TWIST score of 7, you should strongly consider obtaining a diagnostic ultrasound to confirm the diagnosis of testicular torsion if that ultrasound can be performed in a reasonable time frame.

What Do I Tell My Patient?

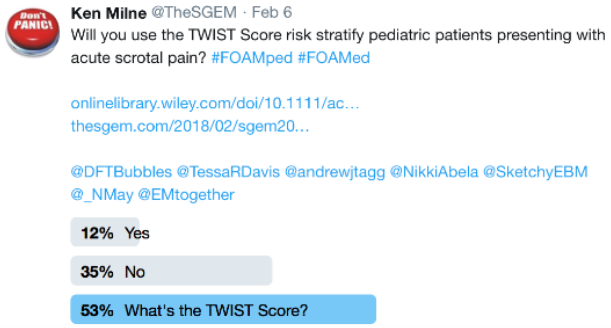
Brian, your pain could be due to a twisting of your testicles (balls) called torsion. This can cut off the blood supply and permanently damage your testicle. You will need urgent surgery if the blood supply has been blocked. There is a scoring system we use with 0 being the lowest (less worried) and 7 the highest (most worried). Your score is in the middle at 4 which means it could be something else. To find out the right diagnosis we have ordered an urgent ultrasound. While we get that arranged would you like some pain medication?

Episode End Notes

Infographic:



Twitter Poll:



SGEM#
206

I'm Wheezy Like a Pre-Schooler:

Prednisolone for Wheezy Children

Question

Does Oral Prednisolone improve virus-associated wheeze in preschool age children?

Case

Tom is a 4-year-old boy who comes into the emergency department with a wheeze following a viral illness. He has been taking salbutamol at home today but he's still not improving. He has mild work of breathing and a bilateral wheeze. His oxygen saturation is 94% on room air. Tom has no other previous medical history. You start to write up the salbutamol, *but should you give him a dose of prednisolone too?*

Bottom Line

in pre-school children presenting with wheeze to the emergency department, who have tried and failed using salbutamol at home, early use of oral prednisolone should be considered.

Guest Skeptic: Dr. Tessa Davis is a Pediatrician specialising in Pediatric Emergency Medicine and currently practicing in a central London hospital. She is also the co-founder of *Don't Forget the Bubbles* and on the *FeminEM Speaker Bureau*.

Date: Febuary 6th, 2018

Reference: Foster SJ et al. Oral prednisolone in preschool children with virus-associated wheeze: a prospective, randomised, double-blind, placebo-controlled trial. Lancet January 2018.
Severe Pain in the Emergency Department. AJEM 2017.

Episode 206 Overview

Case:

Tom is a 4-year-old boy who comes into the emergency department with a wheeze following a viral illness. He has been taking salbutamol at home today but he's still not improving.

He has mild work of breathing and a bilateral wheeze. His oxygen saturation is 94% on room air. Tom has no other previous medical history.

You start to write up the salbutamol, but *should you give him a dose of prednisolone too?*

Background:

We see "little wheezers" in the emergency department all the time. It is really common during the winter months and often due to a viral infection (1).

There has always been some uncertainty about the benefit of prednisolone for viral wheeze in pre-school children. In 2009, a study by Panickar et al found no positive effect in giving steroids to pre-school children with wheeze (2).

Since then, our practice, and our treatment guidelines, have changed, in spite of questions about the applicability of this study (3,4)

Clinical Question

Does oral prednisolone improve virus-associated wheeze in preschool age children?

Population: Patients 24 to 72 months of age with a wheeze plus symptoms or signs of a viral upper respiratory tract infection.

Exclusion: Oxygen saturations <92% on room air; silent chest; shock or sepsis; previous PICU admission with wheeze; prematurity; other cardiac or respiratory disease; likely alternative diagnosis for the wheeze; or steroid treatment within the preceding 14 days.

Intervention: Three-day course of oral prednisolone (1mg/kg once daily). Ceftriaxone 2g IV

Comparison: Placebo that it looked, smelled, and tasted like the prednisolone.

Outcome:

Primary: Length of stay in the hospital.

Secondary: Re-attendance; readmission; salbutamol usage; and residual symptoms after discharge

Author's Conclusion:

"Oral prednisolone had a clear benefit over placebo at reducing the length of stay in children presenting to a paediatric emergency department with virus–associated wheeze and was well tolerated."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department.
- ☑ 2. The patients were adequately randomized.
- ☑ 3. The randomization process was concealed.
- ☒ 4. The patients were analyzed in the groups to which they were randomized
- ? 5. The study patients were recruited consecutively (i.e. no selection bias).
- ? 6. The patients 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. There were 23 patients in the placebo group were given prednisolone later based on clinician judgement. These patients remained in the placebo group for analysis.
- ☑ 9. Follow-up was complete (i.e. at least 80% for both groups).
- ☑ 10. All patient-important outcomes were considered.
- ☑ 11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

They screened 3,727 patients for eligibility with 624 being included in the study. The mean age was 41 months and about 2/3 were male. The median length of stay was signifigantly less in the prednisolone group.

Outcome

Median length of stay was significantly less in the prednisolone group.

Primary Outcomes:

- **Median LOS:** Placebo group was 540 min [IQR 124–971] Prednisolone group 370 min [121–709]
- The unadjusted ratio of geometric mean for LOS was 0·79 (95% CI 0·64–0·97; p=0·0227) favoring the prednisolone group

Note: we are not going to get into subgroup analyses as they are only hypothesis generating.

Secondary Outcomes:

- **Re-Attendance:** No difference
- **Re-Admission:** No difference
- **Salbutamol Usage:** No difference

Adverse Events: No serious adverse events were reported.

Talk Nerdy to Me

1) Selection Bias:

There is a possibility of selection bias. Looking at Figure 1 there were more patients who were not included (771) than were included in the study (624). Most of these declined to participate (488) or were not approached to participate (283). You also noted in the manuscript the difficulty with recruitment in view of junior doctor changeover, so they may not have been recruited consecutively. Do we know any more about the patients not recruited and do you think it is possible it could have impacted the results?

2) Baseline Demographics:

The baseline demographic factors in each group was incomplete (table 1). You state that there is no clinical difference between the groups, but this is not illustrated using statistical analysis?

3) Blinding:

In the methods it said the placebo was "matched for volume, concentration, colour, smell, and taste" of the prednisolone. Did you do a taste-test between the two solutions and could you tell the difference? It would have been easy to ask the parents which group they thought their child was assigned to test for blinding.

4) Pulmonary Score:

This has not been validated for patients under five years of age, so the results from this should be questioned as to accuracy (5).

Pulmonary Score (18) Score 0-3 for the 3 observations ie total score range is from 0-9

Score	Respiratory Rate <6 yo	Wheezing (No wheeze due to minimal air exchange score =3)	Sternocleidomastoid muscle use
0	<30	None	None
1	31-45	End expiration with stethoscope	Mild increase
2	46-60	Entire expiration with stethoscope	Increased
3	>60	Inspiration and expiration without stethoscope	Maximal activity

5) Taste:

Prednisolone tastes awful and is associated with vomiting. We recently covered a paper comparing dexamethasone to prednisolone for pediatric asthma (SGEM#194: Highway to the Dexamethasone). Did you consider using dexamethasone for these children with a wheeze?

6) Family History or Personal History of Atopy:

We found it strange that these things did not affect outcomes in this study. Do you have any idea why?

7) Length of Stay:

This was counted as time from drug administration to the time the child could have been discharged. However, time of day for discharge and delays in families arranging transport prevented the children from being discharged at times. Did this have any real effect on in-patient efficacy. If emergency health-care is 24/7/365 and can be accessed at any time does that mean we should be sending people home at any time?

8) Discharged in Four Hours:

None of the results were significant in the group of patients who were discharged within four hours. So, would this be relevant to emergency department flow?

9) Changing Outcome:

Originally you had dual primary outcomes (there can be only one). This seems like an oxymoron, dual means two and primary means one. It reminded me of terms like jumbo shrimp, fresh frozen and conscious sedation. Then you changed your study post hoc from a non-inferiority trial to a superiority trial. Can you explain why the change and why you picked 10% as what would be considered significantly different?

10) Harm:

We must not just consider efficacy but must also consider adverse events and harms. You reported "No serious adverse events were reported during the study or follow-up period". Like most studies, yours was not powered for harm. One child from each group was reported as being hyperactive but this is something we often associate with steroid usage.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We think the authors' conclusions of efficacy are stronger than the data supports. While there appears to be a benefit to oral steroids for treating wheeze in children, it is not that clear.

Bottom Line

In pre-school children presenting with wheeze to the emergency department, who have tried and failed using salbutamol at home, early use of oral prednisolone should be considered.

Case Resolution

Case Resolution:

In view of Tom's salbutamol use at home, normal oxygen saturations, and pulmonary score of 3, he was given 1mg/kg of oral prednisolone alongside his salbutamol burst treatment. He was able to wean his salbutamol and was discharged eight hours later from the short stay unit.

Clinical Application:

This study isn't going to change what I currently do as I think it supports my intuition that as yet we still don't have a good diagnostic system for infant and childhood wheeze.

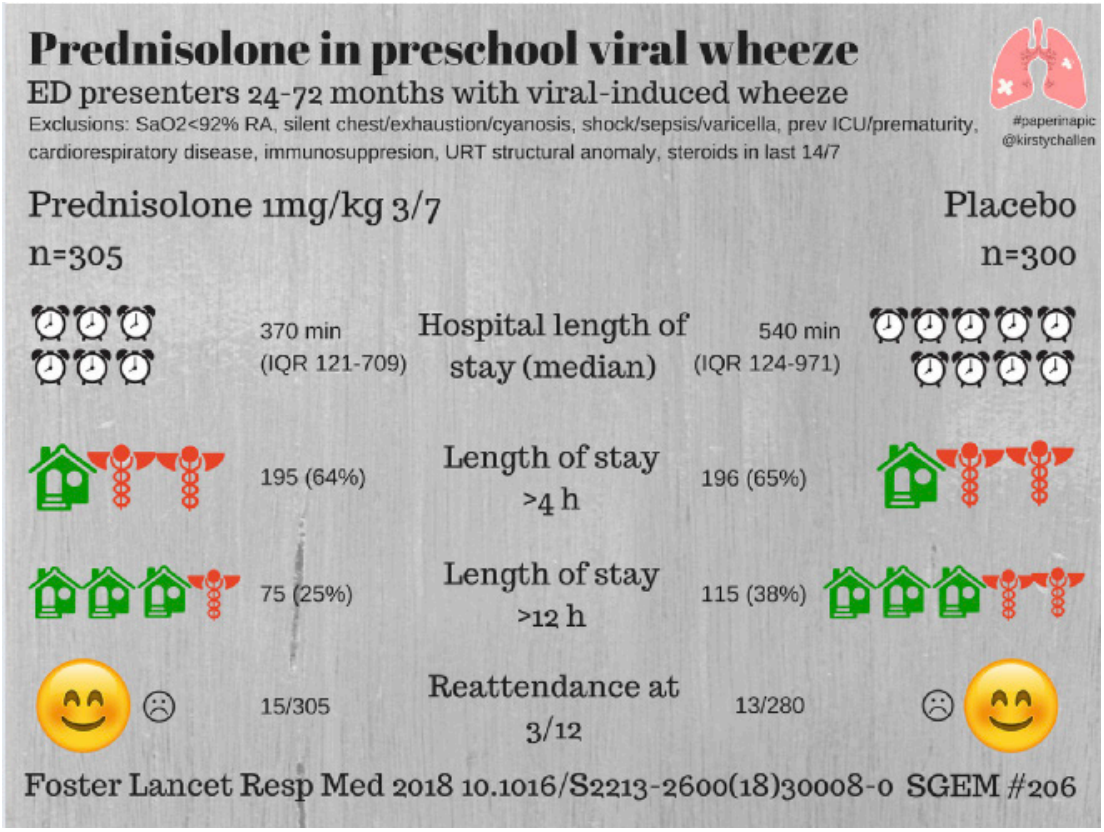
A theory which would support both the Panickar and Foster work is that there are different cohorts of children between the age of 1-5 who present with similar symptomatology but for different pathophysiological reasons. The spectrum of bronchiolitis to viral wheeze to asthma is not precise enough to guide the most effective management. If we can't define the group we are treating how can we adequately assess the response to treatment? What I will be doing is thinking carefully about the diagnosis in patients I see, or are reviewed by me, and asking *"Why shouldn't this patient have steroids?"*

What Do You Tell the Patient ?

I would say to Tommy's parents that this is a grey area and with patients Tommy's age we have spent a lot of time debating between ourselves and looking at evidence as to whether steroids will help Tommy. It is not clear cut for him.

Episode End Notes

Infographic:



Twitter Poll:

Do you give oral prednisolone to pre-schoolers with viral wheeze?
thesgem.com/2018/02/sgem20... #FOAMped
@TessaRDavis @andrewjtagg @DFTBubbles @NikkiAbela @SketchyEBM @_NMay @EMtogether @WeAreCanadiEM @EMCases @BEEMcme

- 7% All the time
- 30% Often
- 48% Rarely
- 15% Never

Other FOAMed:

- **Don't Forget the Bubbles:** Steroids for Pre-School Wheeze
- **RCEM Learning:** "W" is for Winter and Wheeze: Paediatric Acute Asthma
- **PEM Geek:** Wheeze
- **EMDocs:** All that Wheezes is not Asthma
- **EM Cases:** Bronchiolitis
- **WREN:** Preschool wheezers To give steroids or not to give steroids. Have we gone full circle?

References:

1. Jartti T, Lehtinen P, Vanto T, et al. .Pediatr Allergy Immunol 2007; 18: 326–34.
2. Panickar J, Lakhanpaul M, Lambert PC, et al. Oral prednisolone for preschool children with acute virus-induced wheezing. N Engl J Med 2009; 360: 329–38.
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5. Smith SR, Baty JD, Hodge D 3rd. Validation of the pulmonary score: an asthma severity score for children. Acad Emerg Med 2002; 9: 99–104.

SGEM#
207

Ahh (Don't) Push It:

Pre-Hospital IV Antibiotics for Sepsis

Question

Can patients with varying degrees of sepsis benefit from early recognition and pre-hospital administration of IV antibiotics in the ambulance?

Case

EMS is dispatched to a retirement home. They have a 73-year-old man who complains of weakness and a cough for the last 48 hours. You arrive and find the man lying in bed looking ill. He has a history of hypertension, benign prostatic hypertrophy and osteoarthritis. His medications include ramapril, hydrochlorothiazide and tamsulosin. On examination, he has a temperature of 38.7C, heart rate of 105 beats per minute, respiratory rate of 26, oxygen saturation of 88%. and a blood pressure of 88/50 mmHg. You load him on the stretcher, start an intravenous of normal saline and provide some supplemental oxygen via face mask. Clearly something infectious is going on and you wonder if starting antibiotics on route to the hospital would help?

Bottom Line

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.

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

Date: February 14, 2018

Reference: Alam N et al. Prehospital antibiotics in the ambulance for sepsis: a multicentre, open label, randomised trial. The Lancet Nov 2017. Severe Pain in the Emergency Department. AJEM 2017.

Episode 207 Overview

Case:

EMS is dispatched to a retirement home. They have a 73-year-old man who complains of weakness and a cough for the last 48 hours.

You arrive and find the man lying in bed looking ill. He has a history of hypertension, benign prostatic hypertrophy and osteoarthritis. His medications include ramapril, hydrochlorothiazide and tamsulosin.

On examination, he has a temperature of 38.7C, heart rate of 105 beats per minute, respiratory rate of 26, oxygen saturation of 88%. and a blood pressure of 88/50 mmHg.

You load him on the stretcher, start an intravenous of normal saline and provide some supplemental oxygen via face mask. Clearly something infectious is going on and you wonder if starting antibiotics on route to the hospital would help?

Background:

We have covered sepsis many times on the SGEM over the years (SGEM# 69, 90, 92, 113, and 168). It is a serious condition associated with high morbidity and mortality.

Other serious time-dependent conditions such as myocardial infarction and trauma have been improved significantly with emergency medical services (EMS). It has been reported that over half of patients with sepsis arrive to the emergency department via ambulance [1]. However, it is not clear if patients with suspected sepsis can have improved survival rates if antibiotics are provided in the pre-hospital setting.

There are studies showing that early recognition and prehospital administration of antibiotics are associated with increased survival rates [2-4]. Delay in antibiotics has been associated with an average decrease in survival of 7.6% per hour (Kumar et al). We need to be skeptical of these retrospective studies, especially when prospective, observational studies have failed to show any association between early antibiotics and a reduction in mortality [5-7].

Now, we have better evidence with the publication of the first prospective, randomized study investigating the effects of early antibiotic administration in patients with suspected sepsis.

Clinical Question

Can patients with varying degrees of sepsis benefit from early recognition and pre-hospital administration of IV antibiotics in the ambulance?

Population: Adult patients (18 years and older) with a diagnosis of suspected infection, temperature >38C or <36C and at least one other SIRS (systemic inflammatory response syndrome) criteria (HR>90bpm, RR>20bpm, or both)

Exclusion: Allergy to ceftriaxone, other beta-lactams, know pregnancy or suspected prosthetic joint infection.

Intervention: Ceftriaxone 2g IV

Control: Usual care (fluid resuscitation and supplementary oxygen)

Outcome:

Primary: All-cause mortality at 28 days

Secondary: *"Number of misdiagnoses of patients enrolled in the study by EMS, mortality during hospital stay and within 90 days, length of hospital stay, ICU admission, length of stay in ICU, TTA to the emergency department for usual care group, and TTA before hospital arrival for intervention group microbiological data, adverse events, and quality of life 1 month after discharge as measured with the SF-36 questionnaire"*

Author's Conclusion:

"In patients with varying severity of sepsis, EMS personnel training improved early recognition and care in the whole acute care chain. However, giving antibiotics in the ambulance did not lead to improved survival, regardless of illness severity."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The patients were adequately randomized.
- [x] 3. The randomization process was concealed. Yes/No
- [x] 4. The patients were analyzed in the groups to which they were randomized
- [✓] 5. The study patients were recruited consecutively (i.e. no selection bias).
- [✓] 6. The patients 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 patient-important outcomes were considered.
- [x] 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

They enrolled 2,698 patients into the study with a mean age of 73 years with 42% female. They stratified patients into non-severe sepsis, severe sepsis, septic shock [8] and other diagnoses. The vast majority of patients (95%) had non-severe sepsis or severe sepsis and one in five patients were already on antibiotics before randomisation.

Outcome

No statistical difference in mortality at 28 days

Primary Outcome:

- 120/1,535 (8%) in the intervention group vs. 93/1,137 (8%) in the control
- Relative risk 0·95 (95% CI 0·74–1·24)

Secondary Outcomes (Intervention vs usual care):

- **Misdiagnoses:** No difference (1% vs. 2%)
- **Mortality within 90 Days:** No difference (12% vs. 12%)
- **Hospital Length of Stay:** No difference (6 days vs. 6 days)
- **ICU Admission:** No difference (10% vs. 9%)
- **ICU Length of Stay:** No difference (4 days vs. 3 days)
- **Quality of Life:** No difference
- **Time to Antibiotics Intervention Group:** Before hospital arrival (26 minutes). This led to a time gain of 96 minutes.
- **Time to Antibiotics Usual Group:** After arriving to the ED (70 minutes). This was 23 minutes faster than the baseline measure before they did the training for the study.

Adverse Events: No serious adverse events were reported.

Subgroup Analysis: This is hypothesis generating. However, there was no difference in the primary outcome (mortality at 28 days) for any of the subgroups including severity of sepsis.

Talk Nerdy to Me

1) Protocol Violation:

During the first few months, EMS personnel were opening envelopes until they found one that read *"intervention."* This led to a higher number of patients being enrolled in the intervention group and a decrease in the randomization of patients.

However, even with the violation, there were no differences between the groups in terms of primary or secondary outcomes.

2) Time to Antibiotics:

This was not measured as time from onset of infection but rather time to antibiotics in the pre-hospital setting or in the emergency department. There was a huge net gain of patients getting antibiotics more than 96 minutes earlier in the intervention group.

However, this did not lead to a mortality benefit and demonstrates the difference between statistical significance and clinical significance. Antibiotics given more than one and a half hours earlier seems to be inconsequential in the overall time from onset of illness to antibiotics.

3) Confounders:

In this study there was concurrent training on sepsis recognition. You can see the improvement in time to antibiotics for the usual care when compared to the baseline statistics. It went from 93 minutes down before they provided training to 70 minutes after the training. This decrease was not statistically significant, but it could decrease any potential benefit of giving antibiotics in the pre-hospital setting.

In addition, the 20% of patients already on antibiotics before randomization may also have diluted any effect of the intervention.

4) Short Response and Transport Times:

They have a very good EMS system in the Netherlands with 93% of cases having a response time of <15min and an average of 40 minutes from dispatch to arrival to the emergency department. Would the results differ if done in a system that was not as robust or in rural remote areas that have longer response/transport times?

5) Staffing of EMS:

As stated previously, this study was conducted in the Netherlands. In their EMS system ambulances are staffed with nurses. It is possible that they have more experience or different skill set in treating septic than other EMS services.

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

Bottom Line

Pre-Hopsital antibiotics in the ambulance do not appear to have a mortality benefit in patients with varying degrees of sepsis in an optimized EMS system.

Case Resolution

Case Resolution:

After loading him up on the stretcher you make your way to the hospital. He receives about 500cc of normal saline on route to the hospital in addition to supplemental oxygen. He arrives no longer hypotensive or hypoxic. You sign over to the triage nurse and express your concerns about this patient having sepsis.

Clinical Application:

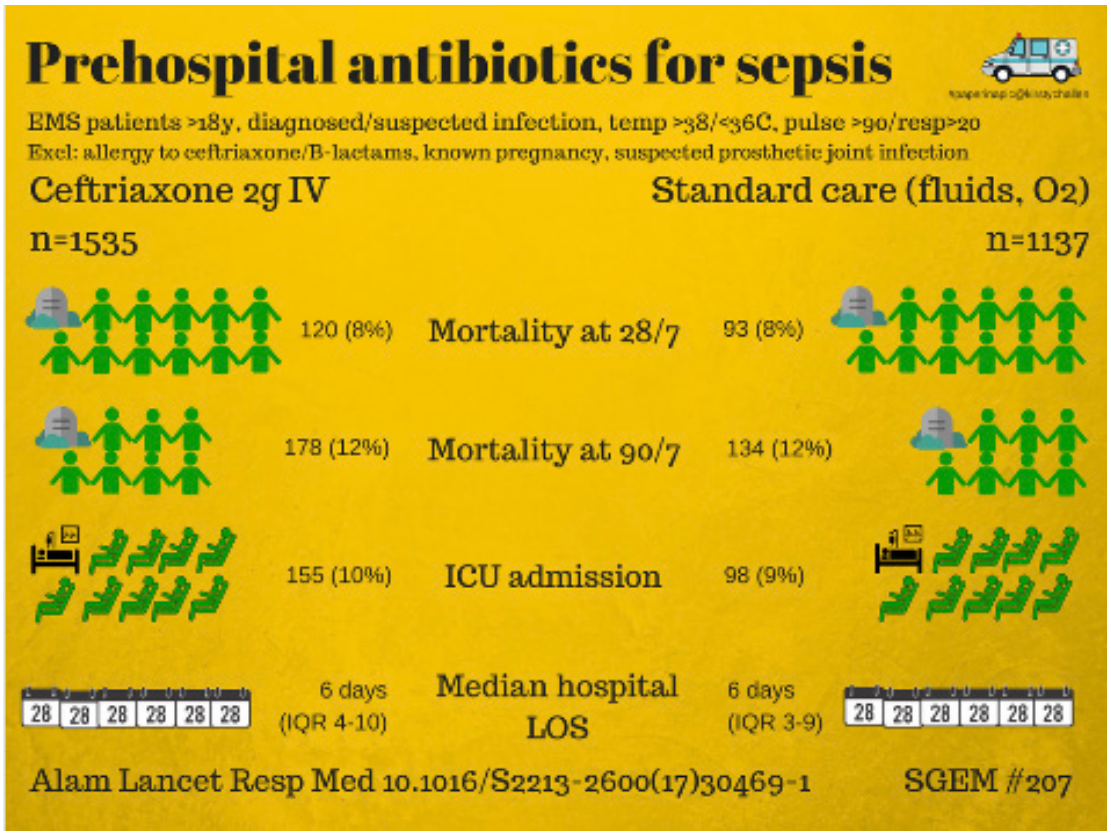
This re-affirms that we should focus on things that provide benefit in the pre-hospital setting and not on those that do not. Until there is good evidence demonstrating a patient-oriented outcome, antibiotics will not be part of our EMS protocol. However, as the superintendent of education, I will be use this as an opportunity to remind staff about early recognition of sepsis and the use of personal protective equipment.

What do you tell the Patient ?

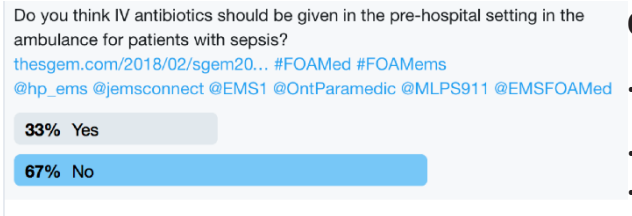
You are probably weak because of an infection. We suspect a chest infection because you were coughing and your oxygen was low. We are going to start an intravenous line, give you some fluids on the way to the hospital and provide extra oxygen. They will do some tests in the emergency department and determine your diagnosis and give you the proper treatment.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- Prehospital JC: Antibiotics in the ambulance for sepsis
- EM in Focus: Do Prehospital Antibiotics Matter?
- EM Nerd: The Case of the Tardy Delegate Continues

References:

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2. Crit Care Med 2007; 35: 1928–36.
3. Kumar A, Roberts D, Wood KE, et al. Duration of hypotension before initiation of e ective antimicrobial therapy is the critical determinant of survival in human septic shock. Crit Care Med 2006; 34: 1589–96.
4. Ferrer R, Martin-Loeches I, Phillips G, et al. Empiric antibiotic treatment reduces mortality in severe sepsis and septic shock from the rst hour: results from a guideline-based performance improvement program. Crit Care Med 2014; 42: 1749–55.
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6. Ryoo SM, Kim WY, Sohn CH, et al. Prognostic value of timing of antibiotic administration in patients with septic shock treated with early quantitative resuscitation. Am J Med Sci 2015;
7. 349: 328–33.
8. de Groot B, Ansems A, Gerling DH, et al. The association between time to antibiotics and relevant clinical outcomes in emergency department patients with various stages of sepsis: a prospective multicenter study. Crit Care 2015; 19: 194.
9. Puskarich MA, Trzeciak S, Shapiro NI, et al. Association between timing of antibiotic administration and mortality from septic shock in patients treated with a quantitative resuscitation protocol.
10. Crit Care Med 2011; 39: 2066–71.
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SGEM#
208

It Makes No Difference:

Glucocorticoids for the Treatment of Septic Shock

Question

Does the administration of a continuous infusion of hydrocortisone to a general population of patients in septic shock on mechanical ventilation improve survival?

Case

64-year-old male presents to your emergency department with worsening abdominal pain, nausea, vomiting and anorexia for the past week. On presentation he is lethargic and hypotensive. He requires control of his airway and is given a 30 cc/kg fluid bolus and started on norepinephrine. His urine analysis is consistent with a urinary tract infection. Over the course of his emergency department stay he has escalating vasopressor requirements. After starting vasopression, you ask yourself if you should be adding steroids for potential relative adrenal insufficiency?

Bottom Line

The administration of a continuous infusion of hydrocortisone to a general population of patients in septic shock on mechanical ventilation cannot be recommended at this time.

Guest Skeptic: Dr. Rory Spiegel (@EMNerd_) is a clinical instructor at University of Maryland, a recent graduate of Stony Brook's Resuscitation Fellowship, and a current Critical Care fellow at University of Maryland. He writes an excellent blog called EM Nerd, which he describes as nihilistic ramblings.

Date: February 14, 2018

Reference: Venkatesh S et al. Adjunctive Glucocorticoid Therapy in Patients with Septic Shock. NEJM January 2018.

Episode 208 Overview

Case:

64-year-old male presents to your emergency department with worsening abdominal pain, nausea, vomiting and anorexia for the past week. On presentation he is lethargic and hypotensive. He requires control of his airway and is given a 30 cc/kg fluid bolus and started on norepinephrine. His urine analysis is consistent with a urinary tract infection.

Over the course of his emergency department stay he has escalating vasopressor requirements. After starting vasopression, you ask yourself if you *should be adding steroids for potential relative adrenal insufficiency?*

Background:

Corticoid steroids have had a tumultuous history when it comes to their use for the treatment of septic shock. The underlying physiological reasoning is for the most part simple.

There is a certain subset of patients in septic shock whose adrenal axis functions well enough to support them in a state of health but are unable to support them in a state of unwell. It is this state of relative adrenal insufficiency that we hope to combat when administering steroids in patients with septic shock.

But when it comes to the clinical evidence supporting the use of glucocorticoid therapy for the treatment of septic shock, we have existed in a state of ambiguity.
There have been two contradictory randomized control trials.

The first, the Annane et al trial published in JAMA in 2002, suggested a mortality benefit in favor of the corticosteroid group in the subset of patients who were found to have relative adrenal insufficiency.

The second, the larger CORTICUS study, published in the NEJM in 2008 found no benefit of the use of corticosteroids compared to placebo.

Now these contradictory results could have come about for a number of reasons. First, the patients in the Annane et al trial represented a much sicker population, isolating the subset of patients who truly benefit from steroid supplementation.

While the negative results observed in the CORTICUS trial were the consequence of enrolling a much healthier population and washing out any chance of identifying the underlying signal.

On the other hand, the results of the Annane et al trial may have been due to statistical noise and a small sample size, and CORTICUS represents nothing more than the expected regression to the mean.

There was also the HYPRESS trial that we reviewed on SGEM#168 with Salim Rezaie from REBEL EM. This looked at hydrocortisone to prevent patients with severe sepsis in developing septic shock. While the primary outcome showed no difference between glucocorticoid treatment and placebo, there was also no secondary mortality benefit observed.

The SGEM bottom line from that episode was that the use of hydrocortisone in adult patients with severe sepsis to prevent septic shock cannot be recommended at this time.

Clinical Question

Does the administration of a continuous infusion of hydrocortisone to a general population of patients in septic shock on mechanical ventilation improve survival?

Population: Adults, age 18 or older who required mechanical ventilation, with septic shock (two or more SIRS criteria on vasoactive agents for at least 4-hours)

Exclusion: Patients likely to receive glucocorticoids for an indication other than septic shock, had received etomidate during the hospitalization, were considered to be likely to die from a pre-existing disease within 90 days or had treatment limitations in place, or had met all the inclusion criteria for >24 hours.

Intervention: IV infusion of hydrocortisone at a dose of 200 mg per day for seven days or until death or discharge from the ICU

Comparison: Placebo infusion

Outcome:

Primary: 90-day mortality from any cause

Secondary: 28-day mortality from any cause, time to resolution of shock, recurrence of shock, ICU length of stay, hospital length of stay, days of mechanical ventilation, renal replacement therapy, incidence of new-onset bacteremia or fungemia and blood transfusions in the ICU.

Authors' Conclusion:

"Among patients with septic shock undergoing mechanical ventilation, a continuous infusion of hydrocortisone did not result in lower 90-day mortality than placebo."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department. No, this was primarily an ICU population.
- [✓] 2. The patients were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The patients were analyzed in the groups to which they were randomized
- [✓] 5. The study patients were recruited consecutively (i.e. no selection bias).
- [✓] 6. The patients 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 patient-important outcomes were considered.
- [x] 11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

They enrolled 3,658 patients into the study. The mean age of patients was early 60's and approximately 60% were male.

Outcome

No statistical difference in all-cause mortality at 90 days.

Primary Outcome (90-Day Mortality):

- 27.9% in the intervention arm vs 28.8% in the control arm
- Odd ratio 0.95 (95% CI, 0.82 to 1.10; P=0.50)

Secondary Outcomes (Treatment vs Placebo):

- 28-day mortality (22% vs. 24%)
- Time to resolution of shock (3 vs. 4 days)
- Recurrence of shock (20% vs, 18%)
- ICU length of stay (10 vs. 12 days)
- Hospital length of stay (39 vs. 43 days)
- Mechanical ventilation (6 vs. 7 days)
- Renal replacement therapy (43% vs. 40%)
- Incidence of new-onset bacteremia or fungemia (14% vs 14%)
- Blood transfusions in the ICU (37% vs. 42%)

Adverse Events: 27 vs. 6 adverse events with hyperglycemia being the most common (6) in the hydrocortisone group.

Talk Nerdy to Me

This was a very well-done, randomized, blinded, multi-center trial with rigorous methods.

1) Power:

It was a little under powered because the prevalence of mortality was a little less than their estimated 33% for mortality and they were a little under on their 3,800-enrollment target. I do not think this fundamentally changes their conclusions or invalidates their results.

2) Secondary Outcomes:

One of the biggest issues in the trial is how exactly do we interpret secondary outcomes? The authors noted that patients in the hydrocortisone group had a faster time to resolution of shock, a shorter time to discharge from the ICU, and a shorter duration of initial mechanical ventilation. But we all know the dangers of interpreting secondary outcomes as truth. The study was not powered for these outcomes and should be considered hypothesis generating.

Moreover, although time to ICU discharge was statistically shorter in patients randomized to receive hydrocortisone, the authors found no difference in number of days alive and outside the ICU, or days alive and outside the hospital. And while duration of initial mechanical ventilation was shorter in the hydrocortisone group, there was no difference in days alive and free of mechanical ventilation nor a difference in the rate of recurrent mechanical ventilation. These inconsistencies make one question the true clinical meaning of these outcomes

3) Statistical vs Clinical:

The difference between statistical and clinical significance is a point we often make on the SGEM. Yes, the authors found a shorter time to resolution of shock in the hydrocortisone group, but the mean difference in MAP between the two groups was only 5.39 mm Hg, and there was no difference in the daily dose of norepinephrine. Many findings, especially those measuring continuous variables like differences in blood pressure can be statistically different. It's always important to judge whether these findings have any effect on clinical outcomes.

4) Regression to Mean:

This is an important concept when appraising a study. The lead author of this trial presented its results at this year's Critical Care Reviews conference in Ireland, put on by our friend Rob McSweeny, and during the presentation he showed the results of the various interim analyses that were conducted during the study

During the first analysis, which was over 900 patients, twice that of the CORTICUS trial, there was a statistically significant improvement in mortality favoring the patients who received hydrocortisone. But over the course of the trial as the sample size grew larger and larger, this difference disappeared. This is the perfect example of how unstable trials are at small sample sizes. Now if this study was stopped early after this first interim analysis, we all would have thought steroids were helpful in septic shock, which of course would have been incorrect.

It is not atypical that trials with small sample sizes to have wide variations in point estimates around the true mean that meet our standard for statistical significance difference, and it is only after a larger validation study is conducted that the point estimate settles around the true effect size.

5) Adverse Events:

Like many studies, this trial was not as rigorous in assessing adverse events. It was up to the individual clinician to decide if any of the adverse events were related to the trial. There were four times as many adverse events in the hydrocortisone group, but these events were not independently evaluated. Regardless, if there is no mortality benefit with treatment then why should patients accept any level of harm?

Comment on Authors' Conclusion Compared to SGEM Conclusion:
The authors conclusion that glucocorticoids do not improve mortality in septic shock is a reasonable assessment. What conclusion we can draw from the secondary outcomes is less clear.

Bottom Line

The administration of a continuous infusion of hydrocortisone to a general population of patients in septic shock on mechanical ventilation cannot be recommended at this time.

About the Bottom Line:

It is hard to view these results as anything but a negative study. While there are some potential signals of benefit in the patients who received hydrocortisone, they were fleeting and ultimately had minimal influence on patient centered outcomes. If a true benefit does exist, it is small and would require an impossibly large trial to empirically demonstrate.

Despite this I think the results of the ADRENAL trial will paradoxically increase the use of glucocorticoids in patients with septic shock. The desire to act in the face of critical illness is strong. And the influential power of a statistically significant p-value is strong.

People should read the article called Don't just do something, stand there! The value and art of deliberate clinical inertia (Emerg Med Austrialas 2018).The senior author on it is Dr. Daniel Fatovich and it is an excellent explanation on why it can be hard to avoid unnecessary tests and treatments.

When faced with a patient in refractory shock, many will continue to give corticosteroids in the hopes they may help the individual patient laying before them. It will just happen with an added degree of hand-wringing, having read the literature refuting this practice and simply want nothing to do with its conclusions

Case Resolution

Case Resolution:

Hydrocortisone was held and the patient's shock worsened over the next few hours. A CT abdomen/pelvis was ordered because of a concern of lack of source control. The imaging identified an obstructive kidney stone with an associated pyelonephritis. Urology was consulted, and a drain was placed. Over the next 24-hours the patient's shock resolved, and he came off his vasopressors

Clinical Application:

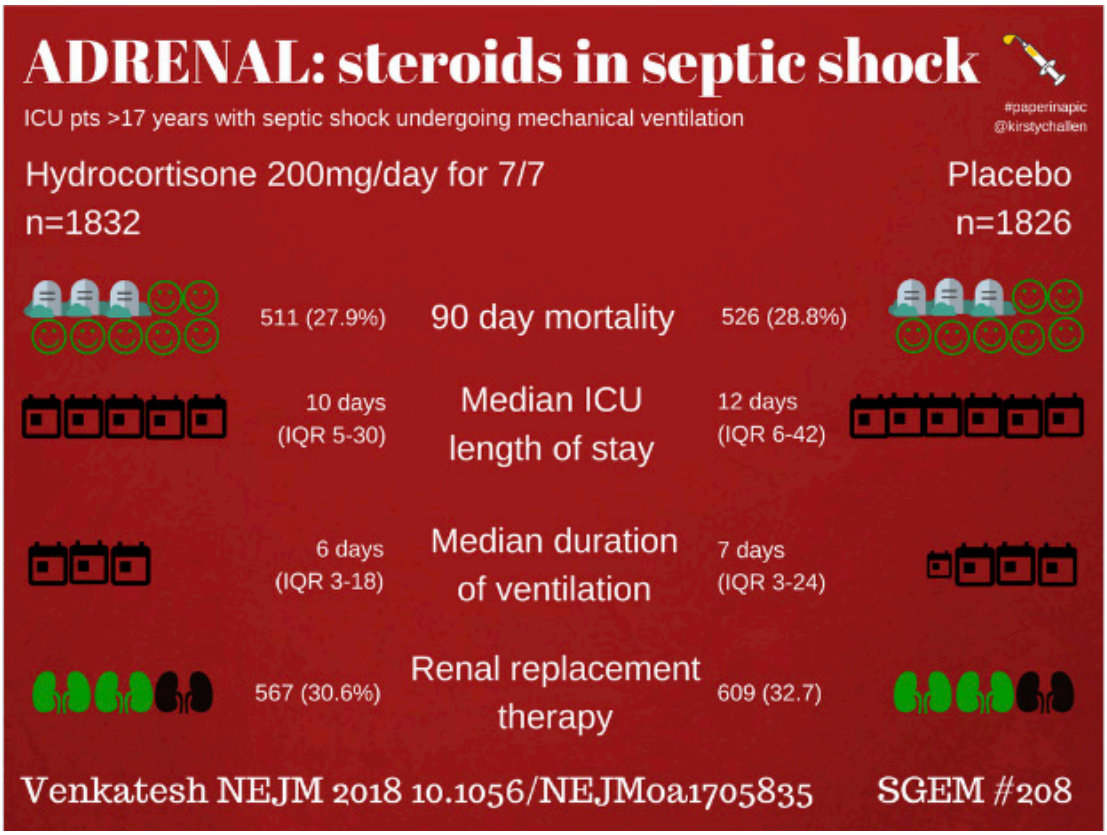
In an undifferentiated cohort of patients with septic shock the addition of glucocorticoid therapy does not improve mortality.

What Do I Tell My Patient's Family?

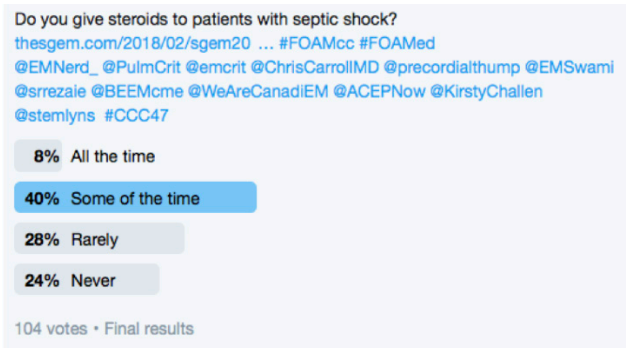
Your husband/father is fairly sick. We have resuscitated him with IV fluids and medications that will bring his blood pressure up to a safe level. Recent literature suggests that the addition of glucocorticoids does not improve outcomes when compared to standard care. Importantly a source was identified, and we know think we have control of his infection.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **EM Nerd:** The Case of the Relative Insufficiency
- **REBEL EM:** The ADRENAL Trial – Steroids in Septic Shock
- **St. Emlyn's:** The End of the 'Roid?'
- **The Bottom Line:** Adjunctive Corticosteroid Treatment in Critically Ill Patients with Septic Shock
- EM Literature of Note: The Definitive Word on Steroids in Septic Shock

SGEM#
209

Cephalexin:

You Are My Only One for Uncomplicated Cellulitis

Question

Does Cephalexin plus TMP-SMX result in higher clinical cure rates in uncomplicated cellulitis versus Cephalexin alone?

Case

A 22-year-old male with no significant past medical history arrives to your department for an area of tender erythema to the right forearm for two days that has grown in size without purulence or drainage. With point of care ultrasound, you diagnose cellulitis without the presence of an abscess affecting a 6cm diameter area. When deciding how to treat for this condition, you have read recently that cephalexin could be used alone and that trimethoprim-sulfamethoxazole (TMP-SMX) may not be needed to cover for methicillin-resistant staphylococcus aureus (MRSA).

Bottom Line

In patients with uncomplicated cellulitis the routine addition of TMP-SMX is not required to improve the clinical cure rate.

Guest Skeptic: Chip Lange is an Emergency Medicine Physician Assistant (PA) working primarily in rural Missouri in community hospitals. He also hosts a great #FOAMed blog and podcast called TOTAL EM.

Date: February 27th, 2018

Reference: Moran et al. Effect of Cephalexin plus Trimethoprim-Sulfamethoxazole vs Cephalexin Alone on Clinical Cure of Uncomplicated Cellulitis – A Randomized Clinical Trial. JAMA May 2017.

Episode 209 Overview

Case:

A 22-year-old male with no significant past medical history arrives to your department for an area of tender erythema to the right forearm for two days that has grown in size without purulence or drainage. With point of care ultrasound, you diagnose cellulitis without the presence of an abscess affecting a 6cm diameter area.

When deciding how to treat for this condition, you have read recently that cephalexin could be used alone and that trimethoprim-sulfamethoxazole (TMP-SMX) may not be needed to cover for methicillin-resistant staphylococcus aureus (MRSA).

Background:

There have been multiple SGEM episodes on abscesses but only one on cellulitis. It was with Meghan Groth (@EMPharmGirl). The SGEM bottom line was for patients with uncomplicated cellulitis, TMP-SMX may represent an alternative to clindamycin in patients with no major co-morbidities (SGEM#131).

Typically, with cellulitis we lack a specimen to obtain a culture and blood cultures are frequently not helpful. With the difficulty to definitively determine the source, Beta-hemolytic streptococci are presumed to be the dominant pathogens. In the case of purulent skin infections though, MRSA is the most common cause.

Currently, the Infectious Diseases Society of America (IDSA) guidelines for patients with cellulitis without systemic signs of infection, penetrating trauma, injection drug use, or other evidence of MRSA recommend only prescribing antibiotics against streptococci (1).

Clinical Question

Does cephalexin plus TMP-SMX result in higher clinical cure rates in uncomplicated cellulitis versus cephalexin alone?

Population: Patients over twelve years of age with uncomplicated cellulitis (erythema without an abscess, purulent drainage, or wound believed to be of infectious etiology present for less than one week with at least 2cm diameter area of involvement).

> **Exclusion:** There were 26 exclusions in their supplemental documentation. Some of the exclusions were patients with allergy to study drug, pregnancy/nursing or expected pregnancy, underlying skin conditions in the affected area, history of IV drug use with fever, concurrent infection at another site, or immunosuppression.for the wheeze; or steroid treatment within the preceding 14 days.

Intervention: Cephalexin 500mg four times daily plus TMP-SMX 160/800 two tables twice daily for seven days.

Comparison: Cephalexin plus placebo for seven days.

Outcomes:

Primary: Clinical cure at 14-21 days after enrollment. This was defined as not meeting failure criteria that was decided by consensus prior to the study (fever, increase in size >25%, worsening of swelling and tenderness during treatment, no decrease in maximal dimension of erythema, no decrease in swelling or tenderness by the end of treatment and fever or more than minimal erythema, swelling or tenderness by the test-of-clinical-cure visit).

Secondary: Composite clinical cure, surgical drainage procedures, changes in erythema size, presence of swelling/induration and tenderness, invasive infections, skin infections at the same or different site, hospitalizations, similar infections in household contacts, days missed from normal activities and work/school, and days of analgesic use.

Authors' Conclusion:

"Among patients with uncomplicated cellulitis, the use of cephalexin plus TMP-SMX compared to cephalexin alone did not result in higher rates of clinical resolution of cellulitis in the per-protocol analysis. However, because imprecision around the findings in the modified intention-to-treat analysis included a clinically important difference favoring cephalexin plus TMP-SMX, further research may be needed."

Quality Checklist for Randomized Clinical Trials

- ✓ 1. The study population included or focused on those in the emergency department.
- ✓ 2. The patients were adequately randomized.
- ✓ 3. The randomization process was concealed.
- X 4. The patients were analyzed in the groups to which they were randomized. YES/NO. They did two modified intention-to-treat (ITT) analyses and at per-protocol (PP) analysis.
- ? 5. The study patients were recruited consecutively (i.e. no selection bias). Unsure. Not explicitly stated.
- ✓ 6. The patients in both groups were similar with respect to prognostic factors.
- ✓ 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation. However, blinding could be broken if a patient had treatment failure or an adverse event.
- ✓ 8. All groups were treated equally except for the intervention.
- X 9. Follow-up was complete (i.e. at least 80% for both groups). YES/NO. Yes, for the mITT but no for the PP. Only 77.8% of the cephalexin alone group was included in the primary outcome of the per-protocol analysis
- ? 10. All patient-important outcomes were considered. UNSURE
- ✓ 11. The treatment effect was large enough and precise enough to be clinically significant. NO. There was no statistical difference in the primary outcome and there was lack of precision around the point estimate in the mITT-1 analysis.

Key Results

They recruited 500 people to be in the study. The median age was 40 years and there were a few more males than females included in the trial. Patients had symptoms for an average of three days, more than 50% were on the lower extremity, about 10% had diabetes and 4% reported a history of MRSA.

Outcome

No statistical difference in clinical cure rate.

Primary Outcome: Clinical cure at 14-21 days after enrolment

- **Per Protocol:** Patients who took at least 75% of the study medication and had an in-person follow-up visit or had clinical failure before the test-of-cure visit and received at least 75% of the study medication during the first 48h of treatment.
- **Modified ITT-1:** Patients who took at least one dose of the study medication and had an in-person or telephone assessment at the test-of-cure visit, as well as those who withdrew from the trial, were lost to follow-up, or had missing or unassigned outcomes
- **Modified ITT-2:** Patients who took at least one dose of study medication and had an in-person follow-up evaluation at any time during the study.

Study Population	Cephalexin and TMP-SMX	Cephalexin and Placebo	Mean Difference
Per Protocol	84%	86%	-2.0 (-9.7 to 5.7) p=0.5
mITT-1	76%	69%	7.3 (-1.0 to 15.5) p=0.07
mITT-2	84%	83%	1.0 (-6.1 to 8.1) p=0.85

Secondary Outcome: No significant difference between treatment groups.

Treatment Failures: No serious adverse events were reported.

- **Cephalexin + TMP-SMX:** 36 patients with 10 (28%) had an abscess at and 9 (25%) had purulent drainage
- **Cephalexin + Placebo:** 28 patients failed treatment with 10 (36%) had an abscess and 10 (36) had purulent drainage
- **MRSA:** 60 patients failed treatment AND had material to culture. Of those, 41 (68%) grew MRSA

Adverse Events: No significant differences between treatment groups. Most adverse events were mild (90%) and the most common was gastrointestinal.

Talk Nerdy to Me

1) Inclusion/Exclusion Criteria:

The criteria were stringent, and many patients will probably not fall into this category of uncomplicated cellulitis. Purulent cellulitis or cellulitis with abscess seems to be a growing problem. These are the patients that most likely benefit from TMP-SMX. Truly uncomplicated cellulitis would be low risk for MRSA and ideally would make sense to use cephalexin alone, but this seems to be a diminishing group of patients.

2) Alternative Antibiotics:

This trial only addresses TMP-SMX but other antibiotics could be used such as clindamycin which has good strep and staph coverage. Additionally, other antibiotics that have MRSA coverage would include doxycycline. However, TMP-SMX, with its low cost and easy use, is probably the most popular for many clinicians.

3) Ultrasound:

Point of care ultrasound (POCUS) was used to evaluate for abscess. Although more and more clinicians are learning POPCUS skills some rural providers may not have the skills or access to the technology. This makes it harder to interpret the results for those settings.

4) MRSA:

An equal portion of MRSA was isolated among clinical treatment failure in each group. However, the study was not powered to find a difference in this subgroup. It is still possible with a larger sample size that a statistical and clinical significance could be found. In addition, only 4% of patients had a history of MRSA. Clinicians working in communities with higher MRSA rates will need to consider this factor when deciding how to clinically apply this study.

5) Dosing Regimen:

The dosing and regimen with TMP-SMX may be different than what most people are currently doing based on previous research using the double dose instead of the "quadruple dose" of this trial. Furthermore, since TMP-SMX does have activity against streptococcus, it may be worth doing a study comparing cephalexin and TMP-SMX both as a single drug regimen.

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

Bottom Line

In patients with uncomplicated cellulitis the routine addition of TMP-SMX is not required to improve the clinical cure rate.

Case Resolution

Case Resolution:

You discuss the situation with the patient further and he seems to be at low risk for MRSA and do not believe that coverage with TMP-SMX is needed. After a careful and detailed discussion, you and the patient decided to use cephalexin alone to treat his cellulitis.

Clinical Application:

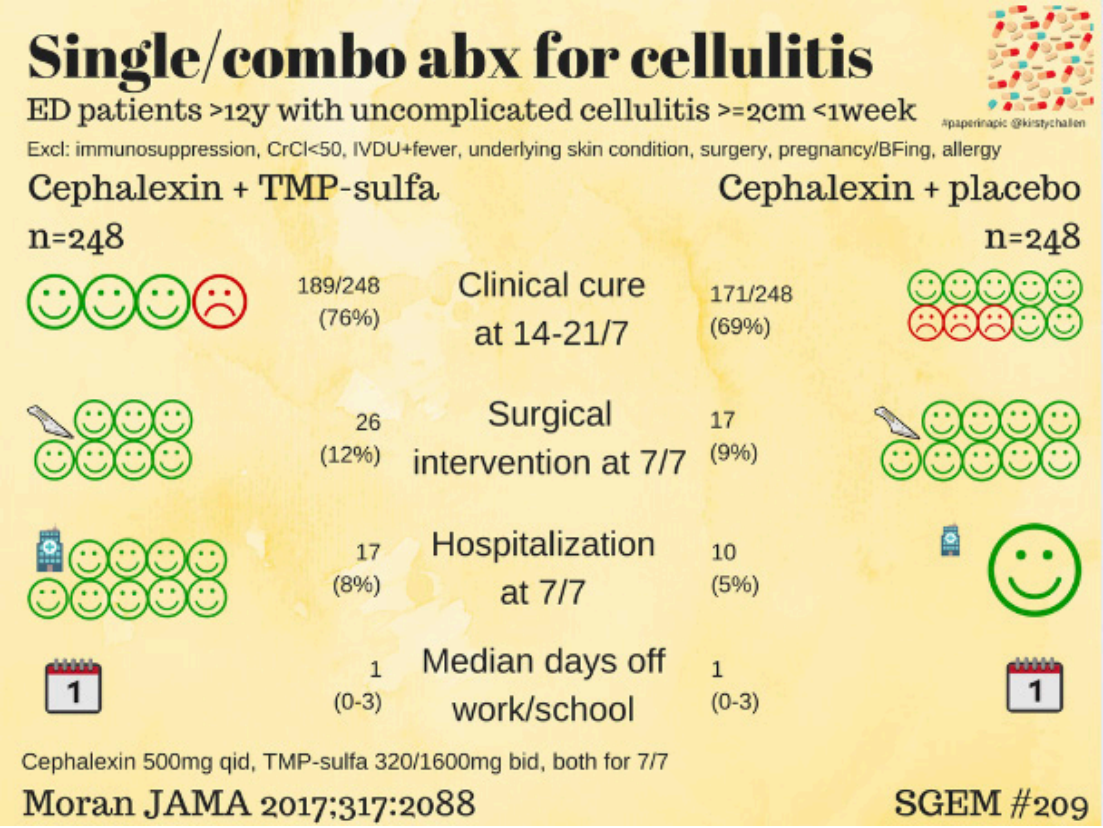
Cephalexin can be used in patients' who are low-risk for MRSA on its own but other antibiotics that will cover for strep and staph as well should be considered. This could still be TMP-SMX but other options include clindamycin for single antibiotic coverage. This paper will not change my clinical practice at this time.

What do you tell the Patient ?

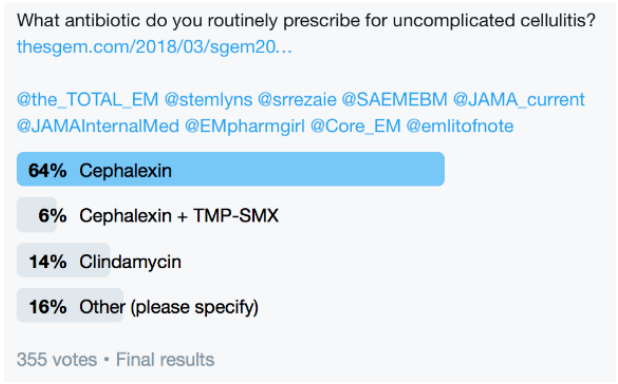
We are going to prescribe you an oral antibiotic called cephalexin for your cellulitis. Sometimes we have to use two oral antibiotics for patients with MRSA. This is a certain type of infection that the regular oral antibiotics do not work. However, you are al low risk for a MRSA infection. If you do not improve or get worse, it could be MRSA and we can another oral antibiotic called TMP-SMX. Another option if that happens is to switch to another single oral antibiotic called clindamycin that treats MRSA but can give you more diarrhea. Sometimes we even have to use intravenous antibiotics to treat these skin infections. Let's just see how the cephalexin works and please come back if you are getting worse, not getting better or are worried.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **EM Literature of Note:** Double Coverage, Cellulitis Edition
- **Pharm ER Tox Guy:** Uncomplicated Cellulitis? Consider Strep-Only Coverage
- **Core EM:** Cellulitis
- **REBEL EM:** Initial Antibiotic Choice in Uncomplicated Cellulitis

References:

1. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin Infect Dis. 2014;59(2):147-159.

SGEM#
210

(Don't) Let It Bleed:

TXA for Epistaxis in Patients on Anti-Platelet Drugs

Question

In patients taking anti-platelet medication who present to the emergency department with Epistaxis, does Topical Tranexamic Acid result in less bleeding than standard anterior nasal packing?

Case

A 77-year-old woman with known coronary artery disease is on clopidogrel and aspirin because of a stent placed four month ago. She has epistaxis that has not resolved despite twenty minutes of well applied anterior pressure. As you are preparing your equipment, she tells you that this is her third episode of epistaxis, and she is really hoping there is some alternative to the anterior packing she had the last two times.

Bottom Line

Despite some limitations in this un-blinded trial, topical tranexamic acid appears to improve some patient important outcomes in patients who are taking anti-platelet medications who present with epistaxis.

Guest Skeptic: 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

Date: March 6, 2018

Reference: Zahed et al. Topical Tranexamic Acid Compared With Anterior Nasal Packing for Treatment of Epistaxis in Patients Taking Antiplatelet Drugs: Randomized Controlled Trial. AEM March 2018.

Episode 210 Overview

Case:

A 77-year-old woman with known coronary artery disease is on clopidogrel and aspirin because of a stent placed four month ago. She has epistaxis that has not resolved despite twenty minutes of well applied anterior pressure. As you are preparing your equipment, she tells you that this is her third episode of epistaxis, and she is really hoping there is some alternative to the anterior packing she had the last two times.

Background:

About 60% of the population will experience a nose bleed. There is a bimodal distribution (<10yrs and > 60yrs) with the majority of refractory hemorrhages are seen in the elderly. In more than two-thirds of the time no cause is identified

INR	Bleeding?	Intervention	Monitoring
Supra-therapeutic but less than 4.5	No	Lower or omit next VKA dose	Recheck INR (next day)
4.5 to 10	No	Omit next 1-2 VKA doses (No routine administration of Vitamin K)	Recheck INR (next day)
Greater than 10	No	Vitamin K 2.5-5 mg orally Omit next 1-2 VKA doses Reduce subsequent dose	Recheck INR (next day)
Serious bleed with any INR	Yes	Vitamin K 5-10 mg slow IV infusion – PLUS - Administer 4-factor PCCs 25-50 units/kg* (preferred over FFP unless 4-factor PCCs unavailable)	Recheck INR 10 to 30min after PCC administration Re-dose PCC if needed Recheck INR q 6 hours

*Repeat PCC (Prothrombin Complex Concentrate) for persistent INR elevation. VKA (Vitamin K Agonist).

An anterior bleed is much more common than a posterior bleed and often occurs at the Kiesselbach's Plexus. It is usually easy to diagnose anterior versus posterior epistaxis with direct visualization.

There are many causes of epistaxis and a variety of treatments. For the adult management of epistaxis there is something called the Dundee Protocol. We will put a link in the show notes to the protocol.

The American College of Chest Physicians published some evidence-based recommendations in 2012 on anticoagulation therapy [1]. We will summarize some of the recommendations for emergent anticoagulation reversal in the emergency department in the show notes.

TXA is a synthetic derivative of lysine that inhibits fibrinolysis and thus stabilizing clots that are formed. TXA has been widely used in elective surgical cases and has shown decreased need for blood transfusion and reduction in mortality. It made sense to look at it for the treatment of epistaxis.

Zahed et al did a randomized control trial (RCT) in 2013 on using TXA for the treatment of anterior epistaxis [2]. They excluded patients on anticoagulation medications but not those taking antiplatelet drugs

We reviewed that RCT on SGEM#53 and the bottom line was that for patients with anterior epistaxis, consider soaking the packing in TXA to stop the bleeding and get them home sooner.

The SGEM also reviewed the use of TXA in the CRASH-2 on SGEM#80 with Anand Swaminathan. And coming up soon, we have an episode reviewing the use of TXA in post-partum hemorrhage.

Clinical Question

The question that asks important stuff

Population: Patients taking antiplatelet medications (aspirin, clopidogrel, or both) with epistaxis continuing after 20 minutes of pressure.

Exclusion: Traumatic epistaxis, anticoagulant use, inherited bleeding disorders, inherited platelet disorders, INR > 1.5, shock, a bleeding visible vessel, renal disease, or lack of consent.

Intervention: Anterior packing with a 15cm cotton pledget soaked in 500mg of tranexamic acid and left in place until bleeding stopped.

Comparison: Anterior packing with a cotton pledget soaked in epinephrine (1:100,000) and lidocaine (2%) and left in place for 10 minutes. It was then removed and a standard anterior nasal pack was placed for three days.

Outcome:

Primary: Bleeding at 10 minutes

Secondary:

- Epistaxis recurrence at 24 hours and 7 days after treatment
- Emergency department length of stay (LOS)
- Patient satisfaction on a 0–10 numeric scale

Authors' Conclusion:

"In our study population, epistaxis treatment with topical application of TXA resulted in faster bleeding cessation, less re-bleeding at 1week, shorter ED LOS, and higher patient satisfaction as compared with ANP".

Quality Checklist for Randomized Clinical Trials

☑	1. The study population included or focused on those in the emergency department.
☑	2. The patients were adequately randomized.
☑	3. The randomization process was concealed.
☑	4. The patients were analyzed in the groups to which they were randomized
☒	5. The study patients were recruited consecutively (i.e. no selection bias). No. There were a high number of exclusion due to lack of consent.
☑	6. The patients 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. Unsure. Other treatments such as cautery not commented upon.
☑	9. Follow-up was complete (i.e. at least 80% for both groups).
☑	10. All patient-important outcomes were considered.
☑	11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

They randomized 124 patients in this trial with a median age of about 60 years with slightly more men than women included in the study.

Outcome

More patients had their epistaxis stopped in 10 minutes when treated with TXA.

Primary Outcome: Bleeding stopped at 10 minutes in 73% of the TXA group and 29% of the standard packing group (absolute difference 44%; 95% confidence interval 26-57%; p<0.01) NNT 2

Secondary Outcomes (Intervention vs usual care):

- **24 Hour Re-Bleeding:** 5% with TXA vs. 10% control (p=0.30)
- **1-Week Re-Bleeding:** 5% with TXA vs. 21% control (p=0.007)
- **Emergency Department Length of Stay:** 97% of TXA group discharged within two hours vs. 13% of controls (p<0.001)
- **Patient Satisfaction:** 9/10 with TXA vs. 4/10 with control (p<0.001)

Adverse Events: No difference in serious adverse events.

Talk Nerdy to Me

1) Bias:

There may have been selection bias introduced into the study. Of the 384 patients approached, 92 were excluded due to failure to provide consent. It is unclear how many patients were screened had their epistaxis resolved with the initial 20 minutes of pressure.

Another possible source of bias in this study is the lack of blinding. They said blinding was not possible due to the different number of pledgets required for anterior nose packing and the differences in the colour, smell and consistency of the medications used. However, the outcome assessors were blinded to group allocation.

2) Strawman Comparison:

This study used bleeding stopped at ten minutes as the primary outcome. Standard anterior packing is not really supposed to stop bleeding at ten minutes and requires time to develop a stable pack. Would a 24 or 48-hour outcome have been a fairer comparison? However, when looking at the secondary outcome of 24 hours or one-week the TXA was still superior to standard care.

3) Length of Stay (LOS):

The LOS times were presented just as the percentage left by two hours. However, it is difficult to determine if the difference is important. If most people in the TXA group left the department after one hour and 55 minutes, and the control group left at two hours and 5 minutes, this may not be an important difference. What was the actually difference in length of stay?

4) Who Was Doing the Packing:

Technique is probably more important in the outcomes after anterior packing than it is in using topical TXA. In this study, procedures were primarily done by trainees (PGY2s and PGY3s). That could impact the generalizability of the results to more experienced providers?

5) Other Treatment Options:

The study looked at anterior nasal packing with cotton pledget. Frequently in epistaxis, multiple treatment options are used. Other options include cautery, epinephrine and commercial packing devices. These other treatment options were not commented upon in the paper.

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

Bottom Line

Despite some limitations in this un-blinded trial, topical tranexamic acid appears to improve some patient important outcomes in patients who are taking antiplatelet medications who present with epistaxis.

Case Resolution

Case Resolution:

You discuss this trial on topical TXA with your patient, and she jumps at the alternative. After ten minutes the bleeding has stopped. You call her a week later to follow-up, and she is thrilled that the bleeding didn't re-occur, and she didn't have to spend multiple days with an anterior pack in place.

Clinical Application:

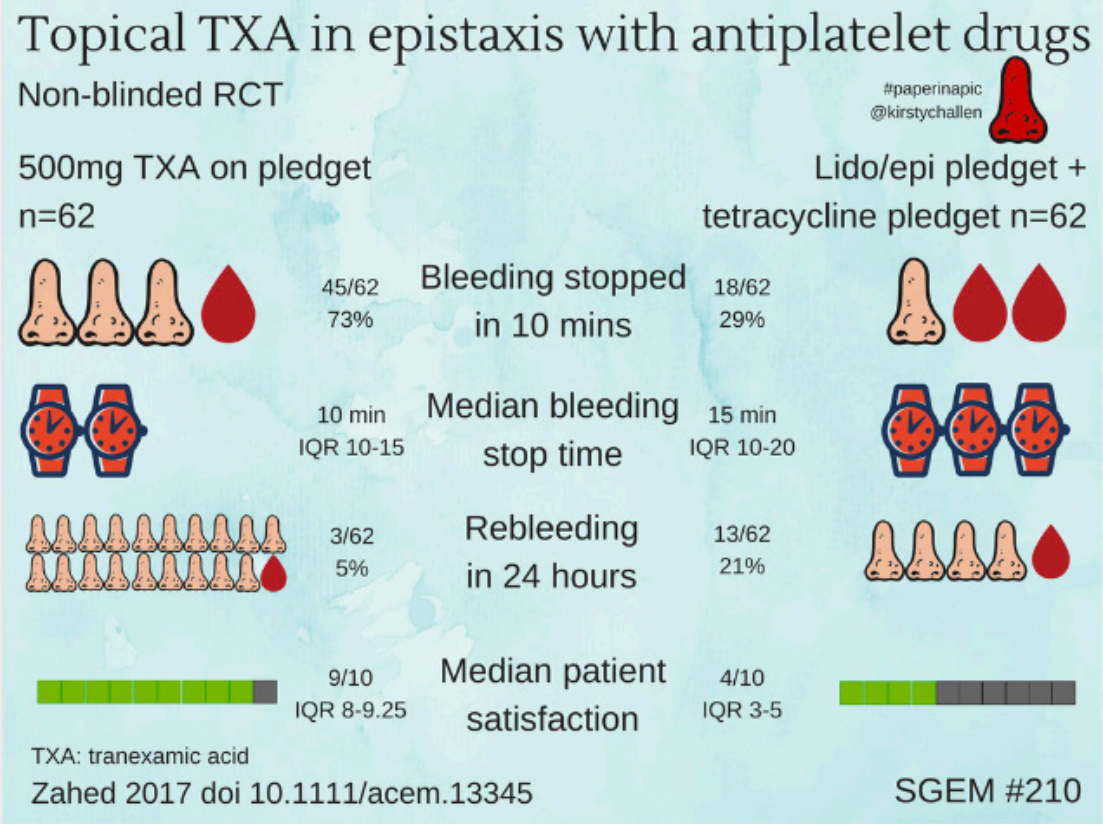
Using topical tranexamic acid for epistaxis in the context of antiplatelet drug use seems to result in faster bleeding cessation, less re-bleeding at one week, and higher patient satisfaction. However, I would like to know if we always wait for the initial trial of 20 minutes of pressure, or are there patients who may benefit from starting TXA immediately? My personal practice is to use epinephrine, lidocaine, and TXA on all patients who are still bleeding by the time I see them in the room.

What Do You Tell the Patient ?

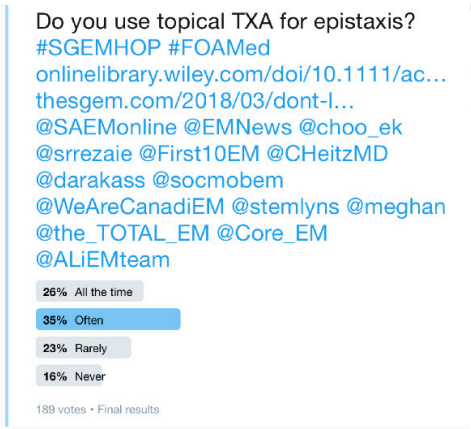
There is a medication called tranexamic acid that might help stop your nose bleed faster and get you out of the emergency department sooner. We also think that it makes the blood clot stronger, so there is less chance that you will start bleeding again later this week. It requires that I place this piece of cotton soaked in the medication in your nose for about ten minutes. We don't know of any major side effects. Would you like to try it?

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **REBEL EM**: Topical TXA in Epistaxis
- **CORE EM:** Topical TXA in Epistaxis

References:

1. Holbrook et al. Evidence-based management of anticoagulant therapy: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest 2012.
2. Zahed et al. A new and rapid method for epistaxis treatment using injectable form of tranexamic acidtopically: a randomized controlled trial. Am J EM 2013

SGEM#
211

Pins and Needles:

Acupuncture for Migraine Prophylaxis

Question

Does treating patients who have migraines without aura with acupuncture prevent the re-occurrence of migraine headaches?

Case

40-year-old male appears with what he describes as his typical migraine that has failed his usual home therapies. In the emergency department after six hours and multiple medications, the patient's pain is finally under control. While being discharged he asks if there anything you can offer to prevent headaches from coming back. He states: *"I have to fly to Chengdu University of Traditional Chinese Medicine next week on a sales call and don't want to have the headache return while I am there"*.

Bottom Line

This study does not provide any evidence of the efficacy of acupuncture to prevent the re-occurrence of migraine headache in patients without aura.

Guest Skeptic: Dr. Alfred Sacchetti is a full time practicing Emergency Physician, who is also the Chief of Emergency Medicine at Our Lady of Lourdes Medical Center in Camden, New Jersey, USA, an Assistant Clinical Professor of Emergency Medicine, an Active Researcher and faculty member for the Emergency Medicine and Acute Care course.

Date: March 18, 2018

Reference: Zhao et al. The Long-Term Effect of Acupuncture for Migraine Prophylaxis: A Randomized Clinical Trial. JAMA Internal Medicine 2017

Episode 211 Overview

Case:

40-year-old male appears with what he describes as his typical migraine that has failed his usual home therapies. In the emergency department after six hours and multiple medications, the patient's pain is finally under control. While being discharged he asks if there anything you can offer to prevent headaches from coming back. He states: *"I have to fly to Chengdu University of Traditional Chinese Medicine next week on a sales call and don't want to have the headache return while I am there".*

Background:

More than 10% of people (6% men and 18% women) suffer from migraines. This condition represents a significant source of both medical costs and lost productivity. Direct costs are estimated at approximately 17 billion dollars a year. There are also indirect costs of about 15 billion dollars a year mainly due to missed work.

There are many options for treating migraine headaches in the emergency department. When every you see so many treatments for the same problem it is an indication that none of them work very well. One of the best treatment options is just to give the patient a quiet/dark space and time to get some sleep. If that does not work, one good therapy to try is IV metoclopramide. A very good drug that is no longer widely available is droperidol. Sometimes opioids are required to treat bad headaches in the emergency department.

We have covered ketorolac on SGEM#66 as a possible therapy for acute migraine in the emergency department. The bottom line from that episode was that ketorolac is a reasonable second-line agent. Don't forget that there is a ceiling effect for NSAIDs that was covered with Chris Bond SGEM#175 featuring a paper by Sergey Motov.

Up to half of patients presenting to the emergency department with their migraines will "bounce-back" to the emergency department within a few days. Dexamethasone has been tried in randomized control trials to prevent bounce-backs.

We covered a SRMA by Coleman et al from the BMJ on SGEM#28: Bang Your Head. It showed that a single parenteral dose of dexamethasone ≥15mg for successfully aborted migraine will significantly reduce early recurrences (NNT=9) with no significant side effects.

The authors of this study felt that because acupuncture has been known to treat migraines, it may also have a role in preventing them as well.

There was a Cochrane review in 2009 [1] that found "*There is no evidence for an effect of 'true' acupuncture over sham interventions, though this is difficult to interpret, as exact point location could be of limited importance.*"

They updated their review in 2016 [2] and claimed acupuncture now did work. Of the studies that included a sham acupuncture group the effect size was small but statistically significant. However, the quality of the evidence was moderate and there was moderate heterogeneity.

Standard Mean Difference:

- -0.18 (95% CI -0.28 to -0.08; I2 = 47%) after treatment
- -0.19 (95% CI -0.30 to -0.09; I2 = 59%) at follow-up
-

This small statistical difference might not be clinically significant and could be explained by the lack of blinding of the provider in the studies. This could increase the placebo effect.

Clinical Question

Does treating patients who have migraines without aura with acupuncture prevent the re-occurrence of migraine headaches?

Population: Patients 18 to 65-years-old with documented migraine without aura as classified by the International Headache Society [3] and migraine attacks of two to eight per month in the last three months.

Exclusion: Patients were excluded if their headache was caused by an organic disorder; the presence of neurological disease, immunodeficiency, bleeding disorder, or allergy; prophylactic headache treatment with drugs during the previous three months; pregnancy, lactation, or plans to become pregnant within six months.

Intervention: Electrostimulation acupuncture (frequency 2/100 Hz with an intensity from 0.1 to 1.0 mA) at four acupuncture sites to achieve Deqi sensation. They defined Deqi as a sensation of soreness, numbness, distention or radiating that indicates effective needling. The electrostimulation acupuncture was performed once per day for thirty minutes, five days a week for four weeks.

Comparison:

- **Sham Acupuncture:** Same number of needles, electric stimulation and duration of treatment but in four non-points as to NOT to induce the Deqi sensation.
- **No Treatment:** This group of patients received no treatment but were told they would be provide with 20 acupuncture sessions for free but had to wait for 24 weeks.

Outcome:

Primary: Change in frequency of migraine attacks between baseline and 16 weeks after randomization.

Secondary: Number of days with migraine, average headache severity, and medication intake every four weeks within 24 weeks. In addition, migraine-specific quality-of-life questionnaire, pain-related impairment of emotion and self-rating depression scale.

Adverse Events: Bleeding, subcutaneous hemorrhage, hematoma, fainting, serious pain, and local infection.

Authors' Conclusion:

"Among patients with migraine without aura, true acupuncture may be associated with long-term reduction in migraine recurrence compared with sham acupuncture or assigned to waiting list."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department. No. These were clinical patients.
- [✓] 2. The patients were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The patients were analyzed in the groups to which they were randomized
- [?] 5. The study patients were recruited consecutively (i.e. no selection bias). Unsure
- [✓] 6. The patients in both groups were similar with respect to prognostic factors.
- [x] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation. No. Patients in intervention groups were blinded but not the clinicians.
- [x] 8. All groups were treated equally except for the intervention. No. The wait and see group did not have the multiple visits of the other two groups.
- [✓] 9. Follow-up was complete (i.e. at least 80% for both groups).
- [✓] 10. All patient-important outcomes were considered.
- [x] 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

They recruited 249 patients (82 true acupuncture, 80 sham acupuncture and 82 waiting-list). The mean age was in 38-years-old with 77% being women.

Outcome

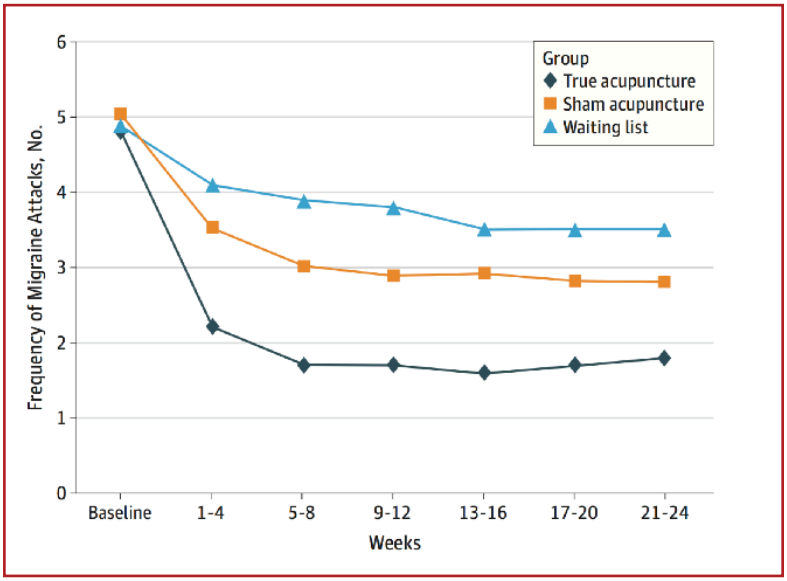
Acupuncture significantly decreased the frequency of migraine attacks.

Primary Outcome: Mean change in frequency of migraine attacks

- True Acupuncture (TA) 3.2
- Sham Acupuncture (SA) 2.1
- Waiting-List Group (WL) 1.4
- Difference between TA and SA 1.1 (95% CI 0.4-1.9; p=0.002)
- Difference between TA and WL 1.8 (95% CI 1.1-2.5; p<0.001)

Secondary Outcomes (Intervention vs usual care):

- Migraine attacks frequency, migraine days, and VAS scores were significantly lower in the TA group than in the other two control groups.
- Figure 2 is a graph showing the frequency of migraine attacks throughout the study. It is difficult to interpret because it lacks error bars. What it seems to show is a placebo effect, but we will discuss that more in the nerdy section.
- Use of acute pain medication was not different between TA and SA



Adverse Events: There were seven patients with adverse events (five in the TA group and two in the SA). All were mild or moderate.

Talk Nerdy to Me

1) Selection Bias/ External Validity:

These were patients recruited from the Department of Acupuncture and Neurology in three clinical centers not emergency department patients. Patients attending these clinics could have self-selected to attend such a clinic believing acupuncture works. More than 20% of the included population had previously used acupuncture. This could have introduced selection bias into the study.

There is also the problem of external validity. Are these the type of migraine patients we see in the emergency department? They selected migraine patients without aura. It is hard to tell if these are true migraines or some other type of severe headache. Would this treatment apply to the headache patients that present to the emergency department seeking relief?

2) Unblanaced Groups:

They said the groups were comparable at baseline. However, looking at Table 1, 43% of the true acupuncture group used acute pain medication compared to only 29% of the sham acupuncture group. It is unclear how this difference could have impacted the results. In addition, there was no difference in the use of pain medication between the true and sham acupuncture group throughout the 24 weeks of the study.

3) Un-Blinded Provider (First Fatal Flaw):

The same clinicians were performing both the true and sham acupuncture. Since much of acupuncture's effects may be related to clinician / patient interaction it is very possible the patient interactions were different between the two groups. Conversation in true acupuncture group "Tell me how much better you are doing since we started these wonderful treatments that I strongly believe will help you." Sham group "Have the headache really gotten any better since I started stinking needles randomly in your head." Obviously, the interaction biases would be subtler, but could still exist.

4) Un-Blinding of the Patients (Second Fatal Flaw):

They claim that patients were blinded to true vs. sham acupuncture. However, these were patients most likely familiar with acupuncture. The true group were treated with electro-acupuncture to achieve Deqi sensations (a sensation of soreness, numbness, distention, or radiating that indicates effective needling). At the very least this would add a placebo effect to those in the true acupuncture group. I suspect the Deqi sensation in the true acupuncture group could have un-blinded the trial. It would have been easy to confirm blinding simply by asking the patients which group they thought they had been allocated.

5) Strawman Comparison (Third Fatal Flaw):

The Acupuncture group all had to have needles placed at points GB20 and GB8 and electrically stimulated until a neurogenic response was generated. Point GB20 is directly over the greater occipital nerve and GB8 is over the auricular nerve, two sites shown to provide migraine relief when injected with anesthetics or simply touched with needles. So, the true acupuncture group is not interacting with any meridians, they are only electrically stimulating (like a TENS unit) over nerves known to relieve migraine headaches. The sham group is just getting needles without electricity and not over nerves that cannot produce the same effect.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We disagree with the authors' conclusions due to the three fatal flaws in the study design.

Bottom Line
This study does not provide any evidence of the efficacy of acupuncture to prevent the re-occurrence of migraine headache in patients without aura.

Case Resolution

Case Resolution:

You offer him a dose of dexamethasone to prevent his headache from re-occurring while away in China.

Clinical Application:

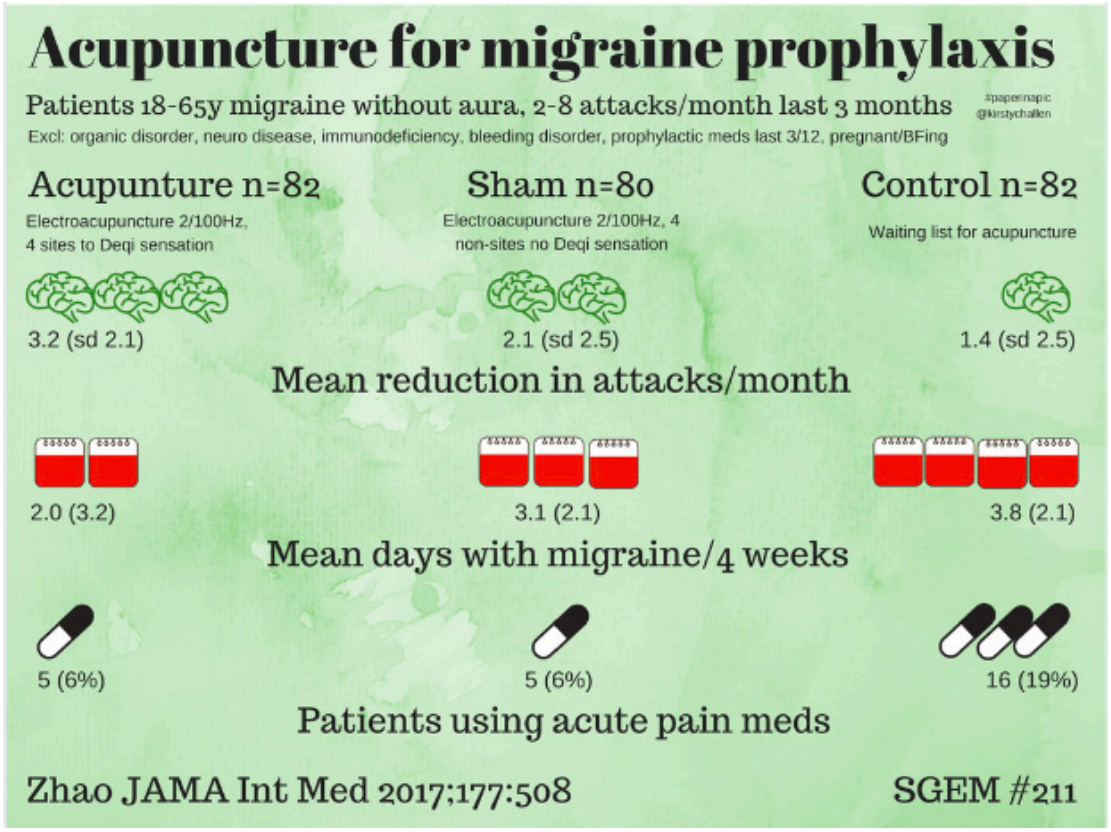
Acupuncture for migraine prevention does not have a clinical application in the emergency department.

What Do You Tell the Patient ?

I'm glad we were able to effectively treat your headache with medication. If you want to prevent the headache from re-occurring in the short term on your trip to China I would recommend a dose of dexamethasone.

Episode End Notes

Infographic:



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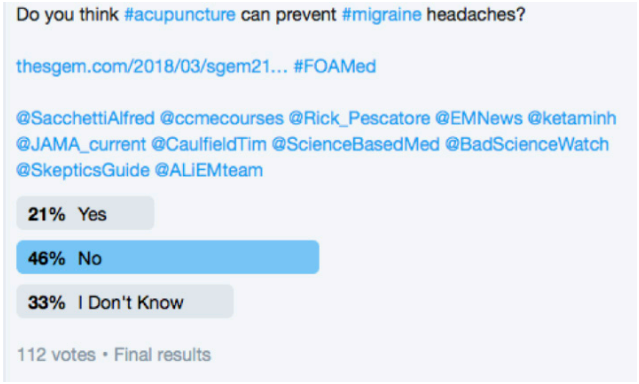


Other FOAMed:

- **Science Based Medicine:** Acupuncture and Migraine – New JAMA Study
- **Headache Currents:** Acupuncture Is All Placebo and Here Is Why
- **Science Based Medicine:** Acupuncture for Migraine
- **JAMA Editorial:** Acupuncture for Migraine Prevention- Still Reaching for Convincing Evidence

References:

1. Linda K et al. Acupuncture for migraine prophylaxis. Cochrane Database Syst Rev. 2009
2. Linde K et al. Acupuncture for the prevention of episodic migraine. Cochrane Database of Syst Rev, 2016,
3. International Classification of Headache Disorders, 2nd edition. Cephalalgia. 2004;24(suppl 1):9-160.

SGEM#
212

Holding Back The Years:

Risk Factors for Adverse Outcomes In Older Adults With Blunt Chest Trauma

Question
What are the main factors that are associated with adverse outcomes in older adults with blunt chest trauma?

Case
An 85-year-old woman with a history of chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), and type-2 diabetes (DM-2), and her 65-year-old otherwise healthy daughter present to the emergency department after a car accident. It was a low speed motor vehicle collision (MVC) in which they rear-ended a stationary car.

However, they were both unrestrained. They both have a Glasgow Coma Scale (GCS) of 15 on arrival and are complaining of chest pain. The physician in the emergency department is deciding what imaging to obtain and will ultimately have to decide the disposition.

Bottom Line
Age, injury severity score, number of rib fractures, and chronic disease are associated with higher morbidity, mortality, and length of stay in blunt trauma patients 65 years or older.

Guest Skeptic: Dr. Christina Shenvi is an Emergency Physician at University of North Carolina. She is fellowship trained in Geriatric Emergency Medicine and has a podcast called GEMCAST. Christina loves serving as the assistant residency director, writing things, reading things, teaching people, and having kids.

Date: March 20, 2018

Reference: Sawa et al. Risk factors for adverse outcomes in older adults with blunt chest trauma: A systematic review. CJEM March 2018

Episode 212 Overview

Case:

An 85-year-old woman with a history of chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), and type-2 diabetes (DM-2), and her 65-year-old otherwise healthy daughter present to the emergency department after a car accident. It was a low speed motor vehicle collision (MVC) in which they rear-ended a stationary car.

However, they were both unrestrained. They both have a Glasgow Coma Scale (GCS) of 15 on arrival and are complaining of chest pain. The physician in the emergency department is deciding what imaging to obtain and will ultimately have to decide the disposition.

Background:

Older adults who sustain a blunt traumatic injury to the chest are at higher risk for greater injury severity for a given mechanism, longer lengths of stay, loss of independence, and higher morbidity and mortality than younger patients.

However, it is not a homogeneous population. Some older adults will do relatively well, while others will be at particularly high risk for adverse outcomes.

Clinical Question

What are the main factors that are associated with adverse outcomes in older adults with blunt chest trauma?

Population: "*Older adults defined as 65-years of age and over. Blunt chest trauma defined as "blunt chest injury resulting in chest wall contusion or rib fractures, with or without immediate life-threatening injury to the lungs or other organ systems."*

Exclusion:

- Review articles, case reports, or case-series
- Population not meeting inclusion criteria
- Did not analyze risk factors for outcome of interest
- Did not examine an outcome of interest

Intervention: Not applicable

Comparison: The comparison was prognostic factors for outcomes of interest. The factors were grouped into three categories:

1. **Patient Factors:** Any underlying features, conditions, or demographics present before the injury such as age, sex, co-morbidities.
2. **Disease Factors:** Any risk factors related to the traumatic event such as number of rib fractures, flail chest, mechanism, other associated trauma.
3. **Institutional Factors:** These had to do with the hospital and emergency department such as: was the patient seen by a trauma team, was there a multi-disciplinary team, and were there any adverse events that occurred.

Outcomes:

- **Morbidity:** Pneumonia, intubation and intensive care admission
- **Mortality:** In-hospital or 30-day
- **Emergency Department Recidivism**
- **Length of Stay (LOS)**
- **Quality of Life (QOL)**
- **Loss of Independence:** Defined as discharge to a higher level of community care than they were admitted from.

Authors' Conclusion:

""While blunt chest wall trauma in older adults is relatively common, the literature on prognostic factors for adverse outcomes in this patient population remains inadequate due to a paucity of high quality studies and lack of consistent reporting standards."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department.
- ☒ 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? Unsure
- ? 4. The individual study period of follow-up was sufficiently long and complete? Yes and No.
- ☒ 5. The search for studies was detailed and exhaustive? No
- ☑ 6. The methodological quality of primary studies were assessed for common forms of prognostic research bias? Yes
- ? 7. The assessment of studies were reproducible? Unsure
- ☒ 8. There was low heterogeneity for estimates of sensitivity or specificity? No
- ☒ 9. The summary prognostic accuracy is sufficiently precise to improve upon existing clinical decision-making models? No

Key Results

Their search resulted in 13 studies that met all their criteria, representing a total of over 79,000 patients. There were eleven studies from the US, one from Egypt, and one from Israel.

All the studies were retrospective cohort studies, primarily relying on trauma registries. Of note, one of the studies accounted for the vast majority of patients and included 67,659 patients. At the other end of the spectrum, the study from Egypt had 39 patients, and the study from Israel had 77 patients.

There was too much heterogeneity and the authors were not able to perform a meta-analysis. However, the overall mortality in the studies was 8.4% and the complication rate was 26.5%. They also wanted to look at emergency department recidivism and quality of life, but none of the studies included this information.

Outcome

Patients are at higher risk of adverse outcomes with increasing age, increasing rib fractures, greater burden of underlying chronic disease, and if they required early intubation or had worse oxygenation on admission.

Mortality:

- **Patient Factors:** One study looked at Age >= 80, which had a statistically significant OR of 2.37, another study found an OR of 1148.5 (CI 184.9-7132.6) with "age" but the paper didn't clarify what it meant by "age". The largest study in the review had an OR of mortality of 1.059 for death. So, for example, if your OR of death were 1 for a 65yo, that would give you an OR of 1.77 at age 75 and 2.36 at 80. Those studies have a pretty big difference in the OR they report. The study that had the OR over 1000 was a study from the US of 1621 patients and had low risk of bias. One study showed OR 5.7 in patients with congestive heart failure

- **Disease/Injury Factors:** Several studies looked at number of rib fractures, and there was a statistically significant increase in mortality, but there was too much heterogeneity to do any sort of meta-analysis. Certainly, with lots of rib fractures (over 8), one study had an OR of 1.54 for mortality

- **Institutional Factors:** Only one study looked at whether admission to a level 1 trauma center had an effect on mortality, and it did, with an OR 4.5. This adjusted for age, ISS, need for intubation, and pre-existing CHF.

Morbidity:

- **Patient Factors:** Outcomes of myocardial infarction, pneumonia, pulmonary contusion and effusion were increased in patients with pre-existing cardiopulmonary disease (OR 8.2). General "pulmonary complications", pneumonia, and contusions, were increased with diabetes (OR 5.7 for the first and 11.5 for the latter 2). Other significant risk factors: COPD, protein calorie malnutrition, and use of ambulatory assist devices. Per year increase in age, the need for mechanical ventilation had an OR of 1.004, and for pneumonia 1.007
- **Disease/Injury Factors**: More pneumonia, pulmonary embolism, or other pulmonary complications, with lower oxygen saturation on admission, more rib fractures, earlier need for mechanical ventilation, and with each increase in rib fractures, or each point increase in ISS.
- **Institutional Factors:** Pleural effusion or pneumonia increased with use of epidural vs. IV analgesia (OR 3.3) after adjusting for ISS and pre-existing disease.

Length of Stay:

- **Patient Factors:** Pre-existing cardiopulmonary disease
- **Disease/Injury Factors**: Need for mechanical ventilation, number of rib fractures, or over five rib fractures.
- **Institutional Factors:** Use of IV vs. epidural analgesia (5.6 vs 8.6 days). Protocolized care of rib fractures vs pre-protocol care reduces LOS (7.1 vs 8.2 days).

Discharge to Insitution: Only one study looked at this and found those with lower mean vital capacities within 48 hours of admission were more likely to be discharged to an extended care facility.

Talk Nerdy to Me

This was a pretty solid systematic review given the limitations of the available evidence. They adhered to the PRISMA and MOOSE guidelines for systematic reviews and meta-analyses.

They described various kappas, confidence intervals, contingency tables, risk of bias, non-weighted average of reported means, and other statistical terms to describe their work.

1) Search Strategy:

They used an expert librarian, searched two electronic databases and hand searched the bibliographies of all the included studies. However, they did not do a great job of searching the grey literature. They did not mention going through conference abstracts or reaching out to experts in the field (like Chris Carpenter). They also restricted inclusion to abstracts in English and French.

2) Heterogeneity:

The studies, unfortunately had a fair amount of heterogeneity. Some measured risk of outcomes based on age or rib fractures in a binary fashion (ex: age >64 or age >80, or <8 or >8 rib fractures) while others measured the effect per year or per fracture. There was also heterogeneity in the trauma burden. The mean Injury Severity Score (ISS) score of studies ranged from 6.9 to 19.4, and four of the studies did not even report ISS, and several of them did not adjust their predictive factors for the patient ISS. Studies also lumped their outcomes, such as including "pneumonia, pleural effusion, and intubation" as a single outcome. This is not very helpful or patient-centered. Having a little pleural effusion is very different from having to be intubated.

3) Follow-Up:

Some of the studies looked at 30-day mortality and LOS, which are pretty standard outcome measures. They did want to measure QOL and loss of independence, but the included studies did not measure these outcomes. Both are very important patient-oriented outcomes, and would need to be measured further out, but just haven't been the focus of studies so far and require more intensive follow-up. As with all systematic reviews, the authors were limited by the available published evidence.

4) Study Bias:

They looked at risk of bias in the study participation, attrition, measurement of prognostic factors and outcomes, study confounding, and statistical analysis and presentation. Unfortunately, most of the studies did have high risk of study confounding and risk of bias in statistical analysis. However, the study that had the largest number of patients, (67,559/79,313 or 85%) had low risk of bias in all categories.

5) Associations and Strengths of Associations:

All the studies included in the systematic review were retrospective cohort studies. This means we are only talking about associations between the reported risk factors and outcomes of interest. In addition, some of the studies did not perform a multivariate analysis. This limits the ability to interpret the relative strength of associations across studies.

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

Bottom Line

Age, injury severity score, number of rib fractures, and chronic disease are associated with higher morbidity, mortality, and length of stay in blunt trauma patients 65 years or older.

Case Resolution

Case Resolution:

The astute emergency physician obtains a chest x-ray in both patients. They are both read as negative. However, the 85-year old patient has marked tenderness over the right lower chest wall. A CT is obtained that shows three rib fractures. The patient is admitted given her very high risk for pneumonia or other respiratory complications. She receives pain medication and pulmonary therapy and is discharged four days later.

The 65-year old patient has some bruising over the chest wall but no significant point tenderness, no splinting, no respiratory distress, and no hypoxia. Since she is generally healthy, ambulatory, oxygen saturation is good, and is unlikely to require admission even if she has an isolated rib fracture, she is discharged with acetaminophen and does well recovering at home.

Clinical Application:

It is challenging to know how to use this information prospectively, as for example, their inclusion requires the diagnosis of chest trauma, such as rib fractures. That implies that imaging has already been performed. But it's not clear, for example whether these rib fractures were diagnosed on X-ray, which misses a lot of fractures, or if it was based on CT. So, it's not necessarily as helpful as one would hope in making the decision about what imaging modality to choose, or whether imaging is needed.

Another problem is that none of the ten-potential patient and disease factors for morbidity are likely to be modifiable. Certainly, a patient's age is not modifiable and hence the theme music…holding back the years… it is not possible.

However, it is reasonable to apply this data to clinical care, primarily by keeping an awareness that patients who are older, have more rib fractures, and more co-morbidities who present with blunt trauma are at higher risk for morbidity and mortality. This may be helpful to guide getting more imaging or helping guide disposition. However, there isn't a really clear cutoff for things, such as how many rib fractures is ok, or how many rib fractures plus co-morbidities are ok?

At the end of the day, just be more cautious in your care of older adults with blunt trauma. Morbidity and mortality is associated with increase with age, ISS, number of rib fractures, and the presence of underlying chronic disease.

What Do You Tell the Patient ?

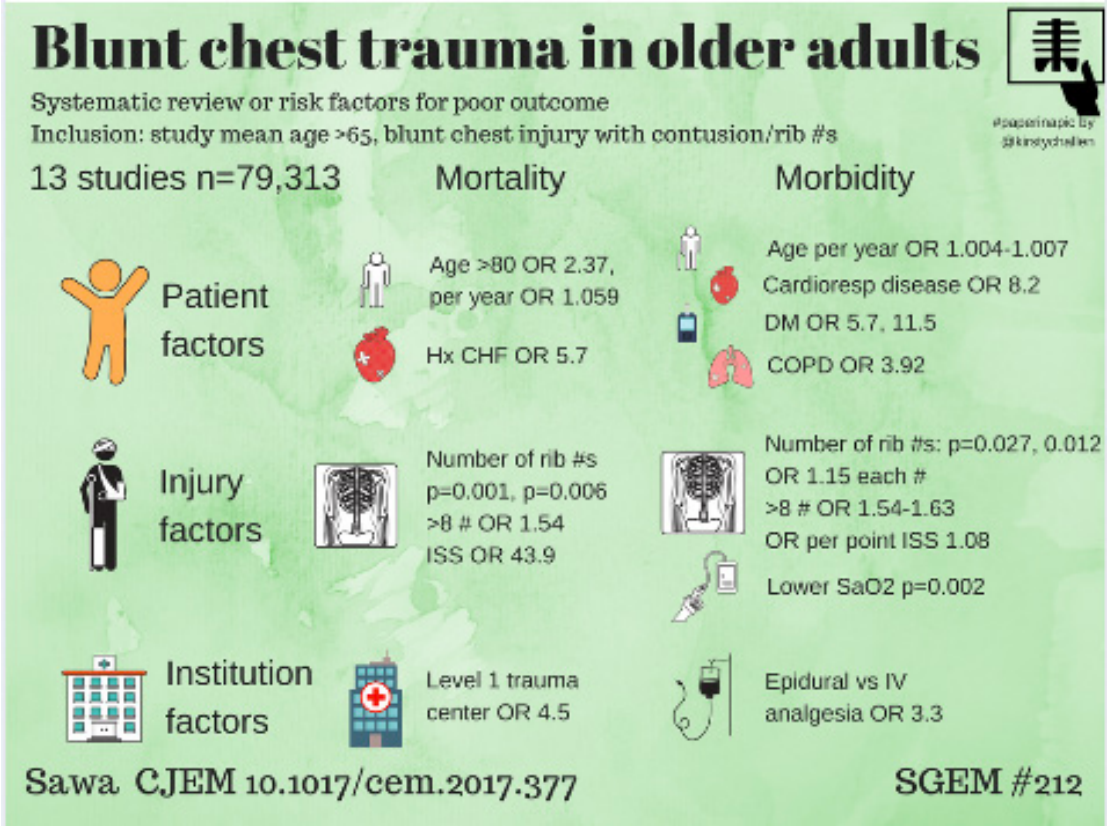
I am concerned that since you have multiple rib fractures, and you have underlying lung disease, that you are at high risk for developing pneumonia, or having worsening difficulty breathing. I think you should be admitted so that we can continue to make sure you are getting enough oxygen, and that your pain is well controlled, so that we can closely monitor and treat you if you do develop difficulty breathing or a lung infection.

Final Comments:

For the 65-year woman I would say we have performed an X-ray, we do not see any rib fractures and since your pain seems to be reasonable controlled with acetaminophen, I would recommend to take this medication as needed at home. However, if you start to have worse pain, cough, fever, or trouble breathing, I want to you come back to the emergency department to be re-evaluated.

Episode End Notes

Infographic:



Twitter Poll:

Risk of adverse outcomes in adult blunt chest trauma are:

thesgem.com/2018/03/sgem21...

@clshenvi @CJEMonline @WeAreCanadiEM @Brent_Thoma @SAEMEBM @gempodcast @CAEP_Docs @EMNews

1% Decreased with age

5% Age makes no difference

94% Increased with age

SGEM#
213

Upside Down You Convert Me Out Of SVT?

Question
Is the upside-down position a safe and effective modified valsalva maneuver?

Case
A seven-year-old girl presents to your emergency department complaining of palpitations. On exam she appears anxious and begs you not to give *"that drug that makes my heart stop like that last doctor did."* You know vagal maneuvers are first-line, but there's variation in techniques. As the patient already tried breathing out of her clenched nose, you wonder if there is another safe method you can try prior to medications.

Bottom Line
The upside-down maneuver exists, but further research is needed to determine if it has efficacy in children with SVT.

Guest Skeptic: Dr. Robert Edmonds is an Emergency physician in the US Air Force. This is his 6th visit to the SGEM.

Date: March 30, 2018

Reference: Bronzetti et al. Upside-down position for the out of hospital management of children with supraventricular tachycardia. International Journal of Cardiology. February 2018.

Episode 213 Overview

Case:

A seven-year-old girl presents to your emergency department complaining of palpitations. On exam she appears anxious and begs you not to give *"that drug that makes my heart stop like that last doctor did."*

You know vagal maneuvers are first-line, but there's variation in techniques. As the patient already tried breathing out of her clenched nose, you wonder if there is another safe method you can try prior to medications.

Background:

Supraventricular tachycardia (SVT) has a prevalence anywhere from 1 in 250 to 1 in 1,000 in children and is the most common arrhythmia in children. Forty percent of patients experience the first episode of SVT in the first month of life, and over 50% have their first episode in their first year of life [1].

Vagal maneuvers are thought to be first-line treatment as they are non-invasive and can rapidly resolve the episode when successful. Several methods exist, such as carotid sinus massage, mammalian dive reflex, and the Valsalva maneuver [2].

We have covered SVT on the SGEM a couple of times. The first time was a Cochrane systematic review done by Smith et al on the effectiveness of the Valsalva maneuver for reversion of SVT (SGEM#67). Only one study in that review was from the emergency department and it reported a reversion rate of 19%.

The second time we covered SVT was a critical review of the REVERT Trial (SGEM#147). It was an randomized control trial using a modified Valsalva maneurer to convert SVT. The result was a return to sinus rhythm at one minute in 43% of patients treated with the modified Valsalva vs. 17% of patients treated with the standard Valsalva.

This gives an NNT of 4. Four patients needed to be treated with the modified Valsalva for one more patients to return to sinus rhythm at one minute. The authors of the study we are talking about today were aware of case studies of a modification to the Valsalva maneuver in children [3-5]. The maneuver involves the child doing a handstand or being held upside down.

Clinical Question

Is the upside-down position a safe and effective modified valsalva maneuver?

Population: Patients age 1-18 years followed at the pediatric arrhythmology outpatient clinic with SVT. SVT was defined by a regular, narrow complex tachycardia with QRS duration <0.12 s on ECG and/or for the demonstrated sensitivity to adenosine diagnosed by a pediatric cardiologist with >15 years of experience in pediatric arrhythmia management.

Exclusion: Age – Greater than 18 years or less than one year

- Unstable – Patients with hypotension or those who required immediate cardioversion
- ECG diagnosis of automatic atrial tachycardia, permanent form of junctional reciprocating tachycardia, atrial fibrillation or flutter
- Underlying congenital heart disease
- Contraindications to Valsalva Maneuver/upside down position or inability to perform them

Intervention: Upside-down position treatment

- Parents manually flipped patients <30 kg or uncooperative and <30 kg upside-down for 30 seconds.
- Cooperative patients >30 kg were asked to perform a handstand for 30 seconds.

Comparison: Standard Valsalva maneuver treatment

- The semi-recumbent patient blew into a 10 ml syringe to move the plunger for 15 seconds.

Outcomes:

Primary: Cardioversion out of SVT
Secondary: "Rescue" cardioversion – If the patients failed the maneuver, they then attempted the other group's technique and this rate of cardioversion was measured.
Relapse: At the patient's first relapse, the patients underwent the opposite intervention, with the protocol to switch techniques in event of failure.

Authors' Conclusion:

"The upside-down position was safe and tended to be more effective than standard VM (Valsalva Maneuver) for out of hospital SVT treatment. Doctors and parents should be more aware of this effective but overlooked manoeuvre."

Quality Checklist for Randomized Clinical Trials

☒	1. The study population included or focused on those in the emergency department.
☑	2. The patients were adequately randomized.
?	3. The randomization process was concealed. Unsure given the information in the paper.
☑	4. The patients were analyzed in the groups to which they were randomized
☒	5. The study patients were recruited consecutively (i.e. no selection bias).
?	6. The patients in both groups were similar with respect to prognostic factors. Yes and 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 patient-important outcomes were considered.
☒	11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

There were 15 girls and 9 boys enrolled in this study with a mean age of 7 years. They had different types of SVT and eight were on pharmacological SVT prophylaxis.

- 16 patients had atrioventricular re-entry tachycardia
- 4 patients had atrioventricular nodal re-entry tachycardia
- 4 patients' ECG features were consistent with both of the aforementioned SVT types

Outcome

The upside-down valsalva maneuver did not statistically convert more children out of SVT compared to standard valsalva maneuver.

Primary Outcome: The upside-down position terminated SVT in 67% of the study group versus 33% of the standard Valsalva maneuver group on the first try (p=0.1)

Secondary Outcomes: Rescue, Relapse and Relapse Rescue

- There was no statistical difference in these outcomes either and the details will be put in the show notes.
- **Rescue:** The upside-down position terminated SVT as a rescue attempt after a failed Valsalva maneuver 50% of the time, and the Valsalva maneuver terminated SVT as a rescue after a failed upside-down 0% of the time (p=0.2).
- **Relapse:** The upside-down terminated SVT in 67% of patients vs 42% of controls (p=0.2)
- **Relapse Rescue:** The upside-down terminated SVT as a rescue attempt after a failed Valsalva maneuver 71% of the time and the Valsalva maneuver terminated SVT as a rescue after a failed upside-down 25% of the time (p=

Adverse Events: There were no adverse events recorded.

Talk Nerdy to Me

Because this is Bob's sixth visit to the SGEM as the guest skeptic we are going to have six nerdy points to discuss.

1) Selection Bias:

The authors address this, but patients were selected exclusively from a tertiary referral center. The authors also state that they selected patients and families that seemed very reliable. This makes it hard to apply these results to all children presenting to an emergency department with SVT

2) Misleading Figure:

Figure 1 shows a flow chart to help describe the manner in which the patients flipped between methods. When describing the patients in the study group for the first episode of SVT, the authors show how 4 of 12 patients failed the upside-down modified Valsalva maneuver. The figure then shows these 4 patients undergoing a rescue Valsalva maneuver but depicts how 8 of 8 patients that failed the upside-down modified Valsalva maneuver failed the rescue Valsalva maneuver. It is unclear how the patients doubled, and this sort of error unfortunately detracts from the study.

3) Adverse Events:

The authors confidently state that the method is safe but do not describe any sort of monitoring for adverse events. It is unclear if the parents were given instructions on needing to document and adverse events. The study was also far too small to claim safety as it was not powered to investigate this outcome. It would have been more accurate to state that there were no adverse events. This is what they did say in the result section of the paper.

3) Adverse Events:

The authors confidently state that the method is safe but do not describe any sort of monitoring for adverse events. It is unclear if the parents were given instructions on needing to document and adverse events. The study was also far too small to claim safety as it was not powered to investigate this outcome. It would have been more accurate to state that there were no adverse events. This is what they did say in the result section of the paper.

4) Study Size:

This was a relatively small study with only 24 patients. It should to be replicated in a larger and preferably multi-center study.

5) Trend:

They report a trend towards greater effectiveness of the upside-down modified version of the Valsalva maneuver compared to the standard maneuver. What that means is the intervention was not statistically significant.

6) P-values:

Dr. Ioannidis just published a paper suggesting we move the threshold for p-values to 0.005 (JAMA 2018). He is the same author who wrote a paper called "Why Most Published Research Findings Are False" (PLoS 2005). This caused a bit of a twitter storm about the misunderstanding and misuse of p-values. This study relied on p-values to interpret the data. P-values do not provide information on effect size, precision or clinical significance of a result. We need to move away from interpreting anything <0.05 as "significant" and anything >0.05 as "not significant". This is a much larger topic and I will put some links in the show notes to better understand this issue.

- S. Greenland et al. Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations. Eur J Epidemiol 2016
- Letter to the Editor.P-values are misunderstood, but do not confound
- J Clin Epi 2011

Comment on Authors' Conclusion Compared to SGEM Conclusion:

We disagree with the authors conclusions. In part because they claimed safety but did not design the study for safety or adequately explain how adverse events were monitored. Additionally, we do not believe doctors and parents should be told this is an effective maneuver until it has been demonstrated in a high-quality study.

Bottom Line

The upside-down maneuver exists, but further research is needed to determine if it has efficacy in children with SVT.

Case Resolution

Case Resolution:

You attempt a standard vagal maneuver with the patient, which fails. The patient then undergoes chemical cardioversion with adenosine successfully.

Clinical Application:

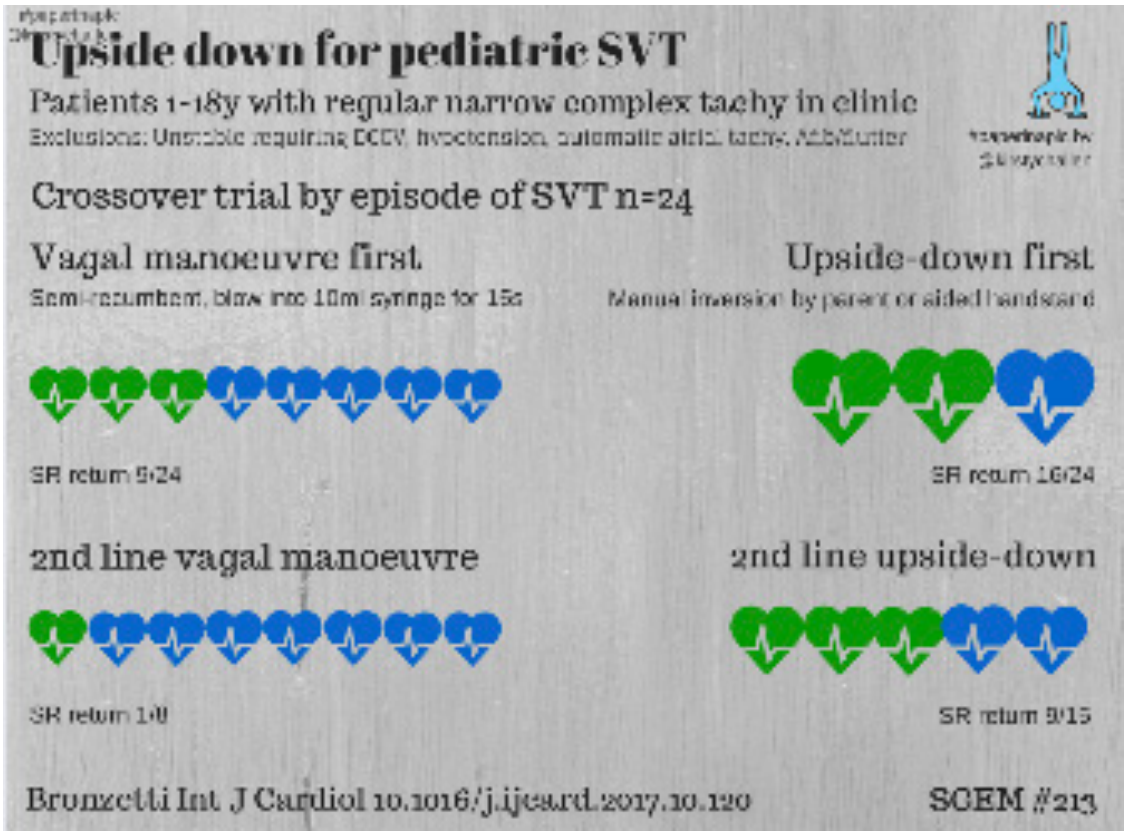
There is no clinical application for this upside-down modified Valsalva maneuver unless future research demonstrates its safety and efficacy.

What Do You Tell the Patient ?

You inform the family that the upside-down technique is still under investigation and not been demonstrated to be better than usual treatment. However, they can always discuss the modified Valsalva maneuver with their cardiologist at their next follow-up.

Episode End Notes

Infographic:



Twitter Poll:

Have you ever used the upside-down position/handstand to convert a child out of SVT? #FOAMed #FOAMped #EBM thesgem.com/2018/04/sgem21... @EMtogether @NikkiAbela @andrewjtagg @SketchyEBM @_NMay @TessaRDavis @DFTBubbles @srrezaie @AAPNews @AmerAcadPeds

- 5% Yes - It worked
- 4% Yes - It did not work
- 60% No - Never used
- 31% What - A handstand ???

References:

1. J.C.Salerno,M.M.Garrison,C.Larison,S.P.Seslar,Case fatality in children with supraventricular tachycardia in the United States, Pacing Clin. Electrophysiol. 34 (7) (2011) 832–836
2. J. Brugada et al. Pharmacological and non-pharmacological therapy for arrhythmias in the pediatric population: EHRA and AEPC-Arrhythmia Working Group joint consensus statement. EP Europace, Volume 15, Issue 9, 1 September 2013, Pages 1337–1382
3. I. Constantiniu, Unusual treatment of paroxysmal tachycardia, Br. Med. J. 1 (5744) (1971) 347.
4. Y.P. Tai, C.B. Colaco, Upside-down position for paroxysmal supraventricular tachycardia, Lancet 2 (8258) (1981) 1289.
5. M. Hare, S. Ramlakhan, Handstands: a treatment for supraventricular tachycardia? Arch. Dis. Child. 100 (1) (2015) 54–55

SGEM#
214

Woman:

The TXA Trial For Post-Partum Hemorrhage

Question

Does TXA improve survival in women with post-partum hemorrhage?

Case

37-year-old primiparous woman has a spontaneous vaginal delivery following an induction of labour at 39 weeks for gestational diabetes for which she is treated with insulin. She delivered a vigorous 3800g boy following a brief episode of shoulder dystocia. She is otherwise healthy but does have a remote history of asthma. Aside from insulin and prenatal vitamins, she takes no medications.

Approximately five minutes after delivery of the placenta, as you are evaluating her perineum, she begins to have a moderate amount of vaginal bleeding. Her nurse performs fundal massage which temporarily improves her flow.

Bottom Line

Tranexamic acid may or may not improve survival in women with post-partum hemorrhage.

Guest Skeptic: Dr. Nick Papalia completed his MD at Western University. He is currently completing his third year of Obstetrics and Gynecology residency at the University of Calgary.

Date: April 13, 2018

Reference: Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial. The Lancet 2017

Episode 214 Overview

Case:

37-year-old primiparous woman has a spontaneous vaginal delivery following an induction of labour at 39 weeks for gestational diabetes for which she is treated with insulin. She delivered a vigorous 3800g boy following a brief episode of shoulder dystocia. She is otherwise healthy but does have a remote history of asthma. Aside from insulin and prenatal vitamins, she takes no medications.

Approximately five minutes after delivery of the placenta, as you are evaluating her perineum, she begins to have a moderate amount of vaginal bleeding. Her nurse performs fundal massage which temporarily improves her flow.

Background:

Utako and Shosuke Okamoto discovered TXA in the 1950's while searching for a treatment for postpartum hemorrhage [1]. TXA is a synthetic analog of the amino acid lysine. The normal process is for plasminogen to breakdown fibrin and prevent blood clots. TXA acts as an antifibrinolytic agent. It binds to lysine receptor sites on plasminogen blocking its action on fibrin. The ultimate result is the fibrin matrix structure is maintained and bleeding is reduced.

Post-partum hemorrhage (PPH) is defined by the World Health Organization (WHO) as:

- *"a cumulative blood loss of greater than or equal to 1,000 mL or blood loss accompanied by signs or symptoms of hypovolemia within 24 hours after the birth process". PPH is one of the leading causes of maternal mortality around the world [2].*

We have covered the use of TXA for trauma (CRASH-2) with Dr. Anand Swaminathan. This trial showed TXA is safe and effective treatment in patients with hemorrhagic shock from trauma in reducing mortality. We also did a couple of podcasts on TXA being effective for epistaxis (SGEM#210 and SGEM#53).

The American College of Obstetricians and Gynecologists (ACOG) published guidelines for the management of postpartum hemorrhage including the use of TXA. They give TXA a Level B recommendation (based on limited or inconsistent scientific evidence): [3]

- *"Given the mortality reduction findings, tranexamic acid should be considered in the setting of obstetric hemorrhage when initial medical therapy fails."*
-

There was also a commentary published in the issue of Obstetrics and Gynecology by Pacheco et al. [4] They concluded that TXA appeared to be a safe and effective option in the treatment of post-partum hemorrhage. Their recommendation is as follows:

- *"In established postpartum hemorrhage, may administer 1 g intravenously within 3 hours of birth. If required, may administer a second dose within the next 24 hours. The half-life of TXA is 2 hours and its antifibrinolytic effect lasts for up to 7–8 hours in serum. A single dose should suffice in most cases."*

We checked to see if the Society of Obstetricians and Gynaecologists of Canada (SOGC) and could not find any practice guidelines on TXA for PPH. The latest guidelines from the SOGC on PPH was published in 2009 [5].

Clinical Question

Does TXA improve survival in women with post-partum hemorrhage?

Population: Women greater than 16 years of age with a clinical diagnosis of PPH after vaginal birth (> 500ml blood loss) or cesarean section (> 1,000ml blood loss) or blood loss causing haemodynamic instability and the clinician was uncertain whether or not to use TXA.

Exclusion: If the clinician felt that TXA would either clearly be beneficial or clearly would not be appropriate.

Intervention: 1g TXA via slow IV infusion in addition to usual management. Option of additional administration if bleeding continued for 30 minutes or more or stopped and restarted.

Comparison: Placebo

Outcomes:

Primary: All-cause mortality or hysterectomy within 42 days of randomisation

Secondary:

- Mortality due to bleeding
- Thromboembolic events (deep-vein thrombosis, pulmonary embolism, myocardial infarction, and stroke)
- Surgical interventions (intrauterine tamponade, embolisation, brace sutures, arterial ligation, hysterectomy, and laparotomies done after randomisation to control bleeding and achieve haemostasis)
- Complications (renal failure, cardiac failure, respiratory failure, hepatic failure, sepsis, and seizures)
- Adverse events (untoward medical events)
- Quality of life measured using the EQ5D
- Status of any thromboembolic events in breastfed babies

Authors' Conclusion:

"Tranexamic acid reduces death due to bleeding in women with post-partum haemorrhage with no adverse effects. When used as a treatment for postpartum haemorrhage, tranexamic acid should be given as soon as possible after bleeding onset."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The patients were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The patients were analyzed in the groups to which they were randomized
- [?] 5. The study patients were recruited consecutively (i.e. no selection bias). Unsure.
- [✓] 6. The patients 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 patient-important outcomes were considered.
- [x] 11. The treatment effect was large enough and precise enough to be clinically significant . Unsure

Key Results

There were 20,021 women included in the trial (10,036 TXA and 9,985 placebo). Maternal death occurred in 483 (2.4%) of all women within 24 hours and 43 (9%) of the deaths were within one hour after randomization

OUTCOME

No statistical difference in the primary composite outcome (all-cause mortality or hysterectomy).

Primary Outcome: All-cause mortality or hysterectomy within 42 days of randomisation

- No difference 5.3% TXA vs. 5.5% Placebo
- RR 0.97, 95% CI 0.87 to 1.09; p=0.65

	TXA	Placebo	RR
All-Cause Mortality or Hysterectomy	5.3%	5.5%	0.97, 95% CI 0.87 - 1.09; p=0.65
All-Cause Mortality	2.3%	2.6%	0·88, 95% CI 0·74–1·05; p=0·16
Hysterectomy Rate	3.6%	3.5%	1·02, 95% CI 0·88–1·07; p=0·84
Mortality Due to Bleeding	1.5%	1.9%	0.81, 95% CI 0.65-1.00; p=0.045
*** Adjusted Mortality			0.78, 95% CI 0·62–0·98; p=0·03
Mortality Due to Bleeding Treated <3hrs	1.2%	1.7%	0·69, 95% CI 0·52–0·91; p=0·008

Secondary Outcomes:

- No All-Cause Mortality: No difference 2.3% vs. 2.6%
  RR 0.88, 95% CI 0.74–1.05; p=0.16
- Hysterectomy Rate: No difference 3.6% vs. 3.5%
  RR 1.02, 95% CI 0.88–1.07; p=0.84
- Mortality Due to Bleeding: Significant 1.5% vs. 1.9%
  RR 0.81, 95% CI 0.65-1.00; p=0.045
  Adjusted RR 0.78, 95% CI 0.62–0.98; p=0.03
  No difference in deaths from other causes (PE, organ failure, sepsis, eclampsia and other causes)
  Subgroup less than three hours: Significant difference 2% vs. 1.7% RR 0.69, 95% CI 0.52–0.91; p=0.008

Thrombotic Events: No difference

Surgical Interventions: Women who had TXA were more likely to have had brace sutures and less likely to have had a laparotomy.

Transfusions: No difference

Of those who did get transfused, no difference in mean number of units between groups
Quality of Life: No difference
Adverse Events: No difference

Subgroup Analysis: This is hypothesis generating. However, there was no difference in the primary outcome (mortality at 28 days) for any of the subgroups including severity of sepsis.

Talk Nerdy to Me

1) Inclusion:

Clinical diagnosis of PPH was based on estimated blood loss. This is a subjective parameter. Can physicians reliably tell who has lost more than 500ml after a vaginal delivery and 1,000ml post C-section? In addition, they used hemodynamic instability as another inclusion criteria but did not define what would constitute compromised stability. Was it based on an objective measure of blood pressure and/or heart rate?

It is even more complicated/vague because the inclusion was not just based on the presence of post-partum hemorrhage but the clinicians needed to be uncertain about giving TXA. While these inclusion criteria may be pragmatic they can also introduce selection bias. It is unclear if the bias would be in favor or against the efficacy of TXA.

You could also see how this vague inclusion criteria could lead to indication creep where all women with any bleeding post-partum are given TXA routinely.

2) Power:

There were some complications with how they powered the study. It was originally powered for a 25% relative reduction of the composite outcome (all-cause mortality or hysterectomy). This relative reduction translates to a 1% absolute reduction (4% to 3%). Then they figured out the decision to do a hysterectomy was made usually at the same time as randomization.

Therefore, they recalculated the sample size for 25% all-cause mortality relative reduction. This decreases the absolute reduction to only 0.75% (3% to 2.25%). As a result, the sample size increased from 15,000 to 20,000 due to the small effect size they were trying to determine.

Their sample size was achieved by recruiting just over 20,000 women to determine if TXA would decrease all-cause mortality by 0.75%. However, the observed all-cause mortality rate was a little lower (2.6%) than the 3% estimated. Regardless, they found only a 0.4% absolute reduction in all-cause mortality and this was not statistically significant (RR 0·88, 95% CI 0·74–1·05; p=0·16)

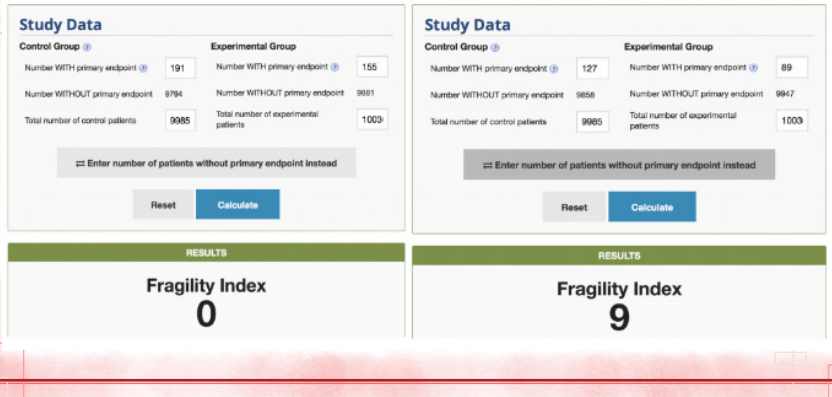
3) Sub-Group Analyses:

They pre-planned a number of subgroup analyses for the primary composite outcome. One was to look at time to TXA after birth, another was type of birth (vaginal vs. C-section) and the third was primary cause of hemorrhage (uterine atony vs. all others). The only statistical difference observed was in the time to TXA if given in less than three hours after birth. This positive result should be viewed with much skepticism. Subgroup analyses are considered hypothesis generating and should not be over-interpreted.

4) Fragility:

This study can also be viewed using the fragility index [6]. This is a way to measure the robustness of the results obtained. It is calculated by converting one patient in the group (treatment or control) from "non-event"to an "event". In this case, how many women would have to have a different outcome for the study not to be statistically significant ($p \geq 0.05$)?

The primary composite outcome of all-cause mortality or hysterectomy was not statistically different. All-cause mortality was also not statistically different. However, there was a statistical difference in death due to bleeding. But the calculated fragility index was zero [7]. This result emphasizes the lack of robustness of the WOMAN trial.

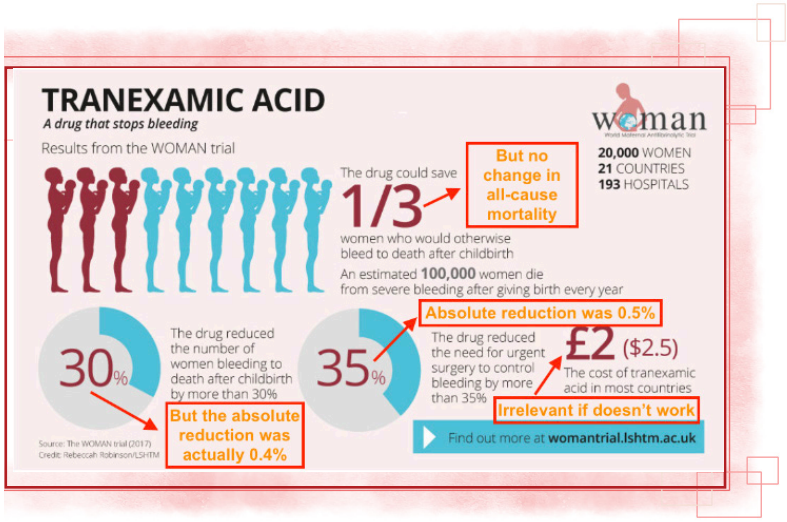


If you calculate the fragility index for the subgroup analysis of the secondary outcome of bleeding mortality treated within three hours, it is nine.

So, if nine women had their death attributed to something other than bleeding by the treating clinician than the results would no longer be considered statistically significant.

5) Spin:

This study seems to have been spun as a positive study despite the lack of statistical difference in the primary composite outcome. This is evident in the first sentence of the discussion. They did not lead with the primary outcome but rather with a secondary outcome (death due to bleeding) and gave a relative number (nearly 1/3 reduction in death) rather than absolute number. The absolute reduction in death due to bleeding was 0.4% (NNT=250). But the fragility index was zero.



An infographic created from the WOMAN trial data presents a distorted picture. They highlight the relative reduction of the secondary outcome. They do not identify that there was no statistical difference in the primary outcome. They also do not report the absolute reduction in death due to bleeding was actually 0.4%.

6) Jerome Hoffman:

I discussed this trial with Legend of EM Dr. Jerome Hoffman about this paper. He wanted to emphasize a few points:

1. External validity from developing countries to developed countries. What resources did their health care system have to address post-partum hemorrhage?
2. The over powering of studies. We often talk about under-powered studies but not over powered studies. Studies are usually designed to find a difference between two things and if you have a large enough study you will find a statistical difference because no two things are identical.
3. Disease specific mortality can be hard to define. Overall mortality was not statistically different between the two groups but death due to bleeding was lower. Clinicians were requested to record the immediate cause of death rather than the underlying cause of death. At the end of the day, if we save more women from bleeding to death due to post-partum hemorrhage but the overall number of deaths is the same then what is the benefit?
4. Coagulation in the body is finely tuned. When we tip the balance towards less bleeding it tends to increase clotting.
5. The study was funded in part by Pfizer the maker of TXA. This should make us more skeptical of the results and how the results will be marketed by the sponsor.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We do not agree with the authors' conclusions.

Bottom Line

Tranexamic acid may or may not improve survival in women with post-partum hemorrhage.

Case Resolution

Case Resolution:

You determine that your patient's bleeding to be secondary to atony, the number one cause of post-partum hemorrhage. You perform a bimanual exam to evacuate any remaining tissue and clots while asking the bedside nurse to initiate an oxytocin infusion. You also request for the post-partum hemorrhage kit in the room which has essential medications. Her bleeding has improved and she's no longer passing clots. You decide she needs a uterotonic beyond oxytocin but given her history of asthma, you elect for ergotomine which the nurse administers intra-muscularly.

Over next 15 minutes you repair her second degree laceration which has mostly been hemostatic. You assess her total estimated blood loss to be 1000mL (which is probably inaccurate) so you ask the nurse to administer 1g TXA by IV.

She has no further bleeding and is transferred to post-partum. On post-partum day one her hemoglobin is 83g/L (8.3g/dl) and she is discharged with a prescription for iron polysaccharide.

Clinical Application:

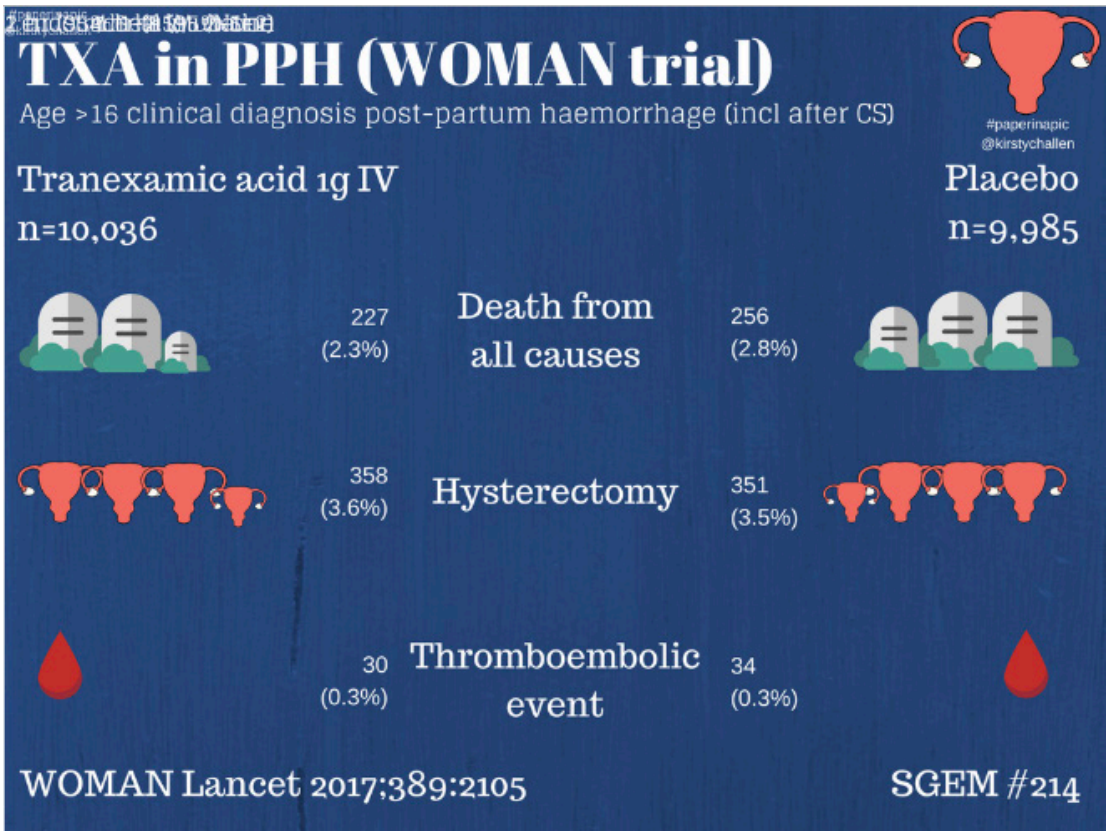
We do not have good evidence that TXA provides a mortality benefit in post-partum hemorrhage. Until there is better evidence of efficacy it should not be incorporated into protocols for routine use but rather may be considered as suggested by the ACOG level B recommendation.

What Do You Tell the Patient ?

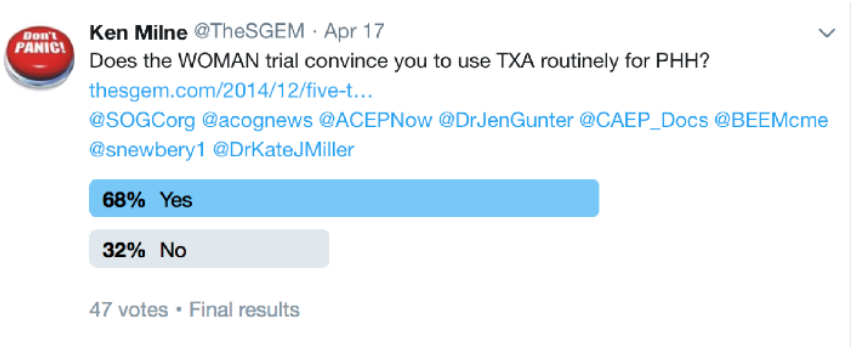
When you are having heavier bleeding after your vaginal delivery. We have strong evidence for some medicines can improve bleeding. There is a newly purposed medicine called TXA that may or may not have a benefit. There is not enough evidence to suggest we should use TXA routinely in favour of the other medications that we know are effective.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **REBEL EM:** The WOMAN Trial Early TXA in Post-Partum Hemorrhage
- **EM Literatura of Note**
- **Broome Docs:** Thoughts WOMAN Trial

References:

1. TXA Central
2. Say L, Chou D, Gemmill A, Tuncalp O, Moller AB, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health 2014
3. ACOG Practice Bulletin – Postpartum Hemorrhage 2017.
4. Pacheco LD et al. Tranexamic Acid for the Management of Obstetric Hemorrhage. Obs and Gyn Oct 2017
5. SOGC – Active Management of the Third Stage of Labour: Prevention and Treatment of Postpartum Hemorrhage 2009

SGEM#
215

Love Will Tear Us Apart:

Diagnostic Challenges Of Aortic Dissection

Question

What is the diagnostic accuracy in aortic dissection of various clinical features (history and physical), imaging tests and clinical decision instruments?

Case

You are in the emergency department caring for a 65-year-old man with sharp chest pain radiating to the back. Blood pressure is elevated, and his pain was sudden in onset. His chest x-ray is normal, and there is no sign of asymmetric pulses. The EKG and laboratory tests are normal. You are wondering if you need to order a CT to rule out an aortic dissection.

Bottom Line

Diagnosing aortic dissection in an undifferentiated population presenting to the emergency department continues to be a diagnostic challenge.

Guest Skeptic: Dr. Corey Heitz is an emergency physician in Roanoke, Virginia. He is also the CME editor for Academic Emergency Medicine (AEM).

Date: April 12, 2018

Reference: Ohle R et al. Clinical Examination for Acute Aortic Dissection: A Systematic Review and Meta-analysis. AEM April 2018.

Episode 215 Overview

Case:

You are in the emergency department caring for a 65-year-old man with sharp chest pain radiating to the back. Blood pressure is elevated, and his pain was sudden in onset. His chest x-ray is normal, and there is no sign of asymmetric pulses. The EKG and laboratory tests are normal. You are wondering if you need to order a CT to rule out an aortic dissection.

Background:

Aortic dissection is a rare but deadly disease which can confound the emergency physician's diagnostic abilities. Some estimates are that up to 38% of cases are initially missed [1]. Mortality is up to 40% in the acute phase [2] , and 70% by two weeks [3].

The most common feature of aortic dissection is pain, in the chest, back, and/or abdomen, but with aortic dissection being so rare and pain being so prevalent a complaint, diagnosing aortic dissection becomes difficult. Data is lacking on predictive value of clinical features; much of the prior literature focuses on patients already diagnosed with aortic dissection.

There are two clinical prediction tools for the diagnosis of aortic dissection. One is from the American Heart Association called the aortic dissection detection (ADD) risk score. Our good friend over at REBEL EM, Salim Rezaie put together a nice table showing the score that we will include in the show notes. If any one of the predisposing conditions, pain features or physical exam findings are positive you add one point to the score

The other is a simpler three-variable rule called the Von Kodolitsch score. This tool includes aortic pain (immediate-onset tearing or ripping pain), mediastinal/aortic widening on chest x-ray, or pulse/BP differential.

Aortic Dissection Detection Score

Predisposing Conditions	Pain Features	Physical Exam Findings
Marfan Syndrome	Abrupt Onset of Pain	Pulse Deficit or SBP Differential
Family History of Aortic Disease	Severe Pain Intensity	Focal Neurological Deficit • Pain
Known Aortic Valve Disease	Ripping or Tearing Pain	New Aortic Insufficiency Murmur • Pain
Recent Aortic Manipulation		Hypotension/Shock State
Known Thoracic Aortic Aneurysm		
If positive in any column, then add one point		

American College of Emergency Physicians (ACEP) published a guideline in 2015 for the diagnosis of acute aortic dissection. ACEP gives level C recommendations for the use of existing clinical decision tools:

- *"In an attempt to identify patients at very low risk for acute non-traumatic thoracic aortic dissection, do not use existing clinical decision rules alone. The decision to pursue further workup for acute non-traumatic aortic dissection should be at the discretion of the treating physician."* [4]

Clinical Question

What is the diagnostic accuracy in aortic dissection of various clinical features (history and physical), imaging tests and clinical decision instruments?

Population: Adult patients presenting to the emergency department with suspected acute aortic dissection in whom testing, criterion standard, and results of testing were available,

Intervention: This was a review of diagnostic accuracy in aortic dissection, so no interventions were performed.

Comparison: None

Outcome: Diagnostic accuracy of various tests, features of aortic dissection and clinical decision instruments (sensitivity, specificity and likelihood ratios).

This is an SGEMHOP episode. We are pleased to welcome the lead author of this SRMA, Dr. Robert Ohle. Robert is a practicing emergency medicine physician and Director of Research for emergency medicine at Health Science North in Sudbury, Ontario. His research program focuses on improving recognition and reducing time to treatment of acute aortic dissection. He is currently working on Canadian practice guidelines for the diagnosis of acute aortic dissection in the emergency department.

Authors' Conclusion:

"Suspicion for acute aortic dissection should be raised with hypotension, pulse, or neurologic deficit. Conversely, a low AHA ADD score decreases suspicion. Clinical gestalt informed by high- and low-risk features together with an absence of an alternative diagnosis should drive investigation for acute aortic dissection."

Quality Checklist for Randomized Clinical Trials

- ☑ 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.

Key Results

From the search, 792 abstracts and articles were found, and 60 met the eligibility criteria. Nine studies were included in the review. The overall quality was considered acceptable but there was moderate to high heterogeneity.

Outcome

No individual risk factors, historical features, physical exam findings or basic investigations can rule in or out aortic dissection. Clinical decision instruments show some potential in improving diagnostic accuracy but are not ready for

Risk Factors:

- **History of Hypertension:** LR+ 1-1.53 (I2 47%), LR- 0.61-1 (I2 84%)
- **Diabetes:** LR+ 0.13-0.69 (I2 48%)
- **Connective Tissue Disease:** LR+ 0.09-16.54 (I2 84%), LR- 1.11
- **Ischemic Heart Disease:** LR+ 1.29 (95% CI = 1.14–1.45), LR– 0.39 (95% CI = 0.18–0.88)

Historical Features:

- **Syncope:** LR+ 1–2.4 (I2 35%)
- **Severe Pain:** LR+ 1.47–2.29 (I2 95%), LR– 0.31–0.68 (I2 90%)
- **Acute Onset:** LR+ 1.01–2.60 (I2 95%), LR– 0.30–0.98 (I2 95%)
- **Back Pain:** LR+ 1.04–23.14 (I2 95%), LR– 0.64–0.99
- **Tearing/Ripping:** LR+ 0.85-10.76 (I2 89%), LR- 0.41-1.26 (I2 34%)

Adverse Events:

- Focal Neurologic Deficits: LR+ 4.34 (95% CI 3.33–5.65)
- Pulse Deficit: LR+ 2.48 (95% CI 1.51–4.09)
- Hypotension: LR+ 1.2–4.3 (I2 = 42%)
- BP Differential Alone: No studies
- Pulse differential: Sensitivity 21%-49%, specificity 82%–95%

Basic Investigations:

- Mediastinum <8cm: LR– 0.136–0.600 (I2 93%)
- WBCs >15,000 cells/ml: LR+ 0.37 (95% CI 0.20–0.68)
- Ischemic Changes on ECG LR+ 1.03 (95% CI 0.29-3.63)

Clinical Decision Tools:

- Von Kodolitsch score 0: LR– 0.07 (95% CI 0.06–0.09)
- Von Kodolitsch score 3: LR+ 65.79 (95% CI 4.08–1061.4)
- AHA ADD risk score = 0: LR– of 0.22 (95% CI 0.15–0.33)
- AHA ADD risk score >1: LR+ 2.29 (95% CI 1.83–2.86)

Talk Nerdy to Me

1) Search:

You did a great search. It was interesting to see that four of the nine articles included weren't found on your initial search, but by reviewing references of the ones that were. This emphasizes the importance of not just doing an electronic database search but also having a research librarian, hand searching references and looking for the grey literature. Do you think there may have been other missed studies?

2) Heterogeneity:

The heterogeneity on some of the was moderate to high. Can you explain heterogeneity briefly to the SGEMers and comment on how do you think this should impact our interpretation of the results.?

3) Partial Verification of Bias:

The prevalence of aortic dissection in the included papers ranged from 22% to 76%. These numbers seem higher than clinical practice would tell us when patients present to the emergency department with "undifferentiated chest pain". This suggests partial verification bias. Can you explain partial verification bias to the SGEMers and how it could impact the sensitivity and specificity? Also, can you comment on how we can apply this in practice considering the bias?

4) D-Dimer:

This is an elephant in the room. You did not investigate the diagnostic accuracy of the d-dimer for aortic dissection. Can you explain why you did not address this issue and also summarize your thoughts on the use of the d-dimer?

5) Clinical Decision Tools:

You looked at two clinical decision tools (AHA ADD risk score and the Von Kodolitsch score). ACEP guidelines only give a C recommendation for using clinical decision instruments for the diagnosis of aortic dissection. However, a Von Kodolistch score has a LR- of 0.07 (95% CI 0.06-0.09) which could be considered good enough to rule-out the condition. Would you recommend using the Von Kodolistch scoring system?

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

Bottom Line

Diagnosing aortic dissection in an undifferentiated population presenting to the emergency department continues to be a diagnostic challenge.

Case Resolution

Case Resolution:

The patient's pain persists, and in fact worsens despite medical treatment in the emergency department. You elect to perform a CT angiogram, and diagnose him with a descending aortic dissection.

Clinical Application:

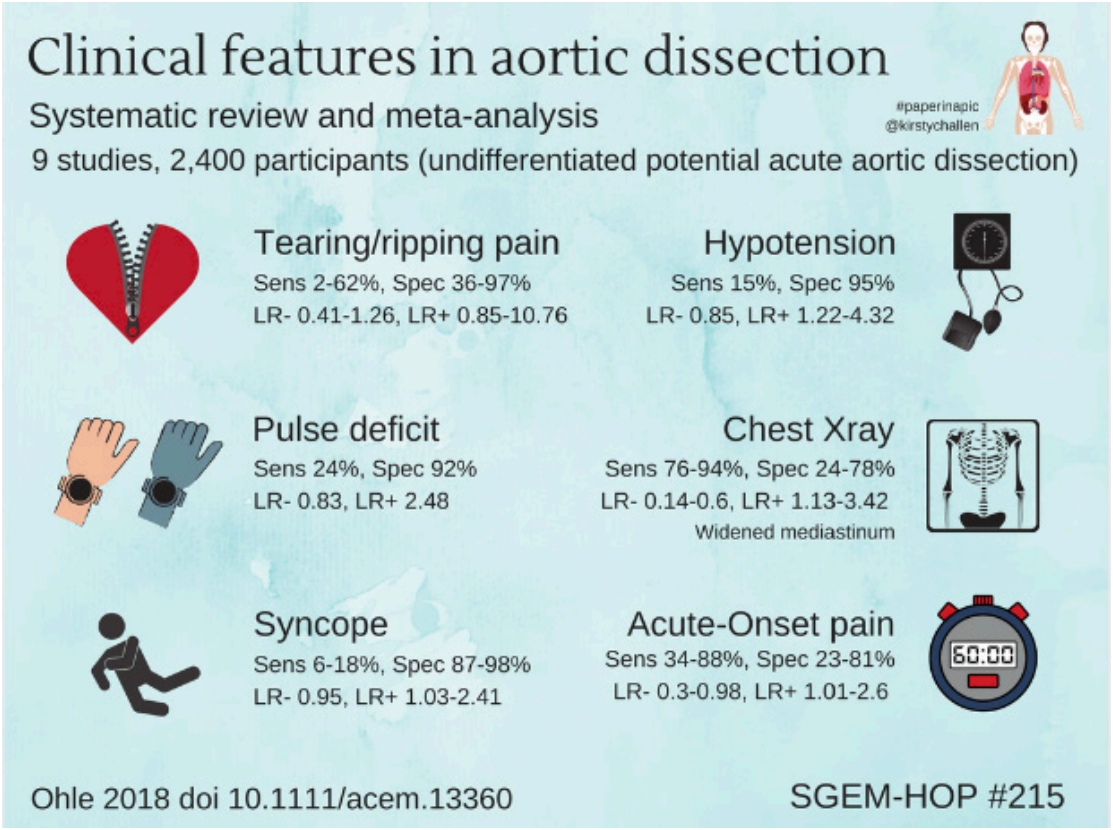
We do not have strong evidence to guide our care in these patients. Various clinical data can increase and decrease the likelihood of an aortic dissection but not rule it in or out. It will take a combination of a good history, followed by a directed physical exam, basic investigations, clinical gestalt and shared decision making on how best to proceed. These decisions will all take place in a context that will depend on many factors (patient, physician and resources, medical-legal environment, etc).

What Do You Tell the Patient ?

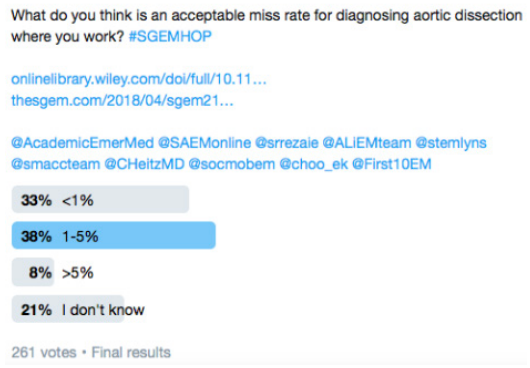
Well, prior to the CT, I tell my patient that his studies looking at acute coronary abnormalities are normal, but his pain is concerning for aortic dissection, or a tear in the big blood vessel coming from his heart. I would like to perform a CT scan to rule out this life-threatening condition.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **Life in the Fast Lane:** Aortic Dissection
- **EM Cases:** Aortic Dissection
- **First10EM:** D-dimer and Aortic Dissections
- **REBEL EM:** The ADVISED Trial – A novel clinical algorithm for the diagnosis of acute aortic syndromes
- **St. Emlyns:** The Time Bomb of Doom What I Think About When I'm Tending Broad Beans
- **BroomeDocs:** Gamblers and Dissection – A Music Treat.

References:

1. Spittell PC, Spittell Jr JA, Joyce JW. et al. Clinical features and differential diagnosis of aortic dissection: experience with 236 cases (1980 through 1990). Mayo Clin Proc.1993;68:642-651.
2. Hirst AE Jr, Johns VJ Jr, Kime SW Jr. Dissecting aneurysm of the aorta: a review of 505 cases. Medicine 1958;37:217–79.
3. Hagan PG, Nienaber CA, Isselbacher EM, et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA 2000;283:897– 903.
4. Diercks DB, Promes SB, Schuur JD, Shah K, Valente JH, Cantrill SV. Clinical policy: critical issues in the evalua- tion and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. Ann Emerg Med 2015;65(32–42):e12.
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SGEM#
216

Pump It Up:

Corticosteroids For Patients With Pneumonia Admitted To Hospital

Question
Do steroids safely reduce morbidity and mortality in patients with community acquired pneumonia?

Case
A 72-year-old gentleman presents to your emergency department. He has been generally unwell for around one week, with a worsening cough, shortness of breath and fever. He is now feeling extremely short of breath, appears confused and is pyrexial at 39 degrees centigrade. His observations are heart rate of 102 beats per minute, respiratory rate of 34 breaths per minute, blood pressure of 110/67 mmHg, and oxygen saturation of 91% on room air.

Bottom Line
Corticosteroids appear to improve mortality and/or morbidity in patients admitted to hospital with community acquired pneumonia.

Guest Skeptic: Dr. Jake Turner, a foundation doctor working in the UK.

Date: April 25, 2018

Reference: Stern A et al, Corticosteroids for pneumonia (Review). Cochrane Database of Systematic Reviews. December 2017.

Episode 216 Overview

Case:

A 72-year-old gentleman presents to your emergency department. He has been generally unwell for around one week, with a worsening cough, shortness of breath and fever.

He is now feeling extremely short of breath, appears confused and is pyrexial at 39 degrees centigrade. His observations are heart rate of 102 beats per minute, respiratory rate of 34 breaths per minute, blood pressure of 110/67 mmHg, and oxygen saturation of 91% on room air.

Background:

There have been a large number of trials on steroids for a variety of conditions in the last year and we have covered some of them on the SGEM:

- *The ADRENAL trial on steroids in septic shock demonstrating no all-cause mortality benefit at 90 days (SGEM#208).*
- *Oral prednisolone in preschool children with virus-associated wheeze showed a decrease in emergency department length-of-stay with steroids compared to placebo (SGEM#206).*
- *Corticosteroids for sore throats seem to provide some modest benefit (SGEM#203).*
- *A single dose of dexamethasone was non-inferior to a three-day course of oral prednisolone in the treatment of children with an acute asthma exacerbation (SGEM#194).*

The Cochrane collaboration has come out with yet another paper on our favourite panacea, the steroid. This time, it is a systematic review and meta-analysis looking at the effects of steroids in patients presenting with a community acquired pneumonia.

This is an update from their previous review on the topic published in 2011. It showed that in most patients with pneumonia, corticosteroids are beneficial for accelerating the time to resolution of symptoms, but lacked enough data to make any recommendations.

- *"In most patients with pneumonia, corticosteroids are generally beneficial for accelerating the time to resolution of symptoms. However, evidence from the included studies was not strong enough to make any recommendations." [1]*

Clinical Question

Do steroids safely reduce morbidity and mortality in patients with community acquired pneumonia?

Population: Adults and or children presenting to the emergency department or primary care settings with a diagnosis of community acquired pneumonia confirmed radiographically.

Exclusion: Studies including only neonates, patients with Pneumocystis pneumonia, and patients with HIV.

Intervention: Systemic corticosteroids given at any dose, by any mode and for any duration. Steroids that were included were: prednisone, prednisolone, methylprednisolone, betamethasone, dexamethasone, triamcinolone, and hydrocortisone.

Comparison: Placebo or no corticosteroids.

Outcomes:

Primary: All-cause mortality at 30 days after randomization. If 30-day mortality not reported then the outcome closest to 30-days was used.

Secondary: They had ten secondary outcomes.

- Do corticosteroids reduce morbidity among people with community acquired pneumonia?
- Do corticosteroids increase complication rates among people with community acquired
- pneumonia?

Authors' Conclusion:

"Corticosteroid therapy reduced mortality and morbidity in adults with severe CAP; the number needed to treat for an additional beneficial outcome was 18 patients (95% CI 12 to 49) to prevent one death. Corticosteroid therapy reduced morbidity, but not mortality, for adults and children with non-severe CAP. Corticosteroid therapy was associated with more adverse events, especially hyperglycaemia, but the harms did not seem to outweigh the benefits."

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.

Key Results

They identified 17 RCTs (n=2,264) with community-acquired pneumonia to include in this SRMA. The majority or the trials (13) were in adults with only 4 (n=310) in children.

OUTCOME

All-cause mortality was significantly reduced with corticosteroid therapy.

Primary Outcome: All-cause mortality

- RR 0.66 (95% CI 0.47 to 0.92; I^2 = 0%, fixed-effect model)
- NNT of 18 to save one life in patients with severe CAP
- Adults with severe pneumonia:RR 0.58 (95% CI 0.40 to 0.84)
- Adults with non-severe pneumonia: RR 0.95 (95% CI 0.45 to 2.00)

Outcomes	Relative Risk	Patients and RCT	Quality of Evidence
Mortality Adult	0.66 (0.47-0.92)	n=1,863 (11 RCTs)	Moderate
Mortality Adults Severe	0.58 (0.40-0.84)	n=995 (9 RCTs)	Moderate
Mortality Adults Non-Severe	0.95 (0.45-2.00)	n=868 (4 RCTs)	Moderate
Early Clinical Failure Adults	0.40 (0.23-0.70)	n=1,324 (6 RCTs)	Moderate
Early Clinical Failure Adults Severe	0.32 (0.15-0.70)	n=419 (5 RCTs)	High
Early Clinical Failure Adults Non-Severe	0.68 (0.56-0.83)	n=905 (2 RCTs)	High
Early Clinical Failure Children	0.41 (0.24-0.70)	N=88 (2 RCTs)	High

Secondary Outcomes:

- **Morbidity:** Better with corticosteroids
- **Adverse Events:** No significant differences except for significantly more hyperglycemia in the corticosteroid group

Talk Nerdy to Me

As you'd expect from a Cochrane systematic review, the paper is pretty well done. I like the fact that one of their stated secondary outcomes was to look at complications from the corticosteroids, as we know that side effects and harms of treatment are often overlooked or under-reported.

1) External Validity:

This was a strong systematic review looking at lots of studies from all over the planet. The trials were conducted worldwide: eight in Europe, four in China or Japan, three in the Middle East, and one each in South Africa and Australia. Four of the 17 trials included in the SRMA were done in children. This makes it a very generalizable outcome and more likely to apply to most patient populations.

2) Patient Oriented Outcomes:

Mortality is a very dichotomous patient-oriented outcome. They also looked at the mostly dead (morbidity) and considered time to cure, hospital length of stay, complications, transfer to the ICU, clinical failure and adverse events.

3) Bias:

Almost all of the trials (14/17) had a high risk of reporting bias. This type bias when the nature and direction of the results influence the dissemination of the research. There are a number of types of reporting biases (publication bias, time lag bias, duplicate publication bias, location bias, citation bias, language bias, outcome reporting bias, etc). It is well recognized that positive trials are more likely to be published and published quicker than negative trials [2]. This type of bias can be compounded when put into a SRMA. They authors explored the possibility of small-study and publication biases using a funnel plot. No small-studies effect was demonstrated in the funnel plot analysis.

4) COPD Patients:

We know that COPD patients commonly present with chest infections and pneumonia, and these patients are known to benefit from steroids. The authors of this study were unable to separate out the patients with COPD from those without. It is possible, although I feel unlikely, that much of the benefit of corticosteroids came from patients with pneumonia and COPD.

5) Unknowns:

Despite this new SRMA containing more data there is still a number of unknowns:

- The number of children included in the review was small and the mortality event rate was low. This makes it difficult to comment on the impact of corticosteroids in this population.
- The trials used a variety of corticosteroids, doses and duration. Therefore, while the effect is consistent across different regiments it is unclear what the optimal management would be.
- Corticosteroids seem to have an effect on all-cause mortality in adults admitted with CAP. This effect is increased in the group with more severe pneumonia. However, the studies of corticosteroids for undifferentiated patients with sepsis have not demonstrated a clear mortality benefit?
- There was a lack of data in the included trials to perform most of the predefined subgroup analyses. Subgroup analyses can be hypothesis generating. Based on the information provided we do not know what the net effect corticosteroids would have on certain patient populations (ex. diabetics, elderly, viral pneumonia, hospital acquired pneumonia, etc).

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

Bottom Line

Corticosteroids appear to improve mortality and/or morbidity in patients admitted to hospital with community acquired pneumonia.

Case Resolution

Case Resolution:

I start the patient on IV co-amoxiclav and oral clarithromycin, as well as giving 40mg of oral prednisolone for seven days.

Clinical Application:

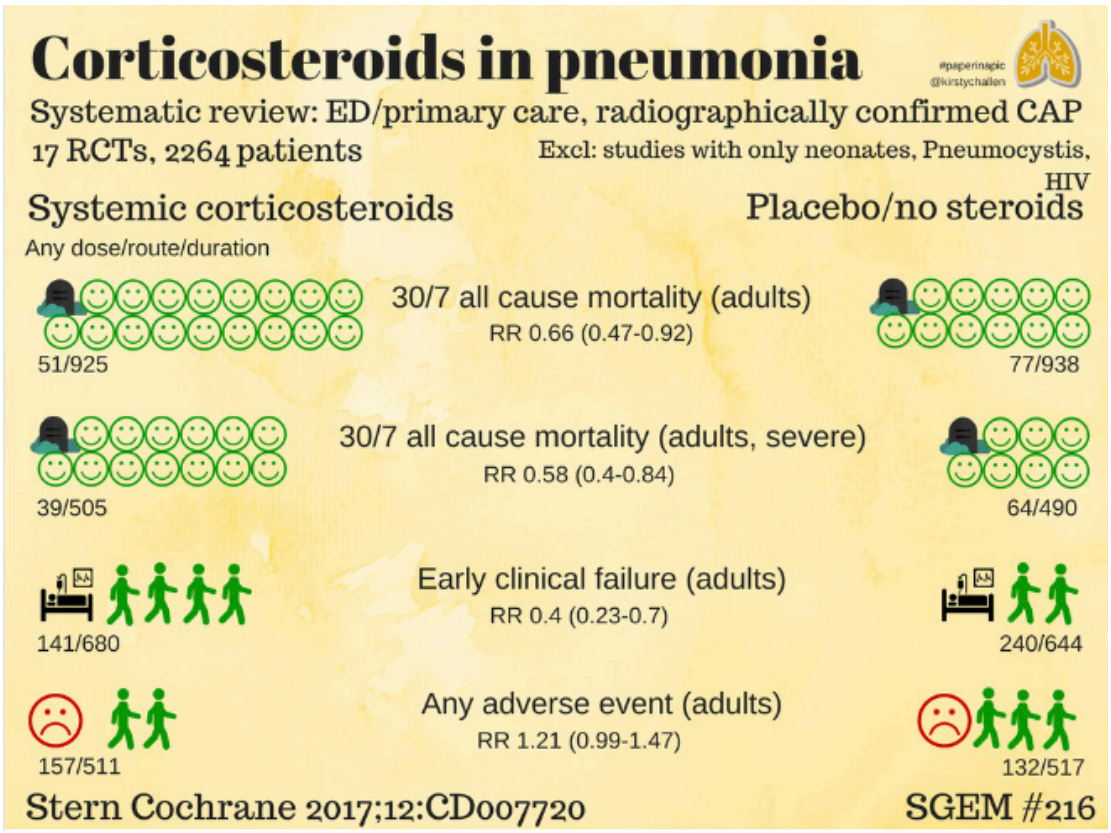
For patients with severe community acquired pneumonia, consider giving corticosteroids (40-50mg or prednisone per day) for seven to ten days as an adjunct to their antibiotics.

What Do You Tell the Patient ?

It looks like you have a severe pneumonia. This is a type of chest infection with bacteria in your lungs. We are going to give you two types of antibiotics to help fight the pneumonia. I'm going to give you another medicine called a corticosteroid. It is a stress hormone that your body naturally makes when you are sick. We are just going to give you a little more for a few days. There is good evidence that this extra stress hormone can decrease your risk of dying and speed up your recovery. The main risk is that it might make your blood sugars go higher. We will keep an eye on your blood sugar and it is unlikely to cause a major problem.

Episode End Notes

Infographic:



Other FOAMed:

- **EM Docs:** Corticosteroids for Pneumonia – Ready for Primetime?

References:

1. Chen Y, Li K, Pu H, Wu T. Corticosteroids for pneumonia. Cochrane Database of Systematic Reviews2011, Issue 3. Art. No.: CD007720. DOI: 10.1002/14651858.CD007720.pub2.
2. Cochrane: Reporting Biases

SGEM#
217

The Batman Effect On Improving Perseverance

Question
Does self-distancing by dressing up as Batman enhance perseverance at a tedious task?

Case
It is flu season and there is an endless stream of patients with sniffles, snot and sneezes! The waiting room is moaning with mildly unwell men; all with 'the worst cold ever!"

The residents are working double shifts in order to cover their fallen comrades. They are doing their best to avoid prescribing antibiotics whilst avoiding being coughed upon and writing endless, uninspiring discharge letters to the primary care docs. It is a Sisyphean task of tremendous tedium.

As the senior doctor in the emergency department you wonder, how can you keep their spirits up and maintain the momentum – we need to maximize perseverance and limit distraction from the tedium.

Bottom Line
The most important thing in life is to be yourself. unless you can be Batman, always be Batman.

Guest Skeptic: Dr. Casey Parker is a rural Generalist working in Broome, Australia. He has particular interests in Emergency Care, Aboriginal Health, Paediatrics, Trauma and Women's Anaesthesia. Casey has this great blog and podcast called Broome Docs. Casey and I made a #Batdoc video at SMACCdub.

Date: March 6, 2018

Reference: White et al. The "Batman Effect": Improving Perseverance in Young Children. Child Development December 2016.

Episode 217 Overview

Case:

It is flu season and there is an endless stream of patients with sniffles, snot and sneezes! The waiting room is moaning with mildly unwell men; all with 'the worst cold ever!"

The residents are working double shifts in order to cover their fallen comrades. They are doing their best to avoid prescribing antibiotics whilst avoiding being coughed upon and writing endless, uninspiring discharge letters to the primary care docs. It is a Sisyphean task of tremendous tedium.

As the senior doctor in the emergency department you wonder, how can you keep their spirits up and maintain the momentum – we need to maximize perseverance and limit distraction from the tedium.

Background:

Working in the emergency department is very tough. Sometimes it feels like it would take super human strength and skills to finish a shift.

There are comic book super heroes that are physicians. Most people are probably familiar with Marvel's Dr. Strange. He was a neurosurgeon who had his hands injured in a car accident. In a desperate search to cure his injuries he turns to occult eastern mysticism. Soranik Natu is also a neurosurgeon, daughter of Sinestro and a member of the Green Lanter Corp. Thor the god of thunder was transformed into a physician named Donald Blake in the earlier comic book series?

Batman Fun Facts:

- Bruce Wayne, Batman's secret identity, came from two historical figures (Robert the Bruce, a Scottish national hero and Mad Anthony Wayne, a hero of the American Revolution)
- There was a Batman course taught at the University of Victoria in Canada called the Science of Batman
- Andy Warhol directed the first-ever Batman movie in 1964 but it was made without the consent of DC Comics.

Clinical Question

Does self-distancing by dressing up as batman enhance perseverance at a tedious task?

Population: Typically developing four- and six-year-old children from the Minneapolis area.
Exclusion: None listed.

Intervention: Impersonating an exemplar other (such as Batman) while doing a repetitive task for 10 minutes. They would be asked is Batman working hard?

- **Repetitive Task:** The task was a simple go/no-go slow process computerized task. The children were told the task was very important and it would be helpful if they worked hard on it as long as they could. They were also told they could take a break by playing an extremely attractive video game.
- **Exemplar Other:** Besides Batman, they could also dress up as Bob the Builder, Rapunzel or Dora the Explorer but the choice was obvious.

Control: Same repetitive task but asked if they were working hard from a third person perspective (is Casey working hard) or a first-person perspective (am I working hard)?

Outcomes:

Primary: Percentage of time spent on the assigned task.

Secondary Outcome: Effect of age (4 vs. 6 controlled for gender), Theory of Mind [1], executive function, forward and backward digit span [2], dimensional change cart sort [3], flanker and receptive vocabulary [4].

Authors' Conclusion:

"Perseverance can pave the pathway to success. Indeed, William James famously noted that the "faculty of voluntarily bringing back a wandering attention over and over again is the very root of judgment, character and will" (2001/1892, p. 95). However, he also lamented the difficulty in teaching this important life skill. The current research suggests that perseverance can be taught through role play, a skill that is accessible to even very young children."

Quality Checklist for Randomized Clinical Trials

- [x] 1. The study population included or focused on those in the emergency department.
- [✓] 2. The patients were adequately randomized.
- [✓] 3. The randomization process was concealed.
- [✓] 4. The patients were analyzed in the groups to which they were randomized
- [x] 5. The study patients were recruited consecutively (i.e. no selection bias).
- [?] 6. The patients in both groups were similar with respect to prognostic factors. Unsure. However, the children were pre-screened for confounders such as autism, developmental and executive function.
- [x] 7. All participants (patients, clinicians, outcome assessors) were unaware of group allocation. No. Everyone knew if you were yourself or dressed up as Batman, Bob the Builder, Rapunzel or Dora the Explorer
- [✓] 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 patient-important outcomes were considered.
- [?] 11. The treatment effect was large enough and precise enough to be clinically significant.

Key Results

They recruited 180 children with about a 50/50 male/female split.

Outcome

Dressing up as batman resulted in longer time on task.

Primary Outcome: Children spent proportionally more time "on task" with increasing degree of self-distancing. However, the 95% confidence intervals seemed to overlap?

Secondary Outcomes: 6-year olds showed more perseverance than 4-year olds. Also, the "time on task" was positively correlated with scores on executive function, ToM and verbal ability testing scores.

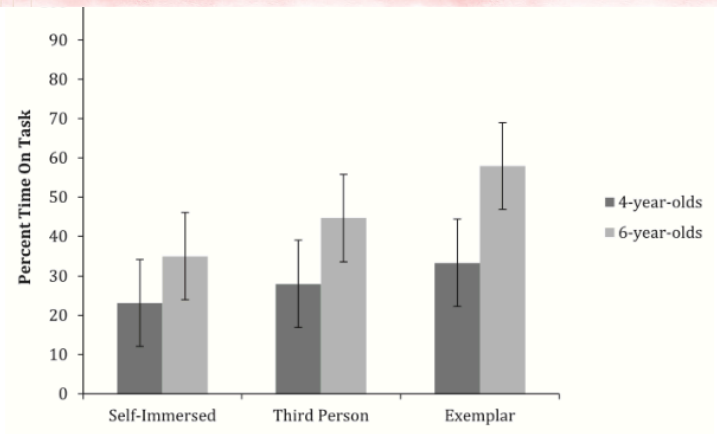


Figure 1. Percentage of time spent on work task by condition

Bottom Line

The most important thing in life is to be yourself. Unless you can be Batman, always be Batman.

Case Resolution

Case Resolution:

We encourage all our residents to wear superhero t-shirts under their scrubs and ask themselves. "Is Bat-doc working hard'? To improve persistence at menial tasks we should encourage role-modelling of heroes – maybe a colleague or attending/ teacher who works hard on the floor? After wearing the t-shirts, the waiting room is quickly cleared, and no staff ever catch the dreaded flu from a patient again!

Clinical Application:

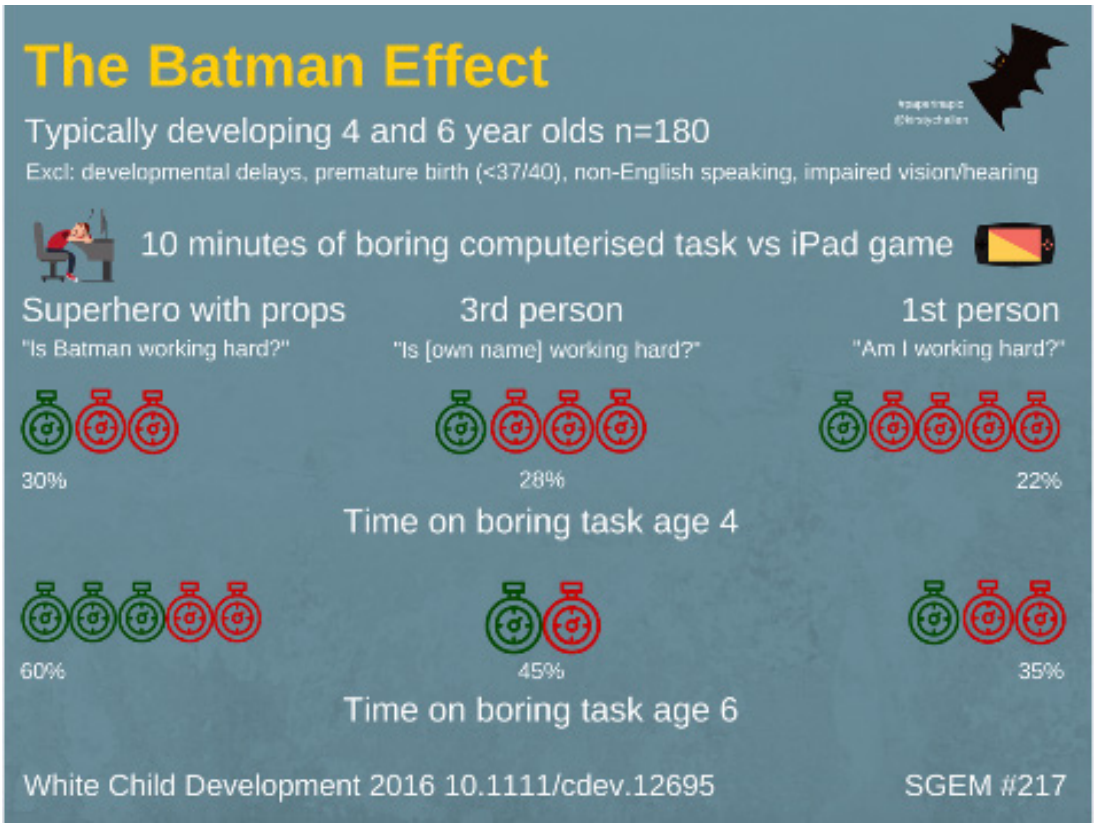
Maybe we as "role models" to students and residents should try to be that "hero" the one they will one day emulate and improve their own performance?

What Do I Tell the Resident?

When faced with a difficult, tedious or soul-destroying repetitive task, put on a super hero t-shirt and ask yourself..."What would Batdoc do?" Then tweet the picture tagging @TheSGEM and @BroomeDocs #WWBDD.

Episode End Notes

Infographic:



Twitter Poll:

What exemplar other would you like to dress up as when performing a repetitive task?

thesgem.com/2018/05/sgem21 ...

@CaulfieldTim @NightShiftMD @broomedocs @darakass @MDaware @emresidents @EMNews @proceduralpause @CAEP_Docs

- **51%** Batman
- **22%** Bob the Builder
- **12%** Dora the Explorer
- **15%** Rapunzel

Other FOAMed:

- **First10EM:** Journal Club January 2018

References:

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3. Zelazo, P. D., Anderson, J. E., Richler, J., Wallner-Allen, K., & Beaumont, J. L., et al. (2013). NIH Toolbox Cogni- tive Function Battery (CFB): Measuring executive func- tion and attention. Monographs of the Society for Research in Child Development, 78 (4, Serial No. 309). doi:10. 1111/mono.12032
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SGEM#
218

Excited Delirium Syndrome

Question
What is the definition, epidemiology, pathophysiology and evidence-based management and treatment of excited delirium?

Case
A 24-year-old male is brought into the emergency department by police. He was running around wearing a Batman suit, jumping on cars and screaming he is Batman. He is brought to the emergency department extremely agitated and despite being held down by two police and three security guards he is still trying to bite the staff. You cannot obtain any vital signs and this patient is a danger to himself and staff. How will you manage this patient?

Bottom Line
The excited delirium syndrome remains a poorly defined disease and is difficult to study because of its inconsistent definition. However, it is a dangerous, high morbidity and mortality condition that requires aggressive management in the emergency department.

Guest Skeptic: Dr. Chris Bond is an emergency physician and clinical lecturer at the University of Calgary. He is currently the host of CAEP Casts, which highlights educational innovations from emergency medicine residency programs across Canada. Chris also has his own #FOAMed blog called Standing on the Corner Minding My Own Business (SOCMOB).

Date: May 12, 2018

Reference: Gonin P et al. Excited Delirium: A Systematic Review. AEM May 2018.

Episode 218 Overview

Case:

A 24-year-old male is brought into the emergency department by police. He was running around wearing a Batman suit, jumping on cars and screaming he is Batman. He is brought to the emergency department extremely agitated and despite being held down by two police and three security guards he is still trying to bite the staff. You cannot obtain any vital signs and this patient is a danger to himself and staff. How will you manage this patient?

Background:

Cases of extreme agitation have been described since the 19thcentury, with Luther Bell's eponymous "Bell's mania" being published in the American Journal of Insanity (now American Journal of Psychiatry) in October, 1849 [1]. Bell distinguished these cases of extreme agitation from delirium tremens, diseases of the meninges and advanced typhoid based on a list of clinical criteria, as well as autopsy results from the brains and intestines of the patients.

Bell's case mortality rate for this condition was approximately 75%, though this was by no means rigorous data analysis. Interestingly, physicians of the day did not think these cases of extreme agitation would benefit from venesection (blood-letting) but did recommend this for the differential diagnoses.

We have covered Alexander Hamilton's blood-letting experiment from 1816 on camp fever with Dr. Rob Leeper on SGEM#200. The number needed to harm (death) with blood-letting for soldiers with camp fever was four (NNH 4) and therefore we could not recommend blood-letting as a treatment modality for camp fever.

The term excited delirium syndrome (ExDS) was coined in the 1980s, after a flurry of deaths of individuals in custody or during arrests following extremeagitation [2]. ExDS usually involved men in their 30s after cocaine, methamphetamine, or ecstacy abuse [3-5].

These cases were not limited to patients in custody, however, and fatal cases of ExDS appeared in the hospital without any trauma, physical restraint or police intervention [5]. Given the significant morbidity and mortality rate of 8-10%, this syndrome remains of great importance to the emergency provider [6,7].

Over 150 years since it was first described, there is still no standardized definition of ExDS and diagnostic criteria have not been universally recognized. While the American Psychiatric Association and World Health Organization do not recognize this syndrome as a distinct clinical entity, the American College of Emergency Physicians (ACEP) has recognized it since 2009 [7].

The ACEP definition of ExDS includes *"acute delirium (not linked to dementia or preexisting pathologies) associated with extreme physical and psychomotor agitation".*The criteria for this diagnosis are inspired by a Canadian police census report [8] and other case descriptions [2, 7, 9]

Clinical Question

What is the definition, epidemiology, pathophysiology and evidence-based management and treatment of excited delirium?

Population: Patients with excited delirium

Intervention: N/A

Control: N/A

Outcome: The review outcome was to clarify and answer four questions:

- What are the definition or diagnostic criteria of ExDS?
- What are the epidemiological characteristics of ExDS (prevalence, incidence, and case characteristics)?
- What are the hypotheses and evidence about the pathophysiologic mechanisms underlying ExDS?
- What are the evidence-based medicine management and treatment recommendations of ExDS?

This is an SGEMHOP episode. Dr. Gonin provided written responses to our questions. Here is what he said got him interested in researching ExDS.

This is an highly acute problematic, requiring a multidisciplinary response, with the coordination of police-men, paramedics, in-hospital nurses, emergency doctors, psychiatrics and event law enforcement special-ist.

Another point is that it's a subject relatively frequently described in media, because witnessed people who see patients in excited delirium are frequently frightened by the agitation, the medical and police responses, and because of the potentially dramatic ending of the mediated cases. This syndrome is relatively ill-defined but clearly present in our "daily business" and we were therefore interested to investigate in the literature the evidence about causes, mechanism and management.

Author's Conclusion:

"The overall quality of studies was poor. A universally recognized definition is lacking, remaining mostly syndromic and based on clinical subjective criteria. High mortality rate may be due to definition inconsis-tency and reporting bias. Our results suggest that ExDS is a real clinical entity that still kills people and that has probably specific mechanisms and risk factors. No comparative study has been performed to conclude whether one treatment approach is preferable to another in the case of ExDS."

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 methodological quality of primary studies were assessed for bias.
☑	5.	The assessment of studies were reproducible.
☑	6.	The outcomes were clinically relevant.
NA	7.	There was low heterogeneity for estimates of sensitivity or specificity. N/A
NA	8.	There was low statistical heterogeneity for the primary outcomes. N/A
NA	9.	The treatment effect was large enough and precise enough to be clinically significant. N/A

Key Results

This review was an attempt to clarify and answer four questions about excited delirium syndrome.

1. **Definition/Diagnostic Criteria for ExDS:** Three retrospective studies totaling 108 patients proposed a definition for ExDS. There was no universally accepted definition of ExDS, and a large variety of criteria were used with the only pre-requisite being "delirium associated with excited behavior or agitation".

2. **Epidemiology of ExDS:** There were 23 articles related to epidemiology of ExDS. These studies came from ExDS patients in the context of police interventions, prehospital emergency services, the forensic setting and in hospital. Overall, ExDS patients were middle aged men:
   14-71 years old (mean 33.3 and median 30.0) with 83-95% male

3. **Pathophysiology of ExDS:**

They identified 27 articles on the management and treatment of ExDS. Some of the key points included: There were 38 articles were related to pathophysiology or risk factors with ExDS mortality. A number of hypotheses were described:

- Twelve articles hypothesized catecholamine surge, either exogenous (drugs) or endogenous (stress or physical exertion related) or a combination of the two (eg. exertion + cocaine)
- Nine articles proposed dopamine transporter pathway activation.
- Six articles proposed individual variation/genetic susceptibility related to chronic stimulant induced abnormalities or dopamine receptor variations.
- Less frequently proposed mechanisms included cocaine induced neurotoxicity from reactive oxygen species in the CNS, and variations in alpha-synuclein protein or opioid receptors.

Table 4
Estimated Mortality Rate of ExDS by Setting

Setting	Estimated Mortality Rate of ExDS
Patients with signs and symptoms consistent with ExDS, unspecified context	8.3%[9]
Reported fatal ExDS cases in the context of:	
Cocaine-related deaths (forensic)	16.5%[12]
CEW-related deaths (forensic)	11.1%[30]
Death in police custody	11.1% to 12.5%[24,25]
Fatal ExDS identified by Spanish coroners	0.38/million/year[20]

CEW = conducted electrical weapon; ExDS = excited delirium syndrome.

Table 3
Estimated Frequency of ExDS by Setting

Setting	Estimated Frequency of ExDS (%)	Studies (Total Number of ExDS Cases)
Reported ExDS cases in the context of		
Use of force by police officers	3.4%	DeBard, 2009 (24)[9]
	2.9%	Hall, 2013 (209)[21]
EMS interventions	1.5%	Baldwin, 2016 (73)[76]
	0.02%	Stratton, 2001 (18)[11]

Drug abuse is the largest risk factor for ExDS and was associated with ExDS in 15 articles, cocaine being the most frequently associated drug.

Odds ratios of specific risk factors for fatal ExDS from all cocaine related deaths in Dade Country, Florida from 1969-1990 [4].

- Male gender (OR = 9.3)
- Young age (OR = 1.1)
- Afro-American origin (OR=3.5)
- Overweight (OR=2.7) – BMI quartiles 2-4

Note: We would have liked to see 95% confidence intervals around these point estimates, also what did they mean by "young"? That is a moving target and goes up with every birthday.

4. Evidence Based Management and Treatment of ExDS:

- Restraint Position – Do not restrain in a prone position. It is recommended to move patients to a side lying or seated position.
- Chemical Sedation – Benzodiazepines (6 articles), neuroleptics (2 articles), benzodiazepines + neuroleptics (1 article) and ketamine (14 articles).
- Hyperthermia – This was not mentioned in the article although treatment is usually just sedation, intubation and external cooling.

Talk Nerdy to Me

It's time to talk nerdy. We normally have the lead author on the podcast to answer our nerdy questions. As mentioned earlier, there were some language barriers that I totally understand. I would not want to discuss the nuances of my research in another language.

Hopefully we will soon have a universal translator like on Star Trek that works over skype. Until then Dr. Gonin has agreed to respond in writing to our nerdy question that will be posted to the SGEM blog.

1) Limits of Evidence Based Medicine:

You did an exhaustive search but there is just not much high-quality literature on the topic of ExDS. This can be a limitation of evidence-based medicine. What question using a PICO format would Dr. Gonin propose to study ExDS?

- First, an "objective" definition is lacking. I think a definition based on objective criteria should be proposed and then used to identify all the cases presented as "Excited delirium". This would better identify and describe the study-Population.

- The Intervention to be investigated could be the use of a "rapid sedation protocol", with clinical quality indicators, such as the reduction of a validated agitation score obtained in a specified time-lapse.

- As Comparison, we could have different groups, with different sedation protocols and different substances

- Outcome – Mortality, according to the sedation protocols, the aetiologies of ExDs and the characteristics of the patient. Interestingly, for the patients who survive, we have no information about potential sequelae or recurrence risk of ExDs.

2) Definition of ExDS:

There is no accepted definition for ExDS and this makes it hard to study. ACEP has recognized this condition back in 2009. What would your definition of ExDS be? Is there any progress toward a universal definition at this time? How useful is establishing a definition clinically, these patients are often so agitated that it's more of an act now and consider the diagnosis later scenario.

- *We didn't find any progress toward a universal definition, especially to an objective definition. The definition proposed by ACEP has partly subjective criteria. This definition has been used by some investigators, but hasn't always had the same number of criteria included.*

- *I think the objective part of the ACEP definition should be kept: delirium and an agitatied state. We should then think about the accompanying criteria, which should also be objective and minimal in number. As criteria, we could think about body temperature or tachypnea for example, and eventually add some in-hospital criteria that could be optionally used (eg. carbon dioxide in blood gas analysis, acidosis, pH, etc.)*

- *It's clear that it is an "act now situation", and this also makes it interesting. By acting without a definitive diagnosis, you are just treating symptoms. But you don't know if you are treating them correctly, or in an evidence-based fashion. In order to know if you are using the best treatment option, you have to investigate the ExDS, and for this you need a universally validated definition. After this you will know, we hope, which treatment option is the best to use first line when you encounter a highly agitated patient.*

3) The Social Determinants of Health:

The risk factors associated with ExDS seem to point towards a social problem (young, male, African-American, substance abuse). What strategies do you think could help address the social determinants of health, so these individuals do not end up presenting to the police and then to the emergency department (education, jobs, food security, access to mental health, affordable housing, drug treatment programs, etc.)
This question is difficult to answer for me. I'm wondering if those strategies are not different in different parts of the world; it is likely substance abuse is an essential issue, and we should see which factors are implicated in this problem. The other important population in this context present with psychiatric comorbidities. An issue could be to see if the stress-inducing situations have different impact on these groups and if the stress should be mitigated more aggressively in some sub-groups, with different sedation protocols or different physical coercive measures.

4) Police/Law Enforcement:

Great emergency care starts in the pre-hospital setting and goes all the way to follow-up after discharge from hospital and everything in-between. Much of the literature found was from non-traditional emergency medicine sources. Police are a very important part of the health care system, are there any specific management recommendations from the police studies?

- *The most important point is that police forces should be aware of this syndrome and should collaborate with the Emergency Medical Services. The aim is to minimize the time the patient is physically exerted, and to initiate sedation at the same time as the physical measures.*

5) Staffing of EMS:

A variety of treatments have been used for ExDS. Clinician's first choice may identify when they trained (B52, type of benzodiazepam, type of anti-psychotic). Ketamine is becoming a treatment for everything (procedural sedation, rapid sequence intubation, depression, pain control). What are your thoughts on the best medication and what agent do you routinely use first? Can you be specific about drugs/doses as table 6 shows very big ranges? What could someone take from this podcast and use on their next shift? As an aside, to give 400 mg ketamine IM, give it as two separate vastus lateralis injections on each side. What about the management of hyperthermia in these cases?

- *That's right, many different sedation protocols have been used and none of them were prospectively validated. The ideal drug should be short-acting, have no secondary effect or complication, and ideally have an antidote available. It would be even better if the drug could be administered to the patient without direct physical contact.*

- *Clearly, this ideal drug does not exist.*

- *Most of the recent publications are related to benzodiazepines, presenting some of the aforementioned characteristics. The doses are highly variable, probably in the absence of an universal standardization of the sedation protocol, but also because of the huge heterogeneity of the patients. The main point is*

probably the rapid titration of the same drug, for example with midazolam 5 mg.

- *Ketamine is an interesting option, but also with limited evidence (most of the cases are case reports or limited case series). The difficulty is to manage ketamine adequately, with the risk of increased agitation with small doses and the anesthetic effect with high doses. But clearly an alternative in extreme agitation! Finally, cocktails should probably be avoided, to prevent secondary effect or complication.*

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

Bottom Line

The excited delirium syndrome remains a poorly defined disease and is difficult to study because of its inconsistent definition. However, it is a dangerous, high morbidity and mortality condition that requires aggressive management in the emergency department.

Case Resolution

Case Resolution:

After attempting to calm the patient verbally, you give him several doses of midazolam and his agitation subsides. His vital signs normalize and after a few hours he is more lucid and no longer thinks he is Batman. He admits to using methamphetamine earlier and you have a discussion about the dangers of drug use and offer support for drug cessation.

Clinical Application:

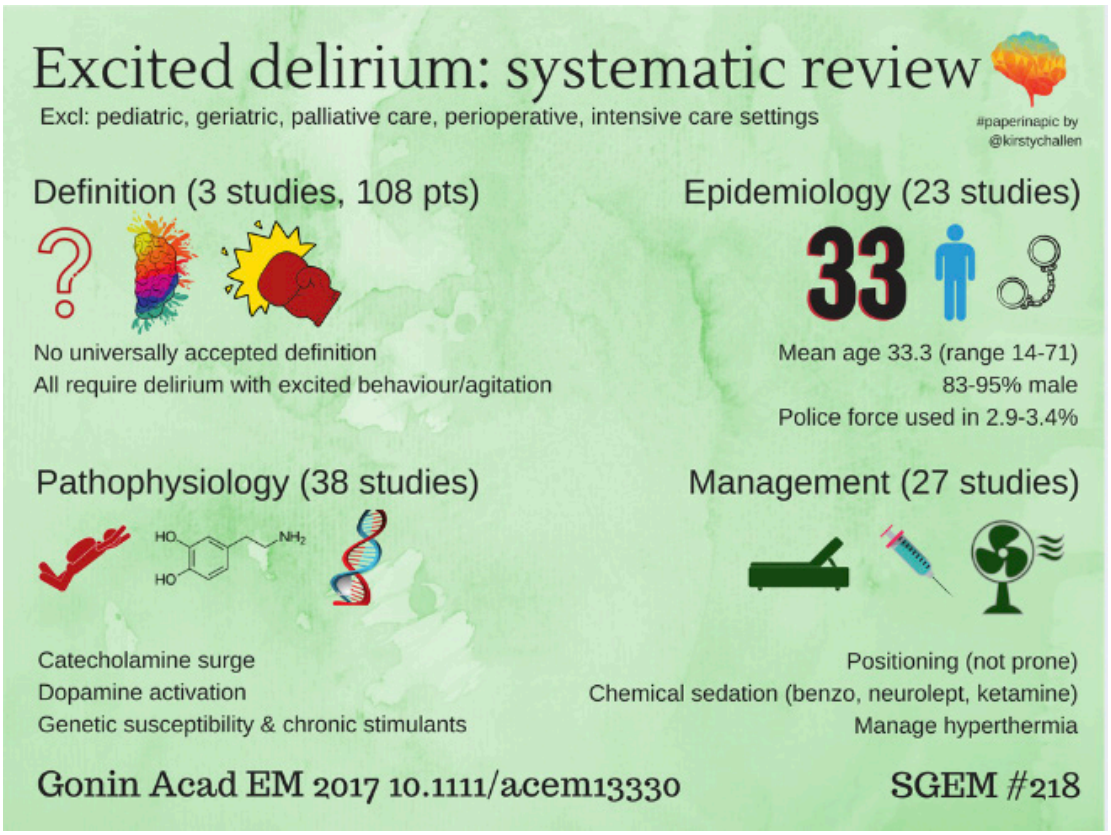
Excited delirium is a life threatening medical condition and must be acted on quickly and aggressively in order to treat the patient and protect staff.

What Do You Tell the Patient ?

You are extremely agitated because of a serious medical condition and/or drugs you have taken. We need to give you medication to calm you down as this is life threatening and you are both a danger to yourself and others in if we do not.

Episode End Notes

Infographic:



Twitter Poll:

What drug(s) do you usually use for excited delirium syndrome?
onlinelibrary.wiley.com/doi/abs/10.111… #SGEMHOP
thesgem.com/2018/05/sgem21…
@SAEMonline @AcademicEmerMed @choo_ek @the_TOTAL_EM
@RJHamiltonMD @emupdates @painfreeED @smaccteam

24% Ketamine
25% Benzo
20% Neuroleptic
31% Combo

163 votes • Final results

Other FOAMed:

- **EM Cases:** Excited Delirium
- **ALiEM:** Ketamine for Excited Delirium Syndrome
- **RCEM Learning:** Anecdote-based Emergency Medicine #1: excited delirium
- **EMCrit:**On Human Bondage and the Art of the Chemical Takedown

References:

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SGEM#
219

Shout, Shout, PERC Rule Them Out

Question
Does PERC rule work in France?

Case
A 47-year-old woman presents to the emergency department with a 24-hour history of chest pain and shortness of breath. She has a past medical history of hypothyroidism and gastroesophageal reflux disease. She is on levo-thyroxine and a proton pump inhibitor. Vital signs are normal (HR 72, BP 130/80, RR 12, O2 Sat 97% and 37.1C) and physical examination does not indicate the cause of her complaint. ECG, chest x-ray and routine lab work is also normal, including a troponin. You risk stratify her by gestalts and Well's criteria as not high risk and *wondering if you can PERC Rule her out and not order a d-dimer.*

Bottom Line
Risk stratify your patients and use the PERC rule for those that are not high-risk.

Guest Skeptic: Dr. Jeffrey Kline (@klinelab) is the Vice Chair of Research in Emergency Medicine and a professor of physiology, Indiana University School of Medicine. He is the editor in chief of AEM, creator of Pulmonary Embolism Rule-out Criteria (PERC) Rule and has published extensively in the area of pulmonary emboli. We have even made a Batdoc Video together on pulmonary embolism.

Date: May 16, 2018

Reference: Freund et al. Effect of the Pulmonary Embolism Rule-Out Criteria on Subsequent Thromboembolic Events Among Low-Risk Emergency Department Patients: The PROPER Randomized Clinical Trial. JAMA February 2018.

Episode 219 Overview

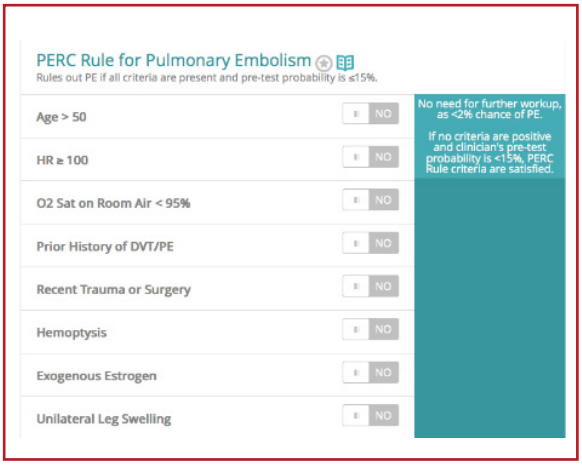
Case:

A 47-year-old woman presents to the emergency department with a 24-hour history of chest pain and shortness of breath. She has a past medical history of hypothyroidism and gastroesophageal reflux disease. She is on levo-thyroxine and a proton pump inhibitor. Vital signs are normal (HR 72, BP 130/80, RR 12, O2 Sat 97% and 37.1C) and physical examination does not indicate the cause of her complaint. ECG, chest x-ray and routine lab work is also normal, including a troponin.

You risk stratify her by gestalts and Well's criteria as not high risk and *wondering if you can PERC Rule her out and not order a d-dimer.*

Background:

The Pulmonary Embolism Rule-out Criteria (PERC) Rule is an eight-item clinical decision instrument. The eight-items include the following clinical criteria. If the answer to any of these questions is positive a d-dimer is indicated.



Listen to the podcast on iTunes to hear Dr. Kline discuss some background information on the diagnosing of pulmonary embolism and the PERC Rule.

1. The History of the PERC Rule – How did it come about, why eight-items instead of five and when did you publish the first PERC paper?
2. The Controversy of its Use in Europe – Why do the Europeans seem not to like the PERC Rule?
3. The Power of Gestalt – How does it compare to risk stratifying tools like Well's Criteria?
4. The Inference about Sub-Segmental PE and Possible Over – Diagnosis?
5. How to Use PERC Rule and Why this Differs from YEARS?

Clinical Question

Does Perc Rule Work In France?

Population: Adult patients presenting to the emergency department with low gestalt clinical probability pulmonary embolism.

Inclusion: New-onset presence or worsening of shortness of breath or chest pain and a low clinical probability of PE, estimated by the treating physician's gestalt as an expectation below 15%.

Exclusion: Obvious etiology to the acute presentation other than PE (eg, pneumothorax or acute coronary syndrome), an acute severe presentation (hypotension, SpO2<90%, respiratory distress), a contraindication to CTPA (impaired renal function with an estimated creatinine clearance <30 mL/min; known allergy to intravenous radio- opaque contrast), pregnancy, inability to be followed up, or if they were receiving any anticoagulant therapy.

Intervention: PERC-based strategy (PERC negative – ruled out, PERC positive – usual care)

Comparison: Usual care

Low Gestalt: D-dimer, if positive CTPA, if negative PE ruled out

Not Low Gestalt: CTPA

Outcomes:

Primary: Occurrence of a symptomatic thromboembolic event within three months.
Secondary: Patients investigated with CTPA, rate of CTPA-related adverse events requiring therapeutic intervention within 24 hours, length of stay in the emergency department, rate of hospital admission or readmission, onset of anticoagulation regimen, severe hemorrhage in patients with anticoagulation therapy, and all-cause mortality at three months

Authors' Conclusion:

"Among very low-risk patients with suspected PE, randomization to a PERC strategy vs conventional strategy did not result in an inferior rate of thromboembolic events over 3 months. These findings support the safety of PERC for very low-risk patients presenting to the emergency department."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department.
- ☑ 2. The patients were adequately randomized.
- ☑ 3. The randomization process was concealed.
- ☑ 4. The patients were analyzed in the groups to which they were randomized
- ☑ 5. The study patients were recruited consecutively (i.e. no selection bias).
- ☑ 6. The patients 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 patient-important outcomes were considered.
- ☒ 11. The treatment effect was large enough and precise enough to be clinically significant. No. This was a non-inferiority designed so they were not looking for a large treatment effect. Yes – The result was fairly precise

Key Results

They recruited 1,916 patients (954 control and 962 PERC). The mean age was in the mid 40's with slightly more women. A diagnosis of PE at the initial emergency department visit was 2.7% in the control group and 1.5% in the PERC group (difference 1.3% [95% CI, -0.1% to 2.7%] p=0.052).

Outcome

PERC based strategy was non-inferior to usual care.

Primary Outcome:
Occurrence of a symptomatic thromboembolic event within three months

- Intension-to-Treat: 0.2% (95% CI -infinity to 1.6%)
- Per-Protocol: 0.1% (95% CI -infinity to 0.8%)

	PERC	Control	Mean Diff % (95%CI)	P value
CTPA Performed	13%	23%	9.7% (6.1 to 13.2)	<0.001
LOS in ED (hr:min)	4:36	5:14	-00:36 (-1:08 to -0:04)	<0.001
Admission Rate	13%	16%	3.3% (0.1% to 6.6%)	0.04
Anticoagulation Therapy	2%	3%	1.3% (0.3% to 2.9%)	0.09
Re-Admission 3 Months	4%	7%	2.1% (-0.1% to 4.3%)	0.51
All-Cause Death 3 Months	0.3%	0.2%	0.1% (-0.5% to 0.7%)	>0.99

Secondary Outcomes: Intention-to-treat analysis (ITT)

The one missed PE or failure of the PERC Rule:

"The only missed pulmonary embolism or failure of the PERC rule to identify a PE that occurred in this study was that of a young male with chest pain and no previous medical history. He was PERC-negative and initially dis- charged but then seen again the next day with ongoing pain. When he presented the second time, a D-dimer was checked and found to be positive followed by a CTPA, interpreted as inconclusive, with radiological signs consistent with pneu- monia. The patient was admitted, had lower-limb Doppler ultrasonography that showed no VTE and then a V /Q˙ scan showed subsegmental defects. He was treated with direct oral anticoagulation for 6 months and had a normal scan at follow up after conclusion of therapy."

Talk Nerdy to Me

1) Low Prevalence:

These were very low risk PE patients because only 2.7% (26 patients) in the control group were diagnosed with a PE in the initial ED visit. Wouldn't any strategy look good with such a low prevalence rate?

2) Non-Inferiority:

This was a non-inferiority design. One of the threats to this design is the loss to follow-up. A total of 54 patents were lost to follow-up in the trial. Worst case is that all of them had an event and that would have breached the upper margins set for the 95% confidence interval of 1.5%.

3) Intention-To-Treat vs. Per-Protocol Analysis:

They did both forms of analysis. Can you comment on the strengths and weaknesses of each type and how we should interpret the results?

4) Miss Rate:

What is an acceptable miss rate? In the USA there seems to be a zero-miss rate culture. While the failure rate observed after a negative CTPA is about 3% you are more likely to get in trouble if you miss a PE and you did not do a CTPA then if you miss a PE and you did do the CTPA.

5) Clinical Decision Tools:

These tools go through typically go through a derivation study followed by validation studies. Few ever make it past this stage and have impact analyses performed. Do you consider this an impact analysis of the PERC rule and what other research would you like see done?

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

Bottom Line

Risk stratify your patients and use the PERC rule for those that are not high-risk.

Case Resolution

Case Resolution:

The patient is Well's criterial non-high risk and PERC Rule negative. You explain this to the patient and discharge her home with a diagnosis of chest pain not yet diagnosed.

Clinical Application:

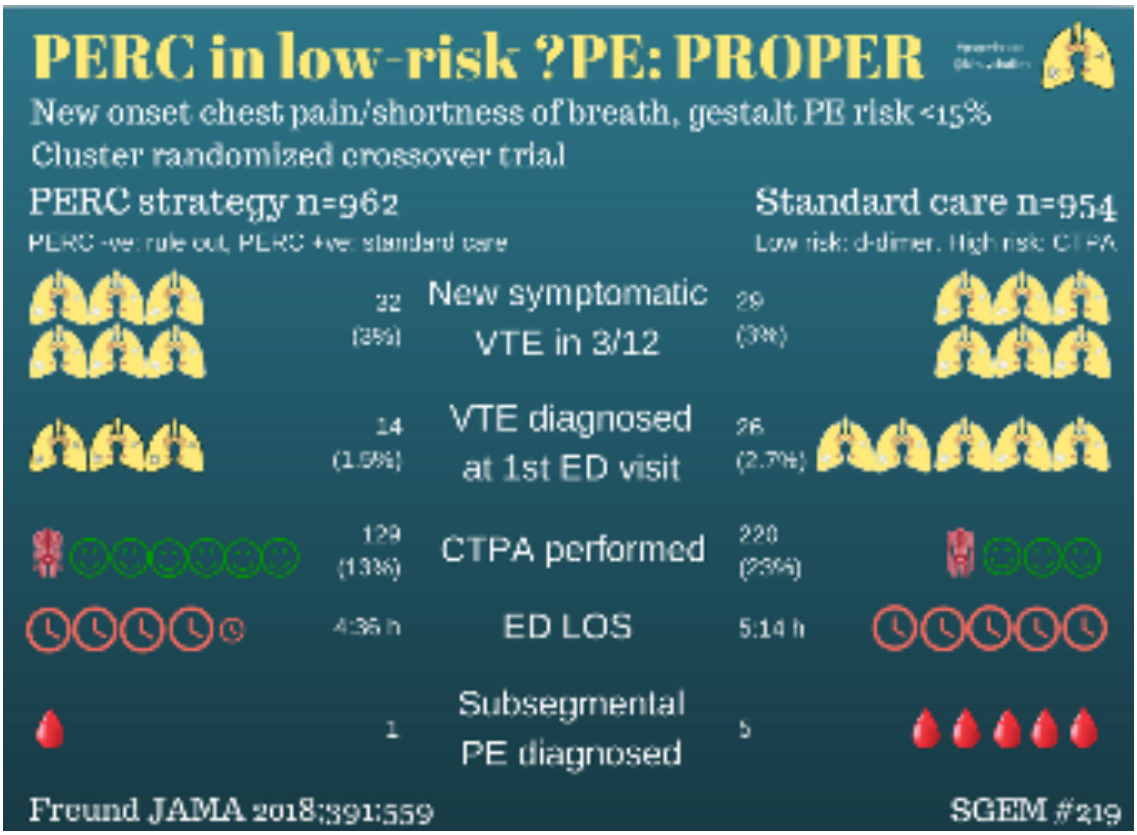
This study validates the PERC rule can be used to decrease the number of patients getting a CTPA without increasing the PE miss rate.

What Do You Tell the Patient ?

We looked into why you are having some chest pain and shortness of breath. The tests show us you have not had a heart attack and have a less than 1% chance of having a blood clot in your lungs. You can go home and try some acetaminophen or ibuprofen for the pain. Please follow-up with your family physician next week. If your pain gets worse, you develop new symptoms (fever, bloody cough, rash, etc) or are worried, we would be happy to see you again in the emergency department.

Episode End Notes

Infographic:



Twitter Poll:

After risk stratifying patients (gestalt or Well's criteria) as not high-risk for pulmonary embolism do you use the PERC Rule?
thesgem.com/2018/05/sgem21…
@JAMA_current @klinelab @SAEMonline @AcademicEmerMed @SAEMEBM
@KirstyChallen @srrezaie @CAEP_Docs

15% No

77% Yes

8% What is the PERC Rule?

106 votes • Final results

SGEM#
220

Acupuncture Vs. Morphine for Renal Colic

Question

In adult patients presenting to the emergency department with renal colic, is acupuncture superior to morphine for pain control?

Case

A 51-year-old man presents to the emergency department complaining of right flank pain radiating to his groin like his previous episodes of renal colic. He states the pain comes in "waves," is associated with nausea but no vomiting. On exam, he is afebrile and appears very uncomfortable while grabbing his right flank. He has used ketorolac, acetaminophen and tamsulosin in the past. He really wants to avoid taking any opioids and *is wondering if acupuncture could work?*

Bottom Line

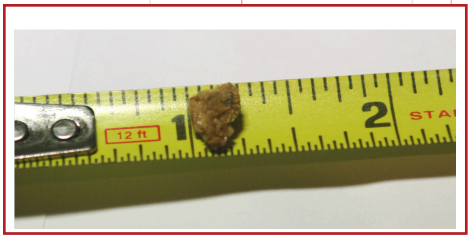
This trial does not support the claim that acupuncture works or is superior to morphine for adult patients presenting to the emergency department.

Guest Skeptic: Dr. Tony Seupaul is the Chairman of the Department of Emergency Medicine, University of Arkansas. Dr. Cordell Cunningham is a PGY 2 in Emergency Medicine at University of Arkansas for Medical Sciences

Date: May 16, 2018

Reference: Beltaief K et al. Acupuncture versus titrated morphine in acute renal colic: a randomized controlled trial. J Pain Res. 2018

Episode 220 Overview



Case:

A 51-year-old man presents to the emergency department complaining of right flank pain radiating to his groin like his previous episodes of renal colic. He states the pain comes in "waves," is associated with nausea but no vomiting. On exam, he is afebrile and appears very uncomfortable while grabbing his right flank. He has used ketorolac, acetaminophen and tamsulosin in the past. He really wants to avoid taking any opioids and *is wondering if acupuncture could work?*

Background:

We have covered renal colic a number of times on the SGEM:

- 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?

Here are the SGEM bottom lines on the management of renal colic from those previous episode:

- Expulsive therapy is unnecessary for ureteric stones < 5mm.
- There is some weak evidence that tamsulosin may help passage of larger stones (5 to 10 mm).
- You don't need to push fluids (oral/IV) or use diuretics to pass kidney stones.
- 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.

We have also covered a couple of acupuncture papers on the SGEM. Watch for a new episode coming up on battlefield ear acupuncture to treat low back pain in the emergency department.

- SGEM#187: Pin Cushion – Acupuncture in the Emergency Department
- SGEM#211: Pins and Needles – Acupuncture for Migraine Prophylaxis

The summary from those two critical reviews were:

- There is no high-quality evidence that acupuncture works for patients presenting to the emergency department with back pain, ankle sprains or migraines.
- The study on acupuncture to prevent the re-occurrence of migraine headaches in patients without aura does not provide any evidence of the efficacy.

The authors of the trial we are going to look at today say that acupuncture has been proven have efficacy treatingrenal colic pain.

- Kaymar M et al. Comparison of the efficacy of diclofenac, acupuncture, and acetaminophen in the treatment of renal colic. Am J Emerg Med. 2015;33:749–753.
- Lee YH et al. Acupuncture in the treatment of renal colic. J Urol. 1992;147:16–18.

These were two small non-blinded trials that limit their conclusions of acupuncture being a reasonable alternative.

Clinical Question

In adult patients presenting to the emergency department with renal colic, is acupuncture superior to morphine for pain control?

Population: Patients greater than 18 years old presenting to a Tunisian emergency department with clinical suspicion of uncomplicated renal colic and a pain score greater than 70 (out of 100) on visual analog scale (VAS).

Exclusion: Complicated renal colic (bilateral pain, fever, and/or decreased urine output), traumatic pain, on anticoagulants, skin afflictions, unable to assess VAS, analgesics in 6 hours prior, refusal of consent and pregnant women.

Intervention: 30 minutes of acupuncture seating needles until deqi (numbness and tingling) was achieved using the urinary bladder meridian points.

Comparison: Titrated morphine chloral hydrate using a bolus of 0.1 mg/kg every five minutes until pain score reached 50% of baseline.

Outcome:

Primary: Success was a composite outcome of durability and rapidity

- **Durability:** Drop in the VAS of at least 50% from baseline at 30 minutes and lasting to 60 minutes.
- **Rapidity**: Time to a drop in the VAS of at least 50% from baseline.

Adverse Events:

- **Intervention:** Local rash/bleeding, itching, needle blockage, and fainting.
- **Control:** Drowsiness, dizziness, nausea and vomiting, respiratory distress, and hypotension.

Authors' Conclusion:

"In ED patients with renal colic, acupuncture was associated with a much faster and deeper analgesic effect and a better tolerance profile in comparison with titrated IV morphine."

Quality Checklist for Randomized Clinical Trials

- ☑ 1. The study population included or focused on those in the emergency department.
- ☑ 2. The patients were adequately randomized.
- ? 3. The randomization process was concealed.
- ? 4. The patients were analyzed in the groups to which they were randomized
- ☑ 5. The study patients were recruited consecutively (i.e. no selection bias).
- ? 6. The patients 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 patient-important outcomes were considered.
- ☒ 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

They consecutively recruited 119 patients to be included in this trial. The mean age was in the low 40's with about a 50/50 split between men and women.

Outcome

No statistical difference in success rate but a statistical difference in resolution time favoring acupuncture.

There were some problems with the result section of the paper.

Success: No difference between groups (87% acupuncture vs. 83% morphine p=0.6)

- **Durability:** Drop in the VAS of at least 50% from baseline at 30 minutes and lasting to 60 minutes – No statistical difference difference
- **Rapidity:** Time to a drop in the VAS of at least 50% from baseline (14.5 +/- 7.8 vs 28.2 +/- 12.4 minutes, P<0.001)

Adverse Events:

- Less adverse events in the acupuncture group (3) vs. the morphine group (42)
- No serious adverse events were reported.

Talk Nerdy to Me

1) Randomization and Concealment:

It is so important to have concealed randomization. There is the potential that randomization might not have been concealed in this study. They used sealed envelopes but did not mention if the envelopes were opaque. This opens up the possibility of the envelopes being opened and re-sealed or looked through to breach randomization. It is much better to have an electronic randomization system to assign patients to study arms.

However, even if the randomization process was concealed there was no blinding of the participants and the providers. This absolutely introduces bias into the study such as the placebo effect and expectations.

2) Baseline Characteristics and External Validity:

They reported common baseline patient characteristics that were similar between groups. A key characteristic they did not report was whether or not the patient had used acupuncture before and what their thoughts were about this treatment modality. Because there is such a strong placebo effect in acupuncture studies this should have been investigated and controlled for in the trial. Fifteen of the 153 consecutive patients refused to participate in the study. Was that because they did not believe in acupuncture and did not want to get randomized into that group?

This trial was conducted in Tunisia. The acceptance of acupuncture in Tunisia may be different that than in North America. There may be cultural issues that minimize applicability to patients in North America who may be conditioned differently or inherently biased about the effects of acupuncture. A key component of the placebo effect working is a belief in the treatment. Would the same trial done in North America or a society that is more skeptical of acupuncture produce the same results?

3) Outcomes:

Their outcome measures were a little confusing. What was the primary outcome? They say the main outcome was success, defined as having two components. This would make it a composite outcome. We know that composite outcomes can be easier to demonstrate significance because you are creating a bigger target. However, their results did not demonstrate a statistical difference between the two groups (87% acupuncture vs. 83% morphine).

When they separated the two groups out they did show significant differences in the VAS at 60 minutes and the mean time to resolution. We will discuss that a little bit more in the fourth and fifth nerdy point.

When it comes to adverse events, there were many more in the morphine group with the vast majority being dizziness, nausea and vomiting. There were no events that were considered serious and no patients seemed to drop out of the trial due to the reported adverse events. They could have asked the patients in the morphine group if theside effects of the treatment were bothersome.

4) Statistical vs. Clinical Significance:

It is generally accepted in pain research that a 13mm change in the VAS is the minimal amount to be considered clinically significant (Gallagher et al AEM 2001). Given that the study was un-blinded and may have unbalanced groups this could represent bias in addition to the random noise in any data set.

There are ways to explore the statistical vs. clinical significance issue. How about asking the patient if they were satisfied with pain reduction? What group would they prefer to have been assigned? If they were having another attack of renal colic would they like the same treatment? These questions could have teased out whether or not the differences observed were patient oriented outcomes.

5) Comparison Group:

Was this a Strawman comparison? I'm not sure whether morphine chloral hydrate dosing is equivalent to morphine sulfate but 16.7 mg total seems like a larger dose than I would typically use in the emergency department for renal colic. They also started the acupuncture at time zero and continued for 30-minute session. So, the placebo effect would have kicked in immediately and been maintained for at least the 30 minutes while the acupuncture was being administered. In contrast, the control group got intermittent contact with morphine being titrated every five minutes. Could that have delayed or shifted the effect of the control group to the right on the x-axis of time? Even looking at the x-axis it does not look correct. The time between 0-10 minutes looks the same distance as between 45-60 minutes? The slopes of the two lines look the same. It looks like if you shifted the morphine results to the left by 10 minutes would it would over-lap the acupuncture line?

The Achilles heel of the trial was a lack of a sham acupuncture group. It has been demonstrated previously that there is no difference between "true" acupuncture and sham acupuncture. One trial showed that just putting toothpicks into a patients back could achieve the same efficacy as real acupuncture for (Cherkin et al Arch Intern Med 2009) for back pain. Without a sham acupuncture group, it is not possible to minimize the placebo effect.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We disagree with the authors' conclusions. It was a flawed study, it does not represent a place in the emergency department analgesic armamentarium and does not deserve to be further investigated due to a lack of biological plausibility.

Bottom Line

This trial does not support the claim that acupuncture works or is superior to morphine for adult patients presenting to the emergency department.

Case Resolution

Case Resolution:

You give 10mg IV ketorolac for the pain and 8mg IV of ondansetron for the nausea. He is re-assessed in 30 minutes without much relief. You discuss using sub-dissociated does of ketamine to minimize the amount of opioid. He agrees and ends up having his pain resolved.

Clinical Application:

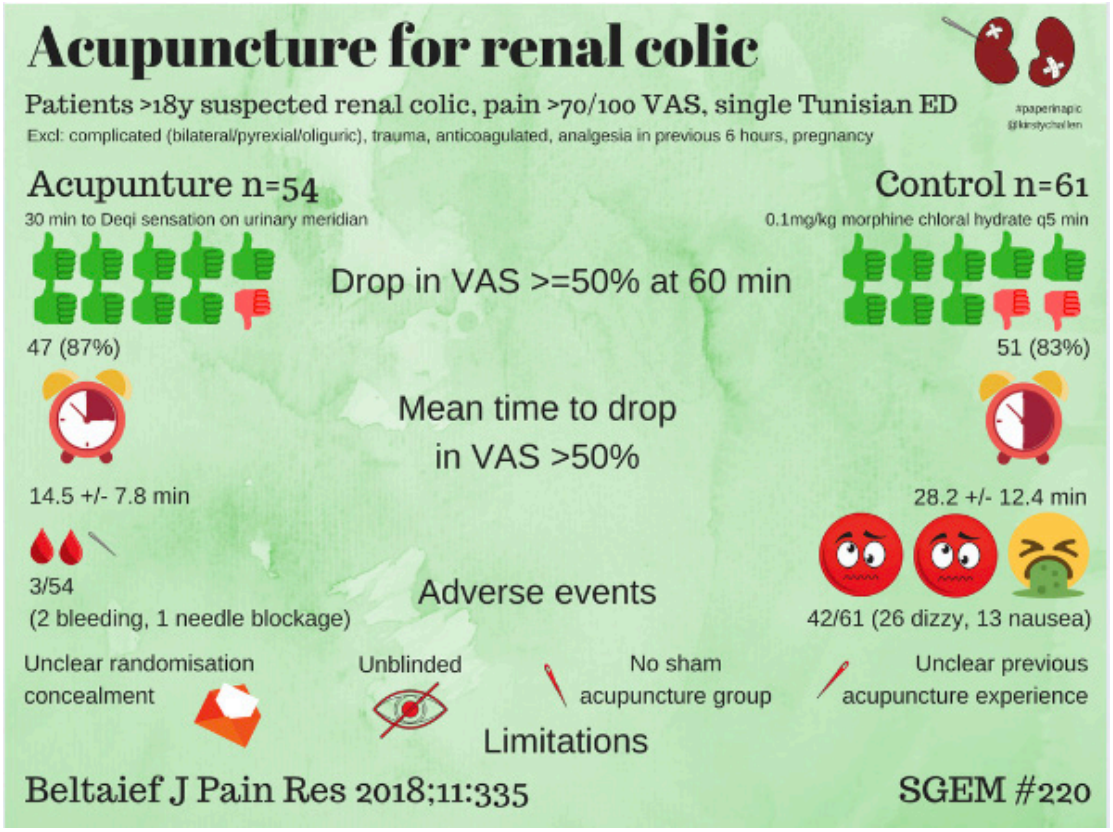
Acupuncture is based on meridians that have never been proven to exist. This seriously calls into question the biological plausibility of manipulating meridians to improve qi (chi). The Bayesian pre-test probability of acupuncture working is very low and would require a large effect size to demonstrate efficacy. This is another low-quality study that does not demonstrate acupuncture is useful for acute pain. It is wrong to use the serious opioid problem to justify a therapy which has not been proven to work.

What Do You Tell the Patient ?

It would be great if acupuncture had been shown to work in renal colic. Unfortunately, there is no good evidence to support it being effective. We will try get your pain down using medications proven to work and even have some new options available that can minimize opioids use.

Episode End Notes

Infographic:



Twitter Poll:

Do you think #acupuncture should be offered in the ED as a treatment for acute renal colic?

thesgem.com/2018/05/sgem22...
#FOAMed #EBM

@TonySeupaul @CAEP_Docs
@CAEPConference @CAEPResidents
@painfreeED @srrezaie @ketaminh

No	78%
Yes	6%
I don't know	16%

112 votes · Final results

SGEM#
221

Smells Like Isopropyl:

Alcohol For Nausea

Question

Does nasally inhaled isopropyl alcohol reduce nausea in adult emergency department patients with or without oral ondansetron?

Case

A 32-year-old woman presents to your emergency department with complaints of nausea (nausea VAS is about a 5 on a scale of 0 to 10) and states she's worried she's coming down with some sort of stomach flu. She's hemodynamically stable and looks a bit queasy but isn't actively retching when you see her.

Bottom Line

In moderately nauseated adult patients presenting to the emergency department who do not need immediate iv access, an inhalation of isopropyl alcohol monotherapy may be a reasonable option. However, it could just be a placebo effect.

Guest Skeptic: Meghan Groth is a pharmacist who has been practicing in emergency medicine for the past six years. She's recently transitioned into industry, taking on a position as a medical science liaison in New England. She's been a contributor for the Academic Life in Emergency Medicine and Emergency Medicine PharmD blogs and is a member of the ALiEMU Capsules team.

Date: June 8, 2018

Reference: April MD, et al. Aromatherapy Versus Oral Ondansetron for Antiemetic Therapy Among Adult Emergency Department Patients: A Randomized Controlled Trial. Ann Emerg Med 2018.

Episode 221 Overview

Case:

A 32-year-old woman presents to your emergency department with complaints of nausea (nausea VAS is about a 5 on a scale of 0 to 10) and states she's worried she's coming down with some sort of stomach flu. She's hemodynamically stable and looks a bit queasy but isn't actively retching when you see her.

Background:

Nausea and vomiting are frequent complaints of patients presenting to the emergency department, accounting for just under five million visits per year.

A number of prescription medications are available to treat these symptoms, including ondansetron, droperidol, metoclopramide, promethazine, and prochlorperazine.

The most commonly utilized antiemetic in US emergency departments is ondansetron, a 5-HT 3 antagonist.

Despite its widespread use, a dose of intravenous ondansetron takes about 30 minutes to take effect, which has led to an interest in more rapidly acting interventions for actively nauseous patients on the verge of vomiting.

A new Cochrane Review by Hines et al published in 2018 looked at aromatherapy for post-operative nausea and vomiting. They concluded that aromatherapy may have similar effectiveness to placebo based on low-quality evidence.

There's some data supporting the use of an inhalation of isopropyl alcohol in emergency department patients (Beadle, et al Ann Emerg Med 2015). We covered that paper on the SGEM in Episode #144.

The SGEM bottom line from that critical review was that for patients presenting to the emergency department with complaints of nausea and vomiting, a nasal inhalation of isopropyl alcohol is a quick, inexpensive way that may transiently improve symptoms without evidence of harm.

Clinical Question

Does nasally inhaled isopropyl alcohol reduce nausea in adult emergency department patients with or without oral ondansetron?

Population: Patients greater than 17-years-old presenting to the emergency department with a chief complaint of nausea, with self-reported nausea severity of three or greater on a numeric response scale (range 0 to 10).

Exclusion: Notably they excluded patients who had already had an intravenous catheter placed or who had received antiemetic therapy prior to enrollment. [rest on website] Allergy to isopropyl alcohol or ondansetron; inability to inhale through the nares; recent intake of medications contraindicating alcohol administration; altered mental status; a known history of QT-segment prolongation; clinical suspicion for serotonin syndrome; suspected or know pregnancy or treating provider discretion.

Intervention: There were three treatment arms in this study

- Inhaled isopropyl alcohol and 4 mg oral ondansetron
- Inhaled isopropyl alcohol and oral placebo
- Inhaled saline placebo with 4 mg oral ondansetron

Comparison: There was no dual placebo arm due to concerns that would discourage patient participation.

Outcomes:

Primary: Change in nausea from baseline to 30 minutes post-intervention as measured on a 0- to 100-mm VAS

Secondary: Change in pain VAS 30 minutes post intervention, nausea scores until emergency department disposition, pain score at emergency department disposition, and satisfaction VAS scores

Authors' Conclusion:

"Among ED patients with acute nausea and not requiring immediate intravenous access, aromatherapy with or without oral ondansetron provides greater nausea relief than oral ondansetron alone."

Quality Checklist for Randomized Clinical Trials

- ✓ 1. The study population included or focused on those in the emergency department.
- ✓ 2. The patients were adequately randomized.
- ✓ 3. The randomization process was concealed.
- ✓ 4. The patients were analyzed in the groups to which they were randomized
- x 5. The study patients were recruited consecutively (i.e. no selection bias).
- ? 6. The patients 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 patient-important outcomes were considered.
- ? 11. The treatment effect was large enough and precise enough to be clinically significant

Key Results

122 patients were enrolled and subsequently randomized, and 120 were included in the modified intent-to-treat population, resulting in a 98% follow up rate. Patient characteristics were pretty similar at baseline except that women represent 35% of the inhaled isopropyl alcohol plus oral placebo compared to ~50% women in the other two groups. The predominant cause of nausea being infectious gastroenteritis (55%) and the nausea score at baseline was just over 50 on a 0- to 100-mm VAS scale.

Outcome

Inhaled isopropyl alcohol alone or in combination with oral ondansetron was superior to oral ondansetron alone.

Primary Outcome: Mean VAS nausea scale reduction at 30 minutes posttreatment was as follows:

i. Inhaled isopropyl alcohol and 4 mg oral ondansetron 30 mm (95% CI 22 to 37 mm)
ii. Inhaled isopropyl alcohol and oral placebo 32 mm (95% CI 25 to 39 mm)
iii. Inhaled saline placebo with 4 mg oral ondansetron 9 mm (95% CI 5 to 14 mm)

Secondary Outcomes: Both groups receiving inhaled isopropyl alcohol experienced lower nausea VAS scores throughout their emergency department stay than the inhaled placebo/oral ondansetron group. These subjects also had lower nausea VAS scores at emergency department disposition and improved satisfaction scores when compared with the inhaled placebo/oral ondansetron group. Both inhaled isopropyl alcohol groups required less rescue antiemetic therapy.

Talk Nerdy to Me

1) Blinding:

The authors acknowledged their challenges with blinding the inhalational intervention in this study. They covered up the labels on the saline or isopropyl alcohol swabs, kept the swabs at arms' length from study investigators, and asked patients to not reveal what they were sniffing. Even so, more than half (60%) of the subjects in the study correctly identified the inhaled product as either placebo or isopropyl alcohol when asked about it afterward. Given that the primary endpoint of the study was also a subjective measure (the nausea score on a VAS), this may have been affected by this obstacle. Also, the pain VAS suggests unblinding of subjects. Those in group three inhaling the placebo got the much less reduction in their mean pain score. Since treatment was left up to the attending physician, could patients in the placebo inhalation group have received more opioids for their pain leading to more nausea and vomiting?

2) Standard of Care:

Study investigators noted that subjects could receive standard of care after enrollment in the trial. This could have included intravenous catheter placement after enrollment and/or rescue anti-emetics and analgesics. In the results section, they described the proportion of patients who received rescue anti-emetics, but they didn't describe those patients who had an IV placed and more importantly, those that received rescue analgesics. To me, it seems like if pain scores were going to be described as an endpoint, then receipt of analgesics would have been important to detail. Especially if the analgesic was an opioid that could produce nausea and vomiting.

3) Pairwise Comparisons:

They compared 1 vs. 2 and 2 vs. 3 but not 1 vs. 3? The comparison of group 1 vs. 2 is really just comparing the addition of oral ondansetron, where the comparison of 2 vs. 3 evaluates the effect of inhaled isopropyl alcohol versus oral ondansetron (both variables are flipped in this comparison). I would have liked to have seen a comparison of group 1 (isopropyl alcohol/oral ondansetron) and group 3 (inhaled placebo/oral ondansetron) that would have evaluated the effect of adding inhaled isopropyl alcohol against a background of oral ondansetron, as might be routinely expected in practice. The mean VAS reduction at 30 minutes for group 1 was 30 and for group 3 was 9, but the standard deviations are fairly large, and I'm not that great at

calculating p-values off the top of my head. I would have found it valuable for the authors to have provided this statistical comparison as well.

4) Not Consecutive Enrolment:

Patients were recruited as a convenience sample. Nurses identified potential candidates. They also did not recruit 24/7, although study personnel were made available during a range of times to capture patients from evening/night time hours and over the weekend. Patients could also be excluded at the treating provider discretion. This introduces the possibility of selection bias.

5) Strawman Comparison:

The primary study end point was nausea score reduction at 30-minutes post-intervention. Under the best of circumstances, intravenous ondansetron has an onset of effect of 30 minutes (Roila and Del Favero) and the peak plasma concentration of oral ondansetron takes 90 minutes (Markham and Sorkin). If attempting to measure the effect of inhaled isopropyl alcohol with or without oral ondansetron, I'm not sure that 30 minutes is the most appropriate time point to do this. I'm concerned that it may have been too soon after intervention for the oral ondansetron to have taken effect. I think you can see this in the article with the inhalational placebo/oral ondansetron group, where the effect on VAS was definitely more pronounced at 60 minutes than at 30 minutes. It depends on what you're trying to demonstrate; if you want to show that inhalational isopropyl alcohol works more quickly than oral ondansetron, then the 30-minute mark has some

Comment on Authors' Conclusion Compared to SGEM Conclusion:

This study adds to the previous research by Beadle and colleagues (SGEM#144) where we concluded that an inhalation of isopropyl alcohol could be considered for transient, symptomatic relief of nausea in emergency department patients, but the present study probably excluded those with more severe nausea/vomiting because they excluded those with IV catheters in place prior to enrollment. That being said, it does appear that an inhalation of isopropyl alcohol with or without oral ondansetron was effective in reducing nausea VAS scores. We are concerned that this might be due to a placebo effect and are disappointed they did not report any safety data.

Bottom Line

In moderately nauseated adult patients presenting to the emergency department who do not need immediate IV access, an inhalation of isopropyl alcohol monotherapy may be a reasonable option. However, it could just be a placebo effect.

Case Resolution

Case Resolution:

After loading him up on the stretcher you make your way to the hospital. He receives about 500cc of normal saline on route to the hospital in addition to supplemental oxygen. He arrives no longer hypotensive or hypoxic. You sign over to the triage nurse and express your concerns about this patient having sepsis.

Clinical Application:

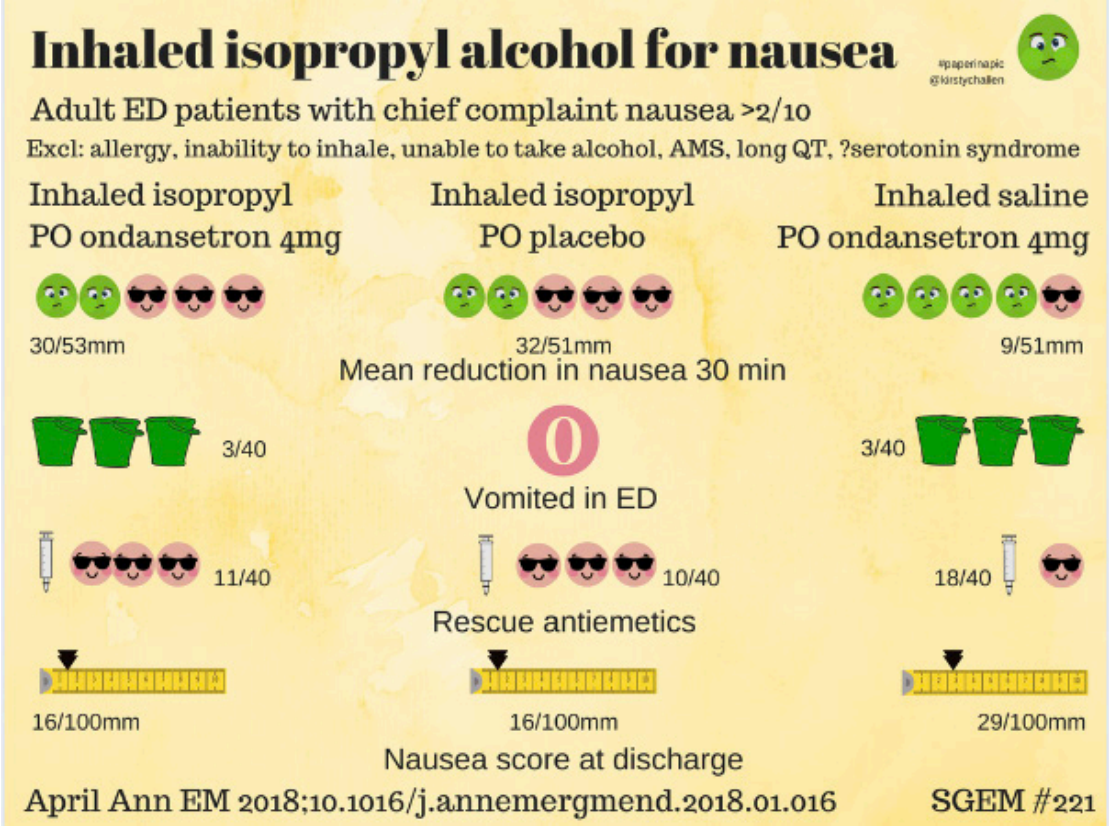
This re-affirms that we should focus on things that provide benefit in the pre-hospital setting and not on those that do not. Until there is good evidence demonstrating a patient-oriented outcome, antibiotics will not be part of our EMS protocol. However, as the superintendent of education, I will be use this as an opportunity to remind staff about early recognition of sepsis and the use of personal protective equipment.

What Do You Tell the Patient ?

You are probably weak because of an infection. We suspect a chest infection because you were coughing and your oxygen was low. We are going to start an intravenous line, give you some fluids on the way to the hospital and provide extra oxygen. They will do some tests in the emergency department and determine your diagnosis and give you the proper treatment.

Episode End Notes

Infographic:



Twitter Poll:

Do you think sniffing isopropyl alcohol swabs can treat nausea?

thesgem.com/2018/06/sgem22...

@BEEMcme @EMpharmgirl @Nadia_EMPharmD @PharmacyJoe
@PharmERToxGuy @srrezaie @KirstyChallen @SAEMEBM @AnnalsofEM
@ACEPNow @DrHowieMell @EverydayMed @MDaware

55% Yes
13% No
17% I don't know
15% It's a placebo

Other FOAMed:

- **First10EM:** Articles of the Year (EMU 2018)
- **St. Emlyn's:** More on alcohol sniffing and nausea
- **New York Times:** A Cure for Nausea? Try Sniffing Alcohol
- **EM Literature of Note:** Wake up and smell the isopropyl
- **Wiki Journal Club:** Aromatherapy with isopropyl alcohol for nausea

SGEM#
222

Rhythm Is Gonna Get You:

Into an Atrial Fibrillation Pathway

Question

Can an emergency department algorithm for atrial fibrillation management decrease the number of patients admitted to hospital?

Case

A 62-year-old Canadian is on vacation in up-state Michigan, and after a celebratory evening, presents to your emergency department with palpitations. *"I've had atrial fibrillation a number of time before. Usually they just shock me and send me home."* Local practice is usually to treat rapid atrial fibrillation with a calcium channel blocker infusion and admit to hospital. As the conversation progresses, you wonder whether it might be safe to discharge some atrial fibrillation patients home for outpatient follow-up.

Bottom Line

There are clearly patients with primary atrial fibrillation who can be managed safely as outpatients. There are no evidence-based criteria for identifying high-risk patients who require admission, so for now we will have to rely on clinical judgement.

Guest Skeptic: Dr. 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 and an amazing photographer.

Date: June 12, 2018

Reference: DeMeester S et al. Implementation of a Novel Algorithm to Decrease Unnecessary Hospitalizations in Patients Presenting to a Community Emergency Department With Atrial Fibrillation. AEM June 2018.

Episode 222 Overview

Case:

A 62-year-old Canadian is on vacation in up-state Michigan, and after a celebratory evening, presents to your emergency department with palpitations. *"I've had atrial fibrillation a number of time before. Usually they just shock me and send me home."*

Local practice is usually to treat rapid atrial fibrillation with a calcium channel blocker infusion and admit to hospital. As the conversation progresses, you wonder whether it might be safe to discharge some atrial fibrillation patients home for outpatient follow-up.

Background:

Atrial fibrillation, rate control vs. rhythm control. This is a debate that has gone on for many years. It is like normal saline vs. Ringer's lactate for fluid resuscitation, steroids vs. no steroids for sepsis, or Coke vs. Pepsi.

Atrial fibrillation is one of the most common dysrhythmias and patients often present to the emergency department with increased heart rates, chest pain and weakness among other presentations. The debate has been going on for years as to which is the best strategy to address these patients, rate or rhythm control.

In patients with chronic atrial fibrillation or unknown time of onset and a rapid ventricular response, rate control and consideration and initiation of anticoagulation therapy are the standard emergency department approach.

Both beta-blockers and calcium channel blockers are commonly used for rate control in the emergency department. SGEM#133 reviewed a study by Fromm C et al. comparing diltiazem vs. metoprolol in the management of atrial fibrillation or flutter with rapid ventricular rate in the emergency department (J Emerg Med 2015).

- The SGEM bottom line was that the best available evidence shows that diltiazem will achieve more rapid rate control in patients with atrial fibrillation than metoprolol (NNT 2).

Dr. Ian Stiell and colleagues published an article in 2011 in Annals of EM looking at variation in recent-onset atrial fibrillation management in Canada and found a lot of variability. Rhythm control was selected in 42-85% of patients across hospitals and electricity was chosen as the primary strategy for rhythm control in 7-69%.

In the USA there is a fear of cardioverting someone in atrial fibrillation because it could cause them to throw a clot. What often happens is that most patients are rate controlled, admitted and cardiology is left to sort it out.

In Canada we do tend to cardiovert patients with recent onset atrial fibrillation. SGEM#88 looked at the effectiveness and safety of the Ottawa Aggressive Protocol to perform rapid cardioversion and discharge of patients with these arrhythmias.

- The SGEM bottom line from that episode was that The Ottawa Aggressive Protocol appears to be highly effective in converting patients with recent onset atrial fibrillation or flutter back to sinus rhythm. The vast majority of patients (97%) were discharged home from the emergency department with 93% in normal sinus rhythm.

We are not going to solve the rate vs. rhythm debate on this show but we are going to address the admission rate observed in the USA.

Clinical Question

Can an emergency department algorithm for atrial fibrillation management decrease the number of patients admitted to hospital?

Population: Adult emergency department patients with a primary diagnosis of atrial fibrillation or atrial flutter.

Exclusion: Individuals with an alternate primary diagnosis (ie sepsis), pregnant, or incarcerated patients.

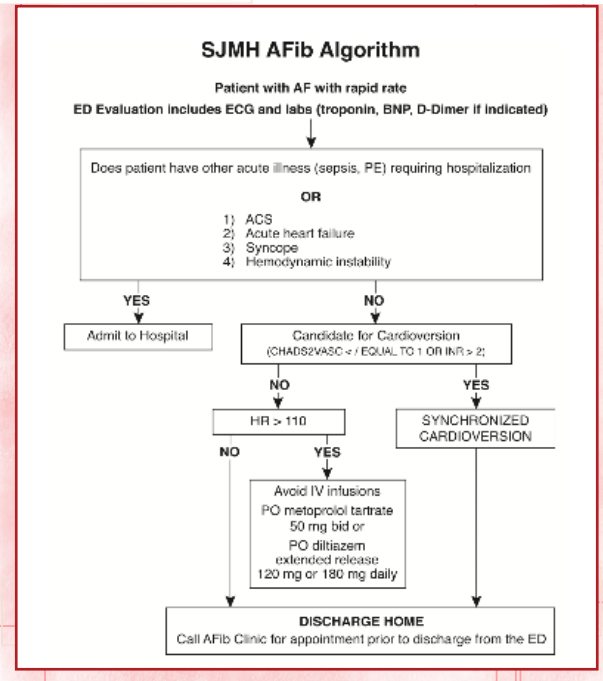
Intervention: An algorithm for the management of atrial fibrillation developed as a collaboration between the emergency and cardiology departments.

Comparison: This is a before and after study. Pre-intervention data was collected over a 1-year period before the algorithm was developed. Post-intervention data was collected over a 1-year period after the algorithm was implemented. (They excluded the year around implementation, as uptake was gradual).

Outcomes:

Primary: Rate of hospital admission.

Secondary: Return visits to the emergency department at 3 and 30 days.



About Author: Dr. Susanne DeMeester completed her residency at the University of Maryland in 2006, She has practiced at St Joseph Mercy Hospital, a mixed community and academic ED, in Ann Arbor, Michigan. She is the director of the emergency observation center and serves as the ED cardiology liaison.

Authors' Conclusion:

"Implementation of a novel algorithm to identify and treat low-risk patients with AFib can significantly decrease the rate of hospital admissions without increased emergency department returns. This simple algorithm could be adopted by other community hospitals and help lower costs."

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?
- [x] 5. Was the outcome accurately measured to minimize bias?
- [?] 6. Have the authors identified all-important confounding factors?
- [x] 7. Was the follow up of subjects complete enough?
- [?] 8. How precise are the results?
- [x] 9. Do you believe the results?
- [?] 10. Can the results be applied to the local population?
- [x] 11. Do the results of this study fit with other available evidence?

Key Results

There were 586 patients with atrial fibrillation in the pre-intervention year, and 522 during the post-intervention year. The mean age was around 70 and there was almost a 50/50 male female split. Overall, they appear to be well watched at baseline.

Outcome

The algorithm decreased the number of patients admitted to hospital.

Primary Outcome: Admissions

- 80.4% before vs. 67.4% after (difference 13%; p<001)

Secondary Outcomes:

- There was no difference is 3 or 30-day ED return visits. The overall bounce back rate was very low – just less than 4% is both groups.
- There were no deaths noted by database search
- Length of emergency department stay was no different.

Talk Nerdy to Me

1) Confounders:

One of the limitations of a before and after study design is the possibility of the confounders. There has been a general trend toward more outpatient management in medicine. Is it possible that admissions might have decreased even without this algorithm, or that there were other factors, such as the Hawthorne effect, that contributed to the observed decline rather than the specific algorithm you developed?

2) External Validity:

As you mention in the manuscript, atrial fibrillation management varies significantly around the world. Where I work, admission rates are much lower than described here, and a higher proportion of patients are managed with a rhythm control strategy. How might that impact the generalizability of your results?

3) Follow-Up:

We noticed that, despite what sounds like incredible outpatient follow-up, more than 10% of patients did not show up for their scheduled outpatient follow-up visits. You designed your algorithm to be simple, delaying some testing and decisions about anticoagulation until the outpatient visit. Do you think that the difficulty with outpatient compliance could affect implementation of protocols like this elsewhere?

4) Clinical Judgement:

You developed your algorithm in conjunction with the cardiology department. You note that there are no clear consensus guidelines to identify patients who can safely be managed as outpatients and those who need admission. So the criteria that you use were based on the expertise of your cardiologists and have not been validated. Do you think that these criteria add anything to simple, unstructured clinical judgement?

5) Adverse Events:

Adverse events were inferred from return visits to the emergency department. If patients had adverse events, they may have been unhappy with their care, and decided to present to different hospitals. Is it possible that you missed some adverse events among discharged patients?

Comment on Authors' Conclusion Compared to SGEM Conclusion:
There are clearly patients with primary atrial fibrillation who can be managed safely as outpatients. There are no evidence-based criteria for identifying high-risk patients who require admission, so for now we will have to rely on clinical judgement.

Bottom Line

There are clearly patients with primary atrial fibrillation who can be managed safely as outpatients. There are no evidence-based criteria for identifying high-risk patients who require admission, so for now we will have to rely on clinical judgement.

Case Resolution

Case Resolution:

After loading him up on the stretcher you make your way to the hospital. He receives about 500cc of normal saline on route to the hospital in addition to supplemental oxygen. He arrives no longer hypotensive or hypoxic. You sign over to the triage nurse and express your concerns about this patient having sepsis.

Clinical Application:

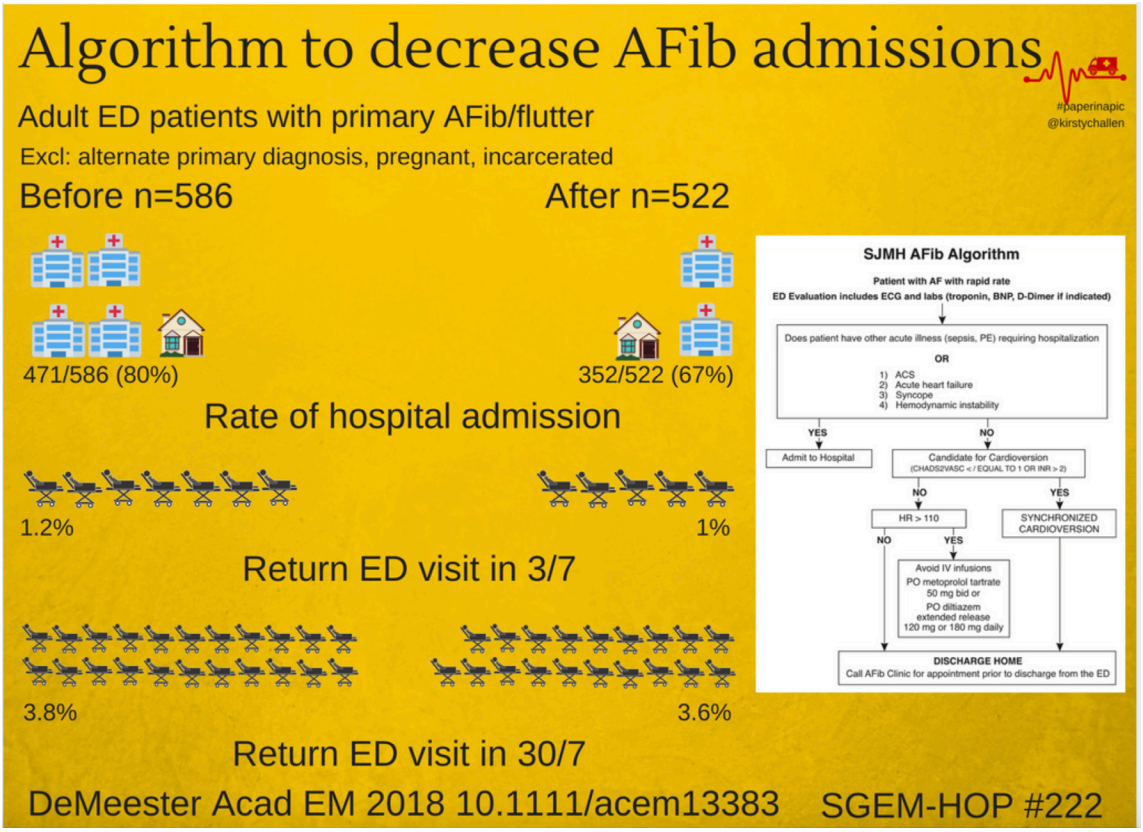
This re-affirms that we should focus on things that provide benefit in the pre-hospital setting and not on those that do not. Until there is good evidence demonstrating a patient-oriented outcome, antibiotics will not be part of our EMS protocol. However, as the superintendent of education, I will be use this as an opportunity to remind staff about early recognition of sepsis and the use of personal protective equipment.

What Do You Tell the Patient ?

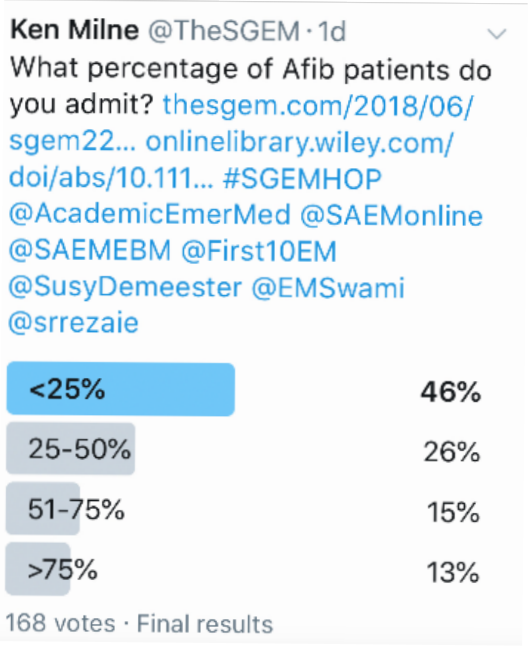
You are probably weak because of an infection. We suspect a chest infection because you were coughing and your oxygen was low. We are going to start an intravenous line, give you some fluids on the way to the hospital and provide extra oxygen. They will do some tests in the emergency department and determine your diagnosis and give you the proper treatment.

Episode End Notes

Infographic:



Twitter Poll:



SGEM#
223

Haven't Got Time For The Pain:

What About IV Lidocaine?

Question

Is administration of intravenous lidocaine safe and effective in managing patients presenting to the emergency department with acute or chronic pain?

Case

A 42-year-old man presents to the emergency department (ED) with chief complaint of severe right flank pain that radiates to his groin of three hours duration. The patient also reports nausea, increase in frequency of urination and blood in his urine. He is writhing in pain and on physical examination he was noted to have a severe right flank tenderness to palpation and tenderness at right costo-vertebral angle. You entertain the clinical diagnosis of renal colic and proceed with ordering 10mg intravenous ketorolac. On re-assessment at 20 minutes post-analgesia, the patient is still complaining of a moderate degree of pain and states that morphine worked well in the past, but he is wondering if you can take away his pain without an opioid. While contemplating your next analgesic choice you suddenly remember listening to a podcast that discussed the role of intravenous lidocaine in managing pain of renal colic origin (SGEM#202). You reassured the patient that you will check on the feasibility of other non-opioid analgesics, but at the same time you decided to quickly review available data on IV Lidocaine utility for acute pain in the ED.

Bottom Line

The currently available evidence is not strong enough to support the routine use of IV lidocaine for analgesia in the emergency department.

Guest Skeptic: Dr. Sergey Motov is an Emergency Physician in the Department of Emergency Medicine, Maimonides Medical Center in New York City.

Date: June 15, 2018

Reference: Silva et al. Safety and Efficacy of Intravenous Lidocaine for Pain Management in the Emergency Department: A Systematic Review. Ann Emerg Med. 2018

Episode 223 Overview

Case:

A 42-year-old man presents to the emergency department (ED) with chief complaint of severe right flank pain that radiates to his groin of three hours duration. The patient also reports nausea, increase in frequency of urination and blood in his urine. He is writhing in pain and on physical examination he was noted to have a severe right flank tenderness to palpation and tenderness at right costo-vertebral angle.

You entertain the clinical diagnosis of renal colic and proceed with ordering 10mg intravenous ketorolac. On re-assessment at 20 minutes post-analgesia, the patient is still complaining of a moderate degree of pain and states that morphine worked well in the past, but *he is wondering if you can take away his pain without an opioid.*

While contemplating your next analgesic choice you suddenly remember listening to a podcast that discussed the role of intravenous lidocaine in managing pain of renal colic origin (SGEM#202). You reassured the patient that you will check on the feasibility of other non-opioid analgesics, but at the same time you decided to quickly review available data on IV Lidocaine utility for acute pain in the ED.

Background:

Pain is one of the most common, if not the most common reason patients present to the ED. Physicians have many pharmacological and non-pharmacological ways to provide safe and effective pain control.

Anesthetic agents like lidocaine that target sodium channels are widely used in the ED for topical and local anesthesia. Lidocaine is a local anesthetic agent with analgesic, anti-hyperalgesic, and anti-inflammatory properties. It has a short half-life (60 to 120 minutes) with often predictable adverse effects.

It has been suggested that IV lidocaine could be an alternative for pain control instead of opioids or NSAIDs. This would be when these other treatment modalities have been ineffective or associated with adverse effects.

We have looked at IV lidocaine for the treatment of renal colic on SGEM #202. The SGEM bottom line from that episode was that lidocaine cannot be recommended for the treatment of renal colic.

Clinical Question

Is administration of intravenous lidocaine safe and effective in managing patients presenting to the emergency department with acute or chronic pain?

Population: Studies of adult patients (>17 years of age) who received at least one dose of IV lidocaine in the ED for their management of acute or chronic pain.

Exclusion: Studies in which patients received IV lidocaine in a setting outside the ED or for indications other than analgesia. Studies that used lidocaine for regional anesthesia (ex: Bier Block) were also not included.

Intervention: IV lidocaine given in the ED.

Comparison: Active controls (opioids, NSAIDs) or placebo.

Outcomes:

Efficacy: Reduction in pain score (through visual analog scale or any other pain assessment tool) and need for rescue analgesia.

Safety: Incidence of adverse drug reactions, both overall and separated into non-serious (e.g. dizziness) and serious (e.g. cardiac arrest) categories.

Risk of Bias: We used the Cochrane Collaboration Bias Appraisal Tool for the randomized controlled trials and a modified Newcastle-Ottawa Scale tool for observational studies.

Certainty: The certainty for each outcome was evaluated with the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methods.

Study Design: Original research articles, including randomized controlled trials and observational studies were considered. Case reports were excluded.

Author's Conclusion:

"There is limited current evidence to define the role of intravenous lidocaine as an analgesic for patients with acute renal colic and critical limb ischemia pain in the ED. Its efficacy for other indications has not been adequately tested. The safety of lidocaine for ED pain management has not been adequately examined."

Quality Checklist for Therapeutic Systematic Reviews

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

Key Results

Almost 2,000 titles were screened for inclusion with 61 articles getting a full text review. Eight studies met inclusion/exclusion criteria, six randomized controlled trials (RCTs) and two case-series for a total of 536 patients. The causes of pain included critical limb ischemia, migraine headaches, radicular low back pain and renal colic.

Efficacy: For the efficacy outcomes, there were six RCTs included and two case-series. Among the six RCTs, IV lidocaine had efficacy equivalent to that of active controls in two studies and was better than active controls in two other studies. In particular, IV lidocaine had pain score reduction comparable to or higher than that of intravenous morphine for pain associated with renal colic and critical limb ischemia. Lidocaine did not appear to be effective for migraine headache in two studies.

Safety: There were 20 adverse events reported by six studies among 225 patients who received intravenous lidocaine in the ED, 19 non-serious and one serious (rate 8.9%, 95% confidence interval 5.5% to 13.4% for any adverse event; and 0.4%, 95% confidence interval 0% to 2.5% for serious adverse events).

Risk of Bias:

Study	Overall Risk of Bias
Bell et al 1990	High
Firouzian et al 2016	Low
Reutens et al 1991	Unclear
Soleimanpour et al 2012	Unclear
Tanen et al 2014	Unclear
Vahidi et al 2015	Low
Fitzpatrick et al 2016	High
Soleimanpour et al 2011	High

Certainty of Evidence:

Outcome	Number of Studies	Certainty
Reduction in Pain Scores	6 RCTs and 2 Obs	Very Low
Need for Rescue Analgesia	5 RCTs and 2 Obs	Very Low
Incidence of Adverse Events	4 RCTs and 2 Obs	Very Low

Talk Nerdy to Me

1) Search Strategy:

This was an excellent example of how to do a good search. Can you please explain how you did the search so others interested in doing a systematic review can follow your example?

2) Combining Studies:

Why did you include the two case-series which are observational studies in the systematic reviews? These are a lower form of evidence and can only conclude associations.

3) Quality of Evidence:

The quality of evidence was low due to methodological problems, risk of bias, inconsistency, small studies and imprecision. There was so much heterogeneity (different painful conditions, lidocaine doses, outcome measures) that you were not able to do a meta-analysis. What value to you think a systematic review (without meta-analysis) has for clinicians?

4) Heirarchy of Evidence:

There is a pyramid of evidence for evidence-based medicine. On the bottom is background information/ expert opinion and at the top is the systematic review. However, in this case when the quality of evidence is so poor I would suggest a well done RCT gets us closer to the truth than a number of low quality RCTs and observational studies.

5) Where Do We Go?:

You guys are both pain researchers. Where to do we go from here? What studies would you suggest to address the insufficient evidence we have to answer the question of whether or not IV lidocaine is safe and effective for pain control in the ED?

Comment on Authors' Conclusion Compared to SGEM Conclusion:
I agree with the authors' conclusion that this systematic review of limited, highly heterogenous, low quality evidence does not support a routine administration of intravenous lidocaine to manage pain of renal colic origin or critical limb ischemia in the emergency department.

Bottom Line

The currently available evidence is not strong enough to support the routine use of IV Lidocaine for analgesia in the emergency department.

Case Resolution

Case Resolution:

After loading him up on the stretcher you make your way to the hospital. He receives about 500cc of normal saline on route to the hospital in addition to supplemental oxygen. He arrives no longer hypotensive or hypoxic. You sign over to the triage nurse and express your concerns about this patient having sepsis.

Clinical Application:

This re-affirms that we should focus on things that provide benefit in the pre-hospital setting and not on those that do not. Until there is good evidence demonstrating a patient-oriented outcome, antibiotics will not be part of our EMS protocol. However, as the superintendent of education, I will be use this as an opportunity to remind staff about early recognition of sepsis and the use of personal protective equipment.

What do you tell the Patient ?

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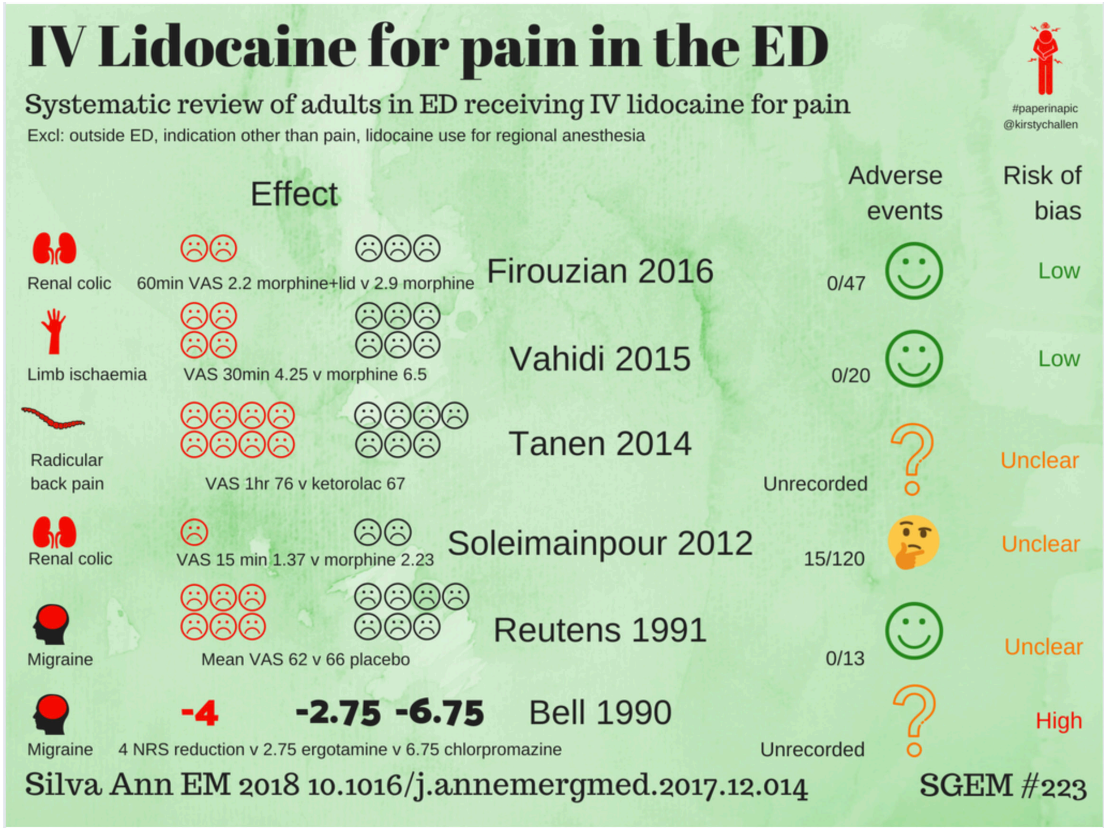
Episode End Notes

Infographic:



Twitter Poll:

Do you use IV lidocaine for pain control in the ED?
thesgem.com/2018/06/sgem22… @ACEPNow @AnnalsofEM @painfreeED
@CabreraERDR @umanamd @KirstyChallen @WeAreCanadiEM @stemlyns
@Core_EM @EMSwami @srrezaie @SAEMEBM @the_TOTAL_EM @NightShiftMD

21% Yes

65% No

14% IV lidocaine for pain?

173 votes • Final results

SGEM#
224

Battlefield Acupuncture:
Don't Do Me Like That

Question
Can patients with low back pain be effectively treated with battlefield acupuncture in the emergency department?

Case
A 48-year-old male presents to your emergency department with seven hours of gradual onset lower back pain that feels identical to prior flares of his chronic lower back pain. He's been previously worked up by his primary physician and found to not have a concerning cause of his pain. During your encounter, he asks if there's anything he can do for his pain that won't make him drowsy.

Bottom Line
Based on this study, battlefield acupuncture cannot be recommended to treat pain in the emergency department.

Guest Skeptic: Dr. Robert Edmonds is an emergency physician in the US Air Force in Virginia. This is Bob's seventh visit to the SGEM, and his first since returning from deployment.

Date: June 20, 2018

Reference: Fox LM et al. Battlefield acupuncture to treat low back pain in the emergency department. Am J EM 2018

Episode 224 Overview

Case:

A 48-year-old male presents to your emergency department with seven hours of gradual onset lower back pain that feels identical to prior flares of his chronic lower back pain. He's been previously worked up by his primary physician and found to not have a concerning cause of his pain. During your encounter, he asks if there's anything he can do for his pain that won't make him drowsy.

Background:

Lower back pain is one of the most common emergency department (ED) complaints, comprising approximately 2.6 million visits per year in the US [1]. Opioids are frequently used in the ED to treat pain and ED physicians are among the most frequent prescribers of opioids [2].

Given the opioid crisis, there is great demand for other methods of treatment for back pain and other painful conditions. One such alternative treatment under recent investigation is Battlefield Acupuncture (BFA), where five semi-permanent ASP needles are inserted into auricular acupuncture points.

Proponents of BFA cite the relative safety of the technique in comparison with opioids. The needles may be left inserted for several days and patients may engage in their regular activities, removing the needles at any time they choose by grasping the end of the needle and lightly pulling.

Acupuncture has been covered on three different episodes of the SGEM. The first time was with Dr. Al Sacchetti. This reviewed a study investigation acupuncture compared to pharmacologic treatment for the treatment of pain the ED

- SGEM#187: There is no high-quality evidence that acupuncture works for patients presenting to the emergency department with back pain, ankle sprains or migraines.

Al was brought back for a second time looking at using electro-acupuncture for migraine prophylaxis.

- SGEM#211: This study does not provide any evidence of the efficacy of acupuncture to prevent the re-occurrence of migraine headache in patients without aura.

The most recent time was looking at acupuncture vs. morphine for renal colic.

- SGEM#220: This trial does not support the claim that acupuncture works or is superior to morphine for adult patients presenting to the emergency department.

Clinical Question

Can patients with low back pain be effectively treated with battlefield acupuncture in the emergency department?

Population: Patients over 18-years-old with a chief complaint of "low back pain"

Intervention: Standard care at the discretion of the treating physician plus Battlefield Acupuncture. BFA involved the placement of ASP indwelling semi-permanent needles in up to five pre-specified points on the ear, corresponding with established auricular acupuncture points. This was according to the protocol described in the US Air Force Acupuncture Center's Battlefield Acupuncture Protocol Book.

Comparison: Standard care at the discretion of the treating physician.

Outcomes:

Primary:

- Timed get up and go test (GUGT)
- Numeric rating scale (NRS) for back pain

Secondary:

- NRS for pain radiating to leg
- Range of motion (ROM) of lumbar spine
- Length of stay (LOS)
- Medications before and after the visit
- Safety outcomes-including if the placement of the needles was too painful to tolerate

Authors' Conclusion:

"This pilot study demonstrates that BFA is feasible as a therapy for LBP in the ED. Furthermore, our data suggest that BFA may be efficacious to improve LBP symptoms, and thus further efficacy studies are warranted."

Quality Checklist for Randomized Clinical Trials

☑	1.	The study population included or focused on those in the emergency department.
☑	2.	The patients were adequately randomized.
☑	3.	The randomization process was concealed.
☒	4.	The patients were analyzed in the groups to which they were randomized
☒	5.	The study patients were recruited consecutively (i.e. no selection bias).
☑	6.	The patients 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 patient-important outcomes were considered.
☒	11.	The treatment effect was large enough and precise enough to be clinically significant

Key Results

They enrolled 30 patients and 25 were available for analysis.

Outcome

No difference in get up and go test (GUGT) but decrease in pain scale at one hour.

Primary Outcome:

- **Timed Get Up and Go Test (GUGT) – No difference :** 21.3 seconds treatment group vs 19.0 seconds control, p=0.33
- **Numeric Rating Scale for Back Pain** – 5.2 (95% CI 4.2-6.2) treatment group vs 6.9 (95% CI 5.7-8.3) control, p=0.04

Secondary Outcomes (Intervention vs usual care):

- **Numeric rating scale for pain radiating to leg – No difference:** 4 treatment vs. 2.2 control, p=0.43
- **Range of motion of lumbar spine – No difference:**
  Flexion-49.8 degrees treatment vs 48.2 degrees control, p=0.82
  Extension-22.8 degrees treatment vs 18.1 degrees control, p=0.28
- **Length of Stay (LOS)**: Mentioned to be not significant difference but no data given
- **Medications before and after the visit**
  Before-Opioids given 2/15 treatment vs 4/15 control
  After-Opioids given 7/15 treatment vs 7/15 control
- **Safety Outcomes**: Two treatment patients complained of discomfort at needle insertion site, but there were no serious adverse events from acupuncture

Talk Nerdy to Me

1) P-Values and Power:

This study did detect a statistically significant difference in the treatment vs. control groups. However, the authors comment on how the study lacks significant power to definitively detect clinical outcomes. Given the small number of patients in the study and the fairly high dropout rate in the control group, single patients had a large effect on the findings, and caution should be applied to the p value. Just because a difference in two groups is less than 0.05 doesn't mean it's infallible.

2) Outcomes:

They had two primary outcomes, GUGT and pain. As SGEMers know there can only be one primary outcome. This got me curious, so I went and check out their a priori primary and secondary outcomes on www.clinicalTrials.gov. Their original primary outcome was GUGT (NCT02399969). To remind everyone this was NEGATIVE (no difference).

Pain on the NRS was not listed as a primary outcome but rather listed as one of their secondary outcomes. The difference in NRS showed a small statistical difference of 1.7. Previous research has shown the difference needs to be greater than 1.3 to be clinically significant. But this was an unblinded trial with no

sham group, so we would expect a strong placebo effect. This only became a primary outcome when published? No explanation was given on why the change. Perhaps it was decided post hoc after the data was reviewed? The original primary outcome of GUGT was negative but one of the secondary outcomes was statistically positive so it was elevated to a primary outcome.

Note that length of stay, medication administered, and adverse events were also added later as secondary outcomes.

3) Bias:

The lack of blinding in this trial introduces bias into the study that would favor the acupuncture group in the form of a placebo effect. There could also be selection bias because these were not consecutive patients. Acupuncture was available during "limited hours" per the authors but this is not further described. They do acknowledge that there was selection bias and lack of blinding in their limitation section.

4) Fallacies and Evidence:

Acupuncture has been used to treat pain for thousands of years. This is a fallacious argument (appeal to antiquity). Just because something has been around for a long time does not means it works. In addition, ear acupuncture has not been around for thousands of years but dates back less than one-hundred years.

- *Appeal to tradition, (also known as argumentum ad antiquitatem, appeal to antiquity, or appeal to common practice) is an argument in which a thesis is deemed correct on the basis that it is correlated with some past or present tradition (Wikipedia)*

Another logical fallacy is the argument from popularity. Just because BFA has been taught to military physicians and is widely implemented does not mean it works.

- *In argumentation theory, an argumentum ad populum (Latin for "argument to the people") is a fallacious argument that concludes that a proposition must be true because many or most people believe it, often concisely encapsulated as: "If many believe so, it is so." (Wikipedia)*

A third fallacy is an appeal to emotion. They justify the study due to wounded soldiers and the opioid epidemic. That is another fallacious argument (appeal to emotion).

- *Appeal to emotion or argumentum ad passiones is a logical fallacy characterized by the manipulation of the recipient's emotions in order to win an argument, especially in the absence of factual evidence. (Wikipedia).*

There is also a lack of good evidence of efficacy. They claim in their introduction that ear acupuncture has positive results for treating pain a variety of settings. However, when you pull the references they are not very enthusiastic endorsements.

The evidence they cite for positive results is a systematic review and meta-analysis of ten studies (five without a sham group and therefore not blinded) showing a small mean difference of statistical efficacy [3].

The authors were not too sure of the results and concluded that ear acupuncture may (MAY NOT) be a promising modality and state that rigorous research is needed to establish definitive evidence of clinical significance. Their weak evidence dampens their enthusiasm for the treatment.

- *Ear acupuncture may be a promising modality to be used for pain reduction within 48 hours, with a low side effect profile. Rigorous re- search is needed to establish definitive evidence of a clinically significant difference from controls or from other pain treatments.*

The evidence for efficacy in the emergency department is also very weak. One study was a case series of four patients (non-blinded) that concluded a potential use of ear acupuncture [4]. The second was a pilot study, unblinded, showed 23% reduction pain compared to control at ED discharge but no difference at 24hrs [5]. This most likely represents a placebo effect.

5) How Long Does This Take?:

One of their outcomes mentioned was LOS in the ED that they said was not different between groups but provided no data. An important aspect is how long does it take to perform the procedure? This is an important aspect and could affect the flow of other patients through the ED. Did it impact the LOS of other patients in the department? The flip side of that is that since it does not demonstrate efficacy beyond a placebo effect then it does not matter if it takes very little time.

Comment on Authors' Conclusion Compared to SGEM Conclusion:
We disagree with the authors' conclusions and do not believe further efficacy studies are warranted.

Bottom Line

Pre-Hopsital antibiotics in the ambulance do not appear to have a mortality benefit in patients with varying degrees of sepsis in an optimized EMS system.

Case Resolution

Case Resolution:

You discuss treatment options with your patient and refer them to their primary physician for continued outpatient management and non-pharmaceutical options. After some toradol in the ED, your patient is discharged and ambulates to the exit.

Clinical Application:

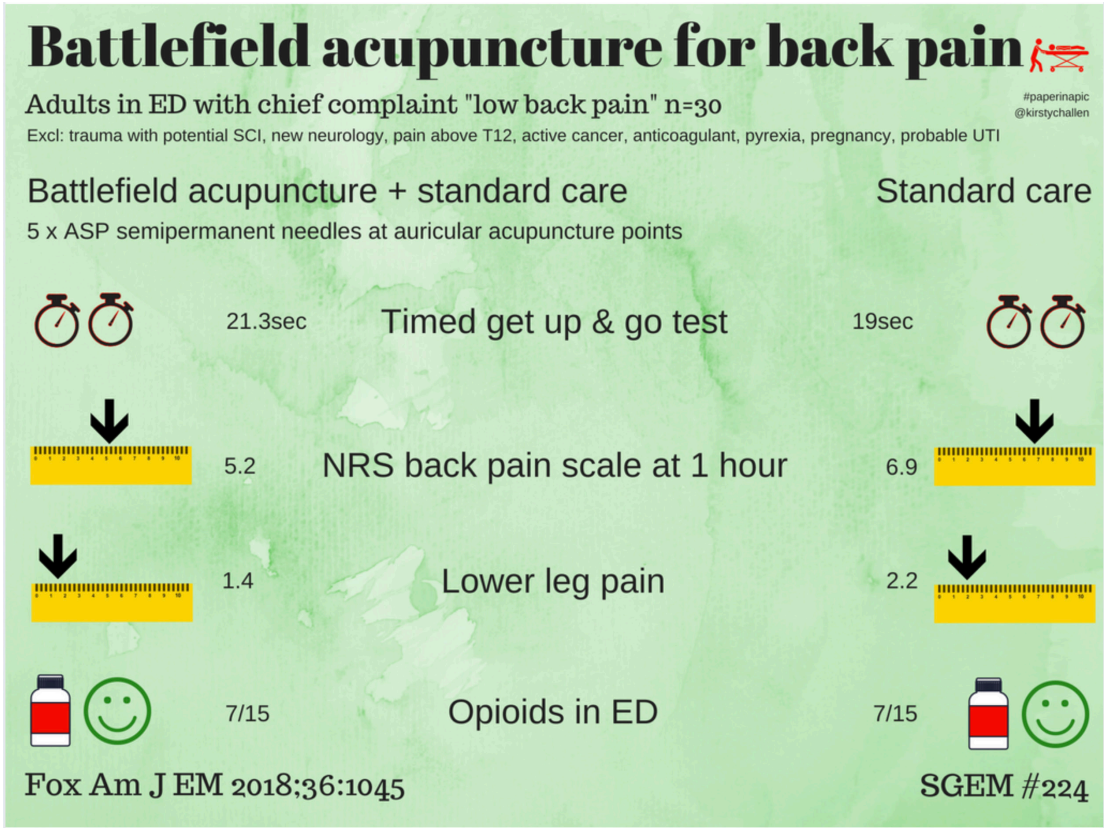
This is another small, poorly designed, unblinded acupuncture study with a lack of a sham control group. Using Bayesian thinking, the pre-test probability of Battlefield acupuncture having efficacy is very low. It would take a very large effect size to demonstrate clinical efficacy. It is wrong to use the serious opioid problem to justify a therapy which has not been proven to work.

What do you tell the Patient ?

Some centers are starting to use BFA to help people with low back pain. There is no good evidence that this works, and I do not feel comfortable recommending this treatment for your pain.

Episode End Notes

Infographic:



References:

1. Friedman BW, Chilstrom M, Bijur PE, Gallagher EJ. "Diagnostic testing and treatment of low back pain in US emergency departments. A national perspective". Spine (Phila Pa 1976) November 2010
2. Volkow ND et al. Characteristics of Opioid Prescriptions in 2009. JAMA 2011
3. Murakami M et al. Ear Acupuncture for Immediate Pain Relief— A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Pain Medicine 2017
4. Tsai S et al. Auricular Acupuncture in Emergency Department Treatment of Acute Pain. Annals if EM. November 2016
5. Goertz CMH et al. Auricular Acupuncture in the Treatment of Acute Pain Syndromes: A Pilot Study. Military Medicine. October 2006

SGEM#
225

Nexus II:
Validation of the Pediatric Head CT Decision Instrument

Question
In pediatric patients with blunt head trauma, can the Nexus II Head CT Decision Instrument be used to rule out the need for imaging in patients who otherwise would have received CT imaging?

Case
You're working in a small rural emergency department when a seven-year-old girl comes in by EMS with a head injury. Her father was teaching her how to bike and he got a little ambitious and sent her down a small hill. She hit a rock, and went over the bars, striking her head on a small tree as she fell. She was helmeted, she did not lose consciousness, has not been vomiting, but the helmet was scratched up where it struck the tree. It's been one hour since the accident and the child's exam is otherwise normal; she's behaving normally and only has a minor headache and some scrapes on her knees. Dad, on the other hand, may need something for anxiety.

Bottom Line
The pediatric Nexus II Head CT Decision Instrument can reliably categorize patients as low risk and may reducing CT imaging in these patients.

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

Date: July 16, 2018

Reference: Gupta M et al. Validation of the Pediatric NEXUS II Head Computed Tomography Decision Instrument for Selective Imaging of Pediatric Patients with Blunt Head Trauma. AEM July 2018.

Episode 225 Overview

Case:

You're working in a small rural emergency department when a seven-year-old girl comes in by EMS with a head injury.

Her father was teaching her how to bike and he got a little ambitious and sent her down a small hill. She hit a rock, and went over the bars, striking her head on a small tree as she fell. She was helmeted, she did not lose consciousness, has not been vomiting, but the helmet was scratched up where it struck the tree.

It's been one hour since the accident and the child's exam is otherwise normal; she's behaving normally and only has a minor headache and some scrapes on her knees. Dad, on the other hand, may need something for anxiety.

Background:

Blunt head trauma is a common presenting complaint in emergency departments, accounting for approximately two million visits per year in the US. CT imaging is often performed but comes with radiation risks and increased medical costs.

Several decision instruments have been developed to assess the risk of significant intracranial injury in children with head trauma (CATCH, CHALICE and PECARN). The PECARN tool has been found to have a high sensitivity, but in one study was shown to increase CT use compared to physician judgement.

We covered concussions on SGEM#112. This episode included the pediatric head trauma CT decisions guide for children less than two years of age and those two years of age and older.

The NEXUS Head CT decision instrument was developed as a "one way" instrument, which would hopefully serve to rule out those children who might otherwise receive imaging (as opposed to classifying many as "high risk".) In the original cohort, use of NEXUS Head CT decision instrument decreased the need for CT by 25%.

Clinical Question

In pediatric patients with blunt head trauma, can the Nexus Head CT Decision Instrument be used to rule out the need for imaging in patients who otherwise would have received CT imaging?

Population: Patients less than 18-years-old with blunt head trauma who underwent CT imaging at one of four participating hospitals

Intervention: Clinical judgement followed by the application of the pediatric NEXUS II Head CT decision instrument

Comparison: There is no comparison

Outcomes:

Primary: Sensitivity, specificity, and negative predictive value (NPV) for the need for neurologic intervention defined as:

i. Death due to head injury
ii. Need for craniotomy
iii. Elevation of skull fracture
iv. Intubation related to head injury
v. Intracranial pressure monitoring, within seven days of head injury

Secondary Outcome: Clinically significant head injury on CT imaging

Study Design: Pre-planned secondary analysis of the decision instrument

About the Author: This is a summer SGEM HOP and we are pleased to have one of the authors on the episode, Dr. William Mower. Bill is a professor in-residence at the UCLA School of Medicine in Los Angeles and among many other things, the director of UCLA Emergency Medicine Research Assistance program.

Pediatric NEXUS II Head CT Decision Instrument?

Pediatric patients with blunt head trauma are classified as low-risk, not requiring CT, if they meet seven criteria:

i. No evidence of skull fracture
ii. No scalp hematoma
iii. No neurological deficits
iv. Normal level of alertness
v. Normal behavior
vi. No persistent vomiting
vii. No coagulopathy

≥1 positive or unassessed criterion categorizes patient as requiring CT.

Authors' Conclusion:

"The Pediatric NEXUS Head CT DI reliably identifies blunt trauma patients who require head CT imaging and could significantly reduce the use of CT imaging."

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.
☑	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.
☒	6.	This is an impact analysis of a previously validated CDR (level I).
☐	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.

Key Results

The original NEXUS CT head validation observational study had close to 8,000 patients with blunt head injury. There were 1,018 patients less than 18 years old who received head CT scans. This cohort included 27 patients (2.7%) who required neurological intervention, and 49 patients (4.8%) had significant intracranial injuries.

Outcome

All 27 patients requiring neurosurgical intervention were identified by the pediatric Nexus II Head CT decision instrument.

Primary Outcome: Need for neurosurgical intervention

- **Sensitivity:** 100% (95% CI 87.2%–100%) – 27 of 27
- **Specificity:** 33% (95% CI 30.3-36.3%) – 330 patients of 991 who did not require intervention were classified as low-risk status by the Pediatric NEXUS II Head CT DI
- **Negative Predictive Value:** 100% (95% CI = 99.6%–100%) – None of the 991 low-risk patients required neurosurgical intervention

Secondary Outcomes(Intervention vs usual care): Clinically significant head injury

- **Sensitivity:** 98% (95% CI 89.1%– 99.9%) – 48 of 49 patients with significant injury were identified by the Pediatric NEXUS II Head CT DI
- **Specificity:** 34% (95% CI 31.0%– 37.0%) – 329 of 969 patients who did not have significant injury were classified as low risk by the Pediatric NEXUS Head CT DI
- **Negative Predictive Value:** 99.7% (95% CI 98.3%–100%) – 329 of 330 low-risk patients were absent of a clinically significant head injury

Talk Nerdy to Me

1) Secondary Analysis:

This was a pre-planned secondary analysis of the NEXUS Head CT decision instrument. Do you think this weakens or limits the conclusions of your study?

2) Power:

The original NEXUS Head CT observational study was powered to have 368 patients with injuries requiring neurosurgical intervention. It was not powered for the subgroup of pediatric patients reported in this study. There were only 27 pediatric patients who required intervention in the cohort. Can you comment on the power of your study to detect the primary outcome of need for neurosurgical intervention?

3) Spectrum Bias/Verification Bias:

The original study did not enroll patients that did not have a CT scan performed. This can introduce spectrum bias and verification bias. How did you address this issue?

4) Exclusions:

You state that clinically significant intracranial injury excluded some intracranial hemorrhage, some skull fractures, and isolated pneumocephaly. In my experience, it's standard practice that if these injuries are found on CT, the vast majority of these patients are admitted. Was any data kept as to how many patients had one of these "nonsignificant" injuries, either in the CT cohort or the verification bias cohort?

5) Intra-Rater Reliability:

Clinical decision tools rely heavily on the ability of the individual components to be evaluated consistently by different clinicians. Can you tell us how consistent and accurate clinicians are at assessing the components of the Pediatric NEXUS II Head CT Decision Instrument?

6) One Miss:

There was one patient with significant injury who was misclassified. Can you talk about that patient a little? Is this a case where inconsistency in assessing criteria may have played a role?

7) Confidence Interval:

The 95% confidence interval around a point estimate gives the precision of results. Your 95% confidence interval around the primary outcome of need for neurosurgical intervention was wide (87% – 100%). This lack of precision and lower boundary of 87% is a concern given the serious patient-oriented outcome. What do you think SGEMers should do with this data?

8) Follow-Up:

Do you think the seven-day follow-up was long enough to capture all the possible significant injuries?

9) One-Way Tool:

NEXUS is a “one-way” clinical decision instrument. Can you discuss this concept of a “one-way” tool and how NEXUS is different from PECARN in that regard?

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

Bottom Line

The pediatric NEXUS II Head CT Decision instrument can reliably categorize patients as low risk and may reducing CT imaging in these patients.

Case Resolution

Case Resolution:

In your patient, all of the low-risk features are present. You discuss with the father that in your clinical judgement you do not feel a head CT is indicated and discuss observation precautions and symptoms to look for and dad seems relieved.

Clinical Application:

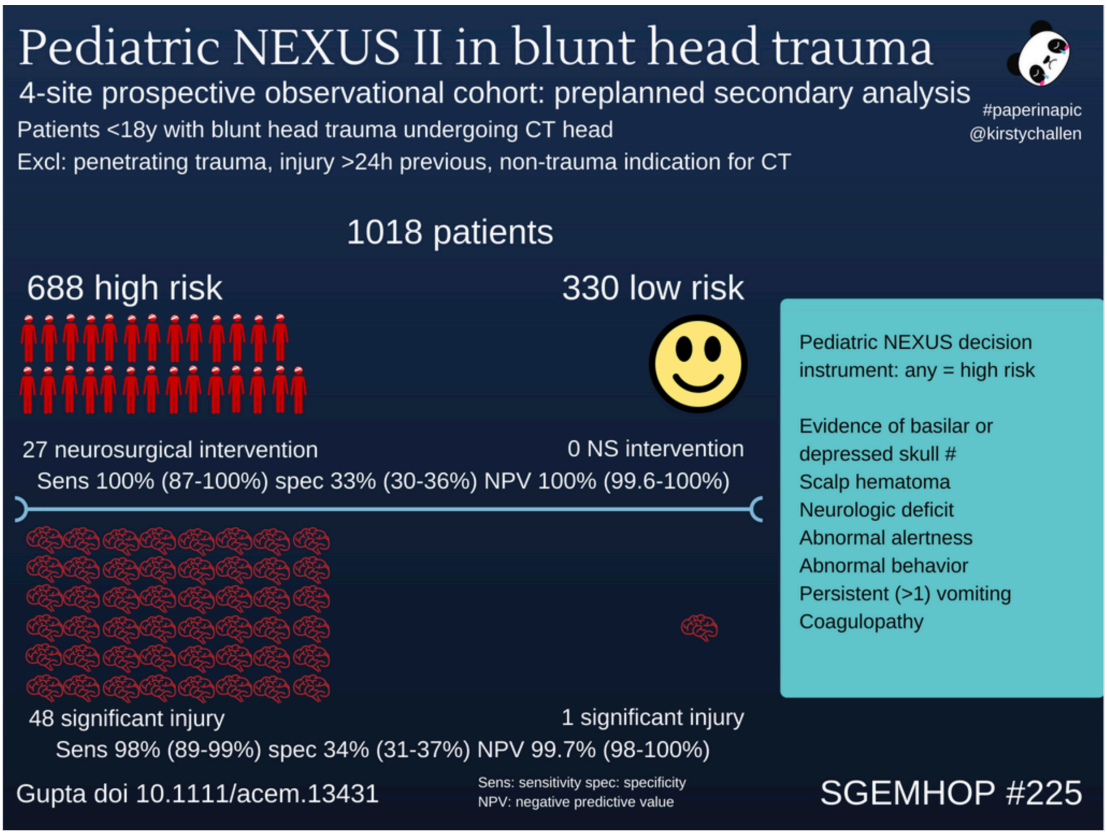
A properly powered study with tighter confidence intervals around the point estimate for the patient-oriented outcome of need for neurosurgical intervention is desireable before the Pediatric NEXUS II Head CT Decision Instrument is widely adopted.

What Do You Tell the Patient ?

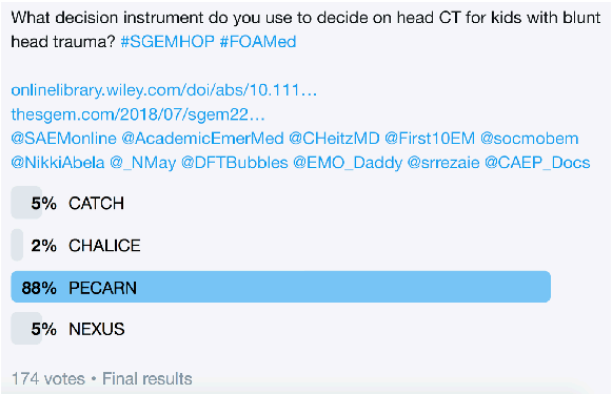
I tell the father that imaging isn’t indicated given the extremely low risk of significant injury. I commend the patient for wearing her helmet and instruct the father that any time a helmet is involved in an accident the recommendation is to replace it.

Episode End Notes

Infographic:



Twitter Poll:



Other FOAMed:

- **EM Literature of Note** – Don't Give NEXUS II Much Thought For Kids
- **Don't Forget the Bubbles** – The 17th Bubble Wrap
- **EM Cases** – BEEM Cases 1 – Pediatric Minor Head Injury
- **EM Cases** – Episode 3: Pediatric Head Injury
- **SGEM#124** – Ultrasound for Skull Fractures: Little Bones
- **SGEM#177** – POCUS: A New Sensation for Diagnosing Pediatric Fractures

SGEM#
226

I Want A New Drug:

One That Doesn't Cause an Adverse Drug Event

Question

Can a clinical decision rule (tool) accurately identify patients presenting to the ed with adverse drug events?

Case

A 54-year-old female presents to the Emergency Department (ED) with abdominal pain and profuse non-bloody diarrhea for the past 24 hours. Her vital signs are within normal limits and she is tolerating oral fluids. There have been no recent suspicious meals or water sources, camping, spelunking, sick contacts and she does not have any birds or reptiles at home. She takes no regular medications; however, she did start amoxicillin/clavulanate (Clavulin or Augmentin) for a sinus infection three days ago.

Bottom Line

Use of a clinical decision rule (tool) by clinical pharmacists and ED physicians can help to identify patients at risk for adverse drug events in the ED.

Guest Skeptic: Dr. Chris Bond is an emergency physician and clinical lecturer at the University of Calgary. He is currently the host of CAEP Casts, which highlights educational innovations from emergency medicine residency programs across Canada. Chris also has his own #FOAMed blog called Standing on the Corner Minding My Own Business (SOCMOB).

Date: August 16, 2018

Reference: Hohl C et al. Prospective Validation of Clinical Criteria to Identify Emergency Department Pa-

Episode 226 Overview

Case:

A 54-year-old female presents to the emergency department (ED) with abdominal pain and profuse non-bloody diarrhea for the past 24 hours. Her vital signs are within normal limits and she is tolerating oral fluids. There have been no recent suspicious meals or water sources, camping, spelunking, sick contacts and she does not have any birds or reptiles at home. She takes no regular medications; however, she did start amoxicillin/clavulanate (Clavulin or Augmentin) for a sinus infection three days ago.

Background:

Preventable adverse drug events (ADEs) are a common cause of ED visits, hospitalizations and death (Ref 1,2). ADEs cause or contribute to one in nine ED visits, and of deaths attributed to medical care, medications are the most common cause (Ref 3-6).

Unfortunately, 20-50% of ADEs are not recognized by emergency and inpatient unit physicians (Refs 7-10). When ADEs are not recognized and corrected, inappropriate medication use continues, resulting in excess morbidity and health care resource utilization.

Clinical pharmacists are trained to focus on medication management and are more likely to recognize medication-related ED presentations than physicians (Ref 11). However, clinical pharmacists are a scarce resource and not available in many centers.

In centers where they are available, routine medication review in all patients presenting to the ED is not feasible. Evidence based criteria to enhance the identification and treatment of ADEs are needed to ensure high-risk patients are evaluated by clinical pharmacists and to improve their outcomes.

Clinical Question

Can a clinical decision rule (tool) accurately identify patients presenting to the ED with adverse drug events?

Population: Patients age 19 years and older presenting to the ED who reported using at least one prescription or over the counter medication in the two weeks prior.

Exclusion: Non-English speaking and no translator with patient, violent behavior, intentional overdose, needlestick injury or sexual assault, previously enrolled, presented for a scheduled revisit, direct transfer to an admitting service, fast track patient, left against medical advice prior to seeing physician and pharmacist.

Intervention: Application of two different clinical decision rules (tools) to identify patients at risk for adverse drug events

Comparison: None

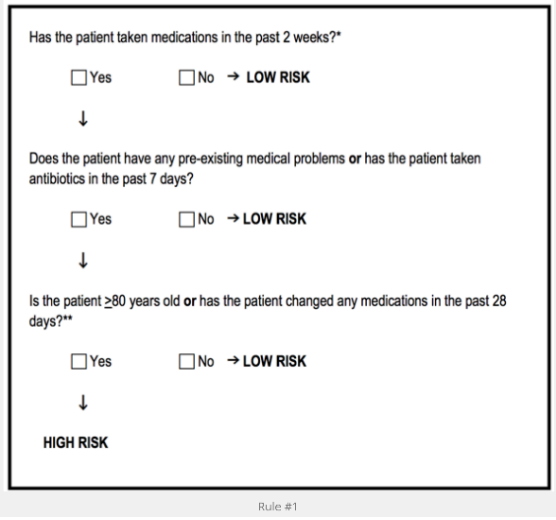
Outcome: A moderate or severe ADEs. This was defined as an *"untoward and unintended event arising from the appropriate or inappropriate use of a prescription or over-the counter medication."*

> **AEDs Included:** *"adverse drug reactions, a response to a prescription or over-the-counter drug that is noxious and unintended, and occurs at doses normally used in man for the prophylaxis, diagnosis or therapy of disease, and events due to non-adherence or drug withdrawal, errors in prescribing, dispensing or medication administration, drug interactions, supra or subtherapeutic dosing, untreated indications and inappropriate drug use".*
>
> **Severe ADE:** Death or required admission
>
> **Moderate ADE:** Change in medical management

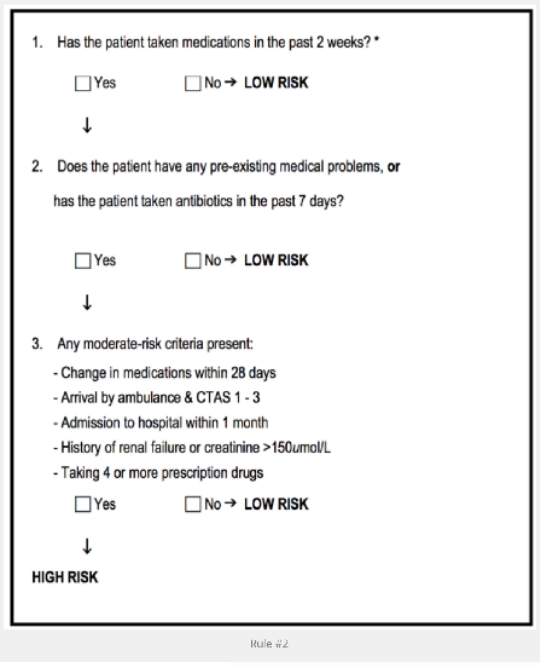
About the Author: We are finishing Season#6 with a SGEM Hot Off the Press episode from AEM. That means we have the lead author Dr. Corinne Hohl on the show. She is an Associate Professor in UBC's Department of Emergency Medicine and a Scientist at the Centre for Clinical Epidemiology and Evaluation. She practices Emergency Medicine at Vancouver General Hospital. Her main research interests are in patient safety, health systems innovations and drug safety and effectiveness.

For Corinne's work on ADEs, she was awarded a Best Paper Award from the American College of Emergency Physicians in 2011. In 2012, she was awarded with a New Investigator Award from the Canadian Institutes of Health Research. She was the recipient of a 2016 Canadian Institutes of Health Research Foundation grant to continue her work on ADE reporting, and is a member of the Canadian Drug Safety and Effectiveness Research Network.

The two AED Rules used in the study:



Rule #1



Rule #2

Author's Conclusion:

"Our study validated clinical decision rules that can be applied by clinical pharmacists to limit the number of patients requiring medication review, while identifying the majority of patients presenting with clinically significant adverse drug events."

Quality Checklist for Clinical Decision Tools

- [x] 1. The study population included or focused on those in the ED.
- [x] 2. The patients were representative of those with the problem.
- [x] 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).
- [NA] 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.

Key Results

There were 1,529 patients enrolled in the study with an average age of 59 years and 56% were female. The median number of prescribed medications was five. There were 184 patients (12%) diagnosed with 202 moderate or severe ADEs. There were no fatalities observed in the study attributed to ADEs.

Outcome

Both rules (tools) identified more than 90% of adverse drug events.

Primary Outcome: Identifying moderate or severe adverse drug events. Variables strongly associated with ADEs included: Age, use of opioids, antihypertensives and antibiotics, recent medication changes and number of prescription medications.

Rule	Sensitivity (95% CI)	Specificity (95% CI)	Positive LR	Negative LR
Rule#1 (168/184)	91.3% (86.3% - 95.0%)	37.9% (35.3% - 40.6%)	1.47 (95% CI 1.38 - 1.56)	0.23 (95% CI 0.14 - 0.37)
Rule#2 (176/184)	95.7% (91.6% - 98.1%)	22.8% (20.6% - 25.2%)	1.24 (95% CI 1.19 - 1.29)	0.19 (95% CI 0.10 - 0.38)

Secondary Outcomes

- Clinical pharmacist's and treating physician's outcome assessment was concordant in 90% of the cases.
- In cases that were ultimately attributed to ADEs, emergency physicians did not attribute the presentation to a drug 35% of the time.
- Emergency physicians were uncertain about whether an ADE had occurred in an additional 16%.

Talk Nerdy to Me

1) Selection Bias:

These were not consecutive patients because it would apparently have impacted negatively on patient flow through the ED. You used some form of algorithm to select patients but that has not been validated. Can you explain the process and tell us about some of the unpublished data you have to support this method of patient selection?

2) Night Shifts:

Another issue is that you did not include night shifts because it was deemed inefficient and costly. Do you think this could have introduced some selection bias?

3) Confounders: You used incentives to motivate the nurses to complete the forms.

- What types of prizes did you have for the nurses?
- Were some nurses more likely to complete the forms than others?
- Did the nurses know the purpose of the study or were they blinded?
- Once the incentives go away do you have any way to ensure that these forms continue to be filled out?

4) Delerium:

One of the presenting complaints likely to be most associated with ADEs is delirium in the elderly. Why not make this and other potential high yield complaints a focus for the pharmacists?

5) Non-English Speaking Patients:

Non-English-speaking patients without a translator with them were excluded from the study due to ED flow reasons. This seems like a group that could be at very high risk for ADEs in the first place. For non-English speaking patients who did have a translator, what was the incidence of ADEs and how did this compare to the English-speaking population? Is there other previous literature in this area?

6) Preventability:

Using this rule, we can better identify ADEs. How many of these would be preventable though? As and example, if you don't know someone has a sulfa allergy, or someone develops Stevens–Johnson syndrome, isn't that just bad luck?

7) Nursing Identification:

There was a significant number of misclassifications made by the nursing staff. We don't have pharmacists at all times of day, so how can we improve identification at triage or earlier in the ED visit?

8) Rule #1 vs. Rule #2:

Rule #1 had a slightly lower sensitivity than Rule 2 (91% vs. 96%) but higher specificity (38% vs. 23%), but Rule #1 seems much easier to use. Which would you recommend for other EDs and why?

9) Electronic Medical Records (EMRs):

I am glad you did not refer to EMRs as electronic HEALTH records (EHRs) because as described by ZdoggMD there is nothing "healthy" about putting a computer between the physician and patient. How do you think EMRs could be used to improve the identification of patients at risk for AEDs?

- EHR State of Mind
- Why Your Doctor Won't Look You in the Eye?

10) Impact Analysis:

This was not an impact analysis of these two tools. However, you did published an impact analysis before doing the validation study (Ref 12). Is this not putting the cart before the horse. Could you explain how this happened and what were the results of the impact analysis study?

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

Bottom Line

Pre-Hopsital antibiotics in the ambulance do not appear to have a mortality benefit in patients with varying degrees of sepsis in an optimized EMS system.

Case Resolution

Case Resolution:

Based on her recent initiation of antibiotics, you suspect this diarrhea may be due to an adverse drug event. You send stool cultures for C. difficile and tell the patient to stop the amoxicillin/clavulanate (Clavulin or Augmentin) as it is not needed for sinusitis anyway. The next day her stool assay is positive for C. difficile, and you call the patient to start her on appropriate therapy.

Clinical Application:

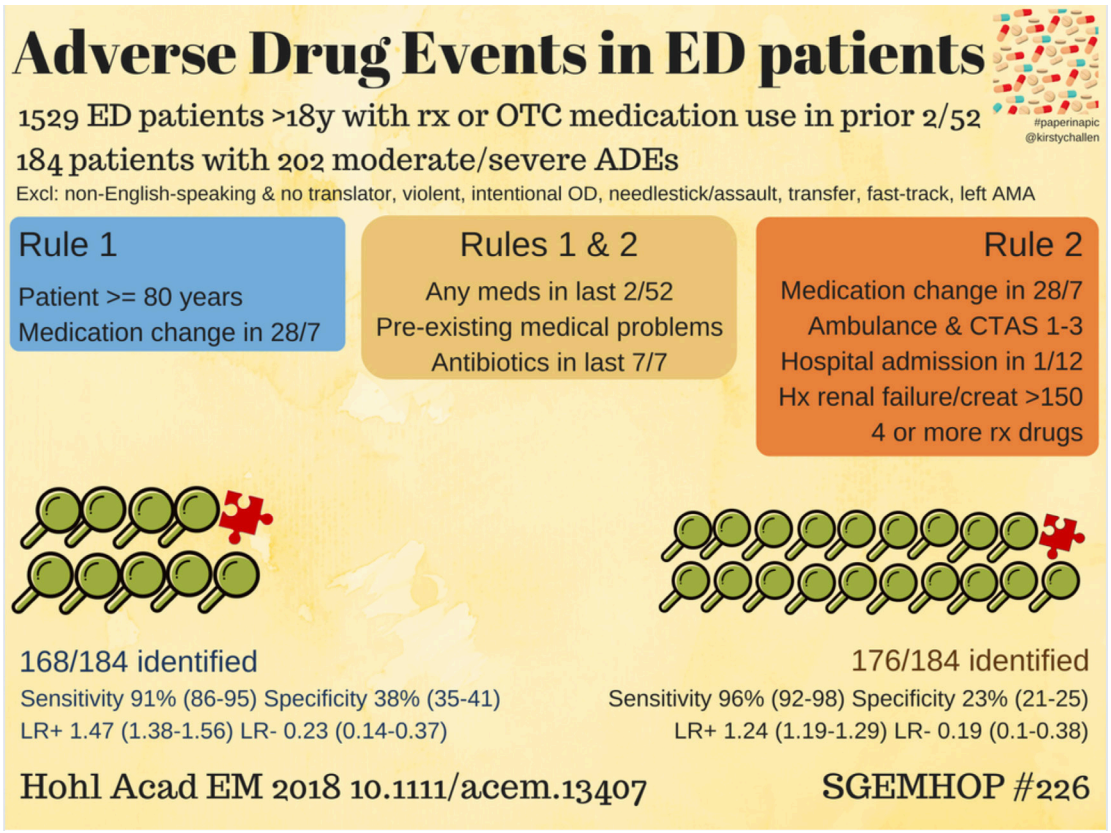
Clinical pharmacists can be a great resource to the emergency department. These two tools look promising, especially Rule #1, to micro allocate this important scare medical resources to those patients at higher risk of ADEs. It would be great to have another impact analysis of these tools before implementing them widely to ensure that they have a net patient-oriented benefit.

What Do You Tell the Patient ?

You have experienced an adverse drug reaction from the antibiotic used to treat your sinus infection. Antibiotics can disrupt the normal bacteria in your gut and this can sometimes result in the development of an infection called C. difficile. We will stop your other antibiotic and need to treat this infection with a different drug as it can become serious if left untreated.

Episode End Notes

Infographic:



Twitter Poll:

Do you have an EM Pharmacist in your ED to help recognize adverse drug events? #SGEMHOP

onlinelibrary.wiley.com/doi/abs/10.111…
thesgem.com/2018/08/sgem22…

@choo_ek @socmobem @snewbery1
@SRPCanada @SAEMonline
@CHeitzMD @First10EM @HeatherM211
@srrezaie @broomedocs
@EMManchester @andrewjtagg

56% Yes
44% No

158 votes • Final results

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Evidence Based Medicine is Easy

EBM is Easy

I know that evidence based medicine scares people. That stats seem complicated. Papers are often full of obtuse language. People are constantly debating small details at journal clubs, which can leave many physicians feeling inadequate.

But I can assure you, evidence based medicine is easy. If I can do it, anyone can. The only difficult part is getting into the habit of actually picking up a paper and starting to read.

I am a community emergency doctor with no special training in quantitative research methodology or epidemiology. Everything I learned about evidence based medicine I learned by picking up papers and reading them for myself (with some important insights from people like Jerry Hoffman and Rick Bukata on the Emergency Medical Abstracts). This post runs through the simplified approach I take when reading the medical literature, with the hope that I can convince you that you are also capable of taking an active role in critiquing the medical literature.

Steps to Take

Step 1: How do I find a paper to read?

When you are just starting out, I would suggest picking a paper that other people are also reviewing. This could be a paper that was chosen for your group's journal club, that was featured on a program like the Skeptics' Guide to Emergency Medicine, or one that you found in my Articles of the Month. Read the paper yourself, write down your conclusions, and then compare your thoughts to the conclusions of other experts who have read the same paper.

Eventually, you will probably find it limiting to only read papers chosen by others. Having access to a list of newly published research allows you to pick the topics that are most interesting to you. I currently get all of the abstracts from 47 different journals, but that is simply way too much for most people. Just pick one or two high impact journals in your field to scan each month. You can opt to receive notifications of new publications by e-mail, or you can subscribe to the journal's RSS feed.

If you are interested in a specific topic, another great option is to set up a pubmed email alert. It does require that you create a (free) NCBI account, but is easy and ensures that you will never miss an important paper on a topic that interests you (such as "sexual intercourse for the treatment of nephrolithiasis").

Step 2: Is this paper worth reading?

I use the title and abstract to decide whether a paper is worth reading. However, to save time, I don't read the entire abstract. First, I skip directly to the conclusions. If a paper's conclusions are not interesting, or don't seem relevant to my practice or my patients, I can throw the paper away and not waste any more time. If the conclusions seem interesting, I will look at the methods described in the abstract. If the methods are clearly poor or irrelevant to my current clinical practice (such as animal studies), I will not read the paper. If the conclusions are interesting and the methods seem reasonable I will download the paper to read.

Step 3: Read the paper

At first glance, papers seem long and dense. They are intimidating. simply scanning through a 16-page pdf is often enough to kill one's desire to read. Luckily, many of those pages are superfluous. Most of the time, we can be much more efficient in our reading if we understand the structure of a paper:

Title: Helpful (sometimes) for finding the paper in your original search, but basically useless after that.

Abstract: This quick summary of the paper helps you decide if a paper is worth your while. However, the details are far too scant to help us make clinical decisions, so we can skip the abstract when we actually sit down to read a paper.

Introduction: This section provides background information on the topic. However, the data presented is not the result of a systematic review. There is a lot of room for bias in the introduction section. In a lot of ways, the introduction section is just a summary of the authors' opinions on the topic. If the topic is completely new to you, you might find this background information helpful. Most of the time, though, I just skip the introduction section.

Methods: This is the most important part of any research paper. Good results are meaningless without high quality research methods. Expect to spend most of your time here. The methods section is often the most confusing section, with esoteric language or jargon, but a simplified approach is possible. I will get back to that in a minute. If the methods are very poor, you can save yourself time by stopping now, because with poor methodology you are unlikely to be convinced to change your practice, no matter what you find in the following results section.

Results: This is the real reason you picked up the paper in the first place. You want to know what the study showed, so you are going to have to read through the results section. There are often many different results presented. If you are feeling overwhelmed, focus on the primary outcome of the study (which should have been clearly stated in the methods section).

Discussion: This is another non-systematic review the literature. The authors compare their results to prior studies. Like this introduction, this section represents the opinions of the authors'. Usually, I skip the discussion section.

Conclusion: This is the author's opinion of what their results show. At this point you have already read the methods and results and so should have already drawn your own conclusions about the paper. You don't need to read the authors' conclusions unless you want a taste of the subjectivity present in scientific publication. Therefore, although papers often seem overwhelming long, we can cut down on the amount of time we spend reading by sticking to the most important sections. All of the study's objective science is found in the methods and results sections. The remaining sections add the authors' subjective interpretations, which can be safely skipped most of the time.

Apparently I am not the only one who skips large chunks of research papers. A very similar approach to reading papers is outlined on Sketchy EBM:

Step 4: Interpret the paper (stats are less important than you think)

Medical research can certainly get very complex. Papers often include language understandable only if you have a PhD in statistics. However, the vast majority of the time a quality critical appraisal is possible by simply asking a few common sense questions as you read.

You can think of a trial like a race. We want the race to be fair. In order to be fair, the race has to have a fair start (all patients start the trial at the same spot), everyone needs to run the same course (all trial participants are treated similarly except for the intervention), and there needs to be a fair finish (the outcome is measured the same for everyone, without bias).

One framework I keep in mind when reading papers is the **RAMMBO** approach:

- **R**ecruitment
- **A**llocation
- **M**aintenance
- **M**easurement: Blind or Objective

Recruitment

- Who was included in this study? Do the study patients look like my patients?
- Is the study size appropriate? (Ideally, this should be easy to tell, because the researchers will describe their sample size calculation).
- Were there important exclusions that could affect the results?

Allocation

- Were the groups similar at the beginning of the trial?
- Was assignment to treatment groups randomized? If assignment wasn't randomized, it is worth considering what factors might have made the groups systematically different (confounders), but keep in mind that it is not possible to identify all confounders.

Measurement

- Were patients, clinicians and researchers all blinded to the treatment? (Bias is much more likely when people are aware of the groups patients were assigned to).
- Or, were the outcomes objective and standardized? (In an unblinded trial, bias is less likely with an objective outcome like mortality than it is with a subjective outcome like satisfaction with treatment).
- Were harms adequately measured?

These simplified RAMMBO questions help me distill the methods section down into common sense questions that I can understand. They are primarily aimed at assessing the validity of the trial's results. After I finish reading a paper, I like to pause and ask myself a few other questions to help place the trial in its appropriate context:

1. Why was the study done?
a. Is the question important?
b. Does anyone have a vested interest in the outcome?

2. Is the benefit big enough?
a. To answer this question, you have to consider both how the benefits weighs against harms, but also the cost that any new intervention might have.

3. How does this study fit with previous research?

In my opinion, the answers to these questions are far more important than any of the statistics or p values you might struggle with while reading. I always consider these questions before I even look at the statistics presented. Although comfort with critical appraisal does require some practice, these questions are relatively straightforward and, I think, make basic critical appraisal easy for any practicing clinician.

Step 5: Use a Checklist

Most of the time, the basic questions above are all you need when appraising an article. However, sometimes if a paper is more complex or if I am tackling a more important question, I want to be more thorough with my critical appraisal. In those situations, I recommend using a checklist to help assess all the possible sources of bias in a paper. There are many checklists available. I generally use the Best Evidence in Emergency Medicine (BEEM) checklists:

1. Randomized Clinical Trials
2. Systematic Reviews
3. Diagnostic Studies
4. Clinical Practice Guidelines
5. Clinical Decision Instruments
6. Prognostic Studies

Step 6: Ask for Help

Although I think evidence based medicine is easy, I will admit that there are some aspects that can get very complex. As practicing physicians, it doesn't make a lot of sense for us to learn everything about epidemiology. We need to be expert clinicians, not statisticians. The solution is simple: know when to ask for help. Start by reading the paper, but when you come across topics that you don't fully understand, reach out for some help. There are many incredible resources when it comes to evidence based medicine. Obviously, we have the #FOAMed community, with many excellent podcasts and blogs that can help with critical appraisal. I plan on updating this blog with a number of EBM resources in the coming year, so keep an eye on https://first10em.com/EBM for added resources. Reaching out to experts directly can also be helpful. As I struggled to learn critical appraisal, I have emailed experts like Jerry Hoffman, Ken Milne, and Andrew Worster on multiple occasions, and each time have been rewarded with friendly and brilliant responses. Local experts like medical librarians and university research methodologists are also excellent resources. Finally, don't underestimate the value of a simple search on Google or YouTube.

Step 7: Apply the research

This is where evidence based medicine can get complex. Reading and appraising papers is easy, but real evidence based medicine requires that clinicians interpret the evidence through a lens of clinical expertise and with patient values in mind. Evidence based medicine is not just about the literature. “Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values.” (Sackett 2000)

This is why you are already an evidence based medicine expert. This is why it is better for practicing clinicians to read the literature than expert methodologists. Although a statistician will have incredible insight into the mathematics of the paper, it is only the practicing clinician who can adequately filter the information through their clinical expertise, explain it in simple terms to their patients, and make decisions that mesh the best available evidence with the values of the patient. That is evidence based medicine. These discussions (which we all have every shift) are complex. In comparison, reading the literature is simple, so why not give it a try?

References:

Sackett D et al. Evidence-Based Medicine: How to Practice and Teach EBM, 2nd edition. Churchill Livingstone, Edinburgh, 2000, p.1.

Cite this article as: Justin Morgenstern, “Evidence Based Medicine is Easy”, First10EM blog, January 8, 2018. Available at: https://first10em.com/ebmiseasy/.

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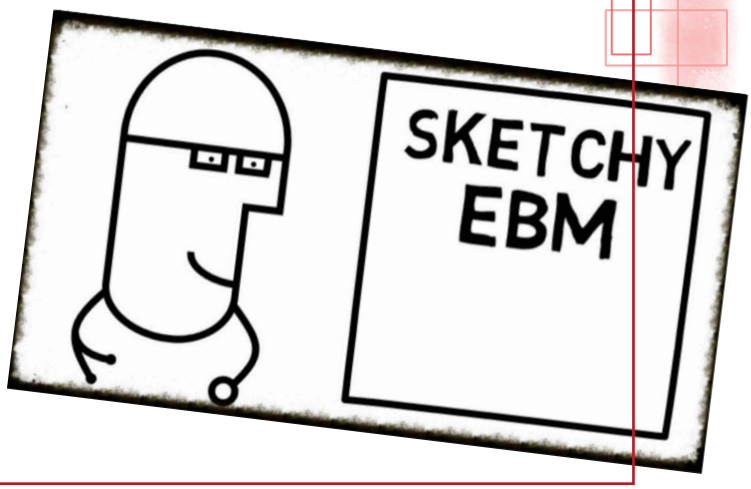
Sketchy EBM

Sketchy EMB - Always Draw Your Own Conclusions



Do you find EBM and clinical epidemiology:
a) Annoying
b) Boring
c) Complicated
d) Useless
e) All of the above

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Are you odd? You'll learn just how ODD you might be! Knowing about odds can make you a better gambler!

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Uncorked rage can be fun and educational!

No matter what you do, remember to always draw your own conclusions!