# THE SKEPTICS GUIDE TO EMERGENCY MEDICINE

## SEASON 2

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FOREWORD BY C. CARPENTER
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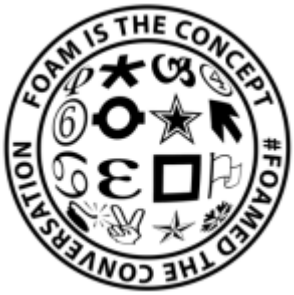
**Based on the famous earthbound podcast series**

# 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 down to 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. FOAM – Medical education for anyone, anywhere, anytime.

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




The SGEM consists of a weekly podcast on iTunes 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 to be skeptical of anything you learn, even if you learned it from the Skeptics' Guide to Emergency Medicine.**

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# DISCLAIMER

The Skeptics' Guide to Emergency Medicine (SGEM) is produced in Canada and is intended for emergency medicine and critical care providers. A goal of the SGEM is to disseminate the best evidence so you can provide your patients with the best care.

The SGEM may discuss commercial products and/or devices as well as the unapproved/investigative use of commercial products/devices.

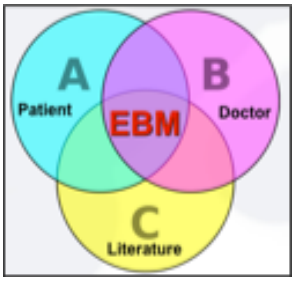
The SGEM does not have significant relationships that create, or may be perceived as creating, a conflict relating to this educational activity.

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

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

# EVIDENCE BASED MEDICINE

Evidence based medicine (EBM) was coined by Dr. Gordon Guyatt and the Evidence Based Medicine Working Group in 1992. It is defined as the overlap between clinician expertise, a patient's unique situation and personal values, and research evidence. It is about increasing patients' choices, not decreasing choices. Unfortunately, a growing body of evidence suggests that clinical experience alone is insufficient to ensure that patients receive contemporary, guideline-based medical care. In fact, half of the patients in the United States do not receive evidence-based management in primary care (1). Since there are over 3,800 biomedical publications that appear every day in PUBMED and since an emergency medicine provider needs to read 26 articles in Annals of Emergency Medicine to find one manuscript that changes their practice (2), it is not surprising that busy clinicians often overlook new innovations and updated guidelines.




It is no wonder that the Institute of Medicine estimates that it takes (on average) 17 years for 14% of research evidence to permeate into everyday bedside practice. One evolving approach to the information overload challenge confronting busy clinicians is the BEEM Rater Instrument, the only validated tool to filter practice-changing medical research from the "noise" of other publications. The BEEM Rater Instrument was designed and validated by SGEM contributors -- and is the methodological backbone of the SGEM evidence selection process. The BEEM process can be used to significantly reduce the "information overload" challenge for busy clinicians.

EBM provides a new approach to incorporating clinical research into bedside practice. The process of EBM provided a template to seek, find, appraise, and apply research findings to individual patients, as opposed to the passive dissemination of research that had been relied upon by investigators, journals, and educators in the past. EBM offers an approach to help busy clinicians to find, evaluate, and use clinical research in their practice, but it is not a panacea (3). Most clinicians lacked a high-quality exposure to EBM during their medical training (4,5) and there is ample evidence that traditional CME is ineffective (6).

1. McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, Kerr EA: The quality of health care delivered to adults in the United States. N Engl J Med 2003, 348(26):2635-2645. PMID 12826639
2. McKibbon KA, Wilczynski NL, Haynes RB: What do evidence-based secondary journals tell us about the publication of clinically important articles in primary healthcare journals? BMC Med 2004, 2:33. PMID 15350200
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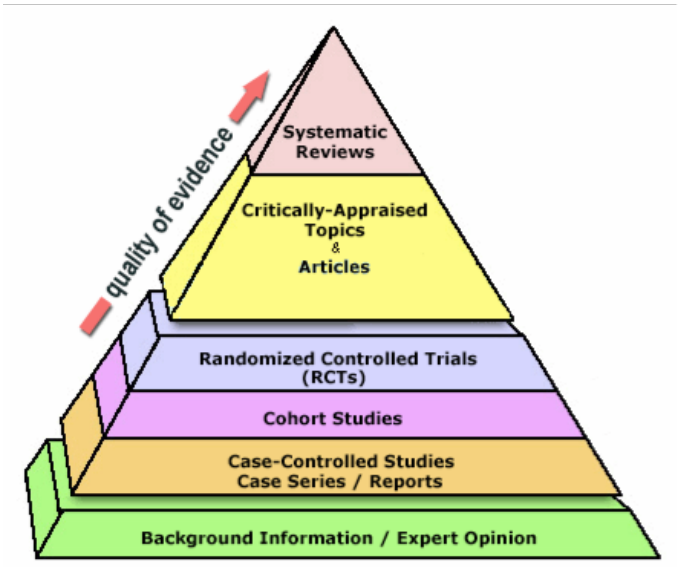
4. Kuhn GJ, Wyer PC, Cordell WH, Rowe BH: A survey to determine the prevalence and characteristics of training in evidence-based medicine in emergency medicine residency programs. J Emerg Med 2005,28(3):353-359. PMID 15769588
5. Carpenter CR, Kane BG, Carter M, Lucas R, Wilbur LG, Graffeo CS: Incorporating evidence-based medicine into resident education: a CORD survey of faculty and resident expectations. Acad Emerg Med 2010, 17(S2):S54-S61. PMID 21199085
6. Forsetlund L, Bjorndal A, Rashidan A, Jamtvedt G, O'Brien MA, Wolf F, Davis D, Odgaard-Jensen J, Oxman AD:Continuing education meetings and workshops: effects on professional practice and health care outcomes.Cochrane Database Syst Rev 2009, Issue 2. Art. No.: CD003030. DOI: 10.1002/14651858.CD003030.pub2. PMID 19370580

EBM critics often portray the EBM construct of finding, appraising, and using clinical evidence as an unreal expectation (7,8.9). However, these same critics offer no viable alternatives (10,11). To misquote Winston Churchill, "EBM is the worst form of medicine, except for all the others that have been tried."

The stepwise approach to EBM involves starting with a specific clinical question you are looking to answer. You then go through a five-step process in an attempt to answer the question.




**Step 1: PICO**

This stands for Population, Intervention, Control and Outcome. You want to find a study population that is similar to your patient. What was the intervention and what were the controls (placebo, sham or other treatment)? Finally, were the outcomes patient oriented outcomes and not disease oriented or surrogate markers?

**Step 2: Devise a Search Strategy**

This could be as broad as a Google or Google scholar search. While capturing many hits, it may be difficult to distinguish the signal from the noise. PubMed is a large database you are probably familiar with already. It has various filters to help refine your search to obtain an answer to your clinical questions. Another search strategy you may want to try is www.TRIPdatabase.com (Turning Research Into Practice). It can be very useful to narrow your search. Alternatively, Washington University's amazing Journal Club (www.emjclub.com) may have already asked and answered the same question.

**Step 3: Select the Least Biased Information**

There is a hierarchy of EBM that is beautifully illustrated in this pyramid. It shows the path from the lowest form of evidence like an expert opinion, to the highest form of evidence such as systematic reviews. You want to find the highest form of evidence possible when trying to answer your clinical question.


7. Tobin MJ: Counterpoint: evidence-based medicine lacks a sound scientific base. Chest 2008, 133(5):1071-1074. PMID 18460514
8. Hatala R: Is evidence-based medicine a teachable skill? Ann Emerg Med 1999, 34(2):226-228. PMID 10424928
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11. Leppäniemi A: From eminence-based to error-based to evidence-based surgery. Scan J Surg 2008, 97(1):2-3. PMID 18450201

**Step 4: Critically Appraise the Study**

You need to review the manuscript found in the search. For a randomized clinical trial (RCT) there are a number of questions you need to ask yourself:

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

**Step 5: Consider the Limitations**

Think about what the limitations were based on your critical appraisal and summarize these thoughts. Consider these broad issues:

- External validity
- Biases
- Randomization
- Blinding
- Patient Oriented Outcomes (POO)
- Clinically Significant

In the end after looking at the evidence, critically appraising it and considering the limitations you will have to decide if the information is practice changing? How would you apply this information clinically? What would you tell your patients?

# Best Evidence in Emergency Medicine

Best Evidence in Emergency Medicine (BEEM) is a knowledge translation and dissemination project. Dr. Andrew Worster of McMaster University started it 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 Medicine practitioners with the best clinical evidence to optimize patient care.

**BEEM Vision:** To be the most valid, reliable, and unbiased global source of current clinically relevant patient-centered medical knowledge for practitioners.

There are close to 3,800 articles published every day. BEEM has a validated and reliable way of screening this mountain of information to separate the signal from the noise. Take a look at the next page for details about the BEEM process.

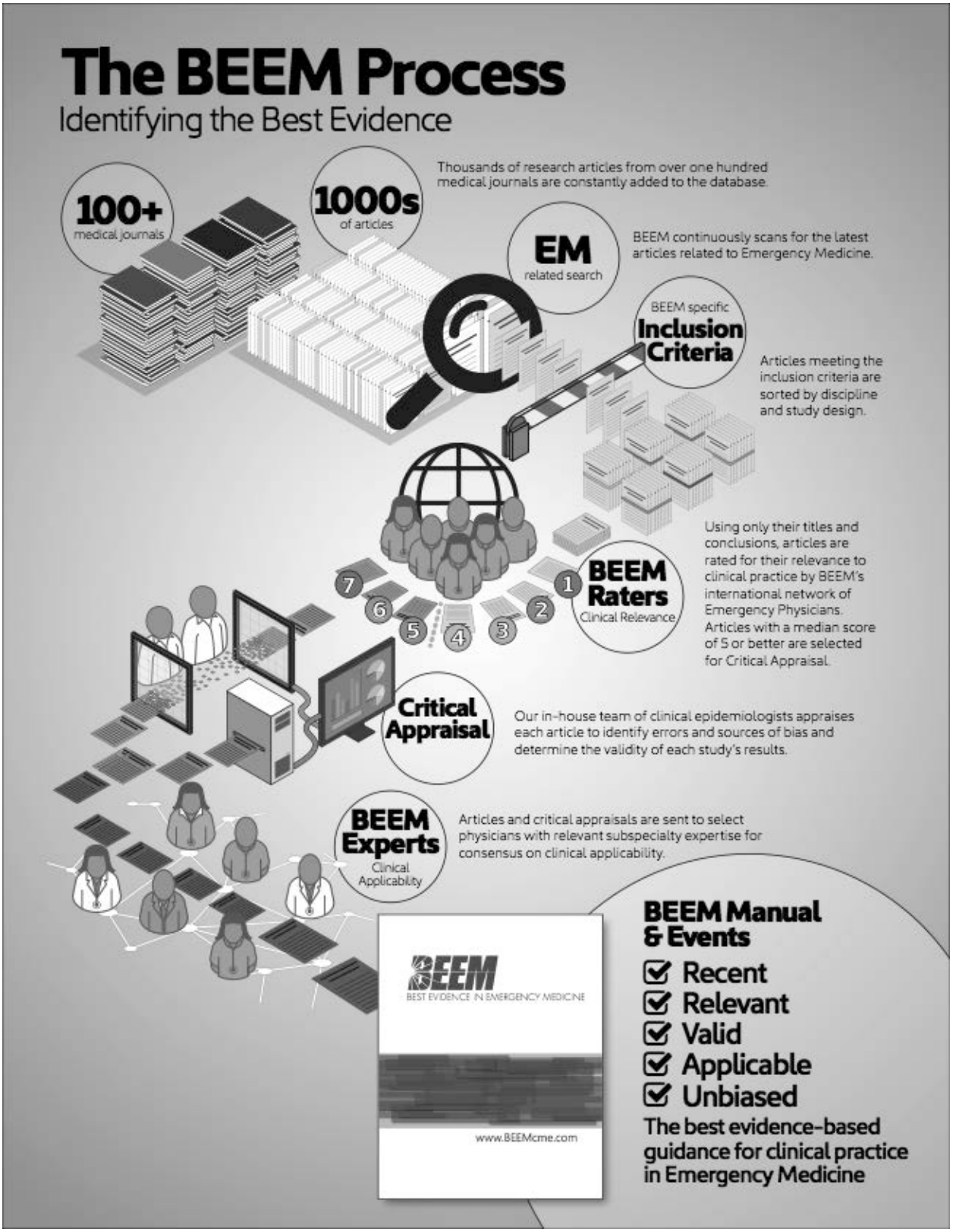
BEEM has the only validated audience rating tool in emergency medicine continuing medical education. (1)

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 (2)

**References:**

1. Worster, A., Kulasegaram, K., Carpenter, C. R., Vallera, T., Upadhye, S., Sherbino, J., & Brian Haynes, R. (2011). 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. Academic Emergency Medicine, 18(11), 1193-1200.

2. Carpenter, C. R., Sarli, C. C., Fowler, S. A., Kulasegaram, K., Vallera, T., Lapaine, P., ... & Worster, A. (2013). Best Evidence in Emergency Medicine (BEEM) rater scores correlate with publications' future citations. Academic Emergency Medicine, 20(10), 1004-1012.


The BEEM Process
Identifying the Best Evidence
100+
medical journals
1000s
of articles
Thousands of research articles from over one hundred medical journals are constantly added to the database.
EM
related search
BEEM continuously scans for the latest articles related to Emergency Medicine.
BEEM specific
Inclusion Criteria
Articles meeting the inclusion criteria are sorted by discipline and study design.
BEEM Raters
Clinical Relevance
1
2
3
4
5
6
7
Using only their titles and conclusions, articles are rated for their relevance to clinical practice by BEEM's international network of Emergency Physicians. Articles with a median score of 5 or better are selected for Critical Appraisal.
Critical Appraisal
Our in-house team of clinical epidemiologists appraises each article to identify errors and sources of bias and determine the validity of each study's results.
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Clinical Applicability
Articles and critical appraisals are sent to select physicians with relevant subspecialty expertise for consensus on clinical applicability.
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# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# 43

# One is the Loneliest Number
## High Sensitivity Troponin

### CASE SCENARIO:

*A 43 year old woman comes in complaining of chest pain for about an hour. The chest pain was at rest with no radiation of the pain. She takes no medications and her medical history includes two c-sections.*

*She is Well's Criteria low and PERC Rule negative. Physical examination and ECG are non-diagnostic.*

### Q:

CAN A SINGLE HIGH-SENSITIVITY CARDIAC TROPONIN (HS-CTN) RULE OUT AN ACUTE MYOCARDIAL INFARCTION?

**BOTTOM LINE**

One is a lonely number. A single negative hs-cTn should not be used to rule out acute myocardial infarction.

# Normal presenting levels of high-sensitivity troponin and myocardial infarction.

## Hoeller et al. Heart 2013 Apr 19

**P** Consecutive adult patients presenting to the emergency department with chest pain

**I** Four different high-sensitivity troponin (hs-cTn)

**C** Two independent cardiologists

**O** Death and acute myocardial infarction

### Author's Conclusion:

*"Normal hs-cTn levels at presentation should not be used as a single parameter to rule out AMI as 6%-23% of adjudicated AMI cases had normal levels of hs-cTn levels at presentation." (Hoeller et al., 2013)*

### Background

There have been many markers used over the last 60 years. These have included Total Creatine Kinase (Total CK), Creatine Kinase Isoenzymes M and B (CK-MB), Lactate Dehydrogenase (LDH), Myoglobin (MB), Troponin (TropT, TropI), Glycogen phosphorylase isoenzyme BB, Pro-Brain Natriuretic Peptide (Pro-BNP), and Ischemia Modified Albumin (IMA). The first practical test utilized as a cardiac marker was serum glutamic oxaloacetic transaminase (SGOT) which is now called aspartate amino-transferase (AST). (LaDue et al) For a deeper dive on the history of cardiac biomarkers you can read JH Ladenson's or Rosalski et al review paper.

Since the late 1990's the cardiac marker of choice has changed from CK-MB to Troponin. This was in part due to the improved time dependent sensitivity and improved specificity of Troponin compared to CK-MB (Apple et al, Mair et al, and Katus et al). Only about 5% of all consecutive patients presenting with acute chest pain will have a ST elevated myocardial infarction (STEMI) (Apple et al). These are the easy ones to diagnose and manage. This leaves the other 95% of chest pain patients. These are the hard ones. We need to figure out who will rule-in vs. rule-out for acute myocardial infarction (AMI). This is where cardiac biomarkers play a major role.

A limitation of current troponin assays is that they can take 3-4 hours to rise. This means the diagnosis of Non-STEMI can take 6-8 hours of continued monitoring with serial blood sampling. Ruling out AMI takes time, uses resources, contributes to overcrowding, and causes patient anxiety.

In 2000, the European Society of Cardiology and the American College of Cardiology (ESC/ACC) jointly redefined myocardial necrosis making cTn assays the primary tool for AMI diagnosis. They proposed the cTn value at the 99th percentile of a healthy reference population as the single cut-off value with analytical imprecision, measured as the coefficient of variation (CV) at ≤10%.

In 2007, the updated definition of AMI advocated a "rise and/or fall" of cTn again over a 6-9 hour time period using the 99th percentile.

The 3rd Universal Definition of AMI (published August 24,2012) has been reduced to 3-6 hours using a sensitive cTn assay. This means that all patients who undergo cTn testing require at least 2 measurements at least 3 hours apart regardless of the time of symptoms onset. Because of the lack of evidence, there is no guidance from the 2012 AMI definition on using hs-cTn assays in the emergency department. The general consensus of the definition of a hs-cTn is that levels can be measured in 50% of the normal population.

The definition for AMI is still at the 99th percentile. You don't need to be an epidemiologist to figure out that this changes the prevalence of AMI. The question is whether this increase in prevalence is a numbers game or that we're detecting people with myocardial injury sooner.

.

| *Marker* | *50% Patients* | *75% Patients* | *95% Patients* |
|---|---|---|---|
| **Troponin** | 3.6 hrs | 4.3 hrs | 7 hrs |
| **CK-MB** | 4.8 hrs | 5.5 hrs | 12 hrs |

The 3rd Universal Definition of AMI is very explicit. It requires detection of a rise and/or fall of cardiac biomarker values [preferably cardiac troponin (cTn)] with at least one value above the 99th percentile upper reference limit (URL) and with at least one of the following: symptoms of ischemia, new or presumed new significant ST-segment–T wave changes or new left bundle branch block, development of pathological Q waves in the ECG, imaging evidence of new loss of viable myocardium or new regional wall motion abnormality, or identification of an intracoronary thrombus by angiography or autopsy.

**SENSITIVITY:** CAN THE TEST IDENTIFY POSITIVE RESULTS OR PEOPLE WITH THE DISEASE ACCURATELY.

$$\frac{\text{TRUE POSITIVES}}{\text{TRUE POSITIVE AND FALSE NEGATIVES}}$$

A HIGHLY 'SENSITIVE' TEST, WHEN NEGATIVE RULES OUT DISEASE.

SN-N-OUT!

**SPECIFICITY:** CAN THE TEST IDENTIFY THE NEGATIVE RESULTS OR PEOPLE WITHOUT THE DISEASE ACCURATELY.

$$\frac{\text{TRUE NEGATIVES}}{\text{TRUE NEGATIVES AND FALSE POSITIVES}}$$

A HIGHLY SPECIFIC TEST, WHEN POSITIVE, RULES IN DISEASE

SP-P-IN!

***NEGATIVE PREDICTIVE VALUE (NPV):***
NPV IS OFTEN USED TO DESCRIBE THE PERFORMANCE OF A DIAGNOSTIC TEST. A HIGH NPV FOR A TEST MEANS THAT IF THE TEST IS NEGATIVE IT IS MOST LIKELY A CORRECT ASSESSMENT.

$$\frac{\text{TRUE NEGATIVES}}{\text{ALL NEGATIVES (TRUE AND FALSE)}}$$

## Results

1. Patients were more likely to rule-in if for AMI if older, previous AMI, diabetes, hypercholesterolemia, hypertension, coronary artery disease, peripheral vascular disease, on ASA or ACE-inhibitor at presentation, ECG changes (LBBB, ST elevation or depression and t-wave inversion)
2. Death in the first 30 days more likely if you had positive hs-cTn at presentation
3. AMI was also more likely in the first 30 days if you had positive hs-cTn at presentation.

| *Test* | *N* | *AMI* | *Sensitivity* | *NPV* |
|---|---|---|---|---|
| **Roche** | 2072 | 21% | 89.6% (95CI 86.4-92.3) | 96.5% (95CI 95.4-97.4) |
| **Siemens** | 1180 | 20% | 94.1% (95CI 90.3-96.7) | 98.0% (95CI 96.6-98.9) |
| **Beckman** | 1151 | 20% | 92.1% (95CI 87.8-95.2) | 97.5% (95CI 96.0-98.5) |
| **Abbott** | 1567 | 20% | 77.2% (95CI 72.1-81.7) | 94.3% (95CI 92.8-95.5) |

# TALK NERDY TO ME

## Commentary

This was a prospective, international, multi-centred study with a primary end point was of all cause mortality and AMI during follow-up. Most chest pain patients did not have AMI. The hs-cTn missed up between 6%-23% of AMI. NPV for the four tests was 94-98% It was no surprise the sensitivity and NPV were better in patients presenting after 6 hours of chest pain. There was variability between four different tests and lack of standardization. Because it is an observational trial, the true clinical benefit can not be determined.

There are a couple of other factors to consider when interpreting the results of this study. The authors state that this is part of the APACE study and they limited their population to ED patients with symptoms suggestive of AMI such as acute chest pain, angina pectoris at rest or other thoracic sensations presumably caused by myocardial ischemia.

Interestingly the other published APACE studies describe their population as patients with different symptoms so we really don't know how all-inclusive the population is. We do know that in North American ED practice we tend to order cTn measurements on a much broader scope of patients.

Second, their follow-up period was 24 months. It is unrealistic for any negative test result to be valid for 24 months.

As an aside, predictive values are dependent upon disease prevalence and their study population has much lower obesity rates than we do in North America which may translate into different coronary artery disease and AMI prevalence.

### Diagnostic Study Quality Checklist

| | |
|---|---|
| The clinical problem is well defined. | ☑ |
| The study population represents the target population that would normally be tested for the condition including | ☑ |
| The study population included or focused on those in the ED. | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | ☑ |
| The diagnostic evaluation was sufficiently comprehensive and applied equally to all patients (i.e. no evidence of verification bias). | ☑ |
| All diagnostic criteria were explicit, valid and reproducible (i.e. no incorporation bias). | |
| The reference standard was appropriate (i.e. no imperfect gold-standard bias). | ☑ |
| All undiagnosed patients underwent sufficiently long and comprehensive follow-up (i.e. no double gold-standard bias). | ☑ |
| The likelihood ratio(s) of the test(s) in question is presented or can be calculated from the information provided. | ☑ |
| The precision of the measure of diagnostic performance is satisfactory. | ☑ |

### CONCLUSION VS COMMENTARY COMPARISON

There was substantial variation in NPV of hs-cTnI among assays and between timeframe of patient presentation and symptom onset. Patient's reported onset time for cardiac symptoms is not always reliable in the clinical setting. The Authors' conclusions that single assays, even hs-cTn testing, should not be used as a rule-out in the evaluation of ACS.

## Case Resolution

You order a hs-cTn on this 43 year old woman when she arrives to the emergency department which is normal. A repeat hs-cTn and ECG are performed three hours later which are also normal. You discuss the results with her and estimate her chance of AMI in the next 30 days of 1/250 based on the NNT. Shared decision making takes place and you discharge her home with a diagnosis of chest pain NYD and ask her to follow-up with her primary care physician in the next week

## Clinical Application

Single assay troponins (high sensitivity) cannot be used as a rule out test on initial presentation for patients with symptoms onset of varying timeframes of presentation (0 - > 6 hours).

**WHAT DO I TELL MY PATIENT?**

Single assay troponins (high sensitivity) cannot be used as a rule out test on initial presentation for patients with symptoms onset of varying timeframes of presentation (0 - > 6 hours).

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Apple, F.S., Voss, E., Lund, L., Preese, L., Berger, C.R., Henry, T.D. (1995). Cardiac troponin, CK-MB and myoglobin for the early detection of acute myocardial infarction and monitoring of reperfusion following thrombolytic therapy. Clin Chim Acta, 237(1-2): 59-66.PMID:7664479

Mair, J., Morandell, D., Genser, N., Lechleitner, P., Dienstl, F., and Puschendorf, B. (1995). Equivalent early sensitivities of myoglobin, creatine kinase MB mass, creatine kinase isoform ratios, and cardiac troponins I and T for acute myocardial infarction. Clin Chem, 41(9): 1266-1272. PMID:7656437

Katus, H.A., Remppis, A., Neumann, F.J., Scheffold, T., Diederich, K.W., Vinar, G., Noe, A., Matern, G. (1991). Diagnostic efficiency of troponin T measurements in acute myocardial infarction. Circulation, 83:902-912. PMID:1999039

Hoeller R., Rubini Gimenez, M., Reichlin, T., Twerenbold, R., Zellweger, C., Moehring, B., Wildi, K., Freese, M., Stelzig, C., Hartmann, B., Stoll, M., Mosimann, T., Reiter, M., Haaf, P., Mueller, M., Meller, B., Hochgruber, T., Balmelli, C., Sou, S.M., Murray, K., Freidank, H., Steuer, S., Minners, J., Osswald, S., Mueller, C. (2013). Normal presenting levels of high-sensitivity troponin and myocardial infarction. Heart, 99(21): 1567-1572. PMID:23604180


**Guest Skeptic: Dr. Andrew Worster, McMaster University**
Associate Professor, Dept of Medicine, Division of Emergency Medicine
Associate Member, Dept of Clinical Epidemiology & Biostatistics
Associate Editor, ACP Journal Club and Canadian Journal of Emergency Medicine

# 44

# PAUSE
## Etomidate and Rapid Sequence Intubation in Sepsis

### CASE SCENARIO:

*A 70 year old man arrives by ambulance from home complaining of being weak and dizzy. No specific complaints of chest pain, shortness of breath, abdominal pain or focal weakness. He has a history of hypertension, benign prostatic hypertrophy, dyslipidemia and osteoarthritis. His vital signs are blood pressure 76/48mmHg, heart rate 110bpm , oxygen sat 86% and temperature of 39.5C. He is difficult to rouse and you decide he needs rapid sequence intubation.*

**Q:**

CAN YOU USE ETOMIDATE FOR RSI IN SEPTIC PATIENTS?

**BOTTOM LINE**

This review updates the controversy on using single-dose etomidate for RSI in septic patients, and raises more concerns about increased in-hospital mortality. However, this is based on a single large observational substudy of a failed RCT, and it is not clear why these trial results were so different from others. This is enough information to give PAUSE to routine use of etomidate in septic RSI, but not to abandon it completely.

# Etomidate is associated with mortality and adrenal insufficiency in sepsis: a meta-analysis. Chan et al. Crit Care Med 2012

**P** Septic patients requiring mechanical ventilation (pediatrics excluded)

**I** Single dose etomidate for RSI

**C** Other various sedative agents

**O** Mortality (all-cause, RCT only, 28 days), adrenal insufficiency

## Author's Conclusion:

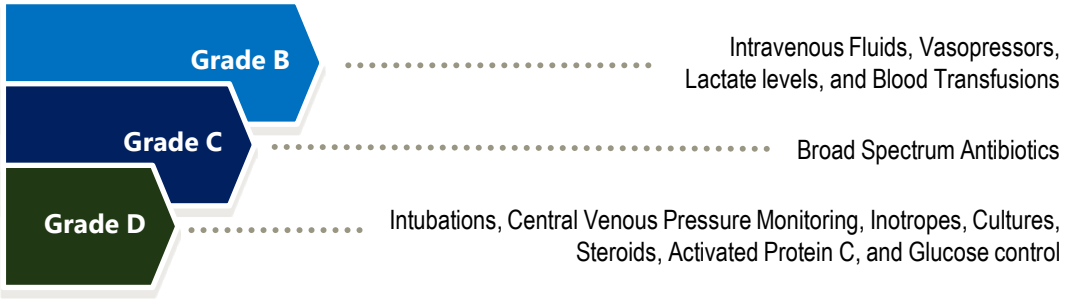
*"Administration of etomidate for rapid sequence intubation is associated with higher rates of adrenal insufficiency and mortality in patients with sepsis." (Chan et al., 2012)*

## Background

Sepsis has received more attention over the last 5 years or so. This includes the Surviving Sepsis Campaign and the Early Goal-Directed Therapy. Both ACEP and CAEP have guidelines that address optimal management of severe sepsis.

"Sepsis is defined as the presence of both systemic inflammatory response syndrome and the suspicion of an infection. Sepsis is a syndrome, and can range from relatively mild (simple infection) to severe (septic shock and multiorgan dysfunction). Morbidity and mortality increase if a patient deteriorates from sepsis to severe sepsis to multiorgan dysfunction (CAEP)".

**Key Aspects of Early Recognition (with Grade of Recommendation):**



# Surviving Sepsis Campaign (SCCM)

### Within 3 hours:

1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 ml/kg crystalloid for hypotension or lactate ≥4 mmol/L

### Within 6 hours:

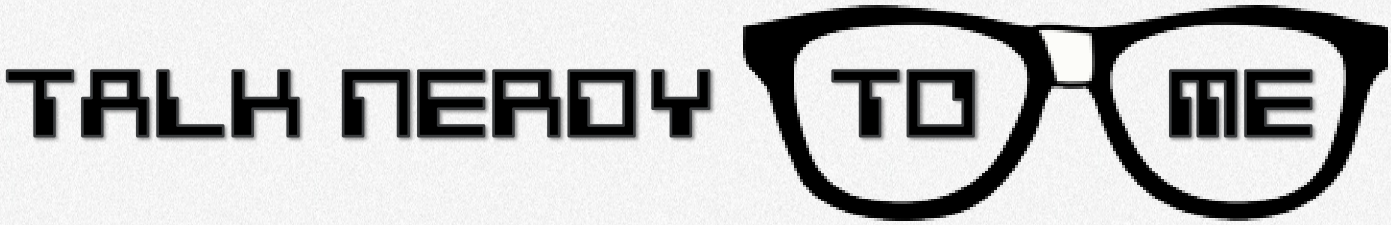
1) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65 mm Hg
2) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL), measure central venous pressure (CVP) and central venous oxygen saturation (ScvO2)*
3) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg; ScvO2 of ≥70%, and normalization of lactate.

## Results

Mortality Outcomes (5 studies, n=867 patients): INCREASED risk of all-cause death with etomidate (RR 1.20; 95%CI 1.02-1.42, I2 = 4.9%). No difference in subgroup analyses with RCT results only, or standardized mortality at 28days. The 95%CI intervals in the all-cause and subgroup mortality analyses are rather wide.

Adrenal Insufficiency (7 studies, n=1303 patients): INCREASED risk of AI with etomidate (RR 1.33; 95%CI 1.22-1.46, I2=43.9%). No difference in sensitivity analysis with RCTs only.




## Comments

This new review raises concerns about the safety of etomidate in septic RSI, as it is the first review that focuses on mortality issues rather than prior studies looking at AI only. The conclusions for mortality risk must be qualified, however, since the biggest study driving the mortality outcome is a positive observational substudy of the CORTICUS RCT by Cuthbertson et al (499 patients) which contributes 37.66-55.84% of the patients to the pooled results in various subgroups. Inspection of the forest plot reveals that this is the only positive study suggesting harm, and the other included studies show no significant difference.

It is clear that excluding the Cuthbertson data would render the results statistically insignificant, which raises doubt about the overall mortality conclusions. Furthermore, the Cuthbertson cohort of patients scored relatively high on the SAPS II score (mean 48; IQR 37-62) which confers a hospital mortality of almost 50%.

Other trials had similar illness severity SAPS II scores, yet found insignificant differences in groups (smaller sample sizes). It is not clear why the Cuthbertson results are an outlier compared to other studies/RCTs, and the results of pooling would certainly not be robust if this one study were removed. The authors do not address why the Cuthbertson results seem to be so different from other included studies…

**Systematic Review Quality Checklist**

| | |
|---|---|
| The clinical question is sensible and answerable | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality | ☑ |
| The assessments of studies were reproducible | ☑ |
| The outcomes were clinically relevant | ☑ |
| There was low statistical heterogeneity for the primary outcome | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | |

A more conservative and methodologically sound MA by Hohl et al (Cdn researcher Vancouver, published Annals EM 2010), rightly excluded this large observational study from RCT SR/MA, and there was no result suggesting increased mortality from etomidate bolus use in RSI in septic shock patients. Specific critiques of the Cuthbertson can also be found in Int J Intens Care 2010 (Pallin and Walls), in CJEM 2011 (Green et al), and most recently in Annals EM 2013 (Syn Snap, Hunter & Kirschner, Indiana University Sch of Med).

## Case Resolution

You initiate 1L normal saline bolus. Do a rapid sequence intubation using etomidate, draw laboratory tests including blood/urine cultures, start broad spectrum antibiotics and call the ICU for admission.

## Clinical Application

I will pause before using etomidate for rapid sequence intubation in septic patients.

**WHAT DO I TELL MY PATIENT?**

You are very sick with a severe infection. You have received broad spectrum antibiotics. We need to put you to sleep and take over the work of breathing. This should give you a better chance of successfully fighting this infection.

## References

Dellinger, R.P., Levy, M.M., Carlet, J.M. et al. (2008). Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock: 2008. Crit Care Med, 36(1): 296-327. PMID:18158437

Green, R.S., Djogovic, D., Gray, S. et al. (2008). Canadian Association of Emergency Physicians sepsis guidelines: the optimal management of severe sepsis in Canadian emergency departments. CJEM, 10(5): 443-459. PMID:18826733

Chan, C.M., Mitchell, A.L., and Shorr, A.F. (2012). Etomidate is associated with mortality and adrenal insufficiency in sepsis: a meta-analysis. Crit Care Med, 40 (11): 2945-2953. PMID:22971586

**More Sepsis Information:**

Walls and Murphy. Clinical Controversies: Etomidate as an Induction Agent for Endotracheal Intubation in Patients With Sepsis. Ann Emerg Med. 2008 Jul;52(1):13-4. doi: 10.1016/j.annemergmed.2008.01.344.

Hohl et al. The Effect of a Bolus Dose of Etomidate on Cortisol Levels, Mortality, and Health Services Utilization: A Systematic Review. doi:10.1016/j.annemergmed.2010.01.030

Hunter and Kirschner. In Patients With Severe Sepsis, Does a Single Dose of Etomidate to Facilitate Intubation Increase Mortality? Ann Emerg Med Vol 61, No. 5: May 3013

Green and Gorman. Safety of etomidate bolus administration in patients with septic shock. CJEM 2011;13(2):105-108

Cuthbertson et al. The effects of etomidate on adrenal responsiveness and mortality in patients with septic shock. Intensive Care Med (2009) 35:1868–1876

**Guest Skeptic: Dr. Suneel Upadhye, McMaster University**
Associate Clin Prof EM, Assoc Member Dept CEB McMaster University
Chair, CAEP Guideline Committee
Sepsis publications: JEM 2009 MEDS score review, CCRT CJEM2007

# 45

# VITAMIN H
## HALOPERIDOL FOR PSYCHOSIS

**CASE SCENARIO:**

*A 23 year old man with schizophrenia presents with police after being picked up for violent outburst at a coffee shop. He is clearly agitated and you need to chemically restrain him.*

**Q:**

IS HALOPERIDOL THE SAFEST AND MOST EFFECTIVE METHOD OF TRANQUILIZATION FOR PATIENTS WITH PSYCHOSIS INDUCED AGGRESSION OR AGITATION?

**BOTTOM LINE**

Haloperidol works and should be used with medication(s) to avert side effects if possible.

# Haloperidol for psychosis-induced aggression or agitation (rapid tranquillisation).

## Powney et al. Cochrane Database of Systematic Review 2012

**P** RCTs involving people with agitation or aggression thought to be due to psychosis

**I** Haloperidol

**C** Nothing, placebo or 18 other treatments

**O** Asleep, repeat injections, or side effects

### Author's Conclusion:

*"If no other alternative exists, sole use of intramuscular haloperidol could be life-saving. Where additional drugs to offset the adverse effects are available, sole use of haloperidol for the extreme emergency, in situations of coercion, could be considered unethical. Addition of the sedating promethazine has support from better-grade evidence from within randomised trials. Use of an alternative antipsychotic drug is only partially supported by fragmented and poor-grade evidence. Evidence for use of newer generation antipsychotic alternatives is no stronger than that for older drugs. Adding a benzodiazepine to haloperidol does not have strong evidence of benefit and carries a risk of additional harm." (Powney et al., 2012)*

### Background

**Serious Reactions of Haloperidol (from Epocrates)**

| | |
|---|---|
| • Neurologic (extrapyramidal, tardive dyskinesia, akithisia, dystonia, and seizure) | • Hematologic (leukopenia, neutropenia, and agranulocytosis) |
| • Hyperpyrexia or heat stroke | • Hyponatremia |
| • Neuroleptic Malignant syndrome | • Hepatic Impairment |
| • Pneumonia | • Sudden Death |
| • Hypotension or hypertension | • Ocular (cataracts and retinopathy) |
| • Cardiac (QT prolongation) | |

## Methods

This was a Cochrane systematic review and they tend to be very well done. The authors searched the Cochrane Schizophrenia Group Trials Register which included major databases, hand searches, and conference proceedings. Those authors of RCTs included in this review were contacted for additional trial data.

One author extracted data using standardized forms and 10% of the data was extracted by a second author to ensure reliability. Discrepancies were resolved by consensus or adjudication. A similar process was used to assess risk of bias (REF). Methodological heterogeneity was assessed using the I2 statistic and the Chi2 P value. Data were pooled, if appropriate, using a fixed effects model. Pooled binary outcome results were expressed as a relative risk (RR with 95% confidence intervals) while pooled continuous data were expressed as a mean difference.

## Results

There were 669 potential studies identified in the search. Thirty-two studies were included for analysis. The age of patients ranged from 18-73 years. Over 80% of patients had a diagnosis of schizophrenia while a minority had drug induced psychosis or an organic mental disorder.

Interestingly, addition of lorazepam did not offset haloperidol induced dystonia (N=67, RR=8.25, CI=0.46 to 147.45) or the need for anti-Parkinson medications (RR=2.74, CI=0.81 to 9.25). One trial investigated the addition of promethazine but was stopped after an interim analysis found that patients in the haloperidol alone group experienced more dystonia (N=316, RR=19.48, CI=1.14 to 331.92) and adverse events (N=316, RR=11.28, CI=1.47 to 86.35).

Table 1. Summary of time to falling asleep expressed as a relative risk with 95% confidence intervals. * Denotes statistical significance.

| | 1 hour (N = 60) | 2 hours (N = 270) | 3 hours (N = 66) |
|---|---|---|---|
| **Haldol vs Placebo** | | 0.88* (0.82 – 0.95) | |
| **Lorazepam vs Haldol** | 1.05 (0.76 – 1.44 | | 1.93* (1.14 – 3.27) |

# TALK NERDY TO ME

## Commentary

The case scenario of needing rapid and safe chemical restraint of an agitated and/or aggressive patient is common in the ED. While physical restraints can be effective they are not without risk to the patient and health care providers. Avoiding over-sedation can be difficult in these situations. Many protocols using single agents or combinations of agents have been investigated. Most trials exploring combination therapy have unfortunately not been done in the ED and are methodologically flawed. The recommends from ACEP is the use of a benzodiazepine (midazolam or lorazepam) OR conventional anti-psychotics (droperidol or haloperidol) as monotherapy for the undifferentiated agitated patient.

### Study Quality Checklist

| | |
|---|---|
| The clinical question is sensible and answerable | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality | |
| The assessments of studies were reproducible | ☑ |
| The outcomes were clinically relevant | ? |
| There was low statistical heterogeneity for the primary outcome | |
| The treatment effect was large enough and precise enough to be clinically significant | ? |

Based on this SR with limited RCT data, haloperidol is effective but should be used in combination with medications that minimize the occurrence of common side effects such as dystonia and akithisia. The authors of this review found that promethazine, benzodiazepines, and anticholinergics are useful but caution that they may add to the sedating effects of haloperidol. One interesting finding was that the use of newer atypical antipsychotics was not superior to the use of haloperidol. In fact, haloperidol may be superior as it is more broadly availability and less expensive.

## Case Resolution

You sedate this 23 year old known schizophrenic with Haloperidol 5mg IM. He is settled and sleeping in two hours. Screening blood work is sent off and he waits for psychiatry service to assess.

## Clinical Application

Haloperidol should be used to sedate undifferentiated agitated patients in the emergency department. It should be used in combination with other medications to offset the possible very disturbing side effects of haloperidol.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

The conclusions from the Cochrane authors are reasonable considering the limitations of the data available on this subject.

## WHAT DO I TELL MY PATIENT?

I can see you are very upset and I want to help. You are in danger of hurting yourself or someone else. I am going to give you something to help you feel better.

### Black Box Warnings ⓘ

**Dementia-Related Psychosis**
not approved for dementia-related psychosis; incr. mortality risk in elderly dementia pts on conventional or atypical antipsychotics; most deaths due to cardiovascular or infectious events; extent to which incr. mortality attributed to antipsychotic vs. some pt characteristic(s) not clear

## References

Powney, M.J., Adams, C.E., and Jones, H. (2012). Haloperidol for psychosis-induced aggression or agitation (rapid tranquillisation). Cochrane Database of Systematic Reviews 2012, Issue 11. Art. No.: CD009377. DOI: 10.1002/14651858.CD009377.pub2. PMID 23152276

**Guest Skeptic: Dr. Anthony (Tony) Seupaul**
Chair of Emergency Medicine, University of Arkansas

# 46

# DON'T PASS THE DUTCHIE
## CANNABINOID HYPEREMESIS SYNDROME

### CASE SCENARIO:

*A 22 year old man presents for the third time in a week with vomiting. He was worked up extensively in the previous two visits and no cause was found. Nothing seems to stop the vomiting. He had a similar bout of cyclical vomiting a few months ago. You go to assess him and he is very anxious and all he want to do is take a hot shower.*

**Q:** HOW DO YOU DIAGNOSE CANNABINOID HYPEREMESIS SYNDROME?

**BOTTOM LINE**

You may not need to do an extensive work-up in patients with suspected cannabinoid hyperemesis syndrome.

# Cannabinoid Hyperemesis: A Case Series of 98 Patients.

## Simonetto et al. Mayo Clin Proc 2012

**P** Patients with cannabis use preceding their symptoms of recurrent vomiting with no other explanation for their symptoms.

**I** None

**C** None

**O** Proposed Clinical Criteria for Cannabinoid Hyperemesis

### Author's Conclusion:

*"Cannabinoid hyperemesis should be considered in younger patients with long-term cannabis use and recurrent nausea, vomiting, and abdominal pain. On the basis of our findings in this large series of patients, we propose major and supportive criteria for the diagnosis of CH." (Simonetto et al., 2012)*

### Background

Marijuana is the number one illegal drug used in the USA and the world with psychoactive and physiologic effects. This podcast will not discuss the legality of marijuana or former presidents who apparently did not inhale. The title song "Pass the Dutchie" was a huge reggae song by British band Musical Youth in 1982 selling 5 million copies world wide. The term dutchie comes from the word kouchie which was slang for cannabis pipe.

Marijuana is often consumed by smoking different parts of the plant. The active substance is tetrahydrocannabinol (THC) which is highly lipophilic and can last in your system for weeks to months. There are two main receptors for marijuana (CB1 and CB2). CB1 is found mainly in the brain while the CB2 receptor is found mainly in the peripheral tissues.

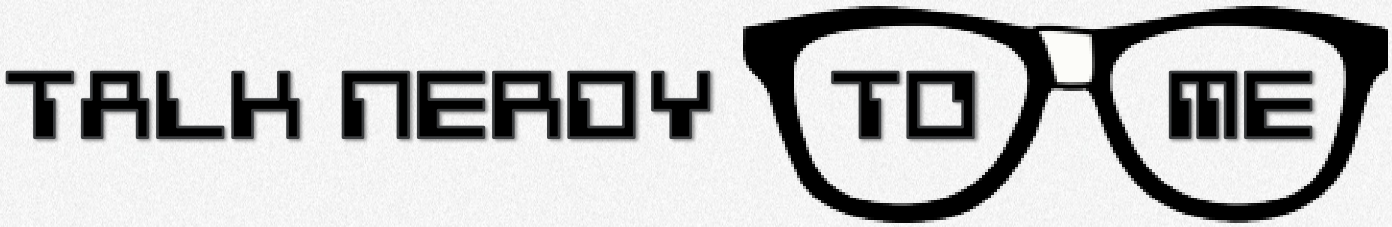
Marijuana has been used for hundreds of years for a variety of reasons. It is used medically to treat different conditions including nausea and vomiting. Paradoxically, chronic use was recently recognized by Allen *el al.* in 2004 to cause cyclical vomiting in patients from South Australia. Roche and Foster quickly reported in 2005 that this was not an isolated problem to the Adelaide Hills of South Australia. The medical condition has became known as cannabinoid hyperemesis syndrome.

## Methods

An electronic medical record search was performed at one institution. Two investigators independently reviewed the charts. Disagreements were resolved by a gastroenterologist.

## Results

1571 patients were identified with 98 meeting inclusion criteria. Average age was 32 years and two-thirds were male. This generated proposed clinical criteria for cannabinoid hyperemesis. Long-term cannabis use as essential for diagnosis. There were five major features and five supportive features.




## Commentary

This is the largest case series describing cannabinoid hyperemesis syndrome from one tertiary care centre. It brings more attention and recognition to a new clinical condition. Despite its large size it still represents a lower form of evidence.

The Oxford Centre for Evidence-based Medicine (CEBM) has five levels of evidence and four grades. A case-series represents a Level 4/Grade C evidence.

- Grade A: Consistent Randomised Controlled Clinical Trial, cohort study, all or none (see note below), clinical decision rule validated in different populations.
- Grade B: Consistent Retrospective Cohort, Exploratory Cohort, Ecological Study, Outcomes Research, case-control study; or extrapolations from level A studies.
- Grade C: Case-series study or extrapolations from level B studies.
- Grade D: Expert opinion without explicit critical appraisal, or based on physiology, bench research or first principles.

There are limits to case series. Their retrospective nature makes them susceptible to recall bias. Case series use a chart review for their data. The reliability of this method has been well described by Gilbert *et al.* and Worster *et al.*

Another limit was about half of these patients were found in gastroenterology clinic notes. This limits the external validity to patients we may see presenting undifferentiated to the emergency department.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Agree with authors to suspect cannabinoid hyperemesis syndrome in patients presenting with major and supportive criteria for the diagnosis.

## Case Resolution

You give him lorazepam 1mg IV and it does not work. You choose wisely and decide not to repeat another extensive/expensive workup. Then you remember last week's SGEM episode on haloperidol in agitation. You did some extra reading around the subject at the time and recall reading a case report about haloperidol and cannabinoid hyperemesis syndrome. You give it a try and he stops vomiting. However, you are skeptical with an n=1 and know the cyclic vomiting could have stopped on its own. The young man is discharged home with the advice to stop smoking so much pot.

## Clinical Application

Have a high index of suspicion of cannabinoid hyperemesis syndrome in patients presenting with major and supportive criteria.

**WHAT DO I TELL MY PATIENT?**

It looks like your nausea, vomiting and abdominal pain is being caused by excessive pot smoking. You do not need more tests and investigations at this time. We will try our best to treat your symptoms. If you stop smoking pot you will probably not have this happen again.

## References


Leggett, T. and the United Nations Office on Drugs and Crime. (2006). A review of the world cannabis situation. Bull Narc. 58(1-2): 1-155. PMID 19066071

Allen, J.H., deMoore, G.M., Heddle, R., Twartz, J.C. (2004). Cannabinoid hyperemesis: cyclical hyperemesis in association with chronic cannabis abuse. Gut, 53:1566-1570. PMID 15479672

Roche, E. and Foster, P.N. (2005). Cannabinoid hyperemesis: not just a problem in Adelaide Hills. Gut, 54(5): 731. PMCID 1774504

Galli, J.A. Andari Sawaya, R., and Friendenberg, F.K. (2011). Cannabinoid hyperemesis syndrome. Curr Durg Abuse Rev., 4(4): 241-249. PMID 22150623

Simonetto, D.A., Oxentenko, A.S., Herman, M.L., and Szostek, J.H. (2012). Cannabinoid hyperemesis: a case series of 98 patients. Mayo Clin Proc. 87(2): 114-119. PMID 22305024

Gilbert, E.H., Lowenstein, S.R., Koziol-McLain, J., Barta, D.C., Steiner, J. (1996). Chart reviews in emergency medicine research: Where are the methods? Ann Emerg Med, 27(3): 305-308. PMID 8599488

Worster, A. and Haines, T. (2004). Advanced statistics: understanding medical record review (MRR) studies. Acad Emerg Med, 11(2): 187-192. PMID 14759964

Hickey, J.L., Witsil, J.C., Mycyk, M.B. (2013). Haloperidol for treatment of cannabinoid hyperemesis syndrome. Am J Emerg Med, 31(6): 1003.e5-6. PMID 23583118

# 47

# HAIL TO THE CHIEF
## CORONARY ARTERY STENTS
## PART 1

**CASE SCENARIO:**

*A 67 year-old former president of the USA presents with fever, lethargy, sore throat difficulty swallowing and breathing.*

**Q:** WHAT IS THE BEST TREATMENT FOR EPIGLOTTITIS?

**BOTTOM LINE**

Do not use blood letting to treat soldiers with fever.

# Inaugural medical dissertation on camp fever.

## Hamilton, A. 1816

- **P** Soldiers with fever
- **I** Blood letting
- **C** No blood letting
- **O** Death

## Background

Epiglottitis is inflammation of the epiglottis. It is usually caused by infection and historically the most common one was *Haemophilus influenzae* type B (Hib). It represents a life-threatening airway emergency. Since the introduction of the Hib vaccine the incidence of epiglottis has decreased significantly.

There used to be approximately 20,000 cases of severe Hib per year in the USA in children <5 years old. These severe infections caused about 1,000 children to die each year. In 2006 Before Hib vaccination, about 20,000 children younger than five developed severe Hib disease in the United States each year, and about 1,000 died. By 2006, the number of reported Hib cases was down to only 29. Vaccines are one of the true success stories of modern medicine.

## Methods

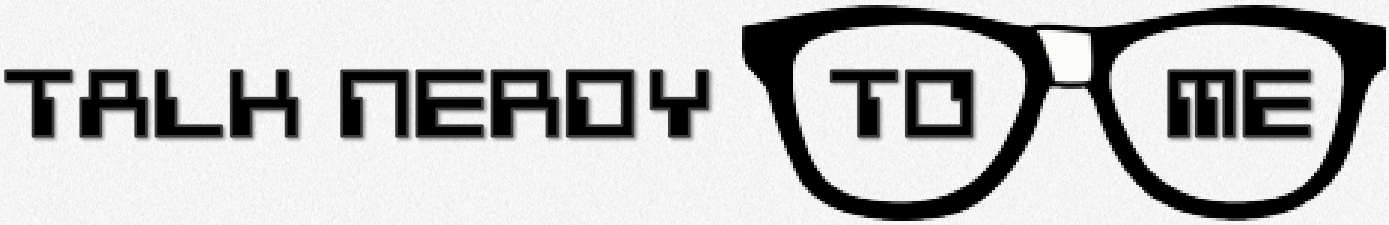
Soldiers presenting with fever were randomly allocated to two groups. Standard blood letting treatment by one surgeon or no blood letting by Dr. Hamilton and Mr. Anderson.

“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. The sick were indiscriminately received, and were attended as nearly as possible with the same care and accommodated with the same comforts. One third of the whole were soldiers of the 61st Regiment, the remainder of my own (the 42nd) Regiment. Neither Mr Anderson nor I ever once employed the lancet.”

## Results

N = 366. The NNH (Number Needed to Harm) is the inverse of the attributable risk. In this case 1/19.1%-3.3% which gives a NNH=6.3 (95% CI 9.1-10.7). So for every 6 people you treat with blood letting you cause the death of one.

| | Blood Letting | No Blood Letting |
|---|---|---|
| **Alive** | 148/183 (80.9%) | 177/183 (96.7%) |
| **Dead** | 35/183 (19.1%) | 6/183 (3.3%) |




## Commentary

This is probably the first trial to demonstrate the importance of randomization. It would have been difficult to do it as a blinded trial. However, all the bias should have favored the blood letting as that was the standard of care.

## Case Resolution

George Washington had 5 pints of blood removed . One doctor suggested a tracheotomy but was over ruled. President Washington went into shock and died the next day.

So this was Presidential care 200 years ago. You may notice that the Hamilton study was not published until 17 years after Washington's death. So it is understandable that they did not know blood letting was probably not the best treatment plan.

Did you know that the barber shop red and white stripe pole represented blood letting? Barbers were the surgeons of the day and did most of the blood letting. The pole was made to look like a bandaged arm with soaking blood running down.

We have come a long way in the last 2 centuries and are much smarter now. Germ theory of disease has replaced the idea that all disease and illness were caused by one of the four humors being unbalanced. Our treatment would be to prevent most cases of epiglottis with immunization. Any recognized case would be treated aggressively with antibiotics and supportive therapy.

### Study Quality Checklist

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

If the airway was compromised, we would address with intubation or a surgical airway like a tracheotomy. And finally, patients with sepsis are given blood when in shock transfusions as opposed to blood letting. Check out Episode#44 for more information about sepsis treatment.

## Clinical Application

Do not employ the lancet when trying to treat undifferentiated fever in soldiers.

## CONCLUSION VS COMMENTARY COMPARISON

Despite the lack of blinding to blood letting it would be hard to argue with the patient oriented outcome of being alive or dead.

## WHAT DO I TELL MY PATIENT?

You have a fever and we will do what we can to help you. However, the standard practice of blood letting has been shown to be harmful. It kills one out of every six soldiers. Therefore, we are not going to use this to treat your fever.

## References

Hamilton, A. (1816). Inaugural medical dissertation on camp fever.

# 47

# HAIL TO THE CHIEF
## CORONARY ARTERY STENTS
## PART 2

**CASE SCENARIO:**

*A 67 year old former President is getting his annual physical. He is known to be very physically fit and active. There is no suggestion of symptomatic coronary artery disease (CAD) suggested.*

**Q:** WHAT IS THE BEST TREATMENT FOR ASYMPTOMATIC CAD?

# Initial coronary stent implantation with medical therapy versus medical therapy alone for stable coronary artery disease: meta-analysis of randomized controlled trials.

Stergiopoulos, K., et al. Arch Intern Med. 2012

**P** Patients with stable CAD

**I** Stent

**C** Medical therapy alone

**O** Death and non-fatal MI

## Author's Conclusion:

*"Initial stent implantation for stable CAD shows no evidence of benefit compared with initial medical therapy for prevention of death, nonfatal MI, unplanned revascularization, or angina". (Stergiopoulous et al., 2012)*

**Background** Heart disease is the leading cause of death killing about 600,000 Americans each year. The prevalence of CAD in the USA is about 6%.

**Methods** Medline search from 1970-2011 of randomized trials.

# TALK NERDY TO ME

## Commentary

Percutaneous coronary interventions (typically stents) are used hundreds of thousands of times each year to open narrowed coronary arteries. Most such patients are not in the midst of an acute coronary syndrome such as a heart attack. This meta-analysis aimed to determine whether stenting (i.e. opening) as an initial approach to narrowed arteries is more beneficial than simply taking medicines to prevent future attacks or death.

PCI and the coronary angiography that necessarily precedes PCI are both invasive procedures with harms. Morbidity from these procedures has been poorly documented and inadequately studied in a contemporary milieu, thus harm numbers are best-guess estimates, however it is widely accepted that major complications include stroke, kidney failure, heart attack, and death.4 The American Heart Association suggests that 2% of patients, or 1 in 50, suffers an important complication.

For the patients in this group of studies, however, who appear to represent the majority of patients currently eligible for PCI, there was no identifiable benefit to the procedure and there are established harms. While the frequency of these harms is not clear, their existence is, thus we have chosen to classify this intervention as 'Black'.

### VIP SYNDROME

**DEFINITION:** A "CONDITION" CAUSED WHEN A VERY IMPORTANT PERSON--V.I.P. BY VIRTUE OF FAME, POSITION OR CLAIM ON PUBLIC INTEREST--DISRUPTS THE NORMAL COURSE OF PT CARE IN A HOSPITAL. SEE CHIEF 'SYNDROME, ' CODE PURPLE.

SEE:

DR. JEFF BROWN: THE VIP SYNDROME AND MEDICINE
DR. JORGE GUZMAN: CARING FOR VIPS- NINE PRINCIPLES
Z MEISEL AND J PINES: VIP SYNDROME- WHY THE RICH AND POWERFUL MIGHT GET SUBSTANDARD MEDICAL CARE.

## Case Resolution

President Bush had an angiogram and stent placed.

## References

Wijeysundera HC, Nallamothu BK, Krumholz HM, Tu JV, Ko DT. (2010). Meta-analysis: effects of percutaneous coronary intervention versus medical therapy on angina relief. Ann Intern Med, 16.152(6):370-9. PMID 20231568

Schömig A, Mehilli J, de Waha A, Seyfarth M, Pache J, Kastrati A. (2008). A meta-analysis of 17 randomized trials of a percutaneous coronary intervention-based strategy in patients with stable coronary artery disease. J Am Coll Cardiol, 52(11):894-904. PMID 18772058

Hamon M, Baron JC, Viader F, Hamon M. (2008). Periprocedural stroke and cardiac catheterization. Circulation, 118:678. PMID 18678784

Scanlon PJ, Faxon DP, Audet AM, Carabello B, et al. (1999). ACC/AHA guidelines for coronary angiography: executive summary and recommendations. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation, 499(17):2345-57. PMID 10226103

**Guest Skeptic: Dr. David Newman**

Associate Professor of Emergency Medicine, Mt. Sinai School of Medicine, NY. The creator of The NNT and SMART EM. Author of Hippocrates' Shadow: Secrets from the House of Medicine.

# 48

# THUNDERSTRUCK
## SUBARACHNOID HEMORRHAGE

**CASE SCENARIO:**

*A 34 year old woman presents with acute onset of headache peaking in 30 minutes with no recent trauma, focal deficits and a normal neurologic examination.*

**Q:**

CAN A CLINICAL DECISION RULE BE USED TO RULE OUT SUBARACHNOID HEMORRHAGE (SAH)?

**BOTTOM LINE**

Ottawa SAH Tool is not ready for prime time to rule out low risk patients from investigations.

# Clinical Decision Rules to Rule Out Subarachonoid Hemorrhage for Acute Headache.

## Perry et al. JAMA 2013

**P** Adult patients with headache peaking within 1hr

**I** Three different clinical decision rules (CDR)

**C** None

**O** SAH (blood on CT, xanthochromia in CSF, RBC in last LP tube and positive angiography)

### EXCLUDED STUDIES:

- *Age<16 years*
- *Fall or direct head trauma in previous seven days*
- *Peak > 1 hour*
- *GCS < 15*
- *Three or more recurrent HA of the same characteristic and intensity over period > six months*
- *Previous diagnosis of cerebral aneurysm, SAH, brain neoplasm or hydrocephalus*
- *Refer from another hospital with diagnosis of SAH*
- *Return for reassessment of same HA after already having CT and LP*
- *Papilledema on fundoscopy*
- *New focal neurologic deficits*

### Author's Conclusion:

*"Among patients presenting to the emergency department with acute nontraumatic headache that reached maximal intensity within 1 hour and who had normal neurologic examination findings, the Ottawa SAH Rule was highly sensitive for identifying subarachnoid hemorrhage. These findings only apply to patients with these specific clinical characteristics and require additional evaluation in implementation studies before the rule is applied in routine emergency clinical care." (Perry et al., 2013)*

## Background

Headaches represent around 2% of all emergency department visits. Of these presentations 1-3% turn out to be SAH (Vermeulen, Perry, Morgenstern). About 5% of SAH are misdiagnosed on the 1st ED assessment (Vermeulen). This is because 50% of SAH present with no neurologic deficit (Weir).

Traditional methods of working up a SAH has been non-contrast CT followed by a LP. The LP aspect was been questioned by our guest last week Dr. David Newman. He suggested LPs are not always needed. The NNT was 700. So are you part of the 700 Club.

## Methods

Prospective multi center cohort study at 10 tertiary care hospitals. Consecutive adult patients presenting with non-traumatic headache that reached maximum intensity within 1 hour.

There were some fancy statistics they did in this study.

One was multivariant recursive partitioning. This is a statistical method of making a decision tree that tries to correctly classify patients in the population based on a number of dichotomous dependent variables. There are some advantages and disadvantages to analyzing the data this way.

**Advantages:**

- Clinically a more intuitive model that does not require calculations.
- Can create a decision rule that is more sensitivity or specificity
- May be more accurate

**Disadvantages:**

- Continuous variables do not work well
- May over fit data

They also did post hoc bootstrapping analysis of the data. This a statistical way of resampling the data to assign measures of accuracy to sample estimates. A great advantage of bootstrap is its simplicity while checking for the stability of the results. You can derive estimates of various complex parameters of a distribution. A weakness is that bootstrapping tends to be overly optimistic in its estimations.

| Number of Patients | Mean age | Gender predominance (% female) | Arrived EMS (%) | With CT (%) | With LP (%) | Final Diagnosis of SAH |
|---|---|---|---|---|---|---|
| 2131 | 44 | 60% | 26% | 83% | 39% | 6.2% |

## Results

There were 605 (22%) patients who were deemed missed potentially eligible. These missed patients were similar to the enrolled patients (mean age 44, 57% women, 29% EMS, 83% CT, 38% LP and 5.5% SAH).

Of the 2131 patients in the cohort, only 35 (1.6%) without both normal CT and LPs could not be contacted. However, none were admitted to regional neuro-surgical centers or identified as dead by coroner.

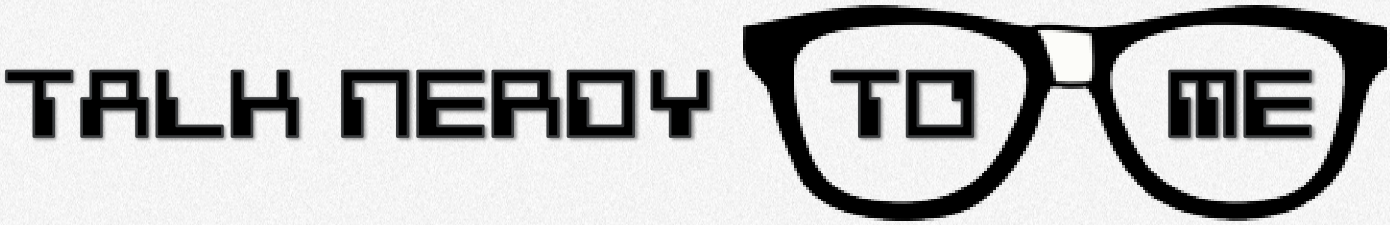
Looking at each of the three rules they had sensitivity which ranged from 95.5-98.5% with specificity from 27.6-35.6%.

All three rules missed a few SAH. No SAH were missed by all three rules. Rule #1 identified 130 or 132 SAH. Only one of the two misses by Rule #1 was considered clinically significant.

The Ottawa SAH Rule consists of the four elements for Rule #1 (Age>40, neck pain/stiffness, witnessed LOC, and onset during exertion) and added two more elements. (thunderclap headache and limited neck flexion). This change increased the sensitivity to 100% (95%CI 97.2-100) but dropped specificity to 15.3% (95% CI 13.8-16.9).

Physicians were also asked about how comfortable they were using the rules and how accurate they were at using the rules. Physicians were comfortable (82%) using Rule #1 and correctly applied it 95% of the time. Misinterpretation of Rule #1 theoretically could have led to 1 missed SAH.

If Rule #1 was used it would have dropped the investigation rate down from 84% to 74%. However, the proposed Ottawa SAH rule would have an investigation rate of 86%




## Commentary

This was a very well done large multi centered prospective validation study. The Ottawa SAH Rule is simple and contains only 6 variables. Applying this clinical decision tool could decrease the miss rate of SAH from about 5% down to almost 0% with only a slight increase in utilization. It remains to be seen whether the Ottawa SAH Rule would have the same impact in other health care systems with different practice environments. There are also some people that say SAH is too complicated a condition for a clinical decision tool to work. Regardless, we should always try and use EBM to increase patients choices using shared decision making. The Ottawa SAH Rule may turn out to be a good way to frame a conversation with patients presenting with a potentially life-threatening condition. We eagerly await the validation studies before we change our practice pattern.

## Case Resolution

You are clinically concerned and get a non-contrast CT head which is negative. You discuss the risks and benefits of an LP with the patient. A shared decision is made with the patient not to do an LP. She is discharged home with appropriate analgesia. She is to return to the emergency department if she develops focal neurologic symptoms, pain increases, LOC, seizure or is otherwise worried.

## Clinical Application

We will need to wait until this new tool has been validated before using the Ottawa SAH Rule (tool).

### Study Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br><br>Comment: This prospective multicenter cohort study was conducted in the EDs of 10 university –affiliated urban Canadian tertiary care teaching hospitals from April 2006 to July 2010. | ☑ |
| The patients were representative of those with the problem | ☑ |
| All important predictor variables and outcomes were explicitly specified | ☑ |
| This is a prospective, multicenter study including a broad spectrum of patients and clinicians (level II) | ☑ |
| Clinicians interpret individual predictor variables and score the clinical decision rule reliably and accurately | ☑ |
| This is an impact analysis of a previously validated CDR (level 1) | |
| For level 1 studies, impact on clinician behaviour and patient-centric outcomes is reported | |
| The follow up was sufficiently long and complete | ☑ |
| The effect was large enough and precise enough to be clinically significant | ? |

**WHAT DO I TELL MY PATIENT?**

You need a CT scan of your head to determine if you have a bleed in your brain.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

This is not a Level I impact analysis. Assessing physicians' comfort with a rule is not a Level I impact analysis. A Level I impact analysis does not assess the diagnostic accuracy of the rule, but instead randomizes physicians (or groups of physicians) to use and not use the rule and then tests resource utilization and patient outcomes as the primary outcome. Very few CDR Level I analyses have ever been conducted (one example is the Ottawa ankle rules for which Stiell conducted cluster randomized trial in Europe).

## References

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**Guest Skeptic: Dr. Jeff Perry**
Senior Scientist, Clinical Epidemiology, Ottawa Hospital Research Institute. Associate Professor, Department of Emergency Medicine, Faculty of Medicine, University of Ottawa.

49

# SPECIAL EDITION
# FIVE STAGES OF EVIDENCE BASED MEDICINE GRIEF

**Guest Skeptic: Dr. Jeremy Faust**
EM resident Mt. Sinai Hospital, New York City

Every few episodes I like to take a 10,000 foot view of evidence based medicine (EBM). It is fun to switch gears from the typical critical reviews of random clinical trials or systematic reviews normally covered on TheSGEM. It is an opportunity to think about the big picture and not to get lost in statistics of likelihood ratios, confidence intervals, NNTs and bootstrapping.

Jeremy Faust is a self described EBM zealot. He writes a column in ACEP News on the topic of social media. Jeremy wrote an article on EBM and the Five Stages of Grief which. So, while attending the American College of Emergency Physicians (ACEP 2013) meeting in Seattle, I asked Jeremy to be a guest skeptic.

**CASE SCENARIO:**
*A well respected EM attending recommends using epinephrine for an unwitnessed, out of hospital, cardiac arrest in an adult patient.*

## Background

There are five stages of grief as originally described by Kubler-Ross in 1969 in the book On Death and Dying. The five stages are: Denial, Anger, Bargaining, Depression and Acceptance. People do not experience these in order, there may be other stages, and not all stages need to be experienced.

This podcast discusses the five stages of grief using a number of medical studies as examples.

- Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest. NJEM. Dr. Ian Steill
- Tissue plasminogen activator for acute ischemic stroke. NEJM. NINDS
- Third International Stroke Trial. IST3. Lancet. See SGEM#29
- Parachute Trial. Smith and Pell. BMJ.

Winston Churchill said “democracy is the worst form of government except all the others that have been tried.” This is how I feel about EBM. It is the worst form of medicine except for all the other that have been tried.

Or for the American SGEM audience a quote from JFK on democracy: “Democracy is a difficult kind of government. It requires the highest qualities of self discipline, restraint, a willingness to make commitments and sacrifices for the general interest and it also requires knowledge. Freedom has many difficulties and democracy is not perfect.”

EBM is a difficult kind of practice. It requires the highest qualities of self discipline, restraint, a willingness to make commitments and sacrifices for the general interest and it also requires us to choose wisely. EBM has many difficulties and it is not perfect. Do we really want to go back to blood letting patients and mesmerizing them with magnets?

We hope this helps you address those friends experiencing the five stages of EBM grief.

# 50

# Under Pressure Journal Club
## Vasopressin, Steroids, and Epinephrine in Cardiac Arrest

### CASE SCENARIO:

*While you are passing through the general ward, a code blue is announced. You find a 72 Y man admitted for pneumonia in PEA arrest. You are the team leader, Would you use this new VSE Protocol?*

### Q:

DOES A VASOPRESSIN, EPINEPHRINE AND CORTICOSTEROID (VSE) PROTOCOL FOR IN-HOSPITAL CARDIAC ARREST RESUSCITATION IMPROVE SURVIVAL WITH FAVORABLE NEUROLOGICAL OUTCOMES COMPARED TO EPINEPHRINE ALONE?

### BOTTOM LINE

The results are very interesting, but we believe it is wise to wait for a validation study (different center, different research team) before making changes to the ACLS protocol.

# Vasopressin, Steroids, and Epinephrine and Neurologically Favorable Survival After In-Hospital Cardiac Arrest: A Randomized Clinical Trial

## Mentzelopoulos et al. JAMA 2013

**P** Adult patients with in-hospital cardiac arrest

**I** Vasopressin, Steroids and Epinephrine (VSE) protocol

**C** Epinephrine alone

**O** Survival to hospital discharge with favourable neurological outcome as defined by Glasgow-Pittsburgh Cerebral Performance Category (CPC) of 1 or 2.

### Author's Conclusion:

*"Among patients with cardiac arrest requiring vasopressors, combined vasopressin-epinephrine and methylprednisolone during CPR and stress-dose hydrocortisone in post resuscitation shock, compared with epinephrine/saline placebo, resulted in improved survival to hospital discharge with favorable neurological status." (Mentzelopoulos et al., 2013)*

### Background

We have good data from the OPALS Trial by Dr. Ian Steil looking at ACLS in out of hospital cardiac arrest. This was published in the NEJM about 10 years ago. It showed that while ACLS drugs may improve survival to hospital admission, it did not improve survival to hospital discharge. If you have an out of hospital arrest your chance of survival in this study was 1 in 20 or 5%. But what about in-hospital arrests? Perhaps we can do better than 5%. This paper asks if vasopressin, epinephrine and corticosteroid (VSE) protocol for in-hospital cardiac arrest resuscitation can improve survival to hospital discharge with favorable neurological outcomes compared to epinephrine alone?

## Methods

Randomized, double-blind, placebo-controlled, parallel-group trial done in 3 Greek tertiary hospitals. Patients were from the ICU, CCU, ED, general wards and operating theatres. Excluded if less than 18yrs old, had a terminal illness, DNR, arrest due to exsanguination or had IV steroids before the arrest.

Consecutively enrolled patents were enrolled into two groups. Standard care which included CPR with epinephrine. Intervention group which received vasopressin 20IU/ CPR cycle to max of 100IU and methylprednisolone 40mg. If the intervention group got ROSC and survived, they also received hydrocortisone 300mg/d up for up to 7 days.

Primary outcome was return of spontaneous circulation (ROSC) for greater than 20 minutes and survival to hospital discharge with favorable neurological recovery.

They had multiple secondary endpoints which were not patient oriented.

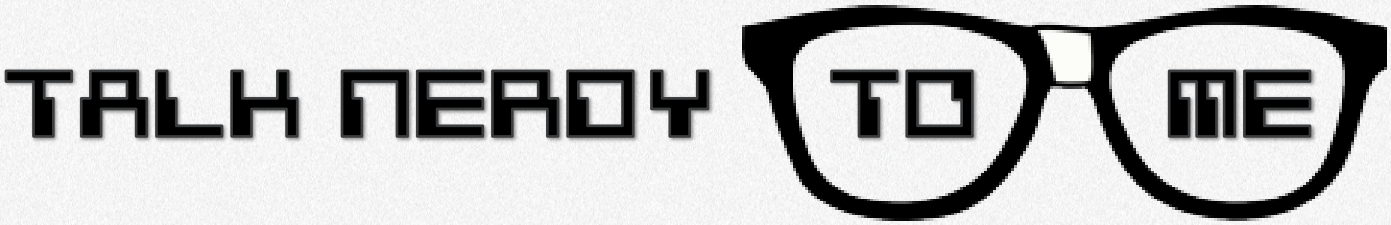
A power calculation was done predicting a 4% survival rate in control compared to 14% in VSE. They used an Alpha 0.05 and power = 0.80 which resulted in a sample size of 244. They analyzed the data with intention to treat and tested for heterogeneity between study sites. A multi variance logistic regression was used to determine Odds Ratios with 95% confidence intervals.

## Results

N=268 Mean age 63 in both groups with the majority being men. The characteristics of the control and VSE were very similar. There was one exception with the cause of cardiac arrest being hypotension 37% in control vs. 47% in VSE group. NNT = 11

Both primary endpoints favored the intervention group of VSE:

- Return of Spontaneous Circulation (ROSC): 84% vs 66% OR 2.98 (95% CI 1.4-6.4)
- Survival to Discharge with CPC of 1 or 2: 14% vs 5% OR 3.28 (95% CI 1.2-9.2)




## Commentary

This was a bold study and the results are exciting. For in-hospital cardiac arrest, the VSE protocol has been shown to improve survival to hospital discharge with good neurological outcomes which is perhaps one of the most relevant patient-centered outcomes.

In terms of methodology, the study was rigorous. We think there is a minimal risk for selection, allocation, performance, attrition and outcome assessment bias. It was well reported as per the CONSORT guidelines, allowing the readers to appreciate most sources of bias.

However, the two groups were not equal to start. The control group had more respiratory and metabolic causes for cardiac arrest. The VSE group had a greater proportion of cardiac arrests secondary to cardiac ischemia. Literature has shown worse outcomes for respiratory causes of cardiac arrest compared to cardiac ischemia. This imbalance may have influenced the results.

There was suboptimal use of therapeutic hypothermia (not all patients with v.fib/v.tach received it as per the ILCOR recommendations, although this proportion was similar in both the treatment and placebo group). One can wonder if a stricter application of hypothermia would have changed the benefits brought by the VSE.

Only a fraction of patients had their CPR quality assessed (those in monitored settings with arterial lines). There is no indication of the quality of the CPR in non-monitored settings.

This article has demonstrated that the combination of steroids, vasopressin and 4-hour post-resuscitative shock steroid dose is beneficial. However, we don't know what the contribution of each element to the outcome is. Steroids are known to impair myocardial healing (which is acknowledged by the authors) and are therefore not benign.

## RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br><br>Comment: Cardiac arrest resuscitation is central to the practice of emergency medicine. Patients arrest in the emergency department secondary to a variety of conditions. However, only 15% of patients in this study came from the ED. The benefit of the VSE protocol in this subgroup is open to speculation. | ☑ |
| The patients were adequately randomized | ☑ |
| The randomization process was concealed | ☑ |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | ? |
| The patients in both groups were similar with respect to prognostic factors | |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | ☑ |
| All groups were treated equally except for the intervention | |
| Follow-up was complete (i.e. at least 80% for both groups)<br><br>Comment: this was good with 100% follow-up (80% is the bench mark) | ☑ |
| All patient-important outcomes were considered<br><br>Comment: survival to discharge neurologically intact | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

## Case Resolution

You run the code on the 72yo man who is only "mostly dead". If you recall he is in a PEA arrest from pneumonia and they often do poorly. There is no VSE protocol to follow in your hospital so you do standard ACLS. He does poorly and you call the code after 20 minutes.

## Clinical Application

Combination resuscitation medications included with epinephrine should be studied specifically in Emergency Department patients. Outcomes of resuscitation and ROSC rates vary between ED and pre-hospital patients versus in-patients (especially with varying levels of care). Currently this study has potential to drive research specific to ED patients looking at combination therapies for resuscitation that may involve mixtures of vasopressors and steroids.

## WHAT DO I TELL MY PATIENT?

Currently resuscitation guidelines do not include steroids in cardiac arrest and there is no compelling argument to include them currently for cardiac arrest presentations seen in the ED.

Steroids may have application to post-resuscitation low blood pressure (severely failing heart with inadequate blood flow through the body) but this study did not adequately answer this question.

## CONCLUSION VS COMMENTARY COMPARISON

This study has the potential to drive further comparative research into resuscitation medications or epinephrine combinations for cardiac arrest and post-resuscitation cardiogenic shock. Perhaps future studies with epinephrine, vasopressin combinations with and without steroids could be compared and followed.

## References

Mentzelopoulos, S.D., Malachias, S., Chamos, C., Konstantopoulos, D., Ntaidou, T., Papastylianou, A., Kolliantzaki, I., Theodoridi, M., Ischaki, H., Makris, D., Zakynthninos, E., Zintzaras, E., Sourlas, S., Aloizos, S., Zakynthinos, S.G. (2013). Vasopressin, steroids, and epinephrine and neurologically favorable survival after in-hospital cardiac arrest: a randomized clinical trial. JAMA, 310(3): 270-279. PMID 23860985

**Guest Skeptics: Dr. Tawfeeq Altherwi and Dr. Tudor Botnaru**

# 51

# HOME
## DISCHARGING PATIENTS WITH ACUTE PULMONARY EMBOLI HOME FROM THE ED

### CASE SCENARIO:

*A healthy 19 year old undergraduate student presents with chest pain and shortness of breath. BP 120/80, HR 60, RR 16, O2 Sat 100% and T 37.1C. She is Wells' low but PERC positive for being on birth control. The D-dimer comes back elevated and the CT scan shows a peripheral PE.*

### Q:

CAN SHE BE SAFELY DISCHARGED HOME FROM THE EMERGENCY DEPARTMENT FOR OUT-PATIENT MANAGEMENT OF HER PULMONARY EMBOLISM?

### BOTTOM LINE

USA: It will depend on your own comfort level with the data and the policies and procedures at your home institution whether or not you treat these low risk PE patients in as out-patients.

Canada: In a Canadian medical/legal environment, we are going to offer out-patient management to low risk patients with newly diagnosed acute PE.

# Can Selected Patients with Newly Diagnosed Pulmonary Embolism Be Safely Treated Without Hospitalization? A Systematic Review.

## Vinson et al. Ann Emerg Med 2012

**P** Adult patients with confirmed PEs

**I** Out-patient management

**C** In-patient management

**O** Recurrent VTE, major hemorrhage and all-cause mortality

### Author's Conclusion:

*"The data on exclusive outpatient management of acute symptomatic pulmonary embolism are limited, but the existing evidence supports the feasibility and safety of this approach in carefully selected low-risk patients." (Vinson et al., 2012)*

### Background

Pulmonary embolism is a common medical problem that gets diagnosed in the emergency department. According to Rosen's textbook of emergency medicine, approximately 1 in every 500 to 1000 (0.1%-0.2%) ED patients have a pulmonary embolism (PE).

Pundits increasingly suggest that contemporary CTs may too accurately diagnose PE's – meaning that clinically insignificant PEs are being detected by modern CT scanners (i.e. PE not the cause of the patient's symptoms, PE not destined to cause patient death or permanent disability).

In support of this observation, there is a significant temporal trend of increased PEs diagnosed since CT became widely available in 1998 in the United States and Australia. If clinically significant PEs were truly becoming more common since 1998 (as opposed to being over-diagnosed due to over-testing), then PE-related mortality should be increasing, but it is stable over the last 40-years – thus meeting one defining element of "over-diagnosis" (Hoffman 2012, Moynihan 2012, Carpenter 2013, Preventing Overdiagnosis Consortium).

Furthermore, we are harming patients in the attempt to diagnose 100% of PEs. Newman estimates that in the pulmonary embolism rule-out criteria study, testing for PE prevented 6 deaths and 24 major/non-fatal PE events, while causing 36 deaths and 37 non-fatal major medical harms (renal failure, major hemorrhage, cancer). Over-testing inextricably links to over-diagnosis and in the case of PE, ↑ testing →↑harm. Harms extend beyond iatrogenic injury. Per-patient inpatient admission costs for PE in the United States ranged from $25,000 to $44,000 between 1998 and 2006 with post-hospitalization warfarin and lab testing estimated at $2694.

**Over-Testing in USA:**

- an unfriendly malpractice environment
- distrust by patients or clinicians of existing non-imaging clinical decision aids (Well's, PERC)
- patient/family belief that more testing equates to better care
- reimbursement streams that reward more testing (or fail to reward less testing)
- physician perception that all PEs are potentially lethal and therefore merit inpatient monitoring (Futterman 2004, Calder 2005, Kabrhel 2010).

**What can be done about Over-testing?**

The first line defense against PE over-diagnosis is to use evidence-based diagnostics to guide which patients to evaluate with D-dimer and advanced imaging (Well's and PERC). The second line of defense against PE over-diagnosis related over-treatment in the ED is to risk stratify patients once we have diagnosed acute PE since some of them may be safely discharged home.

Historically, these patients were all admitted to hospital for initial treatment (Simonneau). American ED physicians currently admit 99% of PE patients, but are asked to discharge about 21% cases from the ED by your admitting services.

This situation is different in Canada. Papers starting coming out in the early 2000 demonstrated the safety of out-patient management of PEs (Kovacs). A pragmatic evaluation of the ambulatory management of PEs in Canada came out in 2008 (Kovacs). This showed 50% of patients being safely treated as out-patients. This was done using clinical gestalt and not a formalized risk scoring system.

It is already acceptable to manage DVTs as outpatients and 1/3 of those have asymptomatic PEs (Koopman, Levine, Dorfman). Most deaths from PE occur after the initial short hospitalization (Couturaud).

So, we have a USA vs. Canada divide with some RCTs, observational trials and chart reviews on the subject. Let's go to a higher level of EBM evidence and look at a systematic review on the topic of ambulatory treatment of acute PE.

## Methods

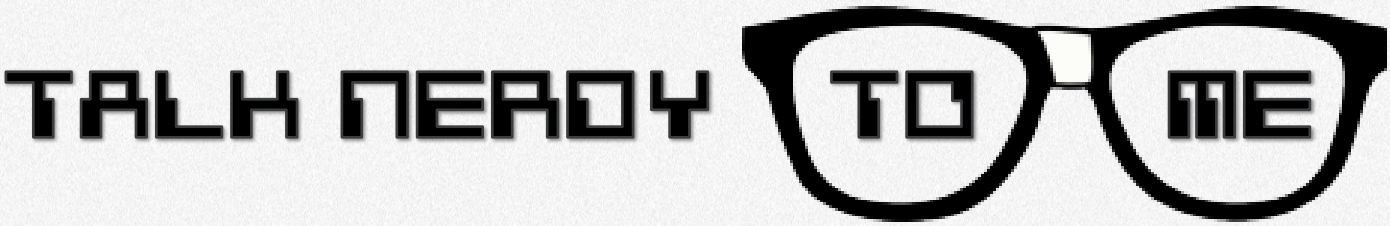
The SR authors searched multiple databases without language restrictions. They also reviewed 4 years of conference proceedings from major EM journals (SAEM, ACEP and CAEP). They even consulted experts in the field to make sure they were not missing any relevant research.

The SR authors followed the PRISMA (Preferred reporting items for systematic reviews and meta-analyses) reporting guidelines and assessed the quality of original studies using the GRADE criteria (Grading of Recommendations Assessment, Development and Evaluation).

## Results

N= 8 studies (777 adult patients)

- 1 RCT and 7 observational studies
- 4 studies were ED based
- No patients lost to follow-up
- 7 studies that reported 90-day outcome measures on 741 patients
- Zero cases of thromboembolic or hemorrhage-related death (95%CI 0-0.62)
- Non-fatal recurrent VTE ranged from 0-6.2%
- Non-fatal hemorrhage 0-1.2%




## Commentary

This was an important study asking an important question. Can some patients with PE be treated as out-patients? However, there were a number of limitations:

- Heterogeneous,
- Poor quality study
- Only 4 ED-based settings
- Failure to assess publication bias.
- No assessment of how many urban ED patients in the U.S. would be eligible for this protocol given the stringent inclusion criteria
- Only one study used PESI to risk stratify patients

### Systematic Review Quality Checklist

| | |
|---|---|
| The clinical question is sensible and answerable | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality | |
| The assessments of studies were reproducible | ☑ |
| The outcomes were clinically relevant | ☑ |
| There was low statistical heterogeneity for the primary outcome | |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

Pulmonary Embolism Severity Index (PESI): This was the preferred risk stratification tool for Washington University (based upon current evidence [Donzé 2008, Choi 2009] and in order to replicate the highest quality ED-based outpatient PE management evidence trials). The PESI can be computed online and consists of the following questions:

| Variable | Original PESI | Simplified PESI |
|---|---|---|
| **Age > 80 years** | Age in years | 1 |
| **Male sex** | +10 | |
| **History of cancer** | +30 | 1 |
| **History of heart failure** | +10 | 1 |
| **History of chronic lung disease** | +10 | 1 |
| **Pulse > 110 beats/minute** | +20 | 1 |
| **Systolic blood pressure < 100 Hg** | +30 | 1 |
| **Respiratory rate > 30 breaths/minute** | +20 | |
| **Temperature < 36 C** | +20 | |
| **Altered mental status** | +60 | |
| **Arterial oxyhemoglobin saturation level < 90%** | +20 | 1 |

| Score | Class | Thirty-day PE-related mortality |
|---|---|---|
| **< 65** | I | 0 - 1.6% |
| **66 – 85** | II | 1.7% - 3.5% |
| **86 – 105** | III | 3.2% - 7.1% |
| **106 – 125** | IV | 4.0% - 11.4% |
| **> 125** | V | 10.0% - 24.5% |

If a subset of PE patients are discharged home, PESI Class I patients are the most obvious target. There are way too many items on the PESI score for this simple community ED doctor. Good thing there is an on-line calculator. But there is a simplified version of the PESI with only 6 items and each item gets 1 point. It had similar prognostic accuracy of the original PESI with areas under the curve of 0.75 (95% CI 0.69-0.80)

## Case Resolution

You engage the patient in shared decision making. You inform her multiple studies have demonstrated that treating a low risk PE at home with shots and pills is as safe and effective as treating you with the same medications in the hospital if she has the ability to follow-up within 7-10 days as scheduled, and have somebody at home to help monitor their care. She decides on out-patient treatment.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

We agree with the authors of this systematic review that the data is limited but does support out-patient management of certain low-risk patients diagnosed with pulmonary embolisms.

## Clinical Application

In select and agreeable non-geriatric adult patients with newly diagnosed PE, transportation access to outpatient anticoagulation care, and a reliable caregiver at home, outpatient management of PE is safe with PE or hemorrhage related deaths <1%.

**WHAT DO I TELL MY PATIENT?**

You have a blood clot in your lung. We have blood thinners to treat this problem. Most people in the USA are admitted for this condition. In Canada about half of patients are treated at home. There is some research that supports home treatment for low risk patients if they have good follow-up. Do you want to be admitted to hospital or be treated at home?

## References

Vinson, D.R., Zehtabchi, S., Yealy, D.M. (2012). Can selected patients with newly diagnosed pulmonary embolism be safely treated without hospitalization? A systematic review. Ann Emerg Med, 60(5): 651-662. PMID 22944455

**Guest Skeptics:**

**Dr. Chris Carpenter**
Associate Professor (Emergency Medicine), Washington University, Author Diagnostic Testing and Clinical Decision Rules.

**Dr. A. Lazo-Langner**
Assistant Professor, Western University, Department of Epidemiology and Biostatistics and Department of Medicine

52

# SPECIAL EDITION

# BREAKFAST AT GLENFIELD
## ASTHMA, SOCIAL MEDIA AND KNOWLEDGE TRANSLATION

**Guest Skeptic: Dr. Tapas Mukherjee**

As many of you know the SGEM was started as a social media project aimed at decreasing the knowledge translation window down from an average of 10 years to 1 year. This is by using the disruptive technology of social media. The ultimate goal was to give you free, high-quality, clinically relevant, evidence based, patient-centred information. This would enable to you to give the best care to your patients based on shared decision making.

I want to turn MedEd on its head. Turn your car into a classroom. Provide free open access to meducation (FOAMed) allowing the best evidence to bubble up. And in the process, the medium (social media) is the message.

There have been some critics over the last year. Some of the constructive criticism has been: How do you know what you are doing works? Fair question. This is a skeptical podcast and we should always be able to turn the critical eye on ourselves.

For a while my answer to critics has been – "I know what doesn't work". The traditional model of textbooks, guidelines, journals and conferences take too long. One definition of insanity is doing the same thing over and over again and expecting a different outcome.

- If you want to know how we practiced medicine 5 years ago, read a textbook.
- If you want to know how we practiced medicine 2 years ago, read a journal.
- If you want to know how we practice medicine now, go to a (good) conference.
- If you want to know how we will practice medicine in the future, listen in the hallways and use FOAM. (allegedly said by Dr. Joe Lex)

But now I have some proof of SoMe impacting KT. This brings me back to Tapas. This talented, enthusiastic and innovative doctor from the UK did a proof of concept project last year. He created a youtube video that went, not fungal, not bacterial but VIRAL. It was called Breakfast at Glenfield. The project used the 1995 pop song Breakfast at Tiffany's by Deep Blue Something to discuss asthma management.

## Problem

The NHS uses outmoded methods of communication with limited finances and innovation to drive change.

## Audit

An audit of 58 healthcare professionals (42 doctors) across University Hospitals of Leicester (UHL) revealed only 66% of staff were aware of hospital asthma guidelines and less than half used them. Knowledge of managing asthma was also poor.

## New Guidelines March

The guidelines were updated to be user friendly with emphasis on highlighted areas of concern. But how could we ensure 100% of staff would be aware of the new guidance?

## Solution

The guidelines were converted to musical lyrics, a smartphone was used to video staff acting out the treatment in tune to the song. This music video was posted on YouTube and shared across sites such as Facebook and Twitter.

## Reaction

A 'viral' like effect resulted in a spread to Facebook, Twitter, The Department of Health, The BBC News and hospitals around the UK. It received over 13000 views in the first month, and won the Award for Innovation in Respiratory Education from the British Thoracic Society. (Now has >63,000 views)

## Re-Audit June 2012

55 UHL staff participated in the repeat audit. The results were analysed using Fisher's exact test. Awareness and use of the guidelines significantly improved ($p<0.001$), with 100% awareness following the project (62% before). There was significant improvement in every question relating to management of acute asthma ($p<0.01$).

**Limitations**

- Small sample size (n=55)
- Only one study
- Repeat audit done one month later (what about 3, 6 12 months?)
- What about patient oriented outcomes (morbidity and mortality)?
- Consider potential harms (more tests/more diagnosis/more treatment)
- What about the quality of guidelines?
- What if this method was used to improve adherence to weak/poor/controversial evidence like let's say tPa in acute CVA

**BOTTOM LINE**

Social media is a powerful tool which we have used to change clinical practice with dramatic results. What it will achieve in future will be limited only by imagination.

# 53

# Sunday, Bloody Sunday
## Epistaxis and Tranexamic Acid

### CASE SCENARIO:

*A 72 year old man presents with epistaxis. He has no history of coagulopathy but does have a history of hypertension, coronary artery disease and osteoarthritis. His vital signs are BP 154/92, HR 70 and RR 14. He is taking an ACE-I, hydrochlorothiazide 25mg and ASA 81mg.*

### Q:

IS TOPICAL TRANEXAMIC ACID (TXA) BETTER THAN NASAL PACKING FOR AN ANTERIOR EPISTAXIS?

**BOTTOM LINE**

For anterior epistaxis consider soaking the packing in TXA to stop the bleeding and get them home sooner.

# A new and rapid method for epistaxis treatment using an injectable form of tranexamic acid topically: a randomized controlled trial.

## Zahed et al. Am J Emerg Med 2013

**P** Adult ED patients (n=216)

**I** 15cm cotton packing soaked in tranexamic acid (500mg in 5ml), removed after bleeding stopped

**C** Cotton packing soaked in epinephrine (1:100,000) + lidocaine (2%) for 10 minutes and then re-packed with cotton pledgets covered with tetracycline

**O** Time to stop bleeding, length of stay (LOS), re-bleeding at 24hrs and 1 week and patient satisfaction

### Author's Conclusion:

*"Topical application of injectable form of tranexamic acid was better than anterior nasal packing in the initial treatment of idiopathic anterior epistaxis." (Zahed et al., 2013)*

### Background

**Eleven Questions Concerning Epistaxis:**

**1. What is the incidence of epistaxis?**

- 60% of the population will experience a nose bleed
- Bimodal distribution (<10yrs and > 60yrs)
- Majority of admissions for refractory hemorrhage in elderly 60-70 years
- In the US 2005 there were 7 deaths related to epistaxis (all over 75 years)
- 70-80% no cause is identified

**2. What are the common causes of epistaxis?**

- Anterior (Kiesselbach's Plexus)
- Remember there are anterior and posterior bleeds and there is post-nasal bleeding from a brisk or uncontrolled anterior bleed. This still has implications for aspiration and post-epistaxis melena and gastritis/vomiting. It will also affect your blood urea nitrogen levels if there is a chronic or recurrent component, if you decide to draw lab investigations.

**3. Does hypertension cause epistaxis?**

- Debated
- Often patients with epistaxis have elevated blood pressure but white coat is up to 20%
- Atherosclerosis of Kesselbach's predisposes you to bleeding, so this might contribute in the elderly distribution of patients
- Might be useful to control long term blood pressure to prevent recurrent epistaxis in adults but not in the acute management in the ER. This may have some implication in who follows up epistaxis from the ED. In adults there may be benefit in family doctor follow-up to also re-examine blood pressure in terms of a preventative health exam.

**4. How do you diagnose anterior versus posterior epistaxis?**

- You should be able to visualize 80% of anterior epistaxis
- Use nasal thudicum or speculum. Personal protective gear. Headlamp if you have it.
- Auroscope with light is fine. Sit the patient up in a proper chair. Blow out the clots.
- Consider normal saline irrigation to clear clots. Rinse mouth out and spit to clear out oropharynx to look for fresh blood.
- Consider signs and symptoms of hemorrhagic shock especially in the vulnerable like the common bimodal presentation patients (youth – congenital abnormalities, polyps, and the elderly with co-morbidities and anti platelet and anti coagulants)!
- Seeing an anterior vessel bleeding is like chart code for "it's not a posterior bleed".

**5. Do you need to do coagulation studies on epistaxis?**

- Not unless already taking anti-coagulants or a refractory paediatric hemorrhage requiring admission (Choose Wisely)
- Reverse to therapeutic level, avoid reversing to sub therapeutic level. The risk of thromboembolism is higher than life threatening hemorrhage from epistaxis. Small dose of oral vitamin K (1mg) may be enough.

**6. Do you need to reverse Coumadin with epistaxis?**

- Just as you normally would
- American College of Chest Physicians, recently discussed on Emergency Medicine Cases recommended for bleeding and INR > 10 to give 1-2 mg PO vitamin K and holding warfarin.

**7. Do you need to do anything different for epistaxis for patients on NOAC?**

- Very debated in the literature
- No antidotes
- What are they: Dabigitran (Pradax, direct thrombin IIa inhibitor), Rivaroxaban (Xarelto) and Apixaben (Eliquis) are both factor Xa inhibitors
- Remember that they have short half lives (12 hours), missed 2-3 doses treat as un-coagulated patient

**8. How do you manage epistaxis in general (Dundee Protocol)?**

- Direct therapy, tamponade, vascular intervention
- Topical vasoconstrictor preparations recommended include 1:1000

adrenalin (epinephrine),9 0.5% phenylephrine hydrochloride,10 4% cocaine, or 0.05% oxymeta- zoline solution,7 but few comparisons have been conducted. One study suggested that oxymetazoline may be more effective than 1:100,000 (dilute) adrenalin, and equally effective with less propensity to induce hypertension when compared with 4% cocaine (not available in many ED's in Canada currently, concerns with elderly and coronary artery disease). Frazier suction catheter is the smaller tip catheter.

- Note: Ice in the mouth reduces anterior plexus blood flow by up to 20%

**9. Are there any differences in the effectiveness of the different packing options?**

Consider bilateral packing even for single side blood for extra pressure.
Ribbon gauze from posterior to anterior coated in petroleum jelly or antibiotic ointment.

**10. Should you use antibiotics in epistaxis?**

- Feared complications: (keener kontest)
- Staphylococcus aureus or Streptococcus progenies but this only occurred in postoperative patients
- If concurrent infection; use antibiotics if appropriate
- Antibiotic choices include; topical, clavulin, macrolide for penicillin allergic
- 5 days for prophylaxis is appropriate
- All posterior packing (which are used in conjunction with anterior packing)
- Consider for anterior packs in more than 24 hours for sure more than 72 hours
- Some advocate topical antibiotic for 7 days after spontaneous epistaxis

**11. How long should I leave anterior packs in?**

- No strong literature
- 1-3 days is common but up to 5-7 have been reported in surgical cases

## Results

| | TXA | Control | Odds Ratio | P |
|---|---|---|---|---|
| **Bleeding stopped <10 min** | **71%** | 31.2% | 2.28 (95%CI 1.68-3.09) | <0.001 |
| **Discharged <2 hrs** | **95.3%** | 6.4% | 14.8 (95%CI 7.2-30.4) | <0.001 |
| **Complications** | **4.7%** | 11% | 0.42 (95%CI 0.16-1.16) | 0.128 |
| **Re-bleed 24 hrs** | **4.7** | 12.8% | 0.36 (95%CI 0.14-0.98) | 0.034 |
| **Re-bleed 1 week** | **2.8%** | 11% | 0.26 (95%CI 0.07-0.88) | 0.018 |
| **Patient Satisfaction** | **85%** | 44% | | <0.001 |

# TALK NERDY TO ME

## Commentary

This was a good randomized clinical trial (RCT) looking at another way to treat a common problem in the emergency department. There was one significant imbalance in the two groups with more people in the TXA group having a history of epistaxis (58% vs 14%). This could exaggerate the effectiveness of the intervention. The study also does not apply to posterior bleeds, patients with a pre-existing bleeding disorder, major trauma, INR>1.5 and when a bleeding vessel is visible. There was no blinding for the providers and patients which could have introduced some bias. Also, there was no grading of epistaxis so we do not know if topical TXA is better or worse than packing for varying severities of bleeds. The results were impressive but it was only one RCT. There are many examples of subsequent superior trials and systematic reviews showing single RCT results to be invalid. While it appears to be the best evidence to date, only time will tell if the results are valid.

## Case Resolution

The 72yo man is informed the traditional method involves packing his nose for three days with a follow-up to remove. The alternative is to try packing with another solution which has been shown in one study to stop the bleeding earlier, get you out of the emergency department faster, no difference in side effects, less re-bleeding and has greater patient satisfaction. He chose wisely and with the TXA packing, left after one hour and did not bounce back to the emergency department within a week.

### RCT Quality Checklist

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

### CONCLUSION VS COMMENTARY COMPARISON

We agree for anterior epistaxis treated with TXA appears to be superior to standard nasal packing.

## Clinical Application

Topical treatment with tranexamic acid seems to be a reasonable option for patients with idiopathic anterior epistaxis.

**WHAT DO I TELL MY PATIENT?**

Your type of nose bleed is a common problem. The traditional treatment includes packing the nose to stop the bleeding. This method can take time to stop the bleeding. People often have to come back in the first 24hrs because it starts bleeding again. There is a small study showing a safe medicine can be applied to the nose for about 10 minutes. It is twice as good as the traditional method for stopping nose bleeds. It also gets people home quicker and they are less likely to have another nose bleed.

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**Guest Skeptic: Dr. Erich Hanel**

Assistant Professor of Emergency Medicine at McMaster University and the newest member of the BEEM Dream Team

# 54

# BABY IT'S COLD OUTSIDE
## PRE-HOSPITAL THERAPEUTIC HYPOTHERMIA IN OUT OF HOSPITAL CARDIAC ARREST

### CASE SCENARIO:

*A 72yo man has a witnessed arrest while watching his grandson's hockey game. By-standard CPR is started and he is shocked out of ventricular fibrillation using the automatic external defibrillator (AED). EMS arrives and finds a patient with vital signs stable but unconscious. Paramedic calls base hospital and asks if they should start cooling on-route.*

### Q:

DOES PRE-HOSPITAL COOLING IMPROVE SURVIVAL TO HOSPITAL DISCHARGE AND NEUROLOGICAL OUTCOME IN PATIENTS PRESENTING WITH VENTRICULAR FIBRILLATION (VF) OR WITHOUT VF?

### BOTTOM LINE

Scoop and run after cardiac arrest with no cooling required in the field.

# Effect of Prehospital Induction of Mild Hypothermia on Survival and Neurological Status Among Adults With Cardiac Arrest: A Randomized Clinical Trial.

## Kim et al. JAMA 2013

**P** Adults (n=1359) with out-of-hospital cardiac arrest and return of spontaneous circulation (ROSC)

**I** Prehospital rapid infusion of 2L of 4C normal saline, 7-10mg of pancuronium and 1-2mg of diazepam

**C** Standard pre-hospital care

**O** Survival and neurological status at hospital discharge and safety data

**EXCLUDED STUDIES:**

- Age < 18 years
- traumatic cardiac arrest
- being awake
- temperature <34C
- not intubated
- no IV access

**Author's Conclusion:**

*"Although use of prehospital cooling reduced core temperature by hospital arrival and reduced the time to reach a temperature of 34C, it did not improve survival or neurological status among patients resuscitated from prehospital VF or those without VF." (Kim et al., 2013)*

**Background**

Therapeutic hypothermia post cardiac arrest has received a great deal of attention over the last decade. Two randomized control trials showed that hypothermia post cardiac arrest resuscitation was neuroprotective. One trial (n=273) in NEJM 2002 used cooled air mattress to demonstrate good outcome at 6 months (55% vs. 39%). The smaller Australian study (n=77) also published in NEJM 2002 showed good neurologic outcome at time of hospital discharge (49% vs. 26%).

Dr. David Newman has calculated the NNT=6 for mild therapeutic hypothermia for neuroprotection following cardiopulmonary resuscitation. The Cochrane Collaboration updated their review on hypothermia for neurprotection in adults after CPR in 2012. They concluded:

*"Conventional cooling methods to induce mild therapeutic hypothermia seem to improve survival and neurologic outcome after cardiac arrest. Our review supports the current best medical practice as recommended by the International Resuscitation Guidelines."*

The SGEM was skeptical after it covered the issue in Episode #21: Ice, Ice Baby. We looked at the paper by Bernard SA et al. called Induction of therapeutic hypothermia by paramedics after resuscitation from out-of-hospital ventricular fibrillation cardiac arrest: a randomized controlled trial, Circulation. 2010;122:737-742. The question was whether pre-hospital therapeutic hypothermia improved patient outcomes after successful resuscitation? The study had 234 patients and used large volumes of ice-cold lactated Ringer's. The primary outcome was about 50% of patients survived to functional hospital discharge and there was not benefit to cooling.

Another big chill entered the therapeutic hypothermic literature yesterday. The NEJM published a large study (n=950) looking at targeted temperature management after cardiac arrest. The conclusion was: "in unconscious survivors of out-of-hospital cardiac arrest of presumed cardiac cause, hypothermia at a targeted temperature of 33°C did not confer a benefit as compared with a targeted temperature of 36°C."

This lit up the blogosphere with postings, tweets and even a podcast discussing the implications of this new study.

- Intensive Care Network
- St. Emlyn's
- EMRap

## Results

Decrease in temperature was -1.20C (95% CI -1.33 to -1.07C) in the VF and -1.30C (95% CI -1.40 to -1.20) in the non-VF arrest cooled patients compared to control.

| | Cooled | Control | P value |
|---|---|---|---|
| **VF Survive to D/C** | **62.7% (57.0-68.0)** | 64.3% (58.6-69.5) | 0.69 |
| **Non-VF Survive to D/C** | **19.2% (15.6-23.4)** | 16.3% (12.9-20.4) | 0.30 |
| **VF Full or Mild Recovery** | **57.5% (51.8-63.1)** | 61.9% (56.2-67.2) | 0.59 |
| **Non-VF Full or Mild Recovery** | **14.4% (11.3-18.2)** | 13.4% (10.4-17.2) | 0.74 |

Rapidly cooled group had more re-arrests in the field than the control group: 26% (95%CI 22-29) vs. 21% (95%CI 18-24) p=0.008 There was also an increased use of diuretics and pulmonary edema on first chest X-ray in the rapid infusion group.

# TALK NERDY TO ME

## Commentary

This was a well done and large randomized control trial of 1359 patients. The paramedics, ED staff, in-patient doctors, and RNs were not blinded. However, the researchers that abstracted the chart data were blinded. The data does clearly show what has been previously observed, it is better to have a VF arrest than an non-VF arrest.

This represents fairly good evidence suggesting that cooling patients prior to hospital arrival after cardiac arrest does not alter survival or neurological outcome (VF or non-VF). While no observed benefit, there was observed harm. More patients in the cooling arm re-arrested which gave a NNH of 20 (95%CI 10-220). So for every 20 patients treated with this cooling protocol, 1 would have re-arrested. This did not change the aggregate outcome of no difference in survival or neurologic outcome.

Why was there such a difference between the two 2002 NEJM studies and this new JAMA article? While the early studies only included VF arrests the new study included VF and non-VF arrests. However, there was no benefit seen in either group whether they were rapidly cooled or not. One of the NEJM article only included 8% of patients considered for eligibility with out of hospital cardiac arrests compared to 24% in the 2013 JAMA study (3x the difference). So perhaps there is a select group that would

### RCT Quality Checklist

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

**CONCLUSION VS COMMENTARY**

**COMPARISON**

We agree that the conclusions by the author are reasonable given the data presented.

benefit from therapeutic hypothermia depending on the inclusion and exclusion criteria. The other 2002 NEJM trial was small (n=77) compared to the new large (n=1359) JAMA trial. Perhaps the difference in the small trial was due to chance (21/43 cooled patients survived vs. 9/34 control patients P=0.046). Both studies were unblinded but perhaps the bias was more in favour of cooling in the small, preliminary trial. This may have introduced unrecognized changes in management which could have impacted on the results of such a small trial. In contrast, the unblinded JAMA investigators would have been aware of the other 2010 pre-hospital trial reporting no difference.

This new pre-hospital cooling data from JAMA combined with the recent NEJM article about in-hospital cooling really does put a chill on this type of intervention. More information will become available as other members of the BEEM Team review this topic. The beauty of being skeptical is you can change your mind when presented with new or compelling information. So stay tuned, I am sure this conversation about therapeutic hypothermia is not over.

## Case Resolution

The patient was not cooled in the field but he was on arrival as part of a pre-existing protocol. He survived to hospital admission but unfortunately, not to hospital discharge.

## Clinical Application

Therapeutic cooling of patients with return of spontaneous circulation after OHCA in pre-hospital setting is not indicated.

**WHAT DO I TELL MY PATIENT?**

Patients in this study are by definition not conscious so I will not be discussing pre-hospital hypothermia for OHCA.

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# 55 Drugs in My Pocket
## Opioids in the Emergency Department

### CASE SCENARIO:

*A 33 year-old man presents to the emergency department at 2 AM complaining of an infected tooth. At triage he requests that "oxy" stuff that worked really well last time.*

### Q:

CAN A DEPARTMENTAL GUIDELINE ON CONTROLLED SUBSTANCE PRESCRIPTIONS REDUCE OPIOID ABUSE?

**BOTTOM LINE**

Opioid prescribing in the ED will continue to be a problem and this study does not provide enough high-quality information to implement this guideline at my hospital.

# A Performance Improvement Prescribing Guideline Reduces Opioid Prescriptions for Emergency Department Dental Pain Patients.

## Fox et al. Ann Emerg Med 2013

**P** Adult patients (>16yrs) presenting to two rural emergency departments with dental pain

**I** Controlled substance prescribing guideline

**C** One year before new guideline

**O** Opioid prescription rate for dental pain and annual dental pain ED visits

### Author's Conclusion:

*"A performance improvement program involving a departmental prescribing guideline was associated with a reduction in the rate of opioid prescriptions and visits for ED patients presenting with dental pain." (Fox et al., 2013)*

### Background

In 2001, the Joint Commission made pain "the fifth vital sign" and raised the awareness of oligoanalgesia in the ED. In the US, ED physicians started being evaluated and compensated by means of patient satisfaction with ED pain control. This provided a misguided incentive for giving out opioids. The threat of oligoanalgesia has become so large that many practitioners liberally prescribe opioids in spite of the risks.

ED physicians are among the most frequent prescribers of opioids. (Volkow et al. JAMA 2011). Attempting to eliminate pain is certainly well-intentioned but you have to ask yourself how many patients are being harmed by the addictive feeling of euphoria and respiratory depressant effect that opioids provide, all in trying to attain a pain score of zero. Somehow many of us have been trained that all pain must be eliminated. We all know that this is unrealistic in many cases of severe and refractory pain.

Do patients want their pain to be eliminated at the expense of their level of awareness and understanding of why they are in pain? We all have had patients who surprisingly refuse opioids. The literature supports that. It seems that educated patients would rather live with some pain. Platts-Mills et al showed that after an MVC, educated patients receive less opioids compared to less educated patients. (Platts-Mills TF, et al. Pain 2012).

Perhaps our biggest failure in pain management is not explaining to patients the cause of their pain and the potential risks of opioid use. Writing a script for Percocet is much easier than having that discussion. Nonetheless, although ED physicians had little to do with causing the problem, we have witnessed a public health crisis in the past decade by way of prescription drug abuse – namely oxycodone. The Dhalla CMAJ study in 2009 raised some serious issues with the way opioids are prescribed. In Ontario alone, opioid-related deaths doubled between 1991 and 2004. This has been attributed to the release of long-acting oxycodone. The addition of long-acting oxycodone to the drug formulary was associated with a five-fold increase in oxycodone-related mortality. Most of these deaths were deemed unintentional. In more than half of these patients, a prescription for oxycodone was filled in the month prior to death. Could these deaths have been prevented?

This disturbing situation with opioids has also been observed in America (Manchikanti L et al. Pain Physician 2012). In October 2012, ACEP published practice guidelines regarding opioids. They suggest that opioid use be carefully individualized and time-limited; that opioids are best left for patients with severe or refractory acute pain; and that exacerbations of chronic pain not be treated with opioids.

**Dr. Atrie's approach to patients in severe acute pain:**

- Explain that the pain will not go away completely.
- Explain what's causing the pain, the natural history of the condition.
- Multimodal approach to medications.
- Acetaminophen and NSAID (if able to tolerate) regularly around the clock.
- Small doses of pure opioids as last resort, emphasizing the side effects of opioids (constipation, drowsiness, delirium, addiction) and to minimize use as much as possible.
- My opioid of choice is hydromorphone which seems to cause less delirium in the elderly, synergy with acetaminophen.
- I completely avoid combination opioids (i.e. Percocet, Tylenol with codeine) completely.
- In dealing with dental pain, my litmus test is whether the patient accepts a nerve block. It they do, I prescribe an opioid.

## Results

Decrease from 59% (302/515) to 42% (65/153) representing an absolute decrease of 17% (95% CI 7%-25%). Decrease in dental pain ED visits from 26 to 21 per 1,000 (95% CI 2-9/1000).

# TALK NERDY TO ME

## Commentary

This study looked at the difficult issue of opioid prescribing in the emergency department. The researchers did not cite the reference standards for performing a chart review as Gilbert et al(Ann Emerg Med 1996) or Worster et al. (Ann Emerg Med 2005). There are 12 items considered to be quality indicators when it comes to conducting chart reviews.

It seemed odd to have a 14 month pre-implementation stage vs. a 5 month post-implementation phase. This study was done in two small rural EDs and the results may not be applicable to large urban areas. Physicians involved in the study were not blinded to what was being studied. The ED chairman solicited input from the physician group and was a "champion" of the project, the goals of which were to reduce controlled substance prescriptions. This may have created an observer effect "whereby subjects improve or modify an aspect of their behavior, which is being experimentally measured, in response to the fact that they know that they are being studied".

Therefore, The decrease in controlled substance prescribing found in the results may be secondary not to the actual prescribing guideline, but to several forms of bias including: performance bias, referral bias, and reviewer bias. In addition, there is not good evidence yet to show that reducing prescriptions from the ED actually means you are reducing abuse or opioid mortality. (Gugelman and Perrone. JAMA 2011).

### Chart Review Quality Checklist

| | |
|---|---|
| Abstract training<br>Comment: one hour of training | ☑ |
| Case Selection<br>Comment: inclusion and exclusion criteria were well defined | ☑ |
| Variable Definition<br>Comment: the primary variable recorded was whether or not a patient presenting with dental pain received a prescription for opioid medication at discharge | ☑ |
| Data Abstraction<br>Comment: recorded predefined variables on a standardized spreadsheet | ☑ |
| Performance monitored<br>Comment: not indicated if the abstractor's performance was monitored | |
| Blinding<br>Comment: the abstractors were not blinded to the objectives of the study | |
| Inter-rater reliability monitored | ☑ |
| Inter-rater reliability tested | ☑ |
| Medical Record Identified<br>Comment: the medical database was described | ☑ |
| Sampling Method<br>Comment: convenience sample – all consecutive cases of computerized ED records with dental pain diagnostic codes | ☑ |
| Missing Data | |
| Ethics<br>Comment: the study was approved by an institutional or ethics review board | ☑ |

## Case Resolution

The 33 year-old man with dental pain is given a dental block, 600mg ibuprofen, a prescription of amoxicillin 500mg TID and information on accessing a dentist the next morning.

**CONCLUSION VS COMMENTARY**

## COMPARISON

We agree the education program did have an impact on decreasing opioid prescribing for patients presenting to the emergency department with dental pain.

## Clinical Application

Emergency medicine providers need to be better educated on this important topic of opioid use and abuse. Patients presenting to the ED with pain should be evaluated without bias. While we may not provide some patients with opioids, we will always try to help every patient address their pain.

## WHAT DO I TELL MY PATIENT?

The non-medical use and abuse of prescription drugs is a serious public health problem. We need to continue to address this issue and being more educated on the topic can help.

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**Guest Skeptics: Dr. Damon Atrie and Dr. Amy McCulloch**

Emergency Medicine Residents at McMaster University.

56

# SPECIAL EDITION

# BEEM ME UP
## IMPACT FACTOR IN THE AGE OF SOCIAL MEDIA

**Guest Skeptics:**

**Dr. Chris Carpenter**
Associate Professor, Emergency Medicine, Director, Evidence Based Medicine, Washington University Division of Emergency Medicine, St. Louis

**Dr. Brent Thoma**
2013 Canadian Emergency Medicine Resident of the Year
Editor-in-Chief BoringEM (www.BoringEM.org)

**CASE SCENARIO:**

*A newly graduated EM resident gets her research paper published in an emergency medicine journal.*

**Q:**

HOW CAN SHE KNOW WHAT KIND OF IMPACT HER PAPER WILL HAVE ON THE PROFESSION?

**BOTTOM LINE**

The BEEM rater system seems to correlate well with future emergency medicine citations.

# Best Evidence in Emergency Medicine (BEEM) Rater Scores Correlate With Publications' Future Citations.

## Carpenter et al. Acad Emerg Med 2013

**P** 200 emergency physicians from around the world.

**I** Best Evidence in Emergency Medicine (BEEM) rater scale

**C** Thomson Reuters Web of Science (WoS) total citation count

**O** BEEM rater scores were correlated with the citation rate using Spearman's rho

**Author's Conclusion:**

*"To the best of our knowledge, the BEEM rater score is the only known measure of clinical relevance. It has a high interrater reliability and face validity and correlates with future citations. Future research should assess this instrument against alternative constructs of clinical relevance." (Carpenter et al., 2013)*

## Background

Best Evidence in Emergency Medicine (BEEM) is a knowledge translation and dissemination project started at McMaster University by Dr. Andrew Worster. The BEEM mission is to provide Emergency Medicine practitioners with the best clinical evidence to optimize patient care.

There are close to 3,800 articles published every day. BEEM has a validated and reliable way of screening this mountain of information to separate the signal from the noise.

BEEM via Health Information Research Unit at McMaster University screens the electronic databases of about 200 journals each month. While most articles do not make it past this point, 10-20 articles are emergency medicine related. These articles are then organized in Survey Monkey.

The survey includes the title of the paper and author's conclusions. Articles are sent to over 100 BEEM raters. These are front line emergency doctors just like you. Raters are asked to assume that the results of this article are valid. They are then asked to rate clinically how important the paper is to their own practice on a seven point Likert scale. Only those highly rated articles are appraised by the BEEM faculty. Standardized EBM tools are used to create a critical appraisal and BEEM bottom line.

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.

## Objective

To validate the BEEM rater score as a predictor of literature citation, using a bibliometric construct of clinical relevance to EM.

## Methods

Approximately 200 EPs from around the world voluntarily reviewed the titles and conclusions of published EM-related studies from 2007-2012 identified by BEEM process. Using the seven-point BEEM instrument, raters independently assigned a scores to approximately 10 to 20 articles each month. Two investigators independently abstracted the bibliometric indices for these articles. A citation rate for each article was calculated by dividing the Thomson Reuters Web of Science (WoS) total citation count by the number of years in publication. BEEM rater scores were correlated with the citation rate using Spearman's rho. The performance of the BEEM rater score was assessed for each article using negative binomial regression with composite citation count as the criterion standard, while controlling for other independent bibliometric variables in three models.

**SOME**

*"Social media refers to interaction among people in which they create, share, and/or exchange information and ideas in virtual communities and networks".*

**FOAM**

*Free Open Access to Meducation*

**ALTMETRICS**

*The creation and study of new metrics based on the Social Web for analyzing, and informing scholarship.*

## Results

A total of 605 articles were reviewed by BEEM raters giving a mean score of 3.84 and a median score of 3.85. The citation rate and BEEM rater score correlated positively (0.144), while the BEEM rater score and the Journal Citation Report (JCR) impact factor score were minimally correlated (0.053). In the first model, the BEEM rater score significantly predicted WoS citation rate ($p < 0.0001$) with an odds ratio (OR) of 1.24 (95% confidence interval [CI] = 1.106 to 1.402). In subsequent models adjusting for the JCR impact factor score, the h-indices of the first and last authors, number of authors, and study design, the BEEM rater score was not significant ($p = 0.08$).

## Limitations

- Surrogate marker of impact
- Citation rate manipulation (gaming the system)
- Selection bias of recruiting BEEM raters
- English language only restrictions

**CONCLUSION VS COMMENTARY**

**COMPARISON**

We agree with the BEEM conclusions.

## Commentary

Discussion Between Chris and Brent:

- Information Overload
- Peer Review/Quality
- Sustainability/You get what you pay for
- Holy Grail/Changing practice and improving patient oriented outcomes

## Clinical Application

Emergency physicians can count on the BEEM rater system as being a valid and reliable way to select high quality, clinically relevant papers.

## Case Resolution

There were be a number of ways to measure the impact factor both traditional and via social media altmetrics.


Become a BEEM Rater!

## References

Carpenter, C.R., Sarli, C.C., Fowler, S.A., Kulasegaram, K. Vallera, T., Lapine, P., Schalet, G., Worster, A. (2013). Best Evidence in Emergency Medicine (BEEM) rater scores correlate with publications' future citations. Acad Emerg Med, 20(10): 1004-1012. PMID 24127703

## Additional Resources

PLOS One article on Altmetrics
A Nature article using Altmetrics
Life in the Fast Lane Blogs List
Life in the Fast Lane Podcasts List
Life in the Fast Lane latest FOAMed Review
Academic Life in Emergency Medicine (ALiEM) Social Media Index

# 57

# Should I Stay or Should I Go
## Biphasic Anaphylactic Response

### CASE SCENARIO:

*A 25 year -old medical student who is allergic to peanuts accidentally eats a cookie at the school holiday party. He arrives to the emergency department covered in hives, hypotensive, short of breath and vomiting. The resident diagnoses him with anaphylaxis and does a great job in treating the reaction. The patient is stable and you are considering discharging him home. However, what about that thing called a biphasic anaphylactic response?*

**Q:**

HOW LONG SHOULD YOU OBSERVE SOMEONE AFTER ANAPHYLAXIS?

**BOTTOM LINE**

Prolonged observation is likely unnecessary in patients whose symptoms resolve with therapy in the ED. Biphasic reactions are rare and can occur anywhere from 10 minutes up to 6 days.

# Incidence of Clinically Important Biphasic Reactions in Emergency Department Patients with Allergic Reactions or Anaphylaxis.

## Grunau et al. Ann of EM 2013

**P** Adult presenting to two urban EDs (age > 17yo) with allergic reactions

**I** Retrospective chart review

**C** N/A

**O** Primary (biphasic reaction) and secondary (mortality)

**EXCLUDED STUDIES:**

- Age < 17 years old
- Primary diagnosis was asthma w/ allergy as secondary
- Patient left ED prior to treatment
- Patient had pre-existing condition of angioedema

### Author's Conclusion:

*"Among ED patients with allergic reactions or anaphylaxis, clinically important biphasic reactions and fatalities are rare. Our data suggest that prolonged routine monitoring of patients whose symptoms have resolved is likely unnecessary for patient safety." (Grunau et al., 2013)*

## Background

**Definition of Anaphylaxis (Simons et al., 2012):**

| | Clinical Criteria for Diagnosing Anaphylaxis |
|---|---|
| **1** | Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg. Generalized urticaria, itching or flushing, swollen lips-tongue-uvula)<br><br>AND AT LEAST ONE OF THE FOLLOWING:<br>A) Respiratory compromise (Eg. Dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia)<br>B) Reduced blood pressure or associated symptoms of end-organ dysfunction (Eg. Hypotonia [collapse], syncope, incontinence) OR |
| **2** | Two or more of the following that occur rapidly after exposure to a likely allergen for that patient (minutes to several hours)<br>A) Involvement of the skin-mucosal tissue (eg. Generalized urticaria, itch-flush, swollen lips-tongue-uvula)<br>B) Respiratory compromise (Eg. Dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia)<br>C) Persistent gastrointestinal symptoms (eg. Crampy abdominal pain, vomiting) OR |
| **3** | Reduced blood pressure after exposure to known allergen for that patient (minutes to several hours)<br>A) Infants and children: low systolic blood pressure (age-specific) or greater than 30% decrease in systolic blood pressure<br>B) Adults: systolic blood pressure of less than 90 mmHg or greater than 30% decrease from that person's baseline |

**Treatment for Anaphylaxis:**

1. **Epinephrine** – 1st line treatment. Give it early, give the right dose and give it the right way (IM).
- Nonspecific alpha and beta agonist
- Should be given to all patients with anaphylaxis
- Optimal: 0.3 – 0.5 mg of 1:1000 epinephrine IM (IM in thigh shown to better than SQ in shoulder)
- Dangers – only seen when wrong dose or wrong route
- I've given inhaled epinephrine for airway swelling. Not much literature. I usually do it with lidocaine or other topical anesthetic in preparation for intubation
- All other treatments are secondary as effects are delayed at best

2. **Inhaled Beta Agonist** – May be useful in wheezing or other lower airway issues

Treatment (Continued):

3. **H1 Blocker (diphenhydramine**) – may be useful but has delayed action.
4. **H2 blocker (ranitidine)** may be useful since ~10% of histamine receptors on skin are H2
5. **Steroids** – 4-6 hours before any help

**Biphasic Anaphylactic Reactions:** We are all taught to fear this reaction. A patient comes in with anaphylaxis or an allergic reaction. We treat them, they get better and then we decide on an observation period. After this, they go home. Some percentage of patients will have a biphasic response. They will go home and have recurrent anaphylaxis.

Prior studies have shown biphasic reaction rates ranging from 3 – 20% (Tole et al 2007). As a result, some authors have recommended observation for up to 24 hours after an anaphylactic reaction. The truth is that there are no consistent recommendations about observation. Tole et al concluded:

*"although extended observation would be justified in patients with severe or protracted anaphylaxis, the added costs and resource use involved in routine prolonged monitoring of patients whose symptoms have resolved may worsen ED crowding while likely adding little to individual patient safety."*

Even if we believe the rate of biphasic reactions can be up to 20%, what we want to know is when and how bad. So we want to look at clinically significant biphasic reactions. As far as when, the literature shows that the biphasic reaction can be delayed. It can occur anywhere from 5 minutes up to 3-4 days out. So watching them for 24 hours may not make sense. There's not much on how bad these reactions can be. Worst-case scenario is that they die from the recurrent reaction.

## Results

- 428,634 ED visits over 5 years
- 2,819 (0.66%) were reviewed
- 496 (18%) classified anaphylactic
- 2,323 (82%) considered allergic
- 185 patients had at least 1 subsequent visit for allergic symptoms (bounce-back)
- 5 (0.18%) clinically important biphasic reactions were identified (95% CI 0.07% to 0.44%)
- 2 biphasic reactions occurred during the ED visit and 3 (0.1%) post-discharge
- 2 (0.4%) biphasic reactions were in the anaphylaxis group (95% CI 0.07 to 1.6%)
- 3 (0.13%) biphasic reactions occurred in the allergic reaction group (95% CI 0.03% to 0.41%)
- No fatalities (95% CI 0% to 0.17%)

# TALK NERDY TO ME

## Commentary

This was a retrospective chart review of consecutive adult patients presenting to the ED with allergic reaction or anaphylaxis. The methods were very good and specifically cite following the Gilbert et al 1996 and Worster et al 2004 criteria.

**Limitations:**

Retrospective – 104 diagnosed allergic patients had missing data (not all 3 vital signs of BP/O2 Sat and RR). There are also the usual strengths and weaknesses to this type of study.

Blinding – Abstractors were not blinded to outcome but variables were entered before evaluation of the outcomes

Protocol - No defined protocol for managing allergic reactions

Missing Patients – Some patients may have been missed (presented to primary care physician's office, 20 patients had no health card, or a patient may have left the province and received care)

Coding - Patients could have been miscoded (shock undefined, rash, etc)

## Case Resolution

Medical student is treated with epinephrine, H1 and H2 blockers. They are observed for 3 hours, reassessed and doing well with no vomiting, hives resolving and no shortness of breath. He is discharged home with an epinephrine auto injector and oral steroids and told avoid his triggers.

### Chart Review Quality Checklist

| | |
|---|---|
| Abstract training<br>Comment: three abstractors were trained on 50 charts | ☑ |
| Case Selection<br>Comment: "Allergic Reaction" was the sole code available to physicians in their EMR | ☑ |
| Variable Definition<br>Comment: very clear definitions were used | ☑ |
| Data Abstraction<br>Comment: Standardized MS-Excel spread sheet | ☑ |
| Performance monitored<br>Comment: weekly meetings | ☑ |
| Blinding<br>Comment: no, but all variables were entered before evaluation of the outcomes. | |
| Inter-rater reliability monitored | ☑ |
| Inter-rater reliability tested<br>Comment: 5% of the cases were randomly selected and reviewed by second individual blinded to patient outcomes | ☑ |
| Medical Record Identified | ☑ |
| Sampling Method | ☑ |
| Missing Data<br>Comment: Yes, they describe how they dealt with missing data | ☑ |
| Ethics | ☑ |

## Clinical Application

**Does this change what you do?** No. Biphasic reactions are rare and could take up to a week to appear. This data suggests it is not necessary to keep patients with anaphylaxis for prolonged periods of observation after their symptoms have resolved.

**If rash only:**

1. H1 Blocker (Diphenhydramine) - 25-50mgPO/IM/IV q2-4hr prn max 300mg/d
   - Cochrane SR Conclusion: "The very limited evidence provided by this review was based on a few old studies of a relatively small size, which we categorised as having high to unclear risk of bias. Thus, at present, the review does not allow confident decision-making about the use of H1-receptor antagonists for urticaria. Although some of these studies have reported a measure of relief of symptoms of urticaria and rather minimal clinical improvement in some of the participants, the evidence was weak and unreliable. We have emphasised the lack of precision and limitations in the reported data where appropriate in this review."
2. H2 Blocker (Ranitidine) – 50mg IV or 150mg PO
   - Cochrane SR Conclusion:"Based on this review, we are unable to make any recommendations for clinical practice. Randomized controlled trials are needed, although these are likely to prove challenging to design and execute."
3. Prednisone - (maybe give in rash only) 1mg/kg up to max of 50mg PO daily for 5 days.
   - Cochrane SR Conclusion: "We are, based on this review, unable to make any recommendations for the use of glucocorticoids in the treatment of anaphylaxis."

**Anaphylaxis:**

The above treatments plus epinephrine 0.3 – 0.5 mg of 1:1000 IM

- Epinephrine Cochrane SR Conclusion: "Based on this review, we are unable to make any new recommendations on the use of adrenaline for the treatment of anaphylaxis. Although there is a need for randomized, double-blind, placebo-controlled clinical trials of high methodological quality in order to define the true extent of benefits from the administration of adrenaline in anaphylaxis, such trials are unlikely to be performed in individuals with anaphylaxis. Indeed, they might be unethical because prompt treatment with adrenaline is deemed to be critically important for survival in anaphylaxis. Also, such studies would be difficult to conduct because anaphylactic episodes usually occur without warning, often in a non-medical setting, and differ in severity both among individuals and from one episode to another in the same individual. Consequently, obtaining baseline measurements and frequent timed measurements might be difficult, or impossible, to obtain. In the absence of appropriate trials, we recommend, albeit on the basis of less than optimal evidence, that adrenaline administration by intramuscular (i.m.) injection should still be regarded as first-line treatment for the management of anaphylaxis."
- Watch for a couple of hours (2-3)
- If no recurrent reaction, go home in 2-3 hours w/ epi pen and steroids
- If require repeat epi, get admitted.

**WHAT DO I TELL MY PATIENT?**

You have had a severe allergic reaction called anaphylaxis. We are going to treat you with epinephrine and some other medications. You will need to stay until your symptoms resolve. I will check on you again before you go home. You will be discharged with an epinephrine auto injector and oral steroids .You should avoid triggers and come back if your symptoms return (shortness of breath, rash, vomiting, etc) or are worried.

## References

Grunau, B.E., Li, J., Yi, T.W., Stenstrom, R., Grafstein, E., Wiens, M.O., Schellenber, R.R., Scheuermeyter, F.X. (2014). Incidence of clinically important biphasic reactions in emergency department patients with allergic reactions or anaphylaxis. Ann Emerg Med, 63(6): 836-744. PMID 24239340

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Simons, F.E.R., Ardusso, L.R.F., Bilo, M.B., El-Gamal, Y.M., Ledford, D.K., Ring, J., Sanchez-Borges, M., Enrico Senna, G., Sheikh, A., Thong, B.Y., and the World Allergy Organization. (2011). World Allergy Organization Guidelines for the Assessment and Management of Anaphylaxis. WAO Journal, 4(2): 13-37. PMID 23268454

**Guest Skeptic: Dr. Anand Swaninathan (Swami)**
He is an assistant program director at NYU/Bellevue Hospital in the Department of Emergency Medicine.

58

# SPECIAL EDITION

# HAPPY HO, HO, HO TO YOU

**Guest Skeptic: Alia Dharamsi**
UBC Medical Student

This will not be a traditional episode of the SGEM. We usually present a case, ask a specific question, review background material on the topic and then do a critical review of a recent publication. All of this to try and cut the knowledge translation window down from over 10 years to less than 1 year. We always hope to provide you with high-quality, clinically relevant, evidence based and patient centred information. The ultimate goal of the SGEM is to help you provide the best care to patients based on the best evidence.

Today will be different. It is near the end of the year and I wanted to take some time to reflect back on what we have done so far on the SGEM. Also talk about holiday time and its affect on emergency care workers. And finally I have a gift for everyone who listens to the podcast, provides feedback and just cares about emergency medicine.

To help me do this I have invited a special guest skeptic. Ms. Alia Dharamsi is a fourth year medical student from the University of British Colombia. She was a guest on Episode#35: We are Young. She participated in a panel discussion on social media, medical education and generational challenges. Alia is very interested in emergency medicine, social inequity and global health. She the one who taught me how to use twitter.

Alia, it is great to have you back on the SGEM. So let's talk about some of our favorite podcasts so far this year. It was hard for me to pick a few because there were so many awesome shows like having my EBM guru Dr. Andrew Worster talking about high sensitivity troponin (One is the Loneliest Number), Dr. David Newman discussing presidential care (Hail to the Chief) or even the Don't Pass the Dutchie episode about cannabinoid hyperemesis syndrome. But we did need to narrow it down so here are our top three picks.

## ALIA'S 1ST PICK

**SGEM#50: Under Pressure Journal Club (Vasopressin, Steroids and Epinephrine in Cardiac Arrest).**

I am so glad you picked this one. Going to Montreal and recording the first SGEM-Journal Club at McGill University where Dr. William Osler started the concept was amazing. The residents were super and they treated me like a rock star.

One of the great benefits of social media is that the time for knowledge translation from the time of a study, through journals and publication, to staff and attendings, and then to us as medical students can be cut down from 10 years, to less than a year, and in some cases into a few days or weeks. What that means is that research being done right now, can be used right now and I think that leads to more interesting and relevant discussion on research, regardless of whether or not it changes our practice. This is really why I'm so interested In social media—shaking up the norms! It also addressed a somewhat esoterically based question that I've had as a medical student, very green and new to the world of ER: for the number of cardiac arrest resuscitations we do, how many have return of spontaneous circulation, and how many survive to discharge. This podcast provided some numbers, but more importantly demonstrated a format for how to asses and evaluate papers in a journal club format, something I've only seen done a few times, and have yet to attempt.

**SGEM#48 Thunderstruck (Subarachnoid hemorrhage).**

## KEN'S 1ST PICK

This was done with Dr. Jeff Perry from Ottawa. We were discussing whether or not a clinical decision rule (TOOL) could be used to rule out subarachnoid hemorrhage (SAH). How great is it to have the principal investigator of a study interviewed less than a month after its publication in JAMA? Having Jeff explain why they used fancy statistics like multivariant recursive partitioning was great EBM content. The bottom line was the Ottawa SAH Tool was not ready for prime time to rule out low risk patients from investigations.

## ALIA'S 2ND PICK

### SGEM#52: Breakfast at Glenfield (Asthma, Social Media and Knowledge Translation)

This is also a favorite because Tapas from the UK, with a smartphone and a set of asthma guidelines, proved that with a little imagination and a pulse on social media, medicine and healthcare can be changed in less than 5 minutes. If you don't believe me you have to watch the YouTube video Breakfast at Glenfield. It's an absolute travesty it wasn't featured at the Much Music Video Awards this year.

Tapas is a superstar. I hope he will make more medical education videos. He manifested how social media can be used effectively for knowledge translation. Tapas did promise to visit Canada on his world tour.

### SGEM#53: Sunday Bloody Sunday (Epistaxis and Tranexamic Acid)

## KEN'S 2ND PICK

This introduced the SGEM listeners to the newest member of the BEEM Dream Team Dr. Erich Hanel. What I really liked about this podcast is it covered a very common presentation in the ED. We all face this bread and butter situation of an older person with a nosebleed. The background information Erich put together was golden but then we got to discuss a very cool new treatment for epistaxis. While this discussed only one small RCT of 216 patients, it had some impressive results. They demonstrated using tranexamic acid soaked packing they could stop nosebleeds 71% of the time in less than 10 minutes. Even more impressive was 95% of patients were discharged in <2hrs with no bleeding, no packing and very satisfied. This is practice changing for me and something I will be trying out in 2014

## ALIA'S 3RD PICK

### SGEM #56 Beem Me Up (Impact factor in the age of SoMe)

I would be totally remiss to leave out #56…which featured one of my role models in social media, Brent Thoma. For anyone who hasn't seen his website BoringEM you really should check it out. It has great resources on social media in medicine, navigating CaRMS and study tools like his "boring cards" and new chalk talks. This podcast provided me lots of guidance about how to answer the age-old question, "what's the use of social media anyways" talking about impact factor in social media. I've noticed that the more involved I get in social media, the more I talk about it, and the more people want to know what's the point anyway. For myself even, it's an important question I've been pondering—is this the best use of my time, and how can we begin to measure the value of social media. Since my interests fall into social media and innovation, in medicine and in education, impact factor has become a theme in gauging what groups of people and what themes garner the most discussion, and how can we leverage social media to impact the future of medicine. A lot of people ask me what I get out of social media, whether it's worth my time, and how it actually advances medicine. This podcast was a great tool to start the discussion.

## SGEM#57 Should I Stay or Should I Go (Biphasic Anaphylactic Response)

## KEN'S 3RD PICK

People just loved this core content stuff. Swami did a great job defining anaphylaxis and discussing the treatment options. We then went on to discuss the feared complication of a biphasic reaction. This large retrospective chart review from Canada was not even in print yet; it was only available as an early electronic release on Annals of Emergency Medicine web site. Talk about cutting down the KT window?

The data suggested that these biphasic anaphylactic responses we fear are black swan events happening rarely (0.1%). The bottom line was that prolonged observation is likely unnecessary in patients whose symptoms resolve with therapy in the ED.

## FINAL THOUGHTS...

**Holiday stress and Healthcare:** Alia and Ken discuss the joys and stress of being a student, resident and emergency health care worker during the holidays.

We have the privilege of being involved with people at the best of times and the worst of times. Remember to be good to each other not just during the holidays but all year round. Appreciate the great team you work with every day. Thank that student/resident who may be away from home for the first time over the holidays. Let them know they are valued and you empathize with how tough medical training can be at times. Watch and listen for signs of fatigue not only in our self, co-workers and those we care for. Make sure you get enough sleep, eat healthy foods and get some exercise.

For those of us who have to work over the holidays, social media can be a way to stay connected. It is easy to send a quick email or text to family and friends. Even cooler, is how we can reach out around the world with Skype/Facetime or Google hangout.

# 59

# CAN I GET A WITNESS
## FAMILY MEMBERS PRESENT DURING CPR

### CASE SCENARIO:

*You are working in a busy ED when a young new paramedic crew brings in a post cardiac arrest that they are resuscitating. They tell you that the patient collapsed at home during a family event and that a family member immediately started CPR while the rest of the family bore witness. The family is now en route to the ED and the paramedics are concerned that they did the wrong thing by allowing the family to watch.*

### Q:

DOES OFFERING A RELATIVE THE CHOICE OF OBSERVING CARDIOPULMONARY RESUSCITATION (CPR) REDUCE THE LIKELIHOOD OF PTSD-RELATED SYMPTOMS? DOES FAMILY PRESENCE DURING CPR AFFECT MEDICAL EFFORTS AT RESUSCITATION, OR WELL-BEING OF THE HEALTH CARE TEAM? DOES FAMILY PRESENCE CHANGE THE OCCURRENCE OF MEDICO LEGAL CLAIMS?

### BOTTOM LINE

Having family members present during resuscitation (or at least offering them the opportunity) may reduce long-term stress effects and will not likely increase provider stress, create conflict or affect resuscitation outcomes. Medicolegal conclusions would be applicable to European healthcare systems.

# Family Presence During Cardiopulmonary Resuscitation.

## Jabre et al. NEJM 2013

**P** Cluster randomized trial of 570 patient's family members when the patient was receiving CPR. The study was conducted from15 different pre-hospital emergency medical services (EMS) in France. Situated in France, the population studied were adult family members of adult patients in cardiac arrest occurring at home. Exclusion criteria were communication barriers with the relative and cardiac arrest cases in which resuscitation was not attempted. These events were attended by one of fifteen pre-hospital emergency medical service [EMS] units consisting at a minimum of an ambulance driver, a nurse and a senior emergency physician.

**I** The intervention consisted of eight out of 15 EMS units following a communication guide to ask family members if they wanted to be present during the resuscitation, to introduce the relative to the scene and if required to help with the announcement of death. In contrast physicians in the control group interacted with families in a standard manner, in that the option to attend was not routinely offered and instead relatives who chose not to attend the CPR event were taken to another room.

**C** The other seven out of 15 EMS units provided standard practice regarding family presence when CPR was being administered. The standard practice was at the desecration of the physician team leader.

**O** The primary outcome was the proportion of relatives with post-traumatic stress disorder (PTSD) symptoms on day 90. This was determined by the Impact Event Scale (IES). The IES is a reliable tool that has been used for many years to evaluated traumatic experiences. It consists of 15 items, which are scored from 0-5. A score of zero is no PTSD and max score of 75 is severe PTSD. A secondary outcome was anxiety and depression symptoms. These were measured on the Hospital Anxiety and Depression Scale (HADS). The HADS is two scales in one. There is a seven-part section, which evaluates anxiety, and another seven-part section, which evaluates depression. The result can range for zero to a maximum of 21. A score of >10 indicate moderate-to-severe symptoms of anxiety or depression. Other secondary outcomes included effects on medical efforts at resuscitation (measured on a visual analogue scale), well being of the health care team, and the occurrence of medico legal claims.

## Author's Conclusion:

*"In conclusion, our results show that the presence of a family member during CPR of an adult patient, performed in the home, was associated with positive results on psychological evaluations and did not interfere with medical efforts, increase stress in the health care team, or result in medical legal conflicts." (Jabre et al., 2013)*

## Background

The effect of family presence during cardiopulmonary resuscitation (CPR) on the family members themselves and the medical team remains controversial. The risks and benefits have been debated in the medical literature since the 1980's.

While on one hand there are suggestions that it may help family members bring closure to the event by allowing them to see the efforts of the resuscitation team and perhaps afford them the opportunity to say a final goodbye to a loved one. This perspective is often outweighed by fears of increased stress and emotional burden placed not only on the families themselves, but also on the health care providers.

Prior to this publication available data has come from simple feedback or small observational studies. There has only been one RCT on the issue and it was terminated after only enrolling 25 patients. Nonetheless the authors note that "major international guidelines for CPR state than available evidence support family witnessed resuscitation and this action is considered reasonable and generally useful."

## Results

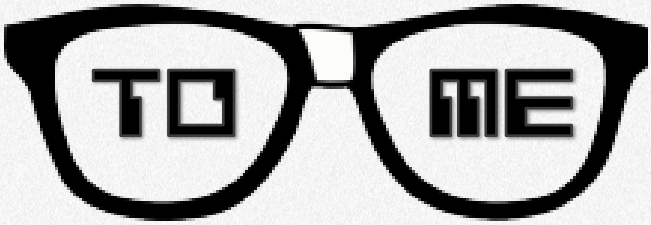
Resuscitation outcome: Of the 570 family members, 60% witnessed resuscitation. Only 4% of patients that were resuscitated were alive at day 28, this was consistent between both witnessed and un-witnessed groups. Resuscitation metrics did not differ between groups (duration of resuscitation, type or amount of infused medications or number of shocks delivered).

Psychological Outcome: The frequency of PTSD-related symptoms was significantly higher in the control group than in the intervention group (OR 1.7; 95% CI 1.2-2.5 p=0.004) and also higher in the family members that did not witness CPR (OR 1.6; 95% CI 1.1-2.5 p=0.02). The frequency of symptoms of anxiety were also higher in the control group versus the intervention group, and again higher in family member that did not witness CPR ($p<0.001$ for both comparisons).

Interference by Family Members: Less than 1% of the family members were aggressive or in conflict with the medical team. Of the family members who did not witness CPR 12% expressed regret at having been absent as compared to 3% of relatives who witnessed CPR and regretted being present.

Stress Assessment of Medical Teams and Medical Legal Conflicts: There was no significant difference in stress levels according to family presence, and with a mean 20-month follow up there were no claims for damages from any participating family members and there were no medical legal conflicts.

# TALK NERDY TO ME



## Commentary

There is potential measurable benefit in providing families the opportunity to witness CPR, but this study only permits us to comment on the pre-hospital environment in France. This system has some similarities to the ED, i.e. the presence of nursing and a physician in the pre-hospital setting, but application to the ED can only be inferred. We also need to be careful about the medical legal conclusions made by the author. The North America and in particular the USA litigation environment may be much different than France. It is reassuring that witnessed resuscitations were not affected in terms of outcomes and family interference was very rare (<1%). This may alleviate fear of family members in the resuscitation.

### ODDS RATIO

ODDS RATIO (OR) CAN BE HARD TO UNDERSTAND. THE OR IS A RATIO OF THE ODDS AN OUTCOME WILL OCCUR IN ONE GROUP DIVIDED BY THE ODDS OF THE OUTCOME WILL OCCUR IN THE OTHER GROUP. THE OR TENDS TO EXAGGERATE EFFECT SIZE COMPARED TO RELATIVE RISK (RR), ESPECIALLY FOR COMMON OUTCOMES. HERE ARE SOME LINKS FOR ADDITIONAL READING ON OR AND RR IN THE BMJ.

## Case Resolution

The patient survives to hospital admission but like the majority of patients does not survive to hospital discharge. You reassure the paramedic that they did the right thing by allowing the family to witness the resuscitation.

## Clinical Application

This adds to the growing body of evidence that inviting family members into the resuscitation room is a reasonable option.

**WHAT DO I TELL MY PATIENT?**

To Family Members:
Your loved one is in critical condition and our team is doing our best. Would you like to come in during the resuscitation attempt? There is some evidence suggesting this might help you cope with whatever the outcome.

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br><br>Comment: They have a different system in France. The RN and Emergency physician are in the ambulance. So they are running the code but in the pre-hospital setting. | ? |
| The patients were adequately randomized<br><br>Comment: They were randomized but it was not completely randomized. They took the 15 EMS units and randomly assigned 8 to have the intervention and 7 to be the control group. | ? |
| The randomization process was concealed<br><br>Comment: The medical teams knew which group they were being assigned too. | |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | ☑ |
| The patients in both groups were similar with respect to prognostic factors | ☑ |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation<br><br>Comment: The paramedics, nurses and doctors knew which group they were allocated. But the trained psychologist doing the structured questionnaire by telephone was unaware of group assignment | |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups)<br><br>Comment: 94% in the intervention group and 89% in the control group. | ☑ |
| All patient-important outcomes were considered | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | |

## References

Jabre, P., Belpomme, V., Azoulay, E., Jacob, L., Bertrand, L., Lapostolle, F. et al. (2013). Family presence during cardiopulmonary resuscitation. NEJM, 368: 1008-1018. PMID 23484827

## Additional References

Lederman, Z., Garasic, M., Piperberg, M. (2013). Family presence during cardiopulmonary resuscitation: who should decide? J Med Ethics, 40(5): 315-319. PMID 23557910

Comptom, S., and Fernandez, R. (2013). Presence during cardiopulmonary resuscitation is beneficial to family members in the out-of-hospital setting. Evid Based Med, 19(1): 13. PMID 23771725

Walker, W.M. (2013). Emergency care staff experiences of lay presence during adult cardiopulmonary resuscitation: a phenomenological study. Emerg Med J, 31(6): 453-458. PMID 23493344

Leske, J.S., McAndrew, N.S., Evans, C.R., Garcia, A.E., Brasel, K.J. (2012). Challenges in conducting research after family presence during resuscitation. J Trauma Nurs, 19(3): 190-194. PMID 22955717

Sak-Dankosky, N., Andruszkiewicz, P., Sherwood, P.R., and Kvist, T. (2013). Integrative review: nurses' and physicians' experiences and attitudes towards inpatient-witnessed resuscitation of an adult patient. J Adv Nurs, 70(5): 957-974. PMID 24164440

**Guest Skeptic: Darin Abbey**

Clinical nurse educator for the emergency department in Nanaimo, British Columbia, Canada

# 60

# NITROUS OXIDE
## IT'S A GAS, GAS, GAS

### CASE SCENARIO:

*You are working at "The Hut" (Ski Patrol Hut) and a 46year old snowboarder comes in after falling. He has an obvious deformity of his right wrist. He is neurovascularly intact but in a moderate pain. It is 45 minutes transfer from the ski hill to the emergency department.*

### Q:

HOW DOES NITROUS OXIDE COMPARE TO MEDICAL AIR FOR PREHOSPITAL TREATMENT OF ADULTS WITH MODERATE TRAUMATIC ACUTE PAIN?

### BOTTOM LINE

Though not ready for widespread and routine ED application, $N_20$ shows promise as an analgesic for moderate traumatic acute pain.

# Nitrous oxide for early analgesia in the emergency setting: a randomized, double-blind multicenter prehospital trial.

## Ducassé et al. Acad Emerg Med 2013

**P** Prospective, randomized, double-blind, multicenter controlled trial of 60 adult French patients who suffered moderate (self-rated pain of 4-6 out of 10) acute pain as a result of traumatic injury. Exclusion criteria included contraindications to premixed 50% N20 and oxygen such as intracranial hypertension, unconsciousness, pneumothorax, recent eye surgery and other disorders involving accumulation of gas in closed body spaces such as emphysema, intestinal ileus, sinusitis, or facial trauma. Other exclusion criteria included lack of a nurse in the fire service team, analgesic medication within 6-hours, pregnancy, or inclusion in another trial. Patients not transported to the reference hospital were not included.

**I** 50% nitrous oxide at 9L/min

**C** Medical air at 9L/min

**O** The primary outcome measure was the percentage of patients with pain relief (numeric pain score of 3 or less) at 15 minutes. Secondary outcomes assessed included safety and adverse events, time to analgesia, and patient and investigator satisfaction with analgesia.

### Author's Conclusion:

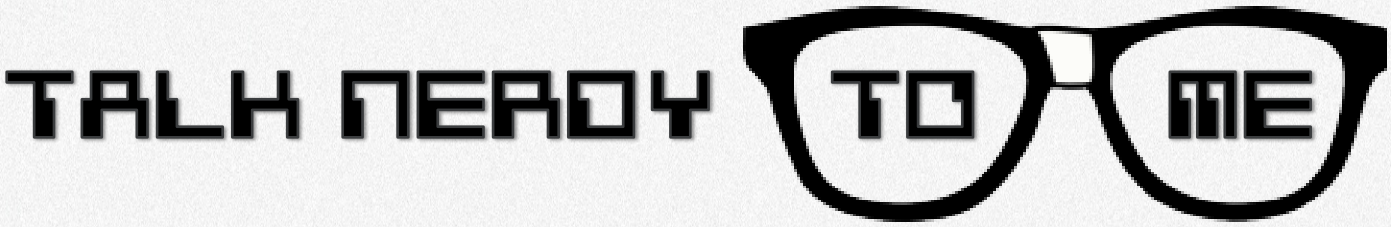
*"Nitrous oxide is an efficacious means of prehospital analgesia for moderate traumatic acute pain." (Ducasse et al., 2013)*

### Background

On the surface $N_2O$ has a lot of the properties we'd like to see in a prehospital analgesic. From studies with children, we know it's safe, non-invasive (doesn't require IV access), has a rapid onset and offset, effective and reversible. However, there is a paucity of high-quality studies looking at adults in the emergency department setting.

## Results

After 15 minutes of N20 versus placebo, 67% of patients in the N20 group reported a numeric pain score of 3 or lower compared to 27% of those in the medical air group. The median pain scores were also lower in the N20 group after 15 minutes of treatment (pain score 2 versus 5). Only one patient in the N20 group described an adverse event.




## Commentary

This was a randomized, double-blind multicenter trial with good methodology, which showed significant results (reduced pain score of 67% in the treatment group versus 27% in the control [95% CI 17% to 63%, $p < 0.001$]). The authors do not provide absolute numbers, a 2×2 contingency table, or any estimate of number needed to treat (NNT), but BEEM did these calculations on your behalf. The NNT with nitrous oxide to obtain a pain score of three or less within 15-minutes in a patient who otherwise would not have obtained this pain score is 3 (95% CI 1.6-8.6).

Two details are particularly important. First, this was a study of efficacy only, so although there is commentary on adverse effects, the study was not designed to assess safety. Second, this was a trial in the prehospital setting and we should not generalise these results to the ED based on this study alone.

Further research is required in the ED setting, particularly for safety before use of $N_20$ in the ED is standard of care. Nonetheless, there is promise for use of this agent without waiting for IV access, with an agent that demonstrates no adverse hemodynamic changes, few adverse effects, and can be easily titrated.

### RCT Quality Checklist

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

## Case Resolution

You recognize the patient is in pain. He is provided with 50% nitrous oxide, splinted and transferred. Within 15 minutes his pain has decreased significantly. He arrives at the emergency department 45 minutes later feeling more comfortable and x-ray confirms a distal radius fracture.

## Clinical Application

If future studies demonstrate safety and efficiency, $N_20$ could be added to analgesic options in the prehospital setting.

## CONCLUSION VS COMMENTARY COMPARISON

The authors accurately conclude that N20 has demonstrated efficacy for treatment of acute moderate traumatic pain in the prehospital setting.

## WHAT DO I TELL MY PATIENT?

We do not have access to nitrous oxide (laughing gas) in the adult ED, although many children's hospitals are using it. Early research in adults indicates that nitrous oxide could be an effective and safe strategy to acutely reduce pain without an IV, but we need to study this medication a bit more. Your dentist's chair is still the likeliest place you'll experience laughing gas.

## References

Ducasse, J.L., Siksik, G., Durand-Bechu, M., Couarraze, S., Valle, B., Lecoules, N., Marco, P., Lacombe, T., Bounes, V. (2013). Nitrous oxide for early analgesia in the emergency setting: a randomized, double-blind multicenter prehospital trial. Acad Emerg Med, 20(2): 178-184. PMID 23406077

**Guest Skeptic: Dr. Josh Williams**
Emergency Physician Kelowna, British Columbia, Canada and BEEM Lecturer

# 61

# BLOOD ON BLOOD
## TRANSFUSION STRATEGIES FOR UPPER GI BLEEDS

**CASE SCENARIO:**

*A 62 year old man arrives with hematemesis. His BP is 112/72, HR is 84 and Hgb is 82 (8.2g/dl).*

**Q:**

WHICH IS BETTER: A CONSERVATIVE OR LIBERAL TRANSFUSION STRATEGY FOR UPPER GI BLEEDS?

**BOTTOM LINE**

When it comes to transfusion strategies for acute upper GI bleeds, less may be more.

# Transfusion Strategies for Acute Upper Gastrointestinal Bleeding.

## Villanueva et al. NEJM 1999

**P** Adults (n=921) with upper GI bleeds

**I** Restrictive strategy (<7g/dl) or Liberal (<9g/dl)

**C** None

**O** Death at 45 days, re-bleeding and adverse outcomes

### EXCLUDED STUDIES:

- *Declined blood transfusion*
- *Massive bleed*
- *ACS, TIA or CVA*
- *Recent transfusion (90d), trauma or surgery*
- *Lower GI bleeds*
- *Previous decision by physician that patients should avoid specific medical therapy, Rockall Score of 0 with HgB >12g/dl*

### INCLUDED STUDIES:

- *18 years and older*
- *hematemesis/blood in NG, melena or both*

### Author's Conclusion:

*"As compared with a liberal transfusion strategy, a restrictive strategy significantly improved outcomes in patients with acute upper gastrointestinal bleeding." (Villanueva et al., 1999)*

# ROCKALL SCORE

THIS IS A SCORING SYSTEM THAT ATTEMPTS TO IDENTIFY PATIENTS AT RISK OF ADVERSE OUTCOME FOLLOWING ACUTE UPPER GASTROINTESTINAL BLEEDING. ROCKALL ET AL. IDENTIFIED INDEPENDENT RISK FACTORS IN 1996 WHICH WERE LATER SHOWN TO PREDICT MORTALITY ACCURATELY. THE SCORING SYSTEM USES CLINICAL CRITERIA (INCREASING AGE, CO-MORBIDITY, SHOCK) AS WELL AS ENDOSCOPIC FINDING (DIAGNOSIS, STIGMATA OF ACUTE BLEEDING). A CONVENIENT MNEMONIC IS ABCDE -- I.E. AGE, BLOOD PRESSURE FALL (SHOCK), CO-MORBIDITY, DIAGNOSIS AND EVIDENCE OF BLEEDING.

| | SCORE | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| **Age** | <60 | 60-79 | >80 | |
| **Shock** | Pulse < 100<br>BP > 100 | Pulse > 100<br>BP < 100 | Pulse > 100<br>BP < 100 | |
| **Comorbidities** | None | | Circulatory failure / coronary artery disease | Renal Failure<br>Liver Failure<br>Disseminated malignancy |
| **Endoscopic signs of bleeding** | None / dark spot | | Blood / adherent clot / visible or spurting vessel | |
| **Diagnosis** | Mallory-Weiss syndrome / no pathology | All other diagnoses | Malignancy of the upper GI tract | |

## Background

- Common ED presentation
- High morbidity and mortality
- Transfusions can be lifesaving in massive bleed
- Controversy for less serious cases
- Observational studies of small controlled trials suggest transfusions may be harmful in patients with hypovolemia anemia
- Animal studies suggest harmful if bleeding from portal hypertensive source due to rebound increased in portal pressure which is associated with a risk of re-bleeding.

## Results

| Outcome | Result | Hazard Ratio | NNT |
|---|---|---|---|
| **Mortality at 45 days** | 5% (23 patients) vs. 9% (41 patients) | 0.55<br>(95% CI 0.33-0.92) | 25 |
| **Further Bleeding** | 10% (45 patients) vs. 16% (71 patients) | 0.68<br>(95% CI 0.47-0.98) | 17 |
| **Overall Adverse Events** | 40% (179 patients) vs. 48% (214 patients) | N/A | 13 |

# TALK NERDY TO ME

## Commentary

This was a good study asking a very important question: When to start transfusion in acute upper GI bleeds. They generated their hypothesis based on a number of considerations. These included trials in critically ill patients (TRICC NEJM 1999), observational studies, small RCTs and animal studies.

While the patients were randomized there was a possibility of selection bias based on the exclusion criteria of the Rockwell Score. They did not include patients at low risk of bleeding and those with massive bleeding. Massive bleeding was not adequately defined in the manuscript. There was no control group in the study design. This introduces bias because patients and physicians were not blinded to allocation. They state it is unlikely any bias would effect their primary outcome of death at 45 days. This seems suspect for a couple of reasons. There were 39 patients (9%) major protocol violators in the restrictive strategy vs. only 15 (3%) in the liberal group. Each group received one unit of blood up front. Then it was at the discretion of the attending physicians when subjective symptoms of anemia developed, massive bleeding occurred or when surgical intervention was required. This may have greater impact than the authors suggest.

- NNT for Death at 45 days = 25 (95% CI 13.5-154.7)
- NNT for Re-Bleed = 17 (95% CI 9.8-71.0)
- NNT prevent Adverse Event = 13 (95% CI 7.0-79.0)

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED | ? |
| The patients were adequately randomized | ☑ |
| The randomization process was concealed | ☑ |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | ? |
| The patients in both groups were similar with respect to prognostic factors | ☑ |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | |
| All groups were treated equally except for the intervention<br><br>Comment: (PUD patients got PPI bolus plus drip for 72hrs [NEWMAN], portal HTN patients received IV somatostatin and prophylactic antibiotics, bleeding esophageal varices were treated with bands or sclerotherapy, and non-bleeding varices were injected with cyanoacrylate) | |
| Follow-up was complete (i.e. at least 80% for both groups) | ☑ |
| All patient-important outcomes were considered | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

Another important consideration was all patients got endoscopy within the first 6 hours. This may not be what happens at your primary place of practice.

This study seems to be consistent with the other smaller studies, observational studies, animal studies and those critically ill patients without acute upper GI bleeds. Most of this protocol takes place outside the emergency department. However, the first unit of blood often gets started in the emergency department. This would suggest that being more conservative than liberal has more benefit and less harm in these patients.

## Case Resolution

You group and cross your patient for 2 units of blood, hang one unit of blood in the emergency department, give pantoprazole 40mg IV and consult GI service.

## Clinical Application

I will probably be less likely to provide blood to patients with non-massive, acute upper GI bleeds with an initial hemoglobin of >7g/dl.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Brief but appears to be accurate.

**WHAT DO I TELL MY PATIENT?**

Sometimes giving blood can cause harm and not be helpful. We are going to see what your hemoglobin is before starting a transfusion. If it is really low you will need some blood but if it is not too low we will discuss the case with the admitting specialist to make sure we are giving you the best care.

## References

PC Hebert et al. (1999). A Multicenter, Randomized, Controlled Clinical Trial of Transfusion Requirements in Critical Care (TRICC). NEJM, 340:409-417. PMID 9971864

Villanueva, C., Colomo, A., Bosch, A., Concepcion, M., Hernandez-Gea, V., Aracil, C., et al. (2013). Transfusion strategies for acute upper gastrointestinal bleeding. NEJM, 368(1): 11-21. PMID 23281973

**Guest Skeptic: Dr. Philippe Rola**

He is chief of ICU at Santa Cabrini Hospital in Montreal and an attending ICU specialist at Scarborough General Hospital in Toronto. Co-founder and president, critical care and ultrasound institute (www.ccusinstitute.org). A social media newbie (www.thinkingcriticalcare.com @ThinkingCC).

# 62

# Take My (Shortness of) Breath Away
## Nebulized Furosemide for COPD

### CASE SCENARIO:

*A 73 year old man presents to the emergency department with an exacerbation of his COPD. He quit smoking two days ago when his breathing got worse. He has a history of hypertension but no history of congestive heart failure. He has been taking all his medication and puffers as prescribed. Vital signs are BP165/85, HR 95, Temp 37.2C, RR 22 and O2 Sat 92% on room air.*

### Q:

WOULD NEBULIZER FUROSEMIDE HELP TREAT HIS COPD EXACERBATION?

**BOTTOM LINE**

No nebulized furosemide for COPDers until we have more data.

# The Adjunctive Effect of Nebulized Furosemide in COPD Exacerbation: A Randomized Controlled Clinical Trial.

## Vahedi et al. Respiratory Care 2013

**P** There were 100 patients, aged >18 with a diagnosis of COPD and presenting with COPD exacerbation. Patients with a history of asthma, congestive heart failure, atopy and lung cancer were excluded. The study was conducted at a tertiary hospital in Teheran, Iran. Teheran is one of the most polluted cities in the world, which is estimated to cause more than 5,000 excess deaths per year. Mean age was 73 years old. Sixty-three percent were male. The mean baseline FEV1 (during the acute exacerbation) was 54%.

**I** Inhalation of 40mg nebulizer furosemide

**C** Conventional therapy alone

**O** Primary outcome: changes in FEV1 and dyspnea severity
Secondary outcomes: changes in other physiological parameters

### Author's Conclusion:

*"The addition of nebulized furosemide to conventional therapy improves dyspnea and physiologic respiratory parameters in patients with COPD exacerbation." (Vahedi et al., 2013)*

### Background

COPD is defined by the WHO as a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible. The more familiar terms 'chronic bronchitis' and 'emphysema' are no longer used, but are now included within the COPD diagnosis. COPD is not simply a "smoker's cough" but an under-diagnosed, life-threatening lung disease.

The most common cause of COPD in the western world is cigarette smoking. There is no cure for COPD but there are effective treatments. These include the most important and most difficult – stop smoking. Other treatments include bronchodilators, anticholinergics and steroids. Pulmonary rehabilitation programs have also proven to be effective.

Hypothesis that nebulizer furosemide might work in COPD came form some early studies suggesting it could modulate vagal afferent activity in animal models, reduce induced dyspnea in healthy subjects and help patients with asthma and lung cancer.

# TALK NERDY TO ME

## RCT Quality Checklist

| | | |
|---|---|---|
| The study population included or focused on those in the ED | ☑ | All patients were enrolled in the ED. |
| The patients were adequately randomized | ? | Randomization was achieved using SPSS 15, but is otherwise not described in the paper. There were exactly 50 patients in both groups. |
| The randomization process was concealed | ? | Not described in the paper. |
| The patients were analyzed in the groups to which they were randomized | ☑ | Not mentioned, but probable since nebulized furosemide is not standard treatment. They may, however, The mean baseline FEV1 was 54% (which in stable COPD corresponds to moderate COPD indicating that these were not very sick patients.) have got oral or intravenous furosemide during their stay in the ED. End-point analyses were performed one hour after treatment, which should reduce this risk. |
| The study patients were recruited consecutively (i.e. no selection bias) | | The selection process is not described. Only patients who were clinically stable, ie not in need of mechanical ventilation (which is not defined), were included. It is not described how these stable patients were selected. |
| The patients in both groups were similar with respect to prognostic factors | | The placebo group was significantly more tachycardic (101 bpm vs 89), had less pronounced respiratory acidosis (NS) with less compensatory metabolic alkalosis. The placebo group also had a lower FEV1 % (52,7 vs 54,8). The baseline characteristics are not complete, e.g. a common differential diagnosis to COPD is pneumonia, but fever is not mentioned. A higher pulse rate in the placebo group could indicate more cases of bacterial pneumonia, which would not respond to conventional bronchodilation therapy. Comorbidities are not described. |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | ? | All furosemide vials were labeled 1 and placebo 2. (Two earlier studies on healthy young people who were given nebulized furosemide doses of 28 to 40 mg found, however, that than only one subject experienced an urge to urinate within an hour.) |
| All groups were treated equally except for the intervention | ☑ | It is, however, not adequately described if the intervention treatment was provided by the regular staff or by the researchers themselves. If the physiologic parameters and dyspnea severity were followed in a more structured manner than usual, this could have resulted in better care than usual for both groups. The conventional treatment included, in addition to hydrocortisone, low doses of salbutamol and ipratropium, not to be repeated, and only 0,5 l/min supplemental oxygen for 30 min. With mean SaO2% of 82,8-84-8% it seems unlikely that no patient got more oxygen. |
| Follow-up was complete (i.e. at least 80% for both groups) | ☑ | Follow-up was a 100%, but not commented on in the paper. |
| All patient-important outcomes were considered | ? | There were two primary outcomes for some reason. FEV1% is not patient oriented and not very relevant in the acute setting. Dyspnea is an important patient outcome. What is the baseline dyspnea score for a patient with mild-moderate COPD? Admission would have been relevant. Were the secondary outcomes even predefined? |
| The treatment effect was large enough and precise enough to be clinically significant | ? | Difficult to say what would be a relevant improvement in dyspnea score. Besides, the VAS scale used was numbered and patients were asked to point to a number from instead of marking on from 1-10, instead of marking on an analogue scales with scores of 1-100 (which was the method used in the study they used to calculate power.) |

## Commentary

This study was designed to evaluate the hypothesis that nebulized furosemide could improve COPD. However, they had poor methods, possible unblinding, multiple surrogate markers and questionable clinical significance. In addition, there was no mention of harm.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

There are a number of limitations which we have outlined in our critical review. This makes it difficult to agree with their conclusions.

## Case Resolution

You treat his COPD exacerbation with conventional therapy, encourage him to stay a non-smoker and give him a flu shot.

## Clinical Application

The addition of nebulized furosemide to conventional therapy is an interesting hypothesis. We do not feel this study is strong enough to support changing practice at this time.

**WHAT DO I TELL MY PATIENT?**

You are having a flare up of your chronic obstructive lung disease. We will treat you with the standard therapy to make you feel better. If that does not work, we can always use a special mask (non-invasive positive pressure ventilation - NIPPV) which has been shown to work well.

## References

Wheikh Motahara Vahedi, H., Mahshidfar, B., Rabiee, H., Saadat, S., Shokoohi, H., Chardoli, M., Rahimi-Movaghar, V. (2013). The adjunctive effect of nebulized furosemide in COPD exacerbation: a randomized controlled clinical trial. Respir Care, 58(11): 1873-1877. PMID 23650431

**Guest Skeptic: Dr. Katrin Hruska**

Swedish doctor, interested in patients. Trying to figure out how to improve emergency care, with a fair amount of skepticism. @Akutdok

# 63

# GOLDFINGER
# MORE DOGMA OF WOUND CARE

## CASE SCENARIO:

*An otherwise healthy 24-year-old man was out at the bar and got into a bit of a tussle at around 11 pm. When he woke up the next morning he was surprised to see a 3 cm laceration on the back of his right hand. He finally figures that he should have it checked out and makes it into the emergency department at noon the next day. This is more than 12 hours later.*

**Q:**

WOULD YOU SUTURE THIS WOUND?

## BOTTOM LINE

The overall rate of infection is low in simple lacerations. There is no good evidence to show that there is an association between infection and time from injury to repair. There is some evidence to suggest wounds on the lower extremities, diabetic patients, size >5cm or those with moderate to heavy contamination are more likely to become infected. Clinicians should consider using prophylactic antibiotics in these high-risk situations.

# Traumatic lacerations: what are the risks for infection and has the 'golden period' of laceration care disappeared?

## Quinn et al. EMJ 2014

**P** Multicenter prospective cohort study of 2663 consecutive patients with lacerations presenting to the ED of one of three participating hospitals (trauma center, community non-teaching hospital and city teaching hospital) between Feb 2008 and Sep 2009.

**I** None

**C** 27 specific patient, laceration and treatment variables including age, sex, race, diabetes, hours from injury to presentation, length, shape, mechanism, location, contamination, repair type and closure method.

**O** Primary outcome was infection at 30 days (seen by a physician and treated with antibiotics). Secondary outcome was cosmetic appearance rated by patients on a 100-point scale.

**EXCLUDED PATIENTS:**

- *Animal and human bites*

### Author's Conclusion:

*"Diabetes, wound contamination, length greater than 5 cm and location on the lower extremity are important risk factors for wound infection. Time from injury to wound closure is not as important as previously thought." (Quinn et al., 2014)*

### Background

We have spoken before about the dogma of wound care on the SGEM#9. This addressed five myths about simple lacerations in the emergency department.

1. Patients have priorities (function/cosmetic) and infection is not number one
2. The solution is dilution and tap water is just fine
3. Non-sterile gloves are fine; save the sterile gloves for sterile procedures
4. Epinephrine containing local anesthetics can go in the tips of everything
5. Simple hand lacerations <2cm do not always need sutures

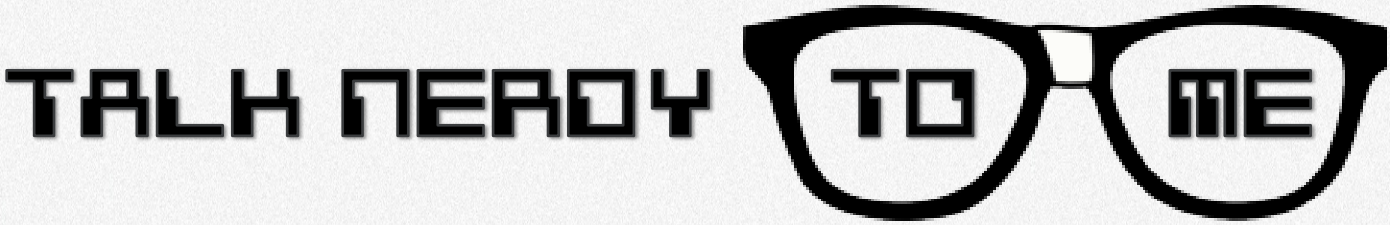
Other good FOAM resource on the topic of wound care include:

- Dr. Chris Bond SOCMOB "Evidence-based Laceration Repair"
- Life in the Fast Lane " Suturing Techniques"
- Eve Purdy Manu et Corde "To suture or Not to Suture"

One piece of dogma we have not addressed is the so-called "Golden Period" for laceration repair. Historically we have taught that the wounds sutured after more than 6 hours are at higher risk for infection. This time frame is based on lab and clinical studies related to the doubling time of bacterial colonization, which can progress to invasive infection. Recent reports have both supported a short suturing time window and refuted the association between wound age and infection. However, the evidence on the topic is poor quality with small sample sizes, retrospective and observational designs.

## Results

- 3957 patients presented with lacerations
- 2663 patients completed follow-up (67%)
- 64% sutures, 24% with glue/sterile strips or both, 7% staples and 4% not closed
- 69 developed an infection or 2.6% (95% CI 2.0-3.3%)
- 2.2% (50/2248) of patients received prophylactic antibiotics
- 2342/2663 (88%) had documented time to injury
- No association between infection and closure/repair before or after 12hrs
- Also, no association between age, sex, race or tetanus status
- Infected wounds received a worse cosmetic rating (70 vs. 87)
- Infected wounds more likely to consider scar revision (24.6% vs. 9.6%)
- Multivariate model for predictors of infection showed lower extremities, diabetes, length >5cm and moderate/heavy contamination




## Commentary

**Strengths:**

- Large sample size, consecutive lacerations, standardized data collection forms
- Three different sites (Level 1 Trauma centre, teaching and non-teaching community hospital)
- Subjective variables were given explicit definitions
- The sample size calculation was deliberate and appropriate
- Statistical analysis seemed appropriate
- Asked patient oriented outcome of cosmetic result
- 2.6% infection rate consistent with other data

**Weakness:**

- Not randomized but this is a limitation of evidence based medicine
- Follow-up was only 67% and they were excluded from analysis
- Doctors who diagnosed infection were not blinded to the time from suture to infection or any other mechanism/wound factors
- Patient records were not used to confirm infection
- #1 patient oriented outcome (function) was not recorded
- Only 85 patients (2.1%) presented >12hrs with only 1 getting infected
- 13/85 (15.3%) were treated without initial closure leaving only 72 patients repaired >12hrs post injury
- This was five times (15% vs. 3%) higher rate than those presenting <12hrs after injury
- Heavy or moderate contamination, identified in the multivariate model as associated with infection, included time in the description
- Unclear about whether people with comorbidities were less likely to have wounds sutured in the first place
- Not very impressive odds ratio (OR 1.9-3.1)

**Systematic Review Quality Checklist**

| | |
|---|---|
| Did the review ask a clear question? | ☑ |
| Was there an appropriate method to answer the question?<br><br>Comment: It may have been hard to get ethics approval for a RCT | ☑ |
| Was the cohort recruited in an acceptable way? | ☑ |
| Was the exposure accurately measured to minimize bias? | ? |
| Was the outcome accurately measured to minimize bias? | |
| Were all important confounding factors identified? | ? |
| Was the follow-up complete and long enough?<br><br>Comment: They only had 63% follow-up. | |
| Do you believe the results? | ☑ |
| Can you apply them to your local population? | ☑ |
| Do the results fit with other available evidence?<br><br>Comment: The results did not support the "golden period" for safe laceration repair. | |

## Case Resolution

After examining the wound you determine that it is a simple laceration with no involvement of tendons, nerves or major blood vessels. You take a good history and learn that the patient does not have diabetes. You discuss the evidence with the patient and despite the long time from injury to presentation you both decide to go for sutures. You clean the wound thoroughly with tap water and use clean but non-sterile gloves for the repair. You inform him of about a 3% risk of infection and advise him of what to watch for and return if concerned.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

We feel the conclusion are reasonable and supported by the data presented.

## Clinical Application

Emergency providers should worry more about wounds to the lower extremities, size >5cm, moderate to heavy contamination and diabetic patients. Infections are more likely in these high risk situation and you should consider prophylactic antibiotics. The "golden period" or time to would repair does not seem to be a significant factor for infection as previously thought.

## WHAT DO I TELL MY PATIENT?

There is some reasonable evidence to say it would be safe to put stitches in now even though you cut yourself over 12 hours ago.

## References

Quinn, J.V., Polevoi, S.K., and Kohn, M.A. (2014). Traumatic lacerations: what are the risks for infection and has the 'golden period' of laceration care disappeared? Emerg Med J, 31(2): 96-100. PMID 23314208

**Guest Skeptic: Eve Purdy**
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# 64

# CLASSIC EM PAPERS
## OPALS STUDY

### CASE SCENARIO:

*A 43-year-old man experiences a cardiac arrest on the street. You are the first provider on scene with EMS. A cardiac defibrillator is hooked up and the patient is in ventricular fibrillation. He is unsuccessfully shocked and chest compressions are started. The paramedics ask you if you want to intubate and administer medications or load for transport.*

### Q:

DO ADVANCED LIFE SUPPORT TECHNIQUES, SPECIFICALLY PHARMACOLOGIC INTERVENTIONS, IMPROVE SURVIVAL TO DISCHARGE VERSUS BASIC LIFE SUPPORT (RAPID DEFIBRILLATION AND CPR) IN PATIENTS WITH OUT-OF-HOSPITAL CARDIAC ARREST (OHCA)?

### BOTTOM LINE

Addition of an advanced life support algorithm to BLS management did not increase the survival to hospital discharge for patients with out of hospital cardiac arrest.

# Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest.

## Stiell et al. NEJM 2004

**P** All persons > 16 years old who had an OHCA and for whom resuscitation was attempted.

**I** Advanced-life-support program whereby paramedics were trained in intubation, IV line placement and IV medication administration.

**C** Basic-life-support – defibrillation + CPR

**O** Primary –Survival to hospital discharge (defined as patient leaving hospital alive).
Secondary – ROSC, admission to hospital and cerebral performance category.

**EXCLUDED PATIENTS:**

- Age < 16
- Persons who were dead,
- Patients with trauma
- Disorders of clearly noncardiac cause

*"The results of the OPALS study did not show any incremental benefit of introducing a full advanced-life-support program to an emergency-medical services system of optimized rapid defibrillation." (Stiell et al., 2004)*

### Background

Sudden cardiac arrest is common and, obviously, very bad. In the US, there are about 500,000 cardiac arrests each year. About half of these cardiac arrests are OHCA and the survival rate is pretty poor. The most recent survival estimates put it at 7 – 9.5% in most communities. About 10-12 years ago, the American Heart Association built the 4-step "chain-of-survival."

- Step One – Early access to emergency care
- Step Two – Early CPR
- Step Three – Early defibrillation

In fact, in communities with high layperson basic life support (BLS) training and automatic electronic defibrillators (AEDs) in the community, the rate of survival after OHCA is higher.

The 4th Step in the chain, however is slightly more controversial, early advanced care. This basically means rapid access to ACLS type resuscitation skills (intubation and intravenous drug therapy). The AHA now has Five Links in the chain of survival with Step Five being Integrated post-cardiac arrest care.

ACLS has little evidence to defend it. Of course, ACLS is not a single treatment. It's a bundle of treatments much like early goal directed therapy. It involves airway management with intubation and drug administration based on set algorithms. In spite of the lack of evidence behind it, ACLS is standard of care. Patients who have OHCA get ACLS treatment in the field (which may delay their transport). Additionally, there are a ton of providers trained in ACLS. It costs about $174-250 every 2 years to get certification and a number of hospitals require ACLS certification in order to practice.

If ACLS isn't proven to help, it brings up a number of issues. Is ACLS training a waste of time and money for providers? Do the therapies in ACLS detract from critical interventions like CPR and defibrillation? Do delays in transit matter now that hospitals are doing ED ECMO? Are we harming patients with ACLS by bringing back more people with severe neurologic disabilities?

The authors of the study we are going to discuss saw these issues more than a decade ago and attempted to tackle them head on. People should be familiar with the lead author on this paper, Dr. Ian Stiell. He is arguably the most famous/cited Canadian EM researcher. If you don't know his name you certainly know his significant contribution to the area of clinical decision instruments. These are the Ottawa Ankle and Knee Rules, Canadian C-Spine and CT Head Rules and his latest, Ottawa SAH Rules. We have covered some of these topics on past episodes of the SGEM:

- SGEM#3: To X-ray or not to X-ray (Ottawa Ankle Rules)
- SGEM#5: Does Johnny "kneed" an X-ray? (Ottawa Knee Rules)
- SGEM#48: Thunderstruck (Subarachnoid Hemorrhage)

## Results

- 5638 patients over 48 months in 17 communities and 11 hospitals
- 1391 Rapid-defibrillation phase (no ACLS) over 12 months
- 4247 Advanced-life-support phase over 36 months
- Initial cardiac rhythm
  - VFib/VTach 34.5% vs. 31.5%
  - PEA 25.8% vs. 25.3%
  - Asystole 38.8% vs. 42.0%
- Medications (ACLS phase)
  - Epinephrine 95.8%
  - Atropine 87.3%
  - Lidocaine 23.6%
- ROSC 12.9% vs. 18.0% (absolute change 5.1% $p < 0.001$)
- Admission to hospital 10.9% vs. 14.6% (absolute change 3.7% $p < 0.001$)
- Survival to hospital discharge 5.0% vs. 5.1% (absolute change 0.1% p 0.83)
- Survivors' Cerebral-performance category level 1 – 78.3% vs. 66.8% (p 0.73)
- Survivors' median Health Utility Index at one year 0.84 vs. 0.79 (p 0.67)

# TALK NERDY TO ME

## Cohort Quality Checklist

| | | |
|---|---|---|
| Did the review ask a clear question? | ☑ | The issue here was whether ACLS management increased patient survival to hospital discharge |
| Appropriate method to answer their question? | ☑ | Ideally, a randomized control trial would have been better but not possible. This was a "before-after" multicenter, cohort trial (before and after ACLS was instituted) with rapid defibrillation only for 12 months and advanced-life-support for 36 months. The methods were very good and specifically cite following Ustein-style guidelines for reporting the data about cardiac arrests. Doing a RCT would not be feasible. You would have to provide ACLS to half of patients (which is believed to be the standard of care) and BLS to the other half. Ethically you cannot do trials that may involve harm. Evidence based medicine has a hierarchy of evidence. A before/after trial is less robust than a RCT. EBM also has limitations and this well-done cohort trial identifies some of these limitations. Sometimes a lower form of evidence will be the "best" evidence we can get. |
| Cohort recruited in an acceptable way? | ☑ | All OHCA in the Ottawa enchantment area were included for analysis. |
| Was the exposure accurately measures to minimize bias? | ☑ | Objective measures were used. The outcomes are ones that both doctors and patients would care about. In fact if there was any bias it was probably in favour the intervention (ACLS). Given the fact that there was no difference in the primary outcome strengthens the conclusion. |
| Was the outcome accurately measured to minimize bias? | ? | There could be no blinding for the patients or doctors in this type of study design. However, the abstractors who are collecting data can be blinded to outcomes. It's not clear if that occurred. Lack of blinding for outcome should not have impacted on the mortality data. Either the patient was or was not alive at discharge. Secondary outcome of CPC also validated in past. |
| All important confounding factors identified? | ? | There is a problem of multiple interventions with the OPALS study. Incorporating ACLS into OHCA treatment involves multiple interventions including drugs (epi, lidoc, atropine), fluids and procedures (intubation). Any of these could individually improve outcomes or worsen outcomes but we have to regard them as a bundle (much like EGDT). |
| Follow-up complete and long enough? | ☑ | ROSC, admit to hospital, survive to discharge, cerebral-performance category at discharge and quality of life at one year |
| What are the results? | | No benefit for survival to discharge neurologically intact |
| How precise are the results? | ☑ | The confidence intervals were pretty small. |
| Do you believe the results? | ☑ | |
| Can you apply them to your local population? | ? | This study was not ED focussed but rather on the pre-hospital setting. However, many systems have MDs working in the field with EMS. It would be important for those individuals to be aware of this study. Also we do not work in isolation but in a continuum of care from pre-hospital, emergency department and then in-patient units (ICU, CCU, trauma). These results apply to the pre-hospital setting in Ontario, Canada. We cannot necessarily extrapolate them to other EMS systems. With regards to the ED setting, there have not been any trials showing benefit of ACLS medications for in-hospital cardiac arrest. In addition, there have been some observational studies suggesting ACLS medications could cause harm. (Dr. David Newman The NNT) |

## Cohort Quality Checklist

| | | |
|---|---|---|
| Do the results fit with other available evidence? | ☑ | There was another study published five years later from Norway (JAMA 2009). It was a RCT of 851 adults with out of hospital non-traumatic cardiac arrests. Patients were randomized to ACLS with or without intravenous drugs. Like OPALS, they showed improved ROSC and admit to hospital but not benefit for discharge from hospital neurologically intact or alive at one year. |

## Case Resolution

Does this change what you do? No, because it's now 10 years later and ACLS is still the standard of care treatment. However, OPALS is one paper in a group that questions the quality of ACLS care and there should be readdressing of this algorithm. Also, we do not work in the pre-hospital setting. We should focus on good CPR and early defibrillation.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

We cannot disagree with their conclusions.

## Clinical Application

These results apply to the pre-hospital setting in Ontario, Canada. We cannot necessarily extrapolate them to other EMS systems.

**WHAT DO I TELL MY PATIENT?**

To Providers:
For EMS providers in Ontario I would tell them the evidence available does not support ACLS for out of hospital cardiac arrest.

## References

Stiell, I.G., Wells, G.A., Field, B., Spaite, D.W., Nesbitt, L.P., De Maio, V.J., Nichol, G., et al. (2004). Advanced cardiac life support in out-of-hospital cardiac arrest. NEJM, 351(7): 647-656. PMID 15306666

**Guest Skeptic: Dr. Anand Swaninathan (Swami)**
He is an assistant program director at NYU/Bellevue Hospital in the Department of Emergency Medicine. @EMSwami

65

# SPECIAL EDITION

# RELAX, DON'T DO IT
## TOP 5 LIST FOR EMERGENCY MEDICINE

**Guest Skeptics:**

**Dr. Jeremiah Schuur:**
Department of Emergency Medicine, Brigham and Women's Hospital, Harvard Medical School

**Dr. Ali Raja**
Department of Emergency Medicine, Brigham and Women's Hospital, Harvard Medical School

**Dr. Arjun Venkatesh:**
Robert Wood Johnson Foundation Clinical Scholar and Clinical Instructor in Emergency Medicine, Yale University

# A Top-Five List for Emergency Medicine: A Pilot Project to Improve the Value of Emergency Care. Schuur et al. JAMA 2014

## Background

This JAMA study was partly inspired by Dr. Howard Brody's article in the NEJM 2010. He challenged specialty societies to come up with a Top 5 List of diagnostic tests which should not be performed. Dr. Brody felt this would be a prescription for how money could be saved without impacting negatively on patient care.

Further inspiration came from the Top 5 List put together for primary care and published in JAMA Intern Med. 2011.

It has been suggested the cost of emergency medicine care has risen 240% from 2003-2011. A significant part of that cost is the diagnostic tests, treatments and hospitalizations that emergency physicians order.

## Author's Conclusion:

*"OurTEP identified clinical actions that are of low value and within the control of ED health care providers. This method can be used to identify additional actionable targets of overuse in emergency medicine." (Schuur et al., 2014)*

## Objective

Develop a Top 5 List of tests/treatments and disposition decisions that are of little value and emergency physicians can control.

## Methods

Modified Delphi consensus of 283 emergency clinicians (MDs, PAs and NPs)

## Results

Originally able to identified 64 low value items. This list was brought down to 17 items (7 labs, 3 meds, 4 imaging studies and 3 dispositions). From these 17 items the top 5 list was decided.

# TOP 5 LIST FOR EM

1. **Do not order CT of the c-spine for patients after trauma who do not meet the NEXUS low-risk criteria or the Canadian C-Spine Rule**

2. **Do not order CT to diagnose PE without first risk stratifying (pretest probability and D-dimer tests if low probability)**

3. **Do not order MRI of the lumbar spine for patients with lower back pain without high-risk features.**

4. **Do not order CT of the head for patients with mild traumatic head injury who do not meet New Orleans Criteria or Canadian CT Head Rule**

5. **Do not order coagulation studies for patients without hemorrhage or suspected coagulopathy**

## Discussion

The American Board of Internal Medicine (ABIM) started the project called Choosing Wisely. According to the ABIM foundation website: "Choosing Wisely is part of a multi-year effort of the ABIM Foundation to help physicians be better stewards of finite health care resources."

ACEP joined the Chooses Wisely campaign in October 2013. Dr. Schuur was co-chair of the committee responsible for coming up with the ACEP Top 5 List.

# ACEP TOP 5 LIST

1. **Avoid CT scans of the head in emergency department patients with minor head injury who are at low risk based on validated decision rules.**

2. **Avoid placing indwelling urinary catheters in the emergency department for either urine output monitoring in stable patients who can void, or for patient or staff convenience.**

3. **Don't delay engaging available palliative and hospice care services in the emergency department for patients likely to benefit.**

4. **Avoid antibiotics and wound cultures in emergency department patients with uncomplicated skin and soft tissue abscesses after successful incision and drainage and with adequate medical follow-up.**

5. **Avoid instituting IV fluids before doing a trial of oral rehydration therapy in uncomplicated emergency department cases of mild to moderate dehydration in children.**

# SHHA TOP 5 LIST

South Huron Hospital Association (SHHA) is known as "Little Hospital that Does"...Choose Wisely. Our medical staff generated its own list. This was done through discussion on five things we could do to improve patient care based on the evidence.

1. Influenza shots for all medical staff with hospital privileges
2. Use Ottawa ankle and knee rules (clinical decision instruments)
3. No routine use of antivirals for Bell's Palsy
4. No routine use of antibiotics for simple cutaneous abscesses
5. No routine use of proton pump inhibitors for upper GI bleeds.

## Limitations

Single healthcare system (mainly academic), no cost data, and affordability projects had begun in parallel.

## References

Schuur, J.D., Carney, D.P., Lyn, E.T., Raja, A.S., Michael, J.A., Ross, N.G., and Venkatesh, A.K. (2014). A top-five list for emergency medicine: a pilot project to improve the value of emergency care. JAMA Internal Medicine, 174(4): 509-515. PMID 24534899

Brody, H. (2010). Medicine's ethical responsibility for health care reform – the top five list. NEJM, 362(4): 283-285. PMID 20032315

Good Stewardship Working Group. (2011). The "top 5" lists in primary care: meeting the responsibility of professionalism. Arch Intern Med, 171(15): 1385-1390. PMID 21606090

# 66

# KING OF PAIN
## MIGRAINE HEADACHES

**CASE SCENARIO:**

*A 32year old woman presents with her usual migraine headache.*

**Q:**

DOES KETOROLAC WORK WELL FOR ACUTE MIGRAINE HEADACHE TREATMENT?

**BOTTOM LINE**

Ketorolac is a reasonable second-line agent in the treatment of acute migraine.

# Ketorolac in the Treatment of Acute Migraine: A Systematic Review.

## Taggart et al. Headache 2013

**P** Eight studies of adult patients (n=321) presenting to the ED with acute severe migraine headache

**I** Ketorolac parental alone or in combination with other migraine abortive therapies

**C** Placebo or other standard therapy

**O** Efficacy (pain relief) and safety

### Author's Conclusion:

*"Overall, ketorolac is an effective alternative agent for the relief of acute migraine headache in the emergency department. Ketorolac results in similar pain relief, and is less potentially addictive than meperidine and more effective than sumatriptan; however, it may not be as effective as metoclopramide/phenothiazine agents." (Taggart et al., 2013)*

### 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 ~17 billion dollars a year. There are also indirect costs of about 15 billion dollars a year mainly due to missed work.

Up to half of patients presenting to the ED with their migraines will "bounce-back" to the ED in a few days. Dexamethasone has been tried in randomized control trials to prevent bounce-backs. Giuliano et al did a good review on this topic in Postgraduate Medicine last year.

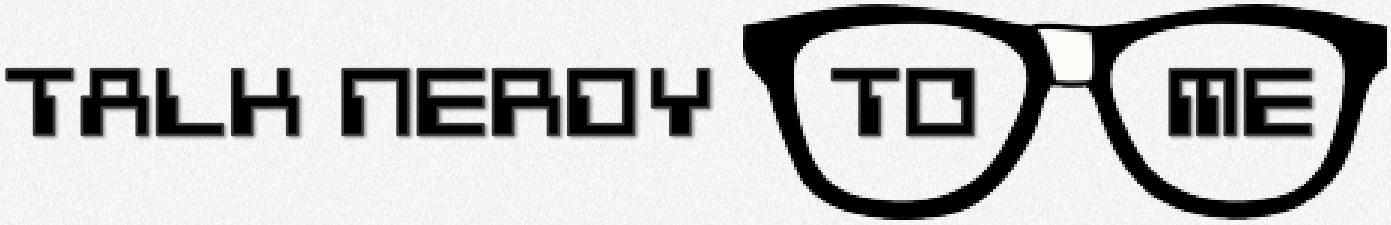
SGEM#28: Bang Your Head talked about the paper by Coleman et al in BMJ on the subject of migraine bounce backs. It showed that a single parenteral dose of dexamethasone ≥15mg for successfully aborted migraine will significantly reduce early recurrences (NNT=9) with no significant side effects.

## Results

Pooled estimates showed no difference in pain relief at 60 minutes between ketorolac alone or in combination compared to placebo or other standard therapy. For meperidine WMD=0.44 (95% CI= – 0.49 to 1.38) and heterogeneity was low (I2=0%).

Only one trial compared ketorolac to sumatriptan and demonstrated significant reduction in migraine pain at 60 minutes (WMD -4.07, 95%CI -6.02—2.12).

Only two trials compared ketorolac to phenothiazine with no significant benefit noted on the summary estimate (WMD 0.82, 95%CI 0.82, 95% CI -1.33- 2.98), though significant heterogeneity was identified (I2 = 70%).




## Commentary

There is a wide variety of practice variations in the treatment of acute migraine. This may be because no single approach has been shown to be clinically superior. This study attempted to review what role ketorolac can play in the treatment of these common and painful presentations to the emergency department.

This SR started with some difficulty because while diagnostic criteria for migraine exist, they are often not used in the emergency department. This made it unclear if patients meet criteria for the diagnosis of migraine. The SR included studies that gave ketorolac IM in 6/8 studies with 5/6 studies using 60mg IM. Giving any medication IM vs. oral increases the placebo effect and could have influenced the results in some of these studies.

**Systematic Review Quality Checklist**

| | |
|---|---|
| The clinical question is sensible and answerable | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality | ☑ |
| The assessments of studies were reproducible | ☑ |
| The outcomes were clinically relevant | ☑ |
| There was low statistical heterogeneity for the primary outcome | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

The quality of the primary studies was moderate to high quality on the Jadad score (3). However, the bias was either “high” or unclear.

The conclusion of ketorolac being more effective than sumatriptan was based on one RCT from 2003 of only 29 patients and should be viewed with caution.

The discussions of ketorolac +/- meperidine seem a bit irrelevant because most departments no longer have meperidine on their formulary. Ketorolac would be the preferred treatment in the ED due to the potential for abuse and addiction with meperidine.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

We agree that ketorolac may not be the first-line agent for treatment of acute migraine but should be considered a good second-line choice.

There was very inconsistent information on rescue medications and no reporting on relapse rates. Previous BEEM review has demonstrated a single dose of dexamethasone can decrease migraine headache recurrence and bounce backs to the ED following an acute migraine (NNT=9).

This SR was of moderate quality, included small studies, high/unclear bias, inconsistent outcome reporting, and lack of data on relapse.

## Case Resolution

I can see you are in pain and that is important to me. We will try some standard treatments first that have been shown to work. I will check back with you in 30-60 minutes to see how you are doing. If your pain is not controlled there is a plan B.

## Clinical Application

Will tend to use ketorolac only as a second-line agent in the treatment of acute migraine.

**WHAT DO I TELL MY PATIENT?**

I can see you are in pain and that is important to me. We will try some standard treatments first that have been shown to work. I will check back with you in 30-60 minutes to see how you are doing. If your pain is not controlled there is a plan B.

## References

Taggart, E., Doran, S., Kokotillo, A., Campbell, S., Villa-Roel, C., and Rowe, B.H. (2013). Ketorolac in the treatment of acute migraine: a systematic review. Headache, 53(2): 277-287. PMID 23298250

# 67

# SHOCK THE MONKEY TONIGHT
## VALSALVA MANEUVER FOR SVT

### CASE SCENARIO:

*A 30 year old woman presents for the first time with supraventricular tachycardia (SVT). You call the cardiologist after three unsuccessfully attempts to chemically convert her into sinus. The cardiologists asked you why you did not try the valsalva maneuver (VM).*

### Q:

IS THE VALSALVA MANEUVER EFFECTIVE IN CONVERTING SUPRA VENTRICULAR TACHYCARDIA?

### BOTTOM LINE

There is no standardized methods to perform a VM to terminate uncomplicated SVT that are evidence based.

# Effectiveness of the Valsalva Manoeuvre for Reversion of Supraventricular Tachycardia. Smith et al. Cochrane Database Syst Rev 2013

**P** 316 patients presenting with SVT from 3 randomized controlled trials from Singapore, England, and Taiwan. 2 studies were done in a controlled arrhythmia lab setting after patients had ceased all medications. One study involved patients presenting undifferentiated to an ED with an episode of SVT.

**I** Valsalva maneuver defined by posture [supine or supine with legs elevated], strain duration [15 to 30 seconds], and pressure [intraoral with range 30 to 50 mm Hg].

**C** Standard pharmacological therapy for cardioversion of SVT.

**O** The primary outcome was reversion of SVT to sinus rhythm. Side effects, cardiovascular effects and mortality associated with VM use for SVT were not reported in any of the studies.

## Author's Conclusion:

*"We did not find sufficient evidence to support or refute the effectiveness of the Valsalva Maneuver for termination of SVT. Further research is needed and this should include a standardized approach to performance technique and methodology." (Smith et al., 2013)*

## Background

Patients with SVT often present to the emergency department. Life in the Fast Lane has a good blog posting about SVT.

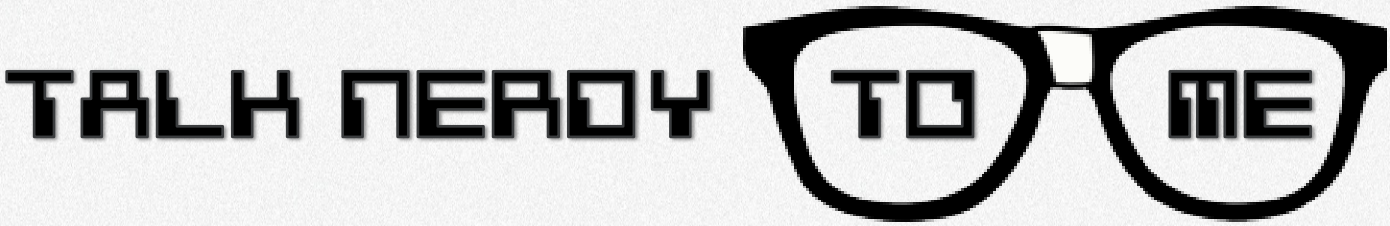
Restoring patents back to a sinus rhythm can be done by the VM, drugs (adenosine, calcium channel blockers or beta-blockers) or electricity (synchronized cardioversion).

The VM is a non-invasive way to convert patients from SVT to sinus. It increases myocardial refractory period by increasing intrathoracic pressure thus stimulating baroreceptors in the aortic arch and carotid bodies Increases vagal tone (parasympathetic).

Another way to convert patients that does not include drugs or electricity uses the mammalian dive reflex. This is used more often in children than in adults. Smith et al also published a review article on this method. The patient puts their face in an ice-cold bath. I have used this one time successfully on a patient who did not want to have adenosine again. I almost picked the mammalian dive reflex as the keener question.

## Results

With respect to the primary outcome of conversion of SVT, two of the studies provided reversion success rates of 54.3% (19/35) and 45.9% (61/133), respectively, while the third (the ER based study) reported reversion success of only 19.4% (12/62). Results could not be pooled due to heterogeneity.




## Commentary

Only one of the included studies was on ED presentations of spontaneous SVT and not induced SVT (controlling for prior medications and co-morbidities). This grouped comparison is not applicable to the emergency medicine group and does not answer questions with respect to varying VM techniques. The patients with induced SVT in the lab, and who had prior medications held do not represent patients seen in the ED with spontaneous SVT or primary SVT. The authors recognize the fact the included review studies are limited in application to SVT presentations.

### Systematic Review Quality Checklist

| | |
|---|---|
| The clinical question is sensible and answerable<br><br>Comment: The question is clinically relevant but unfocused in terms of exact presentation of SVT (varying etiologies, such as primary or recurrent or artificial i.e. induced). | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality<br><br>Comment: The authors assessed risk of bias using the Cochrane Handbook for Systematic Reviews of Intervention checklist to determine potential selection bias, performance bias, attrition bias, or detection bias. Most patients included were pre-selected, prepared and had lab-induced SVT. | ☑ |
| The assessments of studies were reproducible | ☑ |
| There was low statistical heterogeneity for the primary outcome<br><br>Comment: The studies were very heterogeneous, only 1 included ED patients, and 2/3 included induced SVT with prior exclusions of home medications. | |

## Case Resolution

You attempt the VM as suggested by the cardiologist. It too is unsuccessful and you page the cardiologist again to come and see the patient.

## Clinical Application

VM is a viable technique that is poorly researched for the conversion of SVT and should not be considered essential to attempt prior to chemical cardioversion. It may work in up to 20% of presentations. What do I tell my patient:

**CONCLUSION VS COMMENTARY**

**COMPARISON**

The patients with induced SVT in the lab, and who had prior medications held do not represent patients seen in the ED with spontaneous SVT or primary SVT. The authors recognize the fact the included review studies are limited in application to SVT presentations.

**WHAT DO I TELL MY PATIENT?**

We can try a valsalva maneuver (pushing air out with your throat, mouth, and nose closed) with reasonable safety while preparing medications for a rapid heartbeat like you have to attempt to correct your palpitations. However, there is no evidence that pushing the air out will be effective and may only work approximately 1 out of every 5 attempts.

## References

Smith, G.D., Dyson, K., Taylor, D., Morgans, A., Cantwell, K. (2013). Effectiveness of the Valsalva Manoeuvre for reversion of supraventricular tachycardia. Cochrane Database Syst Rev, 3: CD009502. PMID 23543578

# 68

# Sign, Sign Everywhere a Pediatric Vital Sign

**CASE SCENARIO:**
*A 18 month old girl presents to the emergency department with viral gastroenteritis. She has vomiting, diarrhea and fever. Her heart rate is 165 beats per minute.*

**Q:** WHAT ARE THE NORMAL RANGES FOR HEART RATE AND RESPIRATORY RATE IN CHILDREN?

**BOTTOM LINE**

This is a well conducted systematic review of the pediatric normal values for heart rate and respiratory rate. The provided graphs should replace existing values from other sources.

# Normal Ranges of Heart Rate and Respiratory Rate in Children from Birth to 18 Years of Age: A Systematic Review of Observational Studies . Fleming et al. Lancet 2011

**P** Children 18 years and younger

**I** Observational studies on the normal heart rate or respiratory rate of children

**C** Reference ranges from existing text books

**O** Not Applicable

## Author's Conclusion:

*"Evidence-based centile charts for children from birth to 18 years".*

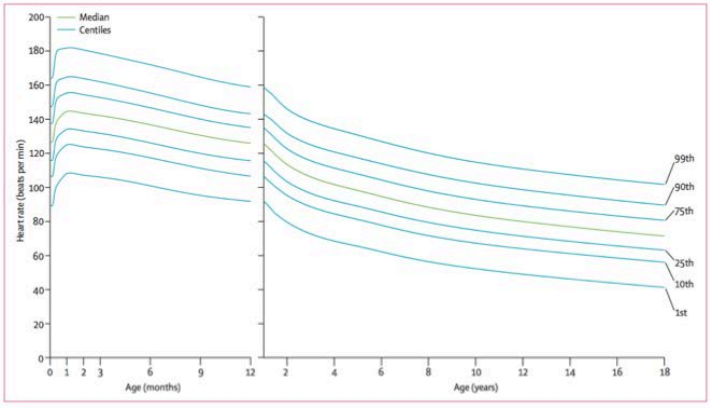
## Background

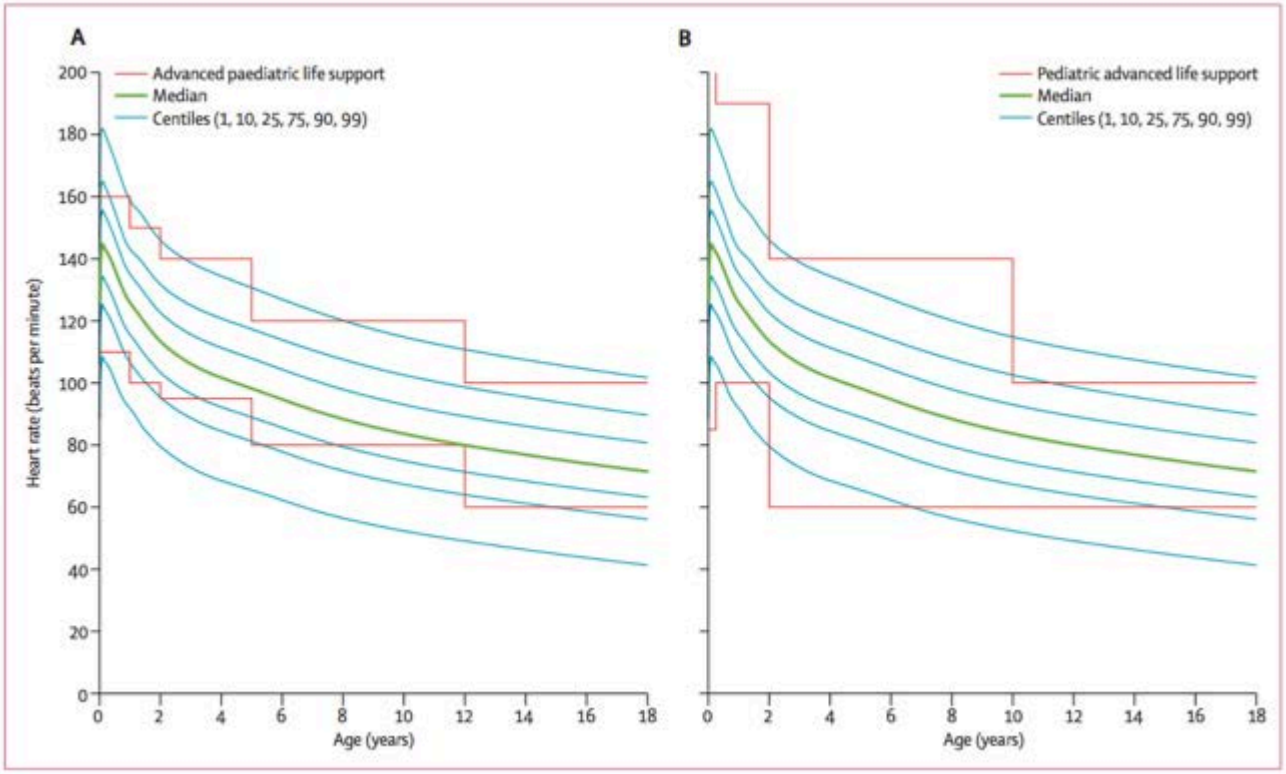
There are a number of ways you can assess pediatric vital signs:

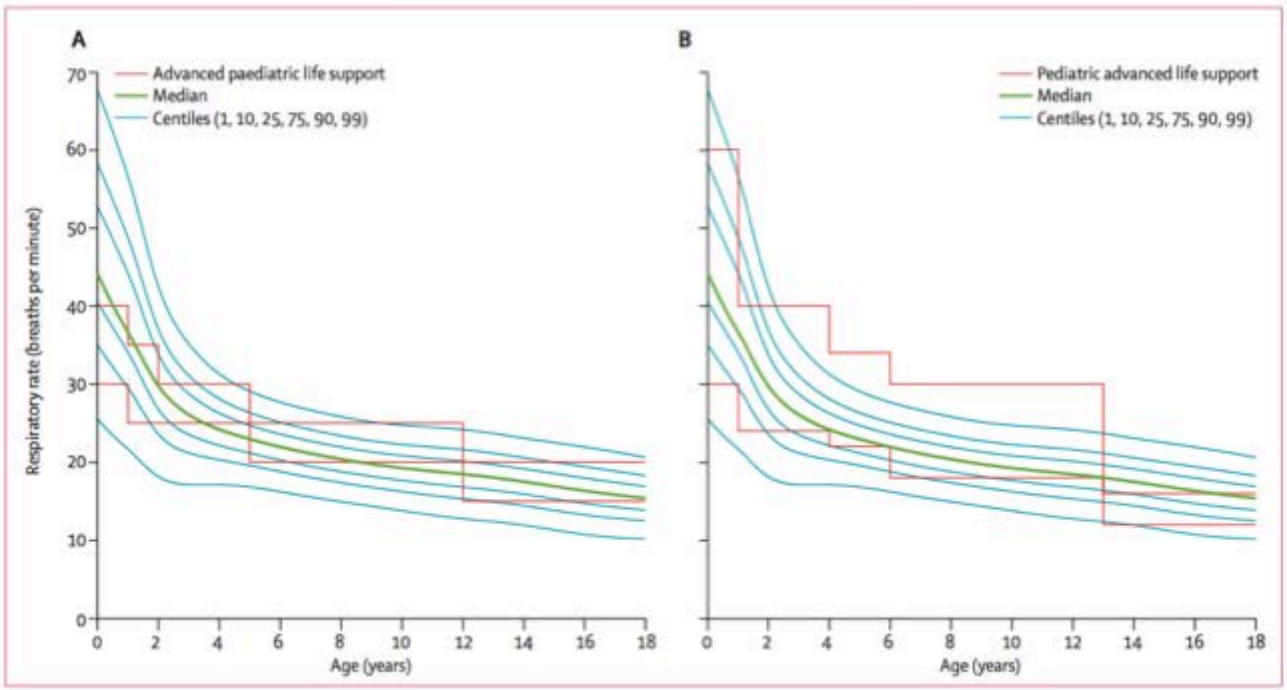
1. Clinical Gestalt
2. PALS – Pediatric Advanced Life Support
3. APLS – Advanced Pediatric Life Support
4. Formula – a variety are available
5. Apps – ex: PediStat

## Results

The following figures present the summarized data from the 69 studies as well as how the pooled data relate to current norms presented by PALS and APLS. (Fleming et al., 2011)






(Images taken from Fleming et al., 2011)

# TALK NERDY TO ME

## Commentary

One of the more challenging aspects of pediatric emergency care is deciding when vital signs fall outside of the normal range. In the past, guidelines from PALS and APLS courses have directed care both at the nursing and physician level.

This well performed systematic review compiles all the data regarding normal heart rates and respiratory rates in children, including over 150,000 data points. The results provide a more accurate reflection of the normal ranges, with percentiles, for children of various ages.

The provided graphs should be used to replace current 'best guess' normal values. The implications for this research affect not only the physicians providing care, but also the nurses at triage deciding on level of acuity.

### Diagnostic Study Quality Checklist

| | |
|---|---|
| The diagnostic question is clinically relevant with an established criterion standard. | ☑ |
| The search for studies was detailed and exhaustive<br><br>*Comment: The authors did a search of MEDLINE, EMBASE, and CINHAL as well as checking reference lists. There were no language restrictions. The authors do not, however, discuss searching abstracts, conference proceedings or discussing with experts in the field.* | |
| The methodological quality of primary studies were assessed for common forms of diagnostic research bias.<br><br>Comment: The authors did not address the quality of the studies included | ? |
| The assessments of studies were reproducible | ? |
| There was low heterogeneity for estimates of sensitivity or specificity verification bias). | ? |

## Case Resolution

I provide her with oral ondansetron (8-15kg=2mg, 15-30kg=4mg and >30kg=8mg) and oral rehydration therapy based upon our previous podcast SGEM#12: Oh Dance-a-Tron

## Clinical Application

I quote and reference this paper ALL THE TIME!. Triage vitals at my hospital are measured against this graph. It is easy to have a PDF of these charts on your smart phone to use as a reference.

### CONCLUSION VS COMMENTARY COMPARISON

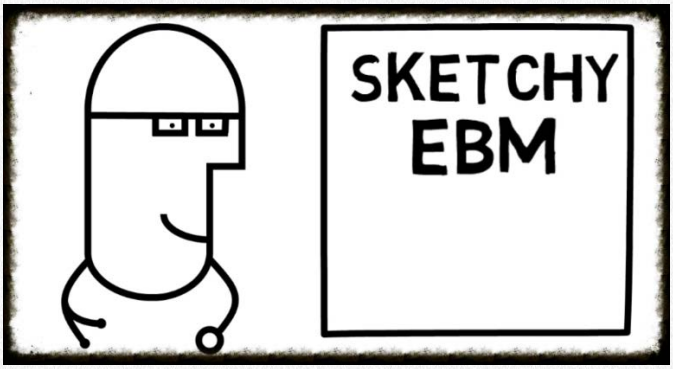
We agree with the data provided.

## WHAT DO I TELL MY PATIENT?

You daughter has abnormal vitals signs. I am going to treat her symptoms and see if we can make her better.

## References

Fleming, S., Thompson, M., Stevens, R., Heneghan, C., Pluddemann, A., Maconochie, I., Tarassenko, L., and Mant, D. (2011). Normal ranges of heart rate and respiratory rate in children from birth to 18 years of age: a systematic review of observational studies. The Lancet, 377(9770): 1011-1018. PMID 21411136



**Guest Skeptic: Dr. Anthony Crocco**
Division Head and Medical Director of Pediatrics Emergency Medicine at McMaster University. RANThony's on YouTube and SketchyEMB.com

# 69

# CRY ME A RIVER
## EARLY GOAL DIRECTED THERAPY (PROCESS TRIAL)

### CASE SCENARIO:

*You are working in a rural community emergency department. The next patient you see is a 71 year old man who has been sick for three days with fever, chills and a productive cough. On arrival, the vital signs were as follows: Temp 38.7C, HR 110, RR 24, BP 95/60 (after a 500ml normal saline bolus by ambulance), oxygen saturations 88% on room air. Skin looks mottled, and the patient seems to be confused on questioning.*

*You diagnose the patient to be in septic shock, and administer another IV crystalloid bolus, broad spectrum antibiotics and oxygen by mask. Your hospital does not have critical care facilities, and if the patient requires intubation or invasive vascular monitoring (eg. CVP, arterial line for MAP), the patient will have to be transferred out to another larger centre.*

*You are aware that the Early Goal Direct Therapy protocols mandated in the 2013 Surviving Sepsis Campaign guidelines include such invasive measures. You are also aware that there have been numerous concerns that such aggressive invasive measures may not be necessary for resuscitating septic patients, and that more conservative measures (intravenous crystalloid boluses, broad spectrum antibiotics, lactate screening) may be just as effective.*

### Q:

IS EARLY GOAL DIRECTED THERAPY (EGDT) OR OTHER PROTOCOL-BASED CARE SUPERIOR TO USUAL CARE FOR SEPTIC SHOCK PATIENTS IN THE ED?

### BOTTOM LINE

Effective care for septic shock hinges on early recognition, lactate screening, intravenous crystalloid resuscitation and early broad spectrum antibiotics

# A Randomized Trial of Protocol-Based Care for Early Septic Shock.

## ProCESS Investigators. NEJM 2014

**P** Adult patients >18 years old with at least 2 systemic inflammatory response syndrome (SIRS) criteria, AND refractory hypotension (systolic BP <90mmHg after fluid challenge or requiring vasopressors) or lactate >4mM. Recruited in 31 US tertiary hospital ED's.

**I** Early Goal Directed Therapy vs other protocol-based care

**C** "Usual care" (at discretion of MD)

**O** Primary = In-hospital death any cause at 60 days.
Secondary = Any death at 90 days, cumulative death at 90 days and 1 year, duration of CV failure, respiratory failure and acute renal failure, hospital and intensive care unit length of stay, and hospital discharge disposition (eg. home, nursing/other long term care facility)

### EXCLUDED STUDIES:

- *acute CVA/ACS/CHF/arrhythmia/ seizure/GI bleed/status asthmaticus/ overdose/burn/trauma/need for immediate surgery*
- *known CD4 count< 50/mm2*
- *advanced directive against resuscitation*
- *CI to CVP line placement*
- *high likelihood of refusing blood transfusion (ie. Jehovah's witness)*
- *resuscitation deemed futile*
- *Pregnancy*
- *transfer from other hospital*
- *participant in another ongoing study*

### Author's Conclusion:

*"In a multicenter trial conducted in the tertiary care setting, protocol-based resuscitation of patients in whom septic shock was diagnosed in emergency departments did not improve outcomes."*

## Background

It all started over 10 years ago when Dr. Emmanuel Rivers published in the NEJM his single centre RCT showing EGDT could reduce septic mortality from 47% to 31% (NNT=6).

Dr. River's "bundle" put emphasis on early recognition, IV fluids, broad spectrum antibiotics. Also included vasopressors, inotropes and blood transfusions. Monitoring required placement of a central venous catheter.

1. Early Recognition – Every 60min delay can increase mortality by 7.5%
2. IV Fluid – Volume is important (30ml/kg IV bolus) with crystalloid better than colloids (Cochrane SR 2013)
3. Normal Saline or Ringers Lactate – ringers lactate will not effect lactate levels
4. Broad Spectrum Antibiotics – Usual source is respiratory genital urinary

## Results

Thirty-one centres screened about 12,000 patients and ultimately included ~10% (n=1,341). There were about 450 patients in each group (EGDT n=439, Protocol-based n=446 and usual care n=456).

All ED physician/resuscitation teams trained in different protocols, ongoing telephone support 24/7, routine site visits and feedback support processes. Baseline characteristics of patients enrolled essentially identical. Sequential recruiting not reported; the primary author reports average 1 patient/month recruited at various sites (D. Yealy, as discussed on ALiEM podcast).

Protocol-based fluid loading was based on CLINICAL findings (jugular venous distention, rales, decreased pulse oximetry readings), hypoperfusion and CLINICAL features (mottled skin, oliguria, altered sensorium, MAP <65mmHg with systolic BP>100, arterial lactate >4)

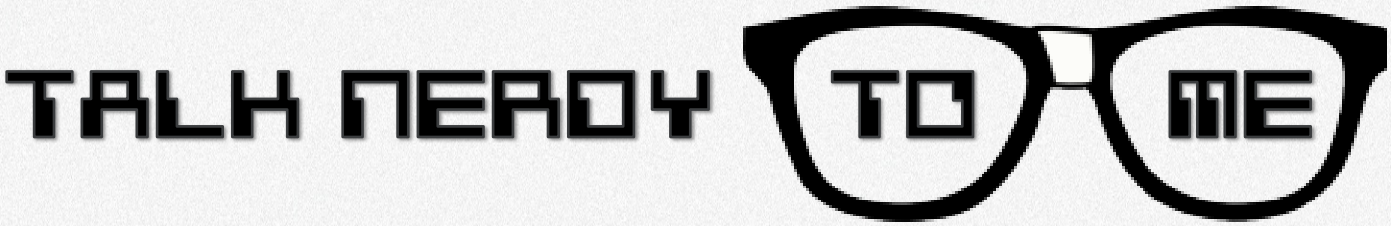
**Outcomes**:

- Primary outcome was in hospital death 60 days: NO DIFFERENCE (EGDT 21%, Protocol 18.2%, Usual care 18.9%)
- Death 90 days: NO DIFFERENCE (31.9%/30.8%/33.7%)
- ICU admissions: More EGDT admissions (91.3% vs. 85.4% vs. 86.2%)
- Hospital LOS: NO DIFFERENCE (11.1 days vs 12.3 vs. 11.3)
- Adverse organ system failures: NO DIFFERENCE for cardiovascular/respiratory/renal; slight increase in acute renal failure requiring dialysis in Protocol group
- Adverse Events: NO DIFFERENCE (5.2% vs 4.9% vs 8.1%)
- Disposition Destinations: NO DIFFERENCES

**Protocol Performance:** The protocol-based algorithm was based on 6 hours of resuscitative care but less aggressive/invasive than EGDT (based on literature review, 2 surveys of ED and ICU physicians worldwide)

- Adherence to Protocols (0-6hrs): EGDT = 89.1%, Protocol = 95.6% and not applicable to Usual care

- Intravenous Fluids: 96% crystalloid overall (colloids not encouraged/excluded): more fluid given in Protocol arm (3.3L) than EGDT (2.8L) or usual care (2.3L)
- Intravenous Antibiotics: 97% in all 3 arms
- CVP line placement: EGDT 94% vs Protocol 56.5% vs Usual care 57.9%; SVO2 rarely measured in latter two groups (4% and 3.5% resp). Those who got CVP lines in latter groups received them much later than the EGDT arm patients who got them right away
- Vasopressor use: 54.9% EGDT vs 52.2% Protocol vs 44.1% Usual
- Dobutamine use RARE: 8% EGDT vs 1.1% Protocol vs 0.9% Usual
- Blood transfusion rate: 14.4% EGDT vs 8.3% Protocol vs 7.5% Usual; transfusion threshold set at Hb <7.5g/dl (4.5mmol/L)




## Commentary

This was a well executed three arm randomized clinical trial looking at three likely resuscitation scenarios. Block randomization 1:1:1 to ensure adequate numbers in each group.

Blinding was not explicitly described in paper or Supp Appendix; but outcomes data locked until Dec 2013 so clinical investigators unaware of different arm outcomes. No industry sponsorship. Near perfect follow-up for outcomes.

They did change their sample size part way through the study. The initial sample size was 1950 and based on a power calculation on the difference seen in the Dr. River's trial. Then they changed the sample size. Initial sample size calculation modified at first planned interim analysis due to less observed mortality in control arm (attributed to the changing trend in improved sepsis care over last decade); reduced from 1950 to 1350 patients with preserved power metrics. The limitations discussed are appropriate and likely irrelevant to the overall conclusions. Overall quality was super.

### RCT Quality Checklist

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

This landmark ED-based study further refines the revolutionary care pioneered in the original Rivers EGDT paper in 2001. It refutes the need for universal invasive monitoring, which will be welcome for most ED clinicians in smaller/rural settings who may not have the full technical support/expertise to fully execute the original EGDT protocol.

This study also reaffirms the importance of early antibiotics, IV crystalloid resuscitation, and following serial lactates to monitor resuscitation success. The options outlined here can likely be extrapolated easily to those patients with severe sepsis as well as septic shock.

Importantly, this article does NOT refute the value of bundled care, which has been proven in prior trials/metaanalyses to be of significant benefit to reduce patient mortality/morbidity, but does suggest that an all-or-nothing super-invasive strategy (a la EGDT) is not universally required. Furthermore, the emphasis on crystalloids for IV resuscitation is congruent with SSC guidelines (update 2013) and a 2013 Cochrane update on fluid resuscitation of critically patients.

Finally, although no vasopressor is specified, the results here again are congruent with use of norepinephrine (NE) vs. dopamine (DA) recommendations from the SSC 2013 update and a recent metaanalysis published supporting NE over DA (De Backer et al. Dopamine versus norepinephrine in the treatment of septic shock: a meta-analysis. Crit Care Med 2012).

## Surviving Sepsis Campaign (SSC) Response to ProCESS Trial

1) Importance of Early Recognition
2) 18% mortality rate in "usual" care is much better than the 46% seen in 2001
3) Because the low mortality rate in the control arm and two other large trials (ARISE and ProMISe) they are not going to revise the bundles at this time
4) ProCESS does not answer the question about using a protocol to manage patients with severe sepsis without septic shock
5) Regarding the SSC 6 hour Bundle
    - Supports MAP target of 65mmHg
    - Repeat lactate testing no addressed in the ProCESS trial
    - More than half of the usual care and protocol based care got central lines

Overall, the SSC are a little more reserved in embracing the ProCESS results, but do support overall principles in conjunction with their recent SSC updates. They do refer to a companion paper that supports a target MAP of 65mmHg (NEJM 2014).

## Case Resolution

A 71 year old man with sepsis probably from a respiratory infection. You have given him 2L of fluid now and intravenous antibiotics. He is looking a little better, his blood pressure is responding and lactate level is going down. You discuss the case with the patient and the family. Ask them if they would like to be transferred to a higher level of care with central monitoring or stay locally. They decide to stay in your rural facility and consider transfer if takes a turn for the worst.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Appropriate and accurate.

## Clinical Application

This information is what most ED physicians have been waiting for since the original EGDT paper in 2001, and confirms what most already suspected: generate a protocol based on early recognition, intravenous crystalloids, broad-spectrum antibiotics and lactate screening. This is READY FOR PRIME TIME, NOW!

**WHAT DO I TELL MY PATIENT?**

It looks like you have a serious infection. We are going to give you intravenous fluids, intravenous antibiotics and admit you to hospital.

## References

ProCESS Investigators, Yealy, D.M., Kellum, J.A., Huang, D.T., Barnato, A.E., Weissfeld, L.A., et al. (2014). A randomized trial of protocol-based care for early septic shock. NEJM, 370(18): 1683-1693. PMID 24635773

De Backer, D., Aldecoa, C., Njimi, H., Vincent, J.L. (2012). Dopamine versus norepinephrine in the treatment of septic shock: a meta-analysis. Crit Care Med, 40(3): 725-730. PMID 22036860

**Guest Skeptic: Dr. Suneel Upadhye**

Associate Professor, Division of Emergency Medicine, McMaster University

Suneel is a founding member of the BEEM Team.

# 70

# THE SECRET OF NINDS
## THROMBOLYSIS FOR ACUTE STROKE

### CASE SCENARIO:

*An 85-year-old woman presents to your ED with left leg and arm weakness and slurred speech for the last two hours. She has a history of hypertension and diabetes. Her vitals are unremarkable except for a blood pressure of 202/115. A non-contrast CT head is performed that shows no acute intracranial pathology. Upon return from CT scan, the patient is speaking clearly but still has weakness (4/5) in the left arm and leg. Your stroke team asks you to administer alteplase and admit.*

### Q:

IS ALTEPLASE AND EFFECTIVE TREATMENT IN PATIENTS WHO PRESENT WITH SIGNS OF AN ISCHEMIC STROKE OF LESS THAN 3 HOURS DURATION?

**BOTTOM LINE**

I'm skeptical that thrombolysis has benefit for acute stroke.

# Tissue Plasminogen Activator for Acute Ischemic Stroke.

## The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. NEJM 1995

**P** All patients that had an ischemic stroke with a clearly defined time of onset, a deficit measurable on the NIHSS and a baseline CT scan showing no intracerebral haemorrhage (ICH).

**I** Administration of IV t-PA (0.9mg/kg)

**C** Placebo

**O** Part 1 – Improvement of > 4 points from baseline NIHSS within 24 hours
Part 2 – Improvement in Barthel index, Modified Rankin Scale (mRS), Glasgow outcome scale and NIHSS at 90 days.

### EXCLUDED STUDIES:

- *Patients with a prior stroke or serious head trauma within 3 months*
- *major surgery within 14 days*
- *history of ICH*
- *systolic BP > 185 mmHg*
- *diastolic BP > 110 mmHg*
- *rapidly improving symptoms*
- *symptoms suggestive of an subarachnoid hemorrhage*
- *gastro intestinal bleed or urinary tract hemorrhage within last 21 days*
- *arterial puncture at non-compressible site within 7 days or seizure at onset of stroke*
- *Patients taking anticoagulants or received heparin within 48 hours (and an elevated aptt)*
- *PT > 15 seconds*
- *platelets < 100,000/mm3*
- *glucose < 50 mg/dl or > 400 mg/dl*
- *patients requiring aggressive treatment of BP to get under 185/110*

### Author's Conclusion:

*"Despite an increased incidence of symptomatic intracerebral hemorrhage, treatment with intravenous t-PA within three hours of the onset of ischemic stroke improved clinical outcome at three months." (NEJM, 1995)*

## Background

Each year, 22 million people worldwide will experience a stroke. About 85% of these are ischemic strokes. For years, there were no effective treatments for these patients. As a result, the burden of ischemic stroke was enormous. Patients often experience debilitating strokes requiring round-the-clock care.

Acute ischemic strokes represent the leading cause of disability in our society and the third most common cause of death. For the longest time there was nothing that could be done acutely for stroke…then enter thrombolytics.

Lytic agents were first used in the treatment of myocardial infarction (MI) in the early 1980's. At this time, the treatment of MI was similarly limited. Stents were not used and so patients either got coronary artery bypass graph or simply had completion of their infarcts while physicians crossed their fingers.

Lytic agents were shown across multiple studies and over 60,000 patients to offer a 1-2% improvement in mortality. Based again on multiple studies, it was additionally found that the benefit of lytic agents in MI was only present in those with STEMI and was indirectly related to the time from onset of symptoms. Therefore, the earlier in the disease process that lytics were given, the better the outcome. This led to the idea that "time is heart."

The evidence in MI formed the basis for the application of lytic agents, specifically alteplase, to ischemic strokes. The theory again was that there was a clot sitting in a vessel and administration of a lytic agent would dissolve the clot and improve patient outcomes. "Time is brain" was pushed hard as well but not based on data pertaining to stroke but based on the data pertaining to MI.

The NINDS article which we'll discuss in a bit was not the first trial looking at the utility of lytic agents in stroke. Prior to NINDS, there were two major randomized control trials (MAST-Italy and ECASS-I). Both of these studies looked at a 6-hour time window (i.e. symptoms starting within 6 hours of drug administration) and found no benefit when streptokinase was given.

The 6-hour window for stroke came from the MI literature. If thrombolytics worked in the heart within 6-hours the hypothesis was that it would work for the brain in a similar fashion. Unfortunately, the two studies you mentioned with >1,200 patients did not show benefit and there was significant harm in the form of increase intracranial hemorrhage.

## Results

| | Primary Endpoint | N | tPA | Placebo | P value | Conclusion |
|---|---|---|---|---|---|---|
| **Part 1** | >4 point improvement in NIHSS | 291 | 67/144 | 57/147 | 0.21 | No significant difference at 24hrs with thrombolysis |

| | Primary Endpoint | N | Conclusion | <2 mRS at 90 days | Absolute Benefit | NNT |
|---|---|---|---|---|---|---|
| **Part 2** | Improvement in stroke scale (Barthel Index, mRS, Glasgow Outcome Score and NIHSS) at 90 days | 333 | Regardless of which stroke scale you looked at, tPA patients did better | 26% placebo vs 39% tPA (13% absolute benefit) | 0.21 | 8 |

**Secondary Endpoint** – > 4 point improvement in NIHSS for NINDS-II

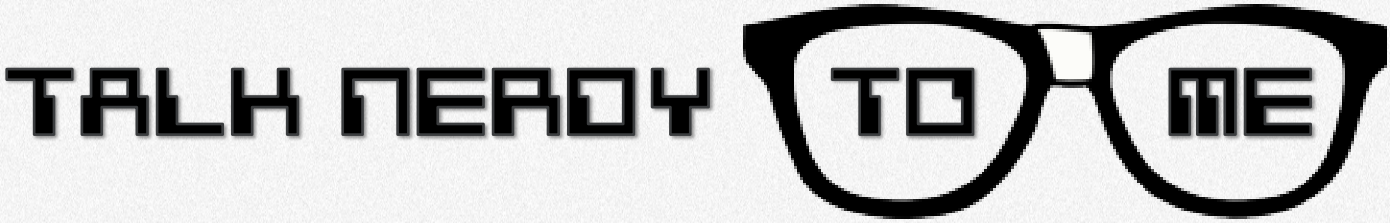
- tPA 48% vs. placebo 39%
- Not significant

**Harm:**

- Symptomatic ICH
  - tPA n = 312. 20 symptomatic ICH, 9 fatal 45% mortality among ICH in tPA
  - This gives us the infamous 6.4% symptomatic ICH bleed rate
  - Placebo n = 312. 2 symptomatic ICH, 1 fatal. 50% mortality among ICH in placebo
  - Symptomatic ICH = 0.6%
- Asymptomatic ICH
  - tPA n = 312. 14 asymptomatic ICH
  - Placebo n = 312. 9 asymptomatic ICH
- NNH= 16 Patients

**Mortality**

- No difference seen in mortality




## Commentary

If you look at these results, you would quickly come to the conclusion that alteplase was beneficial in the treatment of ischemic stroke and that the benefits outweighed the harms. However, there are a lot of caveats to this conclusion.

The end NIHSS was higher in placebo group but there was no significant change. So the placebo group must have been sicker at baseline. This was shown in the reanalysis of the NINDS data in 2004 and subsequently by a number of researchers. Why does this matter? Well, remember that in Part 1, there was a continuous measure of outcomes. They were looking for a 4-point improvement on the NIHSS. This isn't really affected as much by the patients being different at baseline. However, in part 2, it was a dichotomous outcome where they showed benefit. If the patients who were given tPA were less sick at baseline, they are more likely to be less sick at the end regardless of treatment. The reverse is true in the placebo group. Since they were sicker at baseline, it's less likely that they get to that "good outcome" in the dichotomized outcome.

Additionally, there was a difference in outcomes if you were treated < 90 minutes versus 90-180. The majority of the benefit seen was in the < 90 minute group but, they lumped them in with the 90-180 group and tried to argue that 0-180 is all the same. It's not. Why does this matter? Very few patients come in < 90 minutes after symptoms. If you only recommend the drug in this group, it won't be used very often.

Does this change what we do? Of course it did. This study is at the heart of all stroke care in the last 20 years. Stroke alerts, stroke codes, stroke centers, multiple studies and billions of dollars have come from this paper. That seems like a lot for what amounts to a single study of 333 patients with baseline differences showing a benefit.

The adoption of tPA by the American Heart Association (AHA) may have been influenced by monetary issues. Genentech (the makers of tPA) gave 11 million dollars to the AHA prior to the AHA endorsing the drug.

This is an association and not necessarily cause and effect. I am not aware of any direct evidence linking money from Genetech to the change in AHA recommendation. I admit it does not look very good but we should be careful in any conclusions we make about this part of the tPA story.

Regardless, 20 years later, this continues to be a hot button topic in EM. You can see more on the tPA debate here on ERCrit Episode as well as at many other FOAMed resources. This last year, ACEP updated their clinical policy giving a stronger endorsement to tPA within 3 hours and the EM community went nuts.

## RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED | ☑ |
| The patients were adequately randomized | ☑ |
| The randomization process was concealed | ☑ |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias)<br><br>Comment: Not exactly – there had to be one patient included in the <90 min group for every one in the >90 min group. Not explicitly stated but we know more patients present from 90-180 so some patients 90-180 had to be excluded for this to happen. | ? |
| The patients in both groups were similar with respect to prognostic factors<br><br>Comment: The placebo group in both parts had a higher rate of large-vessel occlusions. Subsequent reanalysis of the NINDS data revealed a statistically significant imbalance in initial stroke scale. | |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | ☑ |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups) | ☑ |
| All patient-important outcomes were considered | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ? |

The ACEP recommendation was that "tPA should be offered to all patients who qualify in the less- than-3-hour time window". This was an "A" recommendation: "Generally accepted principles for patient management that reflect a high degree of clinical certainty (ie, based on strength of evidence Class I or overwhelming evidence from strength of evidence Class II studies that directly address all of the issues)."

A recent EP Monthly poll showed that emergency medicine community do not consider tPA for CVA a level "A" recommendation. There were 88% of physicians who thought the new ACEP guidelines should be revised or rescinded. The guidelines did leave some wiggle room by saying "should be offered".

However, there are only two randomized control trials that have shown benefit. There was this NINDS-II which showed better outcome at 90 days if treated within 3 hours. The other positive study was ECASS-III showing benefit with treatment between 3-4.5 hours. Four studies were stopped due to harm or unlikely to prove beneficial. Six studies showed no overall benefit. Green=good, Yellow=no benefit and Red=stopped early.

| Trial | Journal | Time | Primary Benefit | Harm |
|---|---|---|---|---|
| **MAST -Italy** (n=622) | Lancet 1995 | <6hr | **None** | Increased early death |
| **ECASS-I** (n=620) | JAMA 1995 | <6hr | **None** | Beneift not outweigh the risk |
| **NINDS-I** (n=291) | NEJM 1995 | <3hr | **None** | No difference |
| **NINDS -II** (n=333) | NEJM 1995 | <3hr | ~13% absolute benefit mRS at 90d | Increase ICH |
| **MAST - Eu** (n=310) | NEJM 1996 | <6hr | **None** | **Stopped early due to harm** |
| **ASK** (n=340) | JAMA 1996 | <4hr | **None** | **Stopped early due to harm** |
| **ECASS-II** (n=800) | Lancet 1998 | <6hr | **None** | No difference |
| **ATLANTIS-B** (n=613) | JAMA 1999 | 3-4hr | **None** | **Stopped early *"unlikely to prove beneficial"*** |
| **ATLANTIS-A** (n=142) | Stroke 2000 | <6hr | **None** | **Stopped early due to harm** |
| **ECASS-III** (n=821) | NEJM 2008 | 3-4.5hr | 7% absolute benefit | Increase ICH |
| **DIAS-2** (n=193) | Lancet 2009 | 3-9hr | **None** | No difference |
| **IST-3** (n=3035) | Lancet 2012 | <6hr | **None** | No difference |

On a more personal level, NINDS is what led to my evidence based medicine (EBM) interest. I had a case my 1st year as an attending where a patient who may not have been appropriate for the drug got tPA and had a massive and fatal ICH. This case prompted me to go back and read up on NINDS the preceding and subsequent studies and critically review them. You could say that tPA got me hooked on EBM.

## Case Resolution

Based on your in depth knowledge of the NINDS study, you point out to the neurologist that the patient may be a poor candidate for tPA based on her presenting blood pressure, her age and the fact that her symptoms have been improving while in the ED. The neurologist and you have a discussion with the patient and her family about the risks and benefits. Given her improving symptoms, they elect to decline tPA treatment. The patient is admitted to the stroke unit. A week later, she has 4+/5 strength in her upper and lower extremities and she is speaking clearly. She is discharged to the rehabilitation center for further care.

## References

The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. (1995). Tissue plasminogen activator for acute ischemic stroke. NEJM, 333(24): 1581-1587. PMID 7477192

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Multicentre Acute Stroke Trial-Italy (MAST-I) group. (1995). Randomized controlled trial of streptokinase, aspirin, and combination of both in treatment of acute ischemic stroke. The Lancet, 346(8989): 1509-1514. PMID 7491044

**Guest Skeptic: Dr. Anand Swaninathan (Swami)**
He is an assistant program director at NYU/Bellevue Hospital in the Department of Emergency Medicine.

# 71

# Like a Rolling Kidney Stone
## A Systematic Review of Renal Colic

### CASE SCENARIO:

*A 36 yr old previously healthy white male that comes into the emergency department mid morning one Sunday after about 10 hours of right flank pain he describes as sharp/stabbing and that has progressively become worse since onset. He says that over the last couple of hours he has felt that it is radiating down towards his groin. He has been "sick to his stomach" but has not vomited. He denies seeing any blood in his urine and has not experienced any pain with urination.*

*He denies any diarrhea. He has not had any fever that he knows of. He denies any previous pain like this and denies any history of previous kidney stones. He took 400 mg of ibuprofen last night with only some temporary pain relief. CT stone protocol shows a 0.3 cm non-obstructive stone in right proximal to mid ureter. No evidence of hydronephrosis or hydroureter.*

### Q:

IS TAMSULOSIN SAFE AND EFFECTIVE FOR THE EXPULSION OF URETERAL STONES?

### BOTTOM LINE

Tamsulosin is useless in most ED patients with ureteral colic unless their stone size exceeds at least 4mm.

# Tamsulosin for ureteral stones: a systematic review and meta-analysis of a randomized control trial. Lu et al. Urologia Internationalis 2012

**P** 2,763 patients with ureteral stones in 29 trials

**I** Either tamsulosin 0.2 mg (5 trials) or 0.4 mg daily (25 trials)

**C** Tamsulosin v control; Tamsulosin plus standard therapy v control; low dose v standard dose tamsulosin; tamsulosin v ESWL (standard therapies included ketorolac, diclofenac, hydration, cotrimoxazole, and ibuprofen)

**O** The primary outcome was overall ureteral stone expulsion rate

## Author's Conclusion:

*"Tamsulosin is a safe and effective medical expulsive therapy choice for ureteral stones. It should be recommended for most patients with distal ureteral stones before stones are 10 mm in size. In future, high-quality multicenter, randomized and placebo- controlled trials are needed to evaluate the outcome." (Lu et al., 2012)*

## Background

We have covered renal colic before on the SGEM. Episode#4: Getting Unstoned (Renal Colic and Alpha Blockers) looked at a tamsulosin for expulsion of distal ureteral stones. It was a multicentre, randomized, double-blind trial that did not show benefit. Now it was only a small study of 129 patients recruited form 6 French hospitals in over five years.

The other episode was #32: Stone Me (Fluids and Diuretics for Renal Colic). It was a Cochrane Systematic Review done by BEEM founder Dr. Andrew Worster. They were looking for studies on high volume IV/oral fluids or diuretic use to aid with passing kidney stones. Only two small studies met inclusion criteria. The conclusion was no reliable evidence was available to support the use of these treatments.

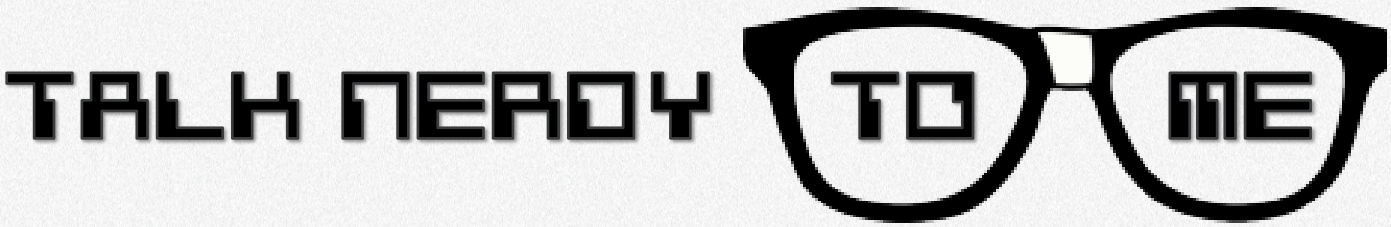
We have been waiting for s Cochrane Systematic Review from Zue et al promised in 2010. Well it has not been published yet but we have another SR. Josh, why don't you give us the citation for the article.

## Results

Stone expulsion Rate (29 studies)
- Significant benefit overall
- tamsulosin vs control (RR 1.33, 95%CI 1.23-1.44)

Subgroup analysis
- tamsulosin 0.4mg alone vs. control (RR1.51, 95%CI 1.34-1.69)
- tamsulosin 0.4mg with standard therapy vs. control (RR 1.41, 95%CI 1.19-1.67)
- No further improvement when comparing 0.4mg group with the 0.2mg tamsulosin group
- No difference between tamsulosin and other alpha-blockers

Stone Expulsion Time (16 studies)
- tamsulosin 0.4mg vs. control (WMD -3.40, 95% CI -4.50 to -2.29)
- tamsulosin 0.4mg with standard therapy vs. control (WMD -3.61, 95% CI -5.08 to -2.14)
- No significant difference between the 0.4mg tamsulosin groups and the 0.2mg tamsulosin group for stone expulsion
- No difference between tamsulosin and other alpha-blockers




## Commentary

The review attempted to answer a sensible question. Literature search was appropriate and covered a significant range of sources without language bias. However, only published studies were sought which may have introduced publication bias as the funnel plot implied.

There was variability in the methodological quality among the studies with a range of high and poor quality and a high number of comparisons, which the authors themselves indicated as a limitation. The meta-analysis suffered from significant heterogeneity.

This systematic review draws similar conclusions to early randomized control data touting the benefits of medical expulsion therapy. The majority of these trials enrolled patients from urology clinics where the average stone size exceeded 5mm.

**Systematic Review Quality Checklist**

| | |
|---|---|
| The clinical question is sensible and answerable | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality | |
| The assessments of studies were reproducible | ? |
| The outcomes were clinically relevant | ☑ |
| There was low statistical heterogeneity for the primary outcome | |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

### WEIGHTED MEAN DIFFERENCE

"The weighted mean could be calculated for groups before and after an intervention (like blood pressure lowering), and the weighted mean difference would be the difference between start and finish values. For this, though, the difference would usually be calculated not as the difference between the overall start value and the overall final value, but rather as the sum of the differences in the individual studies, weighted by the individual variances for each study."

### FUNNEL PLOTS

These are a visual tool for investigating bias in meta-analysis. Publication bias is only one of a number of possible causes of funnel-plot asymmetry. They actually look like a funnel. The larger studies will be closer to the average while smaller studies should show a greater spread from the average. Asymmetry of treatment effect and study size can suggest the possibility publication bias. Cochrane Collaboration has a learning module on publication bias if you would like to read more.

## Case Resolution

You treat the patients pain/vomiting with a dose of IM ketorolac, morphine, and ondansetron. You return after the CT scan to see the patient looking much more comfortable lying on the stretcher. He states he still feels some pain but it is much improved.

You let him know the results of the CT and inform him that he will probably pass the stone on his own. You write him prescription for analgesia and antiemetics. You also arrange a follow up with a urologist and provide him with strict return precautions. He thanks you and you leave the room.

## Clinical Application

Clinical application at this point is reasonable in patients with large stones due to the suggestion of increased clearance and fewer pain episodes and the relative safety of the intervention.

## WHAT DO I TELL MY PATIENT?

I would reserve conversation with ED patients unless stone size is known. Emergency Medicine physicians do see a reasonable number of patients with large renal calculi. For these patients, I would recommend the use of tamsulosin 0.4 mg for at least 2 weeks with urologic follow up.

## References

Lu, Z., Dong, Z., Ding, H., Wang, H., Ma, B., and Wang, Z. (2012). Tamsulosin for ureteral stones: a systematic review and meta-analysis of a randomized controlled trial. Urol Int, 89(1): 107-115. PMID 22739357

**Guest Skeptics: Dr. Anthony (Tony) Seupaul and Dr. Joshua Hughes**

Dr. Anthony (Tony) Seupaul Chairman of the Department of Emergency Medicine, University of Arkansas for Medical Sciences and Dr. Joshua Hughes one of his star residents.

72

# SPECIAL EDITION

# TINY BUBBLES #FOAMED AND #MEDED

**Guest Skeptic: Dr. Nicholas Genes**

Dr. Nicholas Genes is an Assistant Professor in the Department of Emergency Medicine at the Mount Sinai School of Medicine in New York City.

The SGEM is always trying to cut the knowledge translation window down from 10 years to 1 year. It does this using social media to get you the best evidence, critically appraised and easily accessible. This is so you can provide the best care to emergency patients.

We usually do a critical appraisal of a recent paper. However, every so often I like to take a step back to look at the forest not the trees. In this case the beer not the bubbles. So it is time to sit back, relax and discuss a medical education issue.

Nick recently took part in a PRO/CON debate in EP Monthly.

The title was Why #FOAMed is NOT Essential to EM Education. The person asked to provide the PRO side: Why #FOAMed is Essential to EM Education was Dr. Joe Lex. Joe has been referred to as the godfather of the FOAMed movement. Everyone in the FOAM community should be familiar with Joe's famous quote.

# Dr. Lex's Famous Quote...

If you want to know how we practiced medicine 5 years ago, read a textbook.

If you want to know how we practiced medicine 2 years ago, read a journal.

If you want to know how we practiced medicine last year, go to a good conference.

If you want to know how we practice medicine now and in the future, use FOAMed.

# Free Open Access Meducation
## Life in the Fast Lane

Coined in 2012 over a pint of Guinness in Dublin by Dr. Mike Cadogan. FOAM stands for 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. It provides inline (contextual) and offline (asynchronous) content to augment traditional educational principles."

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*FOAM has one objective — to make the world a better place.*

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**Nick and I discuss FOAM:**

FOAM Moderation - The concept of moderation has been suggested for thousands of years. The ancient Temple of Apollo at Delphi says μηδέν άγαν (mēdén ágan = "nothing in excess") Any learning tool used in excess could be counter productive to education. People learn using different strategies and FOAM just represents one tool that can be employed.

Twitter - I think twitter was made for the short attention span of emergency physicians (squirrel). We only get 140 characters to get our message across.

Knowledge Translation - Pathman Leaky Pipe Model demonstrates how it can take an average of 10 years for high quality, clinically relevant to reach the patient bedside.

Retention from Podcasts - There is conflicting data on this idea in the literature. Here is an article by Schreiber et al. and by Zanussi et al. which discuss podcasts for medical education.

Quality of FOAM - Podcasting quality can vary. Some excellent examples are by David Newman (SmartEM) and Scott Weingart (EMCrit). Poor quality does not just happen in social media but also in traditional media used for medical education.

BEEM Process: Best Evidence in Emergency Medicine (BEEM) is a knowledge translation and dissemination project started at McMaster University by Dr. Andrew Worster. The mission is to provide Emergency Medicine practitioners with the best clinical evidence to optimize patient care. 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.
- Carpenter CR et al. Best Evidence in Emergency Medicine (BEEM) Rater Scores Correlate With Publications' Future Citations. Acad Emerg Med. 2013; 20:1004–1012

Referencing FOAM - It is difficult to search and reference FOAM material. However, ALiEM and LITFL are addressing this problem.

FOAM is Too Sexy and Not a Curriculum - There are excellent FOAM resources that look at the boring and fundamental aspects of emergence medicine. These include Brent Thoma and his team (Boring EM) as well as Steve Carroll (EM Basic).

Finite Time of Trainees - Turn your car into a classroom. Exercise your mind while you exercise your body.

FOAM Too Good - We might get intellectually lazy if we just rely on some of the great FOAM resources (EM Literature of Note) and not dive into the data further.

## FINAL THOUGHTS...

Final Thoughts – FOAM is a good way to get up to speed. It is fun to interact with emergency medicine leaders and easy to use. Ironically, without FOAM listeners to this podcast could not get up to speed, have fun and interact with a leader like Nick Genes.

Your conclusion is that you can still be an excellent physician without FOAM. I think the evidence suggests that is very difficult, expensive and time consuming to be an excellent physician without FOAM. Just look at the knowledge translation problem. We know the traditional method takes far to long for high quality, clinically relevant, evidence based information to reach the patients bedside. One definition of insanity is trying the same thing over and over again and expecting a different outcome.

FOAM offers a possible solution to the knowledge translation problem. It is definitely not a panacea. Research is on-going and I look forward to seeing if FOAM will improve the quality of care provided to patients. Why not try FOAM as an adjunct to traditional medical education?

# 73

# How Low Can You Go
## Lowering BP in ICH

**CASE SCENARIO:**

*A 54 year old man presents with acute onset of headache. His blood pressure 210/110mmHg. CT scan shows and acute bleed.*

**Q:**

DOES RAPID LOWERING OF BLOOD PRESSURE IMPROVE OUTCOMES IN PATIENTS WITH ACUTE INTRACEREBRAL HEMORRHAGE?

**BOTTOM LINE**

Intensive blood pressure lowering in patients with ICH is safe but not necessarily better.

# Rapid Blood-Pressure Lowering in Patients with Acute Intracerebral Hemorrhage (INTERACT 2).

## Anderson et al. NEJM 2013

**P** Adults (n=2839) with spontaneous ICH presenting within 6 hours and who have an elevated BP. Exclusion criteria included structural cerebral cause for the intracerebral hemorrhage, deep coma defined by Glasgow Coma Scale (GCS)<5, massive hematoma with poor prognosis, or if early surgery to evacuate the hematoma was planned.

**I** Intensive BP lowering (target <140mmHg) within 1 hour and for 7 days

**C** Guideline-recommended BP lowering (<180mmHg) within 7 days which included ACE-inhibitor and diuretic if not contraindicated and if different drugs were specifically required with the goal of achieving systolic BP less than 140 mm Hg during follow-up

**O** Poor outcome as defined by death or major disability (modified Rankin Scale >2/6) at 90 days and safety. Secondary outcomes included all-cause mortality and cause-specific mortality, health-related quality of life, duration of initial hospitalization, residential care facility placement at 90 days, poor outcomes at 7 days and 28 days, and serious adverse events.

### Author's Conclusion:

*"In patients with intracerebral hemorrhage, intensive lowering of blood pressure did not result in a significant reduction in the rate of the primary outcome of death or severe disability. An ordinal analysis of modified Rankin scores indicated improved functional outcomes with intensive lowering of blood pressure." (Anderson et al., 2013)*

### Background

Pik wrote a really interesting blog posting in December called Hypertension Emergencies: Does it really exist? The Swami told me all I need to say is "hypertensive malignancy" to trigger a rant. Listen to Pik RANT about this issue on the podcast. Pik focused on the concept of end organ damage:

1. Heart – Myocardial Infarction
2. Brain – Headache Myth
3. Kidney – Failure (Chicken and Egg)
4. Eye – Oral Medication Recommended

Acute spontaneous intracerebral hemorrhage is a bad thing to have happen. Bleeding in the brain is not good. Patients often do poorly and their outcome has been associated with their blood pressure. The blood pressure often elevates to very high numbers. Current AHA/ASA Guidelines from 2010 recommend lowering BP as follows:

| Suggested Recommended Guidelines for Treating Elevated BP in Spontaneous ICH (AHA/ASA Guidelines, 2010): |
|---|
| If SBP is >200 mmHg or MAP is >150 mmHg, then consider aggressive reduction of BP with continuous intravenous infusion, with frequent BP monitoring every 5 minutes. |
| If SBP is >180 mmHg or MAP is >130 mmHg and there is the possibility of elevated ICP, then consider monitoring ICP and reducing BP using intermittent or continuous intravenous medications while maintaining a cerebral perfusion pressure ≥60 mmHg. |
| If SBP is >180 mmHg or MAP is >130 mmHg and there is not evidence of elevated ICP, then consider a modest reduction of BP (eg. MAP of 110 mmHg or target BP of 160/90 mmHg) using intermittent or continuous intravenous medications to control BP and clinically re-examine the patient every 15 minutes. |
| Note that these recommendations are Class C. SBP indicates systolic blood pressure; MAP, mean arterial pressure. |

A preliminary study called INTERACT 1 was published in the Lancet in 2008. This trial was a run-in-phase to a larger trial to be called INTERACT 2.

The conclusions from this earlier INTERACT 1 study was "Early intensive BP-lowering treatment is clinically feasible, well tolerated, and seems to reduce haematoma growth in ICH. A large randomised trial is needed to define the effects on clinical outcomes across a broad range of patients with ICH."

Hematoma size is a disease oriented outcome. Patients don't generally care about the size of their hematoma. They are usually more interested if they are alive or dead. If alive they prefer to have a good neurological function rather than a poor one.

## Results

NO DIFFERENCE

Primary Outcome – No statistically significant difference in death, disability or safety between the two treatment groups.

- Poor outcome 90d 52.0% vs. 55.6% (OR=0.87, 95% CI 0.75-1.01; P=0.06))
- Mortality 11.9% vs. 12.0%
- Nonfatal serious adverse events 23.3% vs. 23.6%

Secondary Outcome – Ordinal analysis showed a significantly lower mRS with intensive treatment OR 0.87 (95% CI 0.77 to 1.00; P = 0.04).

# TALK NERDY TO ME

## Commentary

It is not "The" paper on blood pressure and ICH. Despite the large multi-centre RCT ~60% where Chinese men which does not represent Pik's population (external validity).

There was a lot a variability on how they achieved the target blood pressure. The most common IV drug used to lower BP was urapidil (alpha-adrenergic antagonist) which is not available in Canada/USA.

The authors performed an ordinal analysis of the primary outcome (mRS) and found that to be statistically better for intensive treatment (OR for greater disability = 0.87; 95% CI 0.77 to 1.00; P = 0.04).

This method of ordinal analysis is similar to the IST-3 study looking at tPA at <6hrs. This method assumes that OR between each mRS is equal. While this ordinal method of analysis shows "statistical" benefit it is unclear if this translates to patient-oriented outcomes.

This study attempts to answer whether or not lowering the BP to "normal" levels in patients with ICH improves outcome. They did lower the BP in the intensive group at 1 hr to 150mmHg vs. 164mmHg in the standard treatment group. This did not result in a difference in death, disability or safety between the two treatment groups.

There was an absolute decrease in the primary outcome of "poor outcome" of 3.6% (52.0% vs. 55.6%, NNT = 28, 95%CI 14 to infinity) favoring intensive lowering. This represented a 13% relative decrease. Again, this was not a statistically different outcome. Many of the surrogate measures were better with intensive lowering of the BP (anxiety, depression, mobility, and quality-of-life issues).

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED | ☑ |
| Comment: Although the authors do not specifically state that patients were recruited and therapy initiated in the ED for the patients enrolled in 144 hospitals in 21 countries, the median time from the onset of intracerebral hemorrhage to the initiation of intravenous treatment was 4.0 hours in the intensive-treatment group (vs. 4.5 hours in the control group) which is the timeframe in which ED care would be rendered in countries where emergency medicine exists. | |
| The patients were adequately randomized | ☑ |
| The randomization process was concealed | |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | ☑ |
| The patients in both groups were similar with respect to prognostic factors | ? |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups) | ☑ |
| All patient-important outcomes were considered | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | |

The randomization was adequate but there were some differences between the two groups. Patients in the intensive BP group started their treatment 20-30 minutes earlier, it more often took IV medications to reach target BP and a larger number of the subjects in the intensive group (5%) withdrew from therapy compared with the standard group (3%). The investigators did not explain these imbalances adequately.

These observed differences between the two groups may have been because the study was unblinded. Treating physicians and patients were aware of their assigned groups.

Outcome assessors were blinded when followed up patients in person or by telephone at 28 days and 90 days. This lack of blinding may explain why subjective secondary outcomes were better in the intensive treatment group but not in the more objective primary end points.

The last thing is the hypothesis about patients with a history of hypertension, auto regulation and embolic stroke doing worse if blood pressure is acutely lowered. Yet when you look at this study and their subgroup analysis it suggests the opposite. Figure #1 shows the only subgroup that has its point estimate favouring acute lowering of BP with a 95% confidence interval completely below 1.0 is for patients with no history of hypertension.

## Case Resolution

In this patient with ICH and a BP of 210/110mmHg you begin to lower his patient's BP to <180mmHg as per the guidelines. You do not worry about dropping the BP fast or to <140mmHg. Neurosurgery is contacted.

## Clinical Application

In patients with acute ICH I will continue to attempt to lower their BP below 180mmHg. However, I will not be worried if the BP drops to normal levels.

**CONCLUSION VS COMMENTARY**

## COMPARISON

The primary outcome showed no superiority of intensive lowering of blood pressure for patients with intracerebral hemorrhages. We are skeptical the secondary outcome benefit demonstrated on ordinal analysis of the modified Rankin Score.

## WHAT DO I TELL MY PATIENT?

You are having a bleeding stroke which is very serious. You also have high blood pressure with the stroke. There is some weak evidence that aggressive lowering of the blood pressure may help and does not appear dangerous. Based upon this evidence, we will try to carefully lower your blood pressure and get the neurosurgeons to see you as fast as we can.

## References

Anderson, C.S., Heeley, E., Huang, Y., Wang, J., Stapf, C., Delcourt, C., Lindley, R., Robinson, T., et al. (2013). Rapid blood-pressure lowering in patients with acute intracerebral hemorrhage. NEJM, 368(25): 2355-2365. PMID 23713578

Anderson, C.S., Huang, Y., Wang, J.G., Arima, H., Neal, B., Peng, B., Heeley, E., Skulina, C., Parson, M.W., et al. (2008). Intensive blood pressure reduction in acute cerebral hemorrhage trial (INTERACT): a randomized pilot trial. Lancet Neurol, 7(5): 391-399. PMID 18396107

Rothwell, P.M. (2005). External validity of randomised controlled trials: "To whom do the results of this trial apply?" Lancet, 365(9453): 82-93. PMID 15639683

**Guest Skeptic: Dr. Pik Mukherji**
Dr. Mukherji is an emergency physician from New York City. @ERCowboy

# 74

# BROKEN ARMS
## DIAGNOSING ROTATOR CUFF DISEASE

**CASE SCENARIO:**

*A 54 year old man presents with increasing pain in his right shoulder.*

**Q:** DOES THIS PATIENT WITH SHOULDER PAIN HAVE ROTATOR CUFF DISEASE?

**BOTTOM LINE**

Take an x-ray if you are concerned about bone injury or involvement. Conduct an examination you are confident in performing. Treat the patients pain. Arrange for appropriate follow-up.

# Does This Patient With Shoulder Pain Have Rotator Cuff Disease? The Rational Clinical Examination Systematic Review.

## Hermans et al. JAMA 2013

**P** Five studies with a total of 432 patients and 442 shoulders. Not ED based but patients referred to an Orthopaedic, Sports Medicine or Rheumatology Clinic.

**I** Pain provocation test, Strength test, and Composite test

**C** Operating room, ultrasound or MRI

**O** Partial or full tear of rotator cuff

### Author's Conclusion:

*"Because specialists performed all the clinical maneuvers for RCD in each of the included studies with no finding evaluated in more than 3 studies, the generalizability of the results to a non-referred population is unknown. A positive painful arc test result and a positive external rotation resistance test result were the most accurate findings for detecting RCD, whereas the presence of a positive lag test (external or internal rotation) result was most accurate for diagnosis of a full-thickness rotator cuff tear." (Hermans et al., 2013)*

**EXCLUDED STUDIES:**

- Rheumatoid arthritis
- Fibromyalgia
- Shoulder instability
- Labral lesions
- Fractures
- Adhesive capsulitis
- Tumors
- Complex regional pain syndrome
- Disorders from strokes

**INCLUDED STUDIES:**

- Description of history, physical or clinical tests
- Detailing of sensitivity and specificity
- Use of a reference standard with diagnostic criteria pre-specified
- Presentation of original data or available Language of one of the authors (Danish, Dutch, English, French, German, Norwegian, Spanish, Swedish)

## Background

Shoulder pain is the third most common MSK reason for seeking medical attention. There are 4.5 million visits per year in the USA. Rotator cuff disease is the most common cause. It can have a big impact on quality of life especially if it is the dominant arm. Majority of these conditions are treated medically with only few requiring surgery.

Anatomy of the rotator cuff beyond just remembering the SITS mnemonic.

- Supraspinatus – ABducts the arm (suprascapular nerve -C5)
- Infraspinatus – Externally rotates the arm (suprascapular nerve C5-6)
- Teres Minor – Externally rotates the arm and some ADduction (Axillary nerve -C5)
- Subscapularis – Some ADdcution and internally rotates the arm (upper an lower subscapular nerve C5-6)

Patients with rotator cuff disease can present with pain, loss of function, decrease range of motion, weakness, stiffness, crepitus and difficulty sleeping.

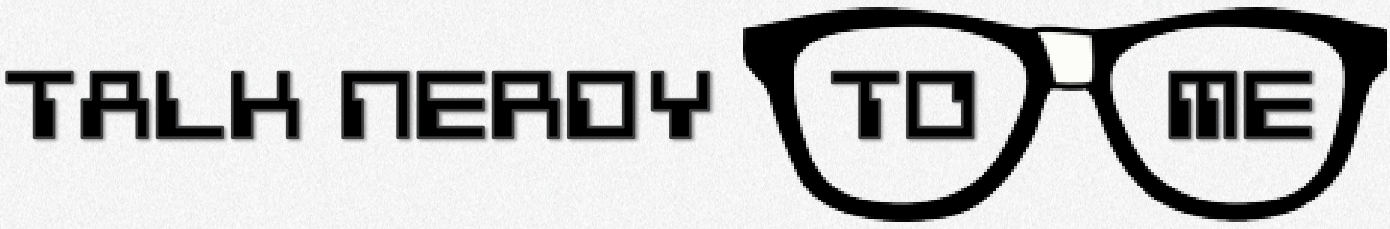
Treatment is often rest, ice and non-steroidal anti-inflammatories. Physical therapy can play a significant role in treatment but can take three months.

## Results

Five studies were included in this JAMA review with between 30-203 shoulders in each study. Prevalence of RCD was from 33% to 81%.

| Test Name | Test Description | Positive Likelihood Ratio | Negative Likelihood Ratio |
|---|---|---|---|
| **Painful Arc Test** | The patient holds arm straight out at the side of their body. Examiner brings the patient's shoulder into full ABduction. The study is positive if patient has pain between 60-120 decrease. This indicates subacromial or rotator cuff disorder. | 3.7 (95% CI, 1.9-7.0) | 0.36 (95% CI, 0.23-0.54) |
| **External Rotation Lag Test** | Elbow bent 90 degrees with hand out front. Examiner passively rotates the patient's arm to full external rotation. Positive test is when patient is unable to maintain a position of full external rotation. | 7.2 (95% CI, 1.7-31) | 0.57 (95% CI, 0.35-0.92) |
| **Internal Rotation Lag Test** | The hand is behind back with elbow flexed 90 degrees. The arm is lifted off the back by examiner and patient is asked to maintain position. Positive test is when patient is unable to maintain the position. | 5.6 (95% CI, 2.6-12) | 0.4 (95% CI, 0.00-0.58) |
| **Drop Arm Test** | Patient holds their arm straight out to the side at shoulder level. They are asked to lower the arm slowly from this ABducted position. The test is positive if the patient immediately drops the arm and complains of pain. | 3.3 (95% CI, 1.0-11) | 0.83 (95% CI, 0.70-0.97) |

JAMA made a video of the paper: Does This Patient With Shoulder Pain Have Rotator Cuff Disease? The Rational Clinical Examination Systematic Review. Click HERE to watch the five minute video.




## Commentary

The most common cause of shoulder pain is rotator cuff disease (RCD). This study tries to shed some light on the physical examination techniques/tests that can help identify who has RCD.

While this is an important question the external validity to the emergency department is limited. None of the five studies included in the review were from the ED. All of the patients were seen in out-patient clinics (orthopedics, rheumatology or sports medicine).

This creates verification bias (work-up or referral bias) and probably accounts for the high prevalence of RCD (33%-81%) compared to the general population estimates of (2.8%-15%). This type of bias tends to overestimate the sensitivity and under-estimate the specificity.

### Diagnostic Study Quality Checklist

| | |
|---|---|
| The diagnostic question is clinically relevant with an established criterion standard. | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The methodological quality of primary studies were assessed for common forms of diagnostic research bias. | ☑ |
| The assessments of studies were reproducible | ☑ |
| There was low heterogeneity for estimates of sensitivity or specificity verification bias). | ? |
| The summary diagnostic accuracy is sufficiently precise to improve upon existing clinical decision making models | |

The painful arc test was the best of all the pain provocation tests (+LR3.7). Best among strength testing was the external rotation lag test (+LR 7.2) and the internal rotation lag test (+LR 5.6) for full thickness tears. The best performing test to rule-out RCD was a normal internal rotation lag test (-LR 0.04).

These are physical examination techniques which can be learned and done easily in the emergency department to assess and diagnose RCD. Because of the verification bias in the available studies we are not sure how accurate these test would be in the emergency department.

Dagny suggests reading a paper by Park et al. Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome. J Bone Joint Surg Am. 2005 Jul;87(7):1446-55. This study looked at the sensitivity, specificity, positive predictive value, negative predictive value, and overall accuracy of eight different tests for making the diagnosis of rotator cuff disease.

## Case Resolution

You take an appropriate history from the man with the painful right shoulder. There is nothing to suggest acute trauma. You perform a directed physical examination including a painful arc test which is positive. The X-ray shows no bony involvement. You suggest trying some acetaminophen, arrange an outpatient ultrasound and encourage him to follows up with his primary care provider for the results.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

No significant disagreement with the conclusions.

## Clinical Application

This study will not change my clinical practice. I will get an x-ray if concerned about bone injury or involvement. Conduct my typical shoulder examination without the specialized tests. Provide appropriate pain medication. Arrange for imaging studies depending on my clinical concern and resources (US vs. MRI). Suggest follow-up with primary care physician or specialist depending on local practice patterns.

You can also consider referring these types of patients to your friendly neighbourhood physiotherapist. Remember that it can take three months to treat rotator cuff pathology with this treatment modality.

**WHAT DO I TELL MY PATIENT?**

It appears your may have a rotator cuff disease. Rest your arm, apply ice and take some NSAIDs for the pain. Follow-up with your primary care doctor in the next week or so. If it is still sore they may suggest getting an US here or sending you to the city for an MRI. Your doctor may suggest seeing a physiotherapist if it is not improving quickly.

## References

Hermans, J., Luime, J.J., Meuffels, D.E., Reijman, M., Simel, D.L., and Bierma-Zeinstra, S.M. (2013). Does this patient with shoulder pain have rotator cuff disease?: The rational clinical examination systematic review. JAMA, 310(8): 837-847. PMID 23982370

Park, H.B., Yokota, A., Gill, H.S., El Rassi, G., McFarland, E.G. (2005). Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome. J Bone Joint Surg Am, 87(7): 1446-1455. PMID 15995110

**Guest Skeptic: Physiotherapist Dagny Kane-Haas**

Dagny is a currently studying for her Masters degree in Clinical Science in Manipulative Therapy.

# 75

# VIDEO KILLED DIRECT LARYNGOSCOPY?

## CASE SCENARIO:

*You are working on a Saturday overnight shift when you get a trauma patient from a rollover motor vehicle accident. The patient is a 21 year old male who had "just two beers" and was speeding at over 90 miles per hour (~160km/hr). He arrives to the ED combative and its clear he has a bad head injury along with several extremity fractures and a surgical abdomen. It's also clear that he needs to be intubated and as Cliff Reid likes to say, he has a lack of ketamine in his blood. You set up your equipment for the intubation and one of the nurses asks you "Are you going to use DL or the GlideScope" You ponder this for a second as your prep your other equipment.*

## Q:

WHICH IS BETTER FOR INTUBATION IN TRAUMA PATIENTS, VIDEO OR DIRECT LARYNGOSCOPY?

## BOTTOM LINE

VL leads to the same outcome as DL in trauma patients. VL takes longer to accomplish and may be associated with higher mortality in patients with severe head injuries, however this relationship will require more study to confirm.

# Effect of video laryngoscopy on trauma patient survival: A randomized controlled trial.

## Yeatts et al. J Trauma Acute Care Surg 2013

**P** Trauma patients at Shock Trauma in Baltimore, Maryland, USA

**I** Video laryngoscopy (Glidescope)

**C** Direct Laryngoscopy

**O** Primary- Mortality

Secondary- Survival among subgroups, duration of intubation attempt, desaturation during procedure, first pass success rates or full tear of rotator cuff

## Author's Conclusion:

*"Video laryngoscopy (VL) and direct laryngoscopy (DL) similar for mortality, post-hoc analysis showed possible increased mortality in those with the most severe head injuries who were randomized into the VL group." (Yeatts et al., 2013)*

## Background

Emergency Medicine owns the acute airway. A paper by Walls et al in 2011 showed that 87% of intubations from the National Emergency Airway Registry were performed by emergency physicians. More than two thirds of the time rapid sequence intubations (RSIs) were performed. The initial attempt had a 95% success rate.

There have been a number of advances in the last few years. Many of these advances have been in new airway management devices. There are a variety of video laryngoscopy (VL) tools which are displacing traditional direct laryngoscopy (DL).

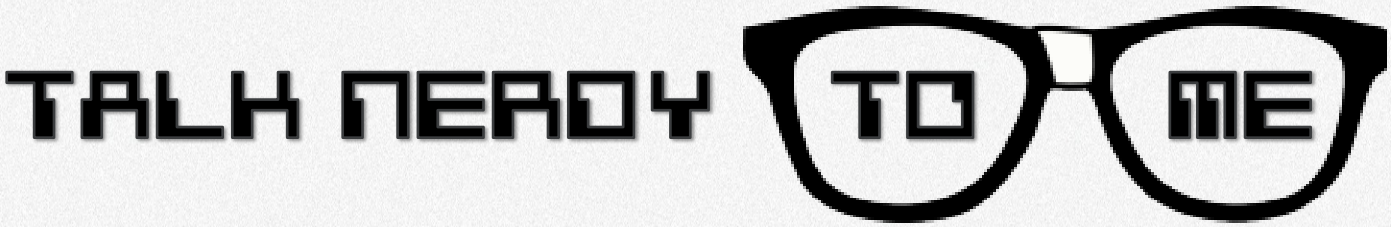
For an excellent discussion on the complexities of DL vs. VL check out the paper by Levitan et al in the Annals of Emergency Medicine 2011. Another good resource to review is by Levitan and Weingart from Annals of Emergency Medicine 2012. They discuss pre-oxygenation and prevention of desaturation during emergency airway management. There are some great FOAM sources which you can review for free on this topic. One is from ALiEM and the other is a PRO/CON discussion about DL vs. VL from LITFL.

## Results

**Primary Outcome** - Mortality was the same

**Secondary Outcomes**

- VL resulted in a longer time to intubation- 56 seconds vs. 40 seconds
- Post-hoc analysis showed that those with the most severe head injuries had a higher mortality and more frequent desaturations below 80% (50% in VL vs. 24% in DL); however this was not included in the original study design
- First pass success was the same in both groups at 80%




## Commentary

This was a well done study with one significant weakness. The strengths include the fact that it was a randomized trial, all patients were followed up for the primary endpoint, and the study used video to record the resuscitation to avoid any bias inherent in a chart review.

The one weakness is that attending physicians were permitted to not enroll patients if they did not want to take part of this study, even if they were eligible. This could have introduced significant selection bias as the more difficult airways may not have been included due to the attending physician wanting to use the technique that they were more comfortable with.

According to the authors, those excluded did not differ significantly from their enrolled patients. The treating physicians knew the treatment assignments but this is not a concern since there is no possible way to blind the clinicians given VL and DL are different procedures that required different equipment.

This study leads support that VL is at least as useful as DL when intubating trauma patients.

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br>Comment: Only the most injured get transferred to Shock Trauma so may have higher ISS scores than the average ED. | ☑ |
| The patients were adequately randomized | ☑ |
| The randomization process was concealed | ☑ |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | |
| The patients in both groups were similar with respect to prognostic factors | ☑ |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups) | ☑ |
| All patient-important outcomes were considered | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | |

## Case Resolution

You decide to use the glidescope in this case because you feel as if it might be better in this case since the patient is in a cervical collar. Knowing that the glidescope may take a little longer to pass the tube you make sure to properly pre-oxygenate the patient with high flow oxygen with a non-rebreather mask at 30-60 liters per minute and use a nasal cannula set at 15 liters per minute kept on during your intubation attempt. You get an excellent view with the GlideScope and pass the tube on your first attempt.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Some conclusions.

## Clinical Application

This study supports the use of video laryngoscopy in trauma patients.

**WHAT DO I TELL MY PATIENT?**

Video laryngoscopy is at least as good as direct laryngoscopy.

## References

Yeatts, D.J., Dutton, R.P., Hu, P.F., Chang, Y.W., Brown, C.H., Chen, H., Grissom, T.E., Kufera, J.A., and Scalea, T.M. (2013). Effect of video laryngoscopy on trauma patient survival: a randomized controlled trial. J Trauma Acute Care Surg, 75(2): 212-219. PMID 23823612

### Guest Skeptic: Dr. Steve Carroll

An active duty Emergency Medicine Physician with the US Army. He runs the EM Basic podcast which reviews core EM topics at the level of a medical student or intern. Steve is currently on the clinical staff at Darnall Army Community Hospital in Fort Hood Texas. However, this summer he will be moving back to San Antonio Military Medical Center to be Emergency Medicine Faculty where he did his residency. Dr. Carroll's views are his own and do not represent those of the Department of Defense or the US Army.

# 76

# And the Beat Goes On
## Azithromycin and Risk of Cardiovascular Death
## PART 1

**CASE SCENARIO:**

*A 56 year old man presents to the emergency department and is diagnosed with community acquired pneumonia. He has a history of osteoarthritis, which he takes ibuprofen on a PRN basis. He does not have a history of cardiac disease but does have an allergy to penicillin. You are about to discharge him home on azithromycin when the resident raises concern about an FDA warning with z-packs and arrhythmias.*

**Q:** DOES USE OF AZITHROMYCIN LEAD TO INCREASED CARDIOVASCULAR DEATH?

**BOTTOM LINE**

This paper does not say thou shall not use azithromycin. However, it did add a bit to the growing evidence that azithromycin may have some cardiovascular risks and you should consider other alternatives for treating upper and lower respiratory infections

# Azithromycin and the Risk of Cardiovascular Death.

## Ray et al. NEJM 2012

**P** Adults 30-74 years old enrolled in Medicaid for >1 year and regular medical care use, no life-threatening non-cardiovascular illnesses, non-nursing home resident, no prior drug abuse, no hospitalization past 30 days. Data extracted from Tennessee Medicaid program 1992-2006.

**I** Azithromycin script (5 day course)

**C** Frequency matched cohorts with placebo or other antibiotics (amoxicillin, ciprofloxacin, levofloxacin)

**O** Primary outcome was cardiovascular death and all cause mortality.

## Author's Conclusion:

*"During 5 days of azithromycin therapy, there was a small absolute increase in cardiovascular deaths, which was most pronounced among patients with a high baseline risk of cardiovascular disease." (Ray et al., 2012)*

## Background

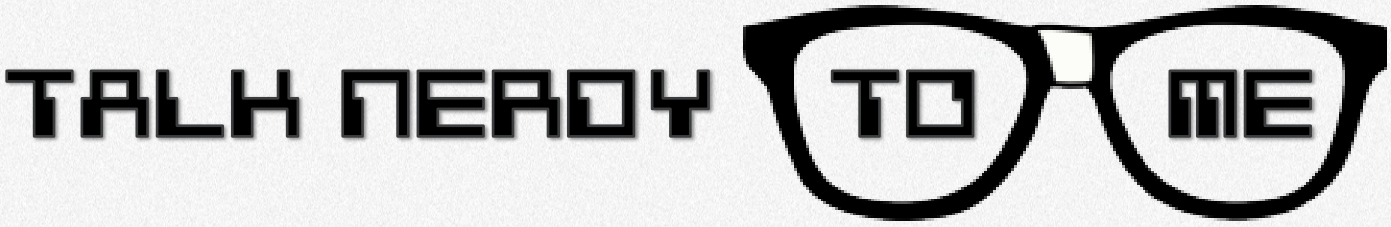
Erythromycin and clarithromycin have been shown to have an increase risk of serious cardiac arrhythmias. It was thought that Azithromycin did not share these cardio toxic effects. Some recent literature has called into question on whether or not azithromycin can lead to serious cardiac arrhythmias and/or death.

## Results

Majority of azithromycin and amoxicillin prescriptions were for upper respiratory infections (URI) or lower respiratory infections (LRI). Ciprofloxacin was mainly for urinary tract infections (URI). Levofloxacin was used for URI/LRI and UTI.

| Drug | Number of Patients or Prescriptions |
|---|---|
| **No Antibiotics** | 1 391 180 Patients |
| **Amoxicillin** | 1 348 672 Prescriptions |
| **Azithromycin** | 347 795 Prescriptions |
| **Ciprofloxacin** | 264 626 Prescriptions |
| **Levofloxacin** | 193 906 Prescriptions |

- Azithromycin vs. no antibiotics had increased risk of cardiovascular death HR 2.88 (CI 1.79 – 4.63) and death from any cause HR 1.85 (CI1.25 – 2.75)
- Azithromycin vs. amoxicillin had increased risk of cardiovascular death HR 2.49 (1.38 – 4.50) and death from any cause HR 2.02 (CI 1.24 – 3.30)
- Cardiovascular death was 29.8 per million with no antibiotics, 85.2 per million with azithromycin, and 31.5 per million with amoxicillin
- Risk of death was highest in patients with the highest cardiovascular risks (245 additional deaths per million 5-day courses of antibiotics)




## Commentary

A challenge of observational studies is the blurring of associations with causality. The authors here show an association of increased risk of cardiovascular/all-cause death with azithromycin 5 day prescriptions compared to placebo or amoxicillin/ciprofloxacin/levofloxacin matched controls in otherwise reasonably balanced cohorts. The event rates seem rather small (approximately 100 deaths per million scripts; 0.01%), yet the hazard ratios (HR) are likely statistically significant on the basis of huge numbers within the comparison cohorts.

An example of correlation not equaling causation was beautifully demonstrated in a recent blog called Spurious Correlations. It illustrated multiple examples of very strange things that seem to have a correlation.

**PROPENSITY SCORE MODEL:**

*A statistical analysis of observational study that tries to remove confounding factors to remove bias from the analysis by comparing a treatment arm to a non-treatment arm. Check out this good review on the topic of PMS in observational studies from the University of Manitoba.*

### Prognostic Study Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED | ? |
| The patients were representative of those with the problem | ☑ |
| The patients were sufficiently homogeneous with respect to prognostic risk | ☑ |
| Objective and unbiased outcome criteria were used | ☑ |
| The follow-up was sufficiently long and complete | ☑ |
| The effect was large enough and precise enough to be clinically significant | ☑ |

- Per capita consumption of mozzarella cheese vs. civil engineering doctorates awarded (correlation = 0.958648)
- People who drowned after falling out of a fishing boat vs. marriage rates in Kentucky (correlation = 0.952407)
- Honey producing bee colonies vs. juvenile arrests for possession of marijuana (correlation = -0.933389)

In rebuttal commentaries to NEJM, various company and non-conflicted reviewers caution that prior randomized controlled trials with azithromycin have not shown increased cardiovascular deaths, and that observational study results need to be interpreted with caution. There are possible differential factors that may be more associated/causal with cardiovascular death beyond azithromycin use (eg. Chlamydia Pneumonia infection) that are not captured in these data sets.

The Food and Drug Administration did issue a safety announcement after this study was published. It issues a warning that azithromycin "can cause abnormal changes in the electrical activity of the heart that may lead to potentially fatal irregular heart rhythm".
Patients and health care providers were encouraged to discuss this potential risk when considering appropriate antimicrobial therapy.

## References

Ray, W.A., Murray, K.T., Hall, K., Arbogast, P.G., and Stein, M. (2012). Azithromycin and the risk of cardiovascular death. NEJM, 366: 1881-1890. PMID 22591294

# 76

# And the Beat Goes On
## Azithromycin and Risk of Cardiovascular Death
## PART 2

**BOTTOM LINE**

Azithromycin is not associated with an increased risk of cardiovascular death in a general adult population when compared to other antibiotics, provided that there is a low baseline cardiovascular risk of arrhythmia/death.

## Use of Azithromycin and Death from Cardiovascular Causes.
Svanstrom et al. NEJM 2013

**P** Adult patients 18–64 years of age, living in Denmark between 1997–2010 not hospitalized or given antibiotics in the prior 30 days

**I** Use of azithromycin

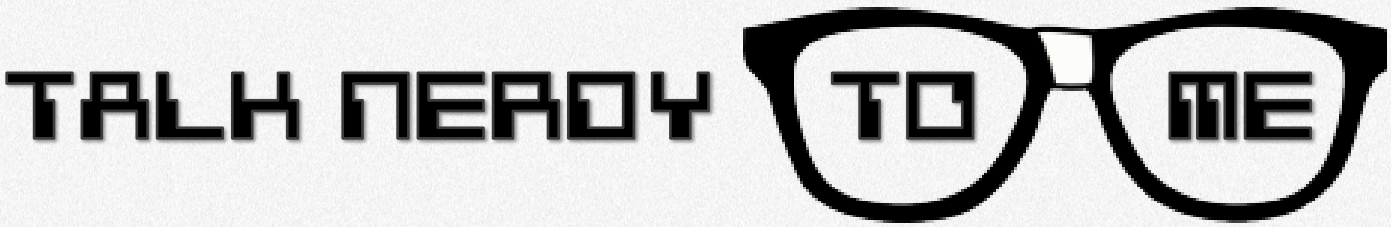
**C** No antibiotics or use of penicillin during the same time period

**O** Primary = Cardiovascular death
Secondary: All-cause mortality

## Results

- Risk of cardiovascular death from Azithromycin use (5 days of treatment) vs. no antibiotics = RR 2.85 (CI 1.13 – 7.24), but this may attributable to the increased risk of death associated with acute infection
- Risk of cardiovascular death from Azithromycin use (5 days of treatment) vs. penicillin V = RR 0.93 (CI 0.56 – 1.55)
- No increased cardiovascular death with recent (past 6 – 10 days) or past use (past 11 – 35 days)
- No increase in all cause death

| Drug | Number of Prescriptions |
|---|---|
| **No Antibiotics** | 7 084 184 Prescriptions |
| **Penicillin** | 7 364 292 Prescriptions |
| **Azithromycin** | 1 102 419 Prescriptions |




## Commentary

This is another observational study but of the entire Danish population aged 18-64. It used a similar propensity score model to remove confounding factors (bias). As discussed before observational trials showing correlation does not equal causation.

This study seems to find the opposite to the previous study by Ray et al which showed a higher risk of cardiovascular death with use of azithromycin. This effect, however, seemed to be linked to higher cardiovascular risk profiles in that US Medicaid cohort (up to age 74), who were not included in this younger Danish population study.

There were a number of limitations to this study. They did not provide the indication for the antibiotic treatment. There was no information on all cardiovascular risk factors or body mass index of patients. The number of events in the subgroup

**Prognostic Study Quality Checklist**

| | |
|---|---|
| The study population included or focused on those in the ED<br><br>*Comments: No specific comments on where prescriptions were received. Azithromycin users were less likely to have visited an emergency department in the past month compared to penicillin users.* | ? |
| The patients were representative of those with the problem | ☑ |
| The patients were sufficiently homogeneous with respect to prognostic risk | ☑ |
| Objective and unbiased outcome criteria were used | ☑ |
| The follow-up was sufficiently long and complete | ☑ |
| The effect was large enough and precise enough to be clinically significant | ☑ |

analysis (age and sex) were small. Cardiovascular causes of death were not specifically defined (arrhythmia vs. acute myocardial infarction).

An editorial by Mosholder et al in this same NEJM issue reaffirms that, despite concerns about QTc prolongation with azithromycin in patients with higher cardiovascular risks, it seems that macrolides are, in fact, safer than other antibiotics (eg. fluoroquinolones) in hospitalized or ambulatory patients with Community Acquired Pneumonia.

There may be other cardiovascular effects of macrolide antibiotics besides arrhythmias. SGEM#36 had discussed the risk of erythromycin and clarithromycin and its association with hypotension in patients taking calcium-channel blockers. This association did not seem to extend to azithromycin.

Local guidelines, pathogen isolates frequencies and resistance patterns should be coupled to patient cardiovascular risk profile to make the best choice about azithromycin usage. Consider the potential risks and potential benefit when prescribing antibiotics:

- Risks: Increased arrhythmia/cardiovascular death in those at higher cardiovascular risk, resistance and more hypotensive events if concurrent use of calcium channel blockers.
- Benefits: May be of greater benefit/safety compared to fluoroquinolones, but definitely not when compared to beta-lactams.

The authors conclusions about relative azithromycin safety in younger adult patients are likely appropriate, with the caveat that there should be some assessment of cardiovascular risk of arrhythmia/death and preferential use of alternative agents when possible.

## Case Resolution

You thank the resident for raising the concern. A discussion is held with the 56 year old man. You consider him low risk from a cardiac standpoint and recognize he has an allergy to penicillin. A shared decision process is made and he is discharged home with the prescription for azithromycin. Dr. Salim Rezaie covered this topic on his blog REBEL EM.

## Clinical Application

Azithromycin is not unsafe in general adult patients with a low risk of CV disease. This is tempered by local treatment guidelines and resistance patterns for the infectious disease for which azithromycin is indicated.

**WHAT DO I TELL MY PATIENT?**

Azithromycin can be a safe choice for bacterial infection treatment, as long as the adult is not >65yrs age and/or at elevated risk of cardiovascular disease.

## References

Svanstrom, H., Pasternak, B., and Hviid, A. (2013). Use of azithromycin and death from cardiovascular causes. NEJM, 368(18): 1704-1712. PMID 23635050

**Guest Skeptic: Dr. Salim Rezaie**
An Assistant Professor in the Department of Emergency Medicine and Internal Medicine at the University of Texas at San Antonio. You may better know him from his website REBEL EM or twitter handle @srrezaie.

77

# SPECIAL EDITION

# TAKE THE HASHTAG, LEAVE THE CLASSROOM

## PRO #FOAMED ARGUMENT

### Guest Skeptic: Dr. Joe Lex

Many consider Dr. Joe Lex the Godfather of the FOAM (Free Open Access to Medication) movement. Dr. Lex is a Professor of Emergency Medicine at Temple University. His site called Free Emergency Medicine Talks has over 2,300 MP3s of lectures. It is an unbelievable global and free resource for anyone interested in emergency medicine. Dr. Lex has been inspiring the next generation of emergency physicians for years.

Everyone in the FOAM community should be familiar with Joe's famous quote. Dr. Lex recently took part in a PRO/CON debate in EP Monthly with Dr. Nick Genes. His PRO side was titled Why #FOAMed is Essential to EM Education while Dr. Genes argued Why #FOAMed is NOT Essential to EM Education.

We covered the CON side of this debate in SGEM#72: Tiny Bubbles (#FOAMed and #MedEd). Dr. Lex was contacted to respond. He provided a sound clip of his famous quote doing a great impersonation of Marlon Brando Godfather character (FOAM Godfather).

# Dr. Lex and I reviewed the concerns raised by Dr. Genes...

**1** **Students and physicians would overdose on FOAM**
- FOAM is essential but maybe not as an exclusive source for medical students and residents
- Need to know the basics and FOAM can build on the fundamental knowledge base
- Mentions Boring EM, EM Basics and Emergency Medicine Abstracts

**2** **Quality of FOAM and difficulty referencing the material**
- Dr. Fox effect
- Ability to reference the FOAM is a trivial matter

**3** **FOAM is not a curriculum**
- Not yet but it is coming
- WikiEM is the closest thing to date
- Life in the Fast Lane is pretty good

**4** **Learners have limited time so should use other more traditional resources**
- Depends on individual learning styles

**5** **FOAM could make people intellectually lazy and not dive deeper into the literature**
- We do that all the time when reading summary articles and meta analysis
- Not intellectually lazy but rather intellectually efficient

# We then expanded on Dr. Lex's famous quote...

**If you want to know how we practiced medicine 5 years ago, read a textbook.**
- ➢ FOAM is like lego for the brain that can fill in the gaps of knowledge that are already there
- ➢ FOAM can not substitute for a text book yet but WikiEM may ready in 2-3 years

**If you want to know how we practiced medicine 2 years ago, read a journal.**
- ➢ Might be a little exaggerated, especially with pre-publication on line now
- ➢ There still is a lag time due to the peer review process

**If you want to know how we practice medicine last year, go to a (good) conference.**
- ➢ Only a handful Dr. Lex considers good (ICEM, AAEM and SMACC)
- ➢ I am biased towards CAEP and BEEM conferences

**If you want to know how we practice medicine now and in the future, listen to the conversations in the hallway and use #FOAMed.**
- ➢ Twitter is an absolutely phenomenal tool

# Final Thoughts...

Dr. Lex is very jealous about the next generation of medical educators who have embraced FOAM. Hippocrates was talking about free open access to medical education in his oath. Dr. Lex has a leaf from the tree of Hippocrates from the town of Kos. It is under this tree Hippocrates taught the art of medicine for free to his students.

# 78

# SUNNY DAYS
## PEDIATRIC PAIN CONTROL
## PART 1

**CASE SCENARIO:**

*A two year old child presents to the emergency department with a simple laceration on his forehead. You decide to use a tissue adhesive rather than sutures.*

**Q:** DOES A TOPICALLY APPLIED ANALGESIC DECREASE PAIN IN CHILDREN UNDERGOING LACERATION REPAIR WITH TISSUE ADHESIVE?

**BOTTOM LINE**

LET gel should be used routinely prior to repairing simple lacerations in children.

# Efficacy of pain control with topical lidocaine-epinephrine-tetracaine during laceration repair with tissue adhesive in children: A randomized controlled trial.

## Harman et al. CMAJ 2013

**P** Children (3mo-17yrs) presenting to the ED with a laceration <3cm

**I** Topically applied lidocaine-epinephrine-tetracaine (LET) gel 45min prior to adhesive repair

**C** Topically applied placebo gel 45min prior to adhesive repair

**O** Primary: Amount of pain experienced during the adhesive repair.

Secondary: Physician rating of difficulty of repair; physician reporting of wound hemostasis prior to repair; physician prediction of experimental group (i.e. LET vs. placebo); unscheduled follow-up visits.

### Author's Conclusion:

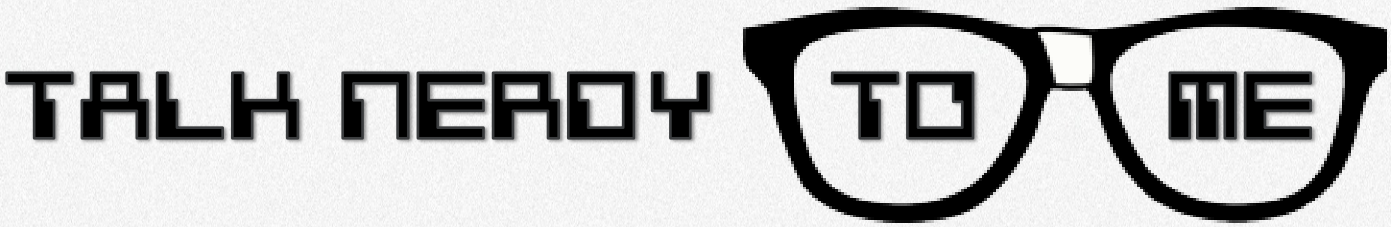
*"Treating minor lacerations with lidocaine-epinephrine-tetracaine before wound closure with tissue adhesive reduced ratings of pain and increased the proportion of pain-free repairs among children aged 3 months to 17 years. This low-risk intervention may benefit children with lacerations requiring tissue adhesives instead of sutures." (Harman et al., 2013)*

### Background

Oligoanalgesia is defined as poor pain management through the underuse of analgesia. It is well known that many patients presenting to the emergency department receive little or no analgesia to manage their pain (Wilson et al). There are several factors felt to contribute to this poor pain management (Motov and Khan). Children represent just one group that is less likely to receive adequate analgesia. (Brown et al, Selbst and Clark). Other factors include elderly patients (Cavalieri TA), certain ethnicities, mental illness (Simon et al) and lack of health insurance (Hosteller et al).

## Results

- Level of pain (measured by Visual Analogue Scale) was less in the LET group compared to placebo (median 0.50, IQR 0.25-1.50 vs. median 1.00, IQR 0.38-2.50; p=0.01). 51.6% children experienced no pain with LET compared to 28.3% children with placebo (RR 0.54, 95%CI 0.37-0.80).
- Wound hemostasis was better in the LET group (78.2%) compared to the placebo group (59.2) (p<0.008).
- Difficulty in wound repair was not significantly different.
- There was no significant differences in follow-up visits between groups.
- Physicians were able to correctly identify the experimental group in 72.9% patients.




## Commentary

Overall this is a well-performed study on an important topic in pediatric emergency medicine. Controlling pain in children is often difficult and LET gel is a non-invasive method of helping achieve this. This study shows that a significantly higher group of children were pain-free with their procedure.

There were a number of limitations to this study which included:

1. No intention-to-treat analysis.
2. Poor follow-up. Ability to follow-up was not made a mandatory requirement of inclusion into the study, so not surprisingly, the follow-up rate was lower. This undermines any conclusions about unplanned return-to-care data.
3. It would be interesting to know if there is any impact on wound healing by LET gel with tissue adhesive. This has not been raised as a major concern, but could have been studied with an established wound assessment score as has been done previously with tissue adhesives and absorbable stitches.
4. Unblinding – almost three-quarters of physicians knew which children where in the treatment group.

### RCT Quality Checklist

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

## Case Resolution

You get the LET out and apply it before using tissue adhesive on this two year old with a forehead laceration.

## Clinical Application

Use LET in children with lacerations in the emergency department.

**CONCLUSION VS COMMENTARY**

## COMPARISON

We can not argue with the authors conclusions. They could have made stronger conclusions if they did an ITT analysis, had better follow-up and included more patient oriented outcomes.

## WHAT DO I TELL MY PATIENT?

We are going to put on some “magic” gel that will help take the pain away.

# 78

# SUNNY DAYS
## PEDIATRIC PAIN CONTROL PART 2

**CASE SCENARIO:**

*A child presents to the emergency department and requires an intravenous line.*

**Q:**

DOES ADDING AMBIENT MUSIC TO STANDARD CARE OF PEDIATRIC PATIENTS PREVENT DISTRESS DURING PAINFUL PROCEDURES?

**BOTTOM LINE**

There appear to be some benefits in playing music during painful procedures in children in the ED. This is a low-cost, non-pharmacologic intervention with no adverse effects. It's a good idea that needs a bit more research, but if the capability is there, can be implemented easily.

# Music to reduce pain and distress in the pediatric emergency department. A randomized clinical trial. Hartling et al. JAMA 2013

**P** Children 3-14 years old presenting to a pediatric ED, requiring an IV, and having an understanding of English

**I** Standard care with music played through an ipod dock (The Planets Op. 32 Jupiter, Storms in Africa, Disco Beat, and Sunny Days) played at a standardized volume, played until the procedure was complete.

**C** Standard care without music

**O** Primary: Patient distress measured with the Observational Scale of Behavioural Distress-Revised (OSBD-R).

Secondary: Change in self-reported pain from baseline; heart rate; parent and health care provider satisfaction; parental anxiety.

## Author's Conclusion:

*"Music may have a positive impact on pain and distress for children undergoing intravenous placement. Benefits were also observed for the parents and health care providers." (Hartling et al., 2013)*

## Results

No difference in the change in behavioural distress from pre-procedure to immediately after the procedure. The pain score for the standard care group increased (median, 2; IQR, 0-4) but remained the same for the music group (median, 0; IQR, -4.0 to 0.5) from before to immediately after the procedure (P=0.04).

There was no difference noted in heart rates or parental anxiety. There were also no significant differences in parental satisfaction noted.

Care providers were more satisfied (P=0.02) and found the procedure easier with music (P=0.03).

# TALK NERDY TO ME

## Commentary

Overall this is an interesting topic. Modification of the stress/pain experience with non-pharmacologic methods is in the best interest of patients, families and caregivers. This is a relatively small study, and the wide confidence intervals and non-significant findings are a product of this. A larger study might more definitively solidify results. There is little downside, however, and this is a very low-cost intervention.

There were a number of limitations to this study which included:

1. It would have been useful for the researchers to keep track of IV success rates as a secondary outcome measure.
2. Blinding was done for those evaluating the video recordings of the subjects, but was, for obvious reasons, not possible for those in the room during the procedure.
3. There were more boys in the standard care group compared to the experimental group (84% vs. 50%), the effect of which is unknown.
4. Multiple sub-groups and regression models were used, and these have the high likelihood of finding erroneous "significant" results. Caution is advised, and in the future it is recommended that these be limited.

### RCT Quality Checklist

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

## Case Resolution

The child care specialist sets up the child to listen to Sunny Days while you start the IV line.

## Clinical Application

For children in the emergency department undergoing painful procedures should be offered music as a non-pharmacologic way to address their pain.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Agree with the weak conclusions given the nature of the study and the results.

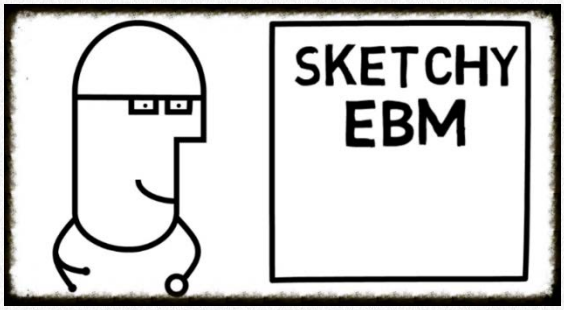
## WHAT DO I TELL MY PATIENT?

We are going to play some music to help you (and us) relax during this procedure!

## References

Harman, S., Zemek, R., Duncan, M.J., Ying, Y, Petrcich, W. (2013). Efficacy of pain control with topical lidocaine–epinephrine–tetracaine during laceration repair with tissue adhesive in children: a randomized controlled trial. CMAJ, 185(13): E629-E634. PMID 23897942

Hartling, L., Newton, A.S., Liang, Y., Jou, H., Hewson, K., Klassen, T.P., and Curtis, S. (2013). Music to reduce pain and distress in the pediatric emergency department: a randomized clinical trial. JAMA Pediatrics, 167(9): 826-835. PMID 23857075






**Guest Skeptic: Dr. Anthony Crocco**
Division Head and Medical Director of Pediatrics Emergency Medicine at McMaster University. Creator of SketchyEBM.com and RANThony's on Youtube.

# 79

# TOMMY CAN YOU HEAR ME
## STEROIDS FOR BACTERIAL MENINGITIS

### CASE SCENARIO:

*24 year old woman presents to the emergency department with a 3 day history of progressively worse flu like symptoms. She has a fever 39.6C, HR 114, BP120/80 and RR 22. You notice a purpuric rash and she has clinical meningismus. Her WBC is elevated and her lactate is borderline elevated. The lumbar puncture demonstrated turbid appearing fluid and no blood.*

### Q:

DO STEROIDS PREVENT DEATH, HEARING LOSS OR OTHER NEUROLOGIC SEQUELAE IN BACTERIAL MENINGITIS?

### BOTTOM LINE

Use dexamethasone 0.6mg/kg/day in all cases of bacterial meningitis in high income countries. It may not save lives necessarily but at least it can spare any hearing loss or other neurologic sequelae. It should be given before or with first dose of antibiotics.

# Corticosteroids for acute bacterial meningitis .

## Brouwer et al. Cochrane Database of Systematic Reviews 2013

**P** Patients with bacterial meningitis (all ages). Higher vs lower income countries defined on basis of UN Human Development Index scores (>0.7 and <0.7 respectively)

**I** Corticosteroids; most commonly dexamethasone (0.6mg/kg/day for four days)

**C** Usual care

**O** Mortality, Hearing loss (Severe hearing loss – bilateral loss >60dB or requiring bilateral hearing aids; any hearing loss), Neurological sequelae [Focal (other than hearing), epilepsy, severe ataxia and severe memory or concentration disturbances], Adverse effects [Clinically evident GI bleed, reactive arthritis, pericarditis, herpes zoster or herpes simplex, fungal infection, recurrent fever (>38C), persistent fever (>5 days)]

### Author's Conclusion:

*"Corticosteroids significantly reduced hearing loss and neurological sequelae, but did not reduce overall mortality. Data support the use of corticosteroids in patients with bacterial meningitis in high-income countries. We found no beneficial effect in low-income countries." (Brouwer et al., 2013)*

### Background

Bacterial meningitis is fatal in children 5-40% and adults 20-50%. This is even with appropriate antibiotic treatment. Concomitant inflammation of brain/meninges is commonly associated with serious neurologic sequelae. One of the worst neurologic outcomes in survivors is sensorineural hearing loss (SNHL). Up to 1/3 of patients will experience bilateral SNHL post meningitis. The cause of SNHL is thought to be multifactorial in bacterial meningitis (Wellman et al):

- Extension of the infection along the 8th cranial nerve, the periotic duct and the cochlear aqueduct
- Cochlear pathology due to serofibrinous exudate, inflammation and granulation cells
- Septic emboli and thrombotic occlusion secondary to vasculitis
- Pathologic formation of new bone within the otic capsule called labyrinthitis ossificans

Worse historical outcomes have previously been observed in lower income countries.

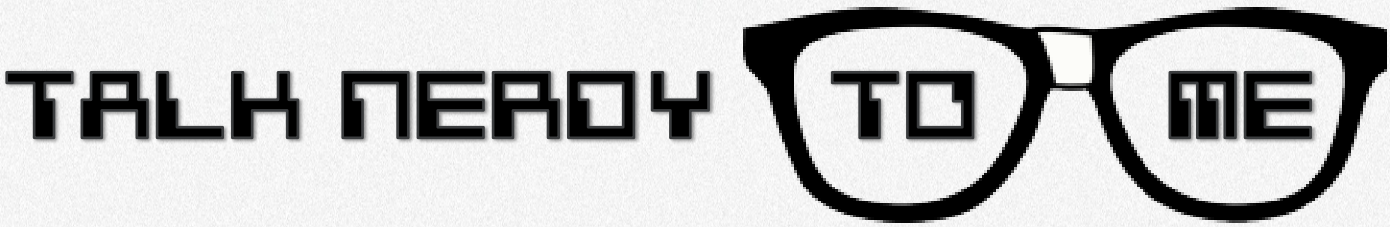
## Results

25 studies included, N=4121 patients. 4 high quality (45% of included patients), 14 medium, 7 low.

1. Overall mortality reduction was not significant: RR 0.90 (19.9% to 17.8%, 95%CI 0.80-1.01, p=0.07)
2. Adult mortality reduction was also not significant: RR 0.74 (95%CI 0.53-1.05, p=0.09).
3. Reduced severe hearing loss: RR 0.67 (95%CI 0.51-0.88); not reduced when high-quality studies analyzed only.
4. Reduced any hearing loss: RR 0.74 (95%CI 0.63-0.87)
5. Reduced neurologic sequelae: RR 0.83 (95%CI 0.69-1.00)
6. Increased recurrent fever: RR 1.27 (95%CI 1.09-1.47), but no other adverse events with steroids.

**Subgroup Analyses:**

1. Some reduced mortality for *S. pneumoniae* meningitis (RR 0.84, 95%CI 0.72-0.98), but not for H. Influenza or *N. meningitidis*.
2. Reduced severe hearing loss in children with *H. influenza* (RR 0.34, 95%CI 0.20-0.59) but not other non-Hemophilus species.
3. No benefits of steroids in low income countries (mortality, severe/any hearing loss, neurologic sequelae).
4. No benefits of steroids in worst-case scenario analyses for missing data amongst trials of high heterogeneity encountered, random effects analysis. Benefit remained significant in WSC analyses amongst trials with low heterogeneity.




## Commentary

Thorough Cochrane review; updated from prior 2007 review. Thorough electronic and manual searches; no mention of language restrictions.

Generally low risk of bias, although reporting bias was almost 70% amongst included trials.

Authors analyzed data based on available-case analysis and worst-case analysis for missing data. Mild/moderate heterogeneity amongst pooled trials (0-33%). Overall mortality data showed an I2 of 21% while the any hearing loss had I2 of 24%.

A rough guide to interpreting Heterogeneity:

- 0% to 40%: might not be important
- 30% to 60%: may represent moderate heterogeneity
- 50% to 90%: may represent substantial heterogeneity
- 75% to 100%: considerable heterogeneity

All outcomes analyzed with fixed effects analytical models. We have spoken before on the SGEM about the difference between fixed and random effects model. A fixed-effect meta-analysis assumes that all the studies share the same effect size. In the random effects model we do not assume this and allow that there could be a distribution of true effect size. (Borenstein, Hedges and Rothestein).

The 2007 Cochrane Database of Systematic Review on this topic did show mortality, hearing loss and short term neurologic benefits (20 studies, 2750 patients), again favoring those from high-income countries. An evidence based summary of the 2007 review was done by Dr. S. Upadhye and published in Annals Emerg Med 2008.

**Systematic Review Quality Checklist**

| | |
|---|---|
| The clinical question is sensible and answerable | ☑ |
| The search for studies was detailed and exhaustive | ☑ |
| The primary studies were of high methodological quality | ☑ |
| The assessments of studies were reproducible | ☑ |
| The outcomes were clinically relevant | ☑ |
| There was low statistical heterogeneity for the primary outcome | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

The current review includes newer randomized control trials from Vietnam and Malawi, where no benefits were realized. Furthermore, a drop in mortality is noted after the introduction of H. Influenza vaccinations in higher income countries.

The randomized clinical trials included in this systematic review did not address four important issues:

1. Minimum duration of corticosteroid therapy
2. Type of corticosteroids (most used dexamethasone 0.4 or 0.6mg/kg/d)
3. Maximum length of time after parenteral antibiotic therapy for starting steroids
4. Long-term effect of corticosteroid therapy

## Case Resolution

This woman with suspected bacterial meningitis is given appropriate broad spectrum IV antibiotics. Dexamethasone 0.6mg/kg/day is given at the same time. She is sent to the ICU and you hope she does well.

## Clinical Application

If practicing in a developed country you should consider giving steroids with your antibiotics in patients with bacterial meningitis.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Agreed overall with general conclusion.

**WHAT DO I TELL MY PATIENT?**

We suspect you have bacterial meningitis. We are going to give you antibiotics. At the same time we are going to give you steroids. This has been shown to prevent swelling, decrease hearing and may help save your life.

## References

Upadhye, S. (2008). Evidence-based emergency medicine/systematic review abstract. Corticosteroids for acute bacterial meningitis. Ann Emerg Med, 52(3): 291-293. PMID 18763355

Brouwer, M.C., McIntyre, P., Prasad, K., van de Beek, D. (2013). Corticosteroids for acute bacterial meningitis. Cochrane Database Syst Rev., 6:CD004405. PMID 23733364

**Guest Skeptic: Dr. Jeremy Faust**

An Emergency Medicine resident Mt. Sinai Hospital, New York City. Jeremy is a self described evidence based medicine zealot. He writes a column in ACEP News on the topic of social media. Jeremy also just launched an excellent new podcast series with Lauren Westafer called FOAMCast.

# 80

# CRASH-2
## CLASSIC PAPER

### CASE SCENARIO:

*You're working in a busy urban trauma center when EMS slams through the doors with a 22-year-old man who was in a major MVC. The patient has significant abdominal and pelvic trauma and is hypotensive and tachycardic. You mobilize your resources and within minutes, the patient is intubated, his pelvis is placed in a binder and blood is being infused through a peripheral intravenous line. Your trauma colleagues are waiting to take the patient to the operating room for an exploratory laparotomy based on your positive FAST exam. Before they leave, one of your bright residents asks if you should start Tranexamic acid on the patient.*

### Q:

DOES TRANEXAMIC ACID (TXA) REDUCE MORTALITY IN PATIENTS WHO HAVE SUSTAINED MAJOR TRAUMA?

### BOTTOM LINE

The use of tranexamic acid in the trauma patient with significant bleeding reduces mortality by 1.5% without increasing thromboembolic events. TXA is a safe and effective treatment in patients with hemorrhagic shock from trauma in reducing mortality. It is an inexpensive therapy, which should be included in the care of these critically injured patients.

# Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised placebo-controlled trial.

## Dakubo et al. Lancet 2010

**P** Adult trauma patients within 8-hours of injury with or at risk of significant bleeding, from 274 hospitals in 40 countries. N=20, 211). Significant haemorrhage was defined as systolic blood pressure < 90mm Hg or heart rate > 110 beats per minute or both.

**I** Loading dose of 1 g of tranexamic acid infused over 10 minutes, followed by an intravenous infusion of 1 g over 8 h (n=10,060).

**C** Placebo (0.9% saline) (n=10,067).

**O** Primary: Death in hospital within 4 weeks of injury.
Secondary: Receipt of a blood-products transfusion, number of units of blood products transfused, surgical intervention, occurrence of thromboembolic episodes (stroke, myocardial infarction, pulmonary embolism, clinical evidence of DVT).

### Author's Conclusion:

*"TXA safely reduced the risk of death in bleeding trauma patients in this study. On the basis of these results, tranexamic acid should be considered for use in bleeding trauma patients." (Dakubo et al., 2010)*

### Background

Injuries are a major cause of death worldwide. Millions of people die every year from traffic injuries. In fact, they are the 9th leading cause of death around the world. Additionally, another 1.5 million people die every year from interpersonal violence. Hemorrhage accounts for about 1/3 of all trauma deaths and as such, it should be our goal to find treatments to decrease death from hemorrhage.

Our bodies have a finely tuned system that allows blood to flow freely and not clot too easily while also allowing the body to form clots when needed. This balance is upset in trauma by loss of blood and factors, acidosis, hypothermia and the inflammatory cascade. Hyperfibrinolysis often occurs making hemostasis extremely challenging.

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 makes sense, then to apply TXA to the trauma patient to see if we can get similar effects.

## Results

All cause mortality was reduced from 16% in the placebo group to 14.5% in the TXA group (RR 0.91, 95% CI 0.85-0.97). This was and absolute risk reduction of 1.5% and was statistically significant. The calculated NNT was 68 (95% CI 0-206) to prevent one death.

There was no significant difference between any of the secondary outcomes:

- Receipt of a blood-products transfusion
- Number of units of blood products transfused
- Surgical intervention
- Occurrence of thromboembolic episodes (stroke, myocardial infarction, pulmonary embolism, clinical evidence of DVT)

Tranexamic acid significantly benefited the subset with systolic blood pressure <75mmHg (Fig 3, RR 0.87; 95% CI 0.76- 0.99).

# TALK NERDY TO ME

## Commentary

This is a very pragmatic real world study which includes trauma patients from 247 hospitals in 40 countries. We do not know the breakdown of which patients were seen in various hospital settings, which may make it difficult to establish if these results can be applied to our patients. However, with such large numbers, it is likely that the randomization process would help ensure generalizability.

It is refreshing to see a well conducted large clinical trial that looks at an inexpensive drug and measures meaningful outcomes rather than some manufactured combined endpoint that gives a positive result for a new expensive me too drug.

The trials of the mega expensive Factor VIIa did not work in these sick patients and had many concerning adverse effects. Although the mechanism of action of tranexamic acid in bleeding trauma patients remains unexplained, this large trial offers promise for an affordable therapeutic alternative to reduce post-traumatic bleeding and deaths.

## Case Resolution

Based on your knowledge of the CRASH2 study, you decide to begin TXA treatment. You give 1 gram of TXA over 10 minutes and hang an infusion of 1 gram over the next 8 hours. The patient goes for an Ex-lap where he's found to have a grade 5 splenic laceration and a grade 3 liver laceration. The patient also has an angio of the pelvis and has embolization to some bleeding veins in the pelvis. His postoperative course is rocky but he is discharged to rehabilitation 3 weeks later.

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED | ☑ |
| The patients were adequately randomized<br>*Comment: A computer random number generator was used to allocate blocks* | ☑ |
| The randomization process was concealed | ☑ |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias)<br>*Comment: with the exception of the exclusions we already mentioned* | ☑ |
| The patients in both groups were similar with respect to prognostic factors<br>*Comment: You can see this in table 1, so why is this important?* | ☑ |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation<br>*Comment: The placebo was administered just like the TXA* | ☑ |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups)<br>*Comment: A total of 80 patients out of over 20,000 were lost to follow up which is amazing* | |
| All patient-important outcomes were considered<br>*Comment: The primary outcome is the most important patient centered outcome... death* | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ☑ |

## Clinical Application

If it hasn't changed what you do, it should. TXA is an inexpensive drug that is found in most hospitals that have operating rooms since it has been used in this setting for years.

This study did not find an increased rate of clinically significant clotting. TXA should be administered to patients with severe trauma. Additionally, CRASH-2 opened the doors on the use of TXA in bleeding.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

Agreed overall with general conclusions.

We have an article showing great efficacy for epistaxis, there's a study going on now for the use in post-partum hemorrhage. I've used it for intraoral bleeding in patients on agents like clopidogrel and Coumadin and in patients with massive GI bleeding. The indications for this drug continue to expand.

**WHAT DO I TELL MY PATIENT?**

You have had serious trauma with significant bleeding. We are going to give you a drug that should help control the bleeding and improve your chances of survival.

## References

CRASH-2 trial collaborators, Shakur, H., Roberts, I., Bautista, R., Caballero, J., Coats, T., Dewan, Y., et al. (2010). Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant hemorrhage (CRASH-2): a randomized, placebo-controlled trial. Lancet, 376(9734): 23-32. PMID 20554319

**Guest Skeptic: Dr. Anand Swaninathan (Swami)**
He is an assistant program director at NYU/Bellevue Hospital in the Department of Emergency Medicine.

# 81

# SORE MOUTH
## LIDOCAINE FOR ORAL ULCERS

### CASE SCENARIO:

*Two year old comes to the ER with a rash on his hands and feet. It is associated with painful mouth ulcers. You diagnose the child with hand, foot and mouth disease. The parents are concerned about dehydration. You estimate the child to be mildly dehydrated. You know from SGEM#12 that ondansetron helps hydrate the child with vomiting but this is different.*

### Q:

DOES FLUID INTAKE IMPROVE WHEN 2% VISCOUS LIDOCAINE IS APPLIED TO ORAL ULCERS?

**BOTTOM LINE**

Viscous lidocaine is not superior to a placebo gel in improving oral intake in children with painful infectious mouth ulcers.

# Topical lidocaine to improve oral intake in children with painful infectious mouth ulcers: a blinded, randomized, placebo-controlled trial.

## Hooper et al. Ann Emerg Med 2014

**P** Pediatric patients aged 6 months to 8 years (n=100) with the mouth ulcers (gingivostomatitis, ulcerative pharyngitis, herpangina or hand, foot and mouth disease) and decreased PO intake (parent/guardian "not drinking well" and <10ml/kg of body fluid in preceding 2 hours).

**I** A single oral dose of 2% lidocaine (weight based at 0.15 mL/kg), patients instructed to gargle and spit (if able) or swallow if not able to follow instructions

**C** Placebo arm administered a topical methylcellulose/cherry flavored solution in an identical fashion

**O** Amount of oral fluid ingested within 60 minutes after study drug administration (mL/kg)

### EXCLUDED:

1. Hypersensitivity to lidocaine or other amide local anesthetics.
2. Diseases in which elevated levels of lidocaine may be dangerous (epilepsy, impaired cardiac conduction, bradycardia, or impaired hepatic or renal function).
3. Severe dehydration or toxic needing immediate resuscitation.
4. Patients with >2 episodes of vomiting before ED arrival, dental disease, mouth trauma, or malignancy.
5. Patients on cardiac or other drugs with possible interactions with lidocaine.
6. Patients who already had >1 dose of topical anesthetic for the same illness.
7. Pre-existing upper airway obstruction or swallowing difficulties, If they had received analgesia <1hr before enrollment.
8. Non-English speaking.

### Author's Conclusion:

*"Viscous lidocaine is not superior to a flavored gel placebo in improving oral intake in otherwise healthy children with painful infectious mouth ulcers. It appears that staff coaching and possibly the coating effect of oral topical agents alone can increase oral intake." (Hooper et al., 2014)*

## Background

Children with infected mouth ulcers is a common emergency department presentation. Most of these can be easily diagnosed clinically. The cause is often viral infections like gingivostomatitis, ulcerative pharyngitis, herpangina and hand, foot and mouth disease.

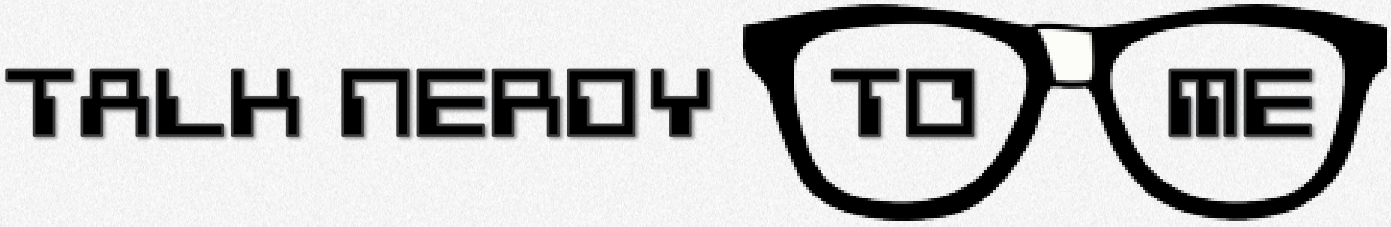
Children usually present because of pain and decreased oral intake. Oligoanalgesia (poor pain management) is a big problem in emergency departments. Children represent a group that is less likely to receive adequate analgesia. (Brown et al, Selbst and Clark).

Goldman et al. published a helpful article describing the degree of dehydration in children ranging from mild, moderate to severe. Dehydration can usually be treated effectively with oral rehydration. For more information visit this site on Oral Rehydration Therapy. The Canadian Pediatric Society also has a algorithm for oral rehydration.

## Results

No difference in the amount of fluid intake at 60 minutes between groups. Lidocaine group 8.5 mL/kg (IQR 4.1-13.8 mL/kg) vs. placebo group 9.3 mL/kg (IQR 3.1-15.2 mL/kg). Difference in medians 0.8 mL/kg (95% CI -2.52 to 3.26 mL/kg)

**Secondary outcomes:** Similar oral intake at multiple time points measured, similar utility of adjunct analgesics. 40% of patients (n=20) in each group required "rescue" treatment. Bottle B 14% (n=7) in lidocaine group, 6% (n=3) in placebo group required admission for fluid administration via either NG or IV route. Longer term outcomes detailed in methods (adverse events, ED LOS) not reported in results section.




## Commentary

This is the first study to evaluate the efficacy of topical lidocaine for painful mouth ulcers in children. The randomization was adequate, but patients were enrolled as a convenience sample as research investigators were only present in the ED about 50 hours per week. Additionally, 40% of patients in each arm received the other "treatment" at 60 minutes.

There is concern about the randomization being concealed. The placebo may have looked, tasted and smelled like the lidocaine viscus but it would not have caused oral numbness. If the child starts talking funny and drooling parents/guardians may have figured out which group their child was in. This information could have been passed along to the research staff even unintentionally.

## Commentary

If there was unblinding the bias would have probably been towards lidocaine treatment. Such that there was no difference between groups this potential unblinding actually strengthens the conclusion to accept the null hypothesis.

One way researchers could have tested for unblinding would have been to ask the parents/guardians and the researchers which group they felt the child was assigned. If they were able to tell more than random chance then randomization was not concealed.

Another issue with this paper was the original intent to report the primary outcome in terms of mean fluid intake at 60 minutes, with the comparison between groups as a mean difference. An interim analysis revealed a skewed data set, thus the primary outcome was ultimately reported as a median with an interquartile range instead.

Both groups may not have been equal with prognostic factors. More patients in the placebo group received topical analgesics in the 24 hours prior to being enrolled in the study. The authors did not report a p value, and did not comment on whether or not this was a significant difference. However, it has the potential to introduce bias as patients in the placebo group may have been more "comfortable" at baseline and thus more likely to increase their oral intake during the study period, a difference which would have been attributed to the intervention.

The authors comment that it may have been coaching from the medical staff and/or simply the coating of the ulcers with a liquid preparation that encouraged an increase in oral intake in this study. I think this is a reasonable conclusion. They did however, only study topical lidocaine by itself.

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br>Comment: These were all pediatric ED patients presenting to the Royal Children's Hospital in Melbourne, Australia | ☑ |
| The patients were adequately randomized<br>Comment: Block randomization with block sizes of 2 and 4. | ☑ |
| The randomization process was concealed<br>*Comment: Numbered bottles by pharmacist independent of the study; patient given two bottles and after 60 minutes the treating clinician could give the second bottle if clinically indicated* | ? |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias)<br>*Comment: Convenience sample when research assistants or investigators were in the ED* | ? |
| The patients in both groups were similar with respect to prognostic factors | ? |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation | ? |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups)<br>Comment: One patient left the ED before completion of the study | ☑ |
| All patient-important outcomes were considered | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant | ? |

**CONCLUSION VS COMMENTARY**

**COMPARISON**

This study calls into question the routine utility of topical lidocaine for painful mouth ulcers. Even though there are a few methodological flaws to the study, it seems as though the conclusion is reasonable.

Mean and Median can both be used to describe the "centre" of a dataset. Which one to use depends on the symmetry of the dataset being measured.

**MEAN: THE AVERAGE**

Add all the data points up and divide by the number of data points. However, if your data is skewed this can represent a problem. The mean can be highly influenced by one or two outliers. It is only representative of the centre if the distribution of the data is symmetric. The mean can be affected by any single change to the data.

**MEDIAN: THE MIDPOINT**

Is not influenced by outlying measurements. So, for asymmetrical data or skewed data the median might better represent the centre of the data. The median does not change with any single data point change.

In US EDs, a "magic mouthwash" preparation is commonly prescribed for painful mouth ulcers, with includes diphenhydramine and an antacid along with lidocaine. Many patients in this cohort (50% in the lidocaine group, 44% in the placebo group) required adjunct analgesia; this appears to be a helpful treatment in this condition.

Although adverse events were not reported in this study, there have been serious adverse events associated with oral lidocaine use (see poison center data from Curtis LA, Dolan TS, Seibert HE. Are one or two dangerous? Lidocaine and topical anesthetic exposures in children. J Emerg Med 2009;37:32-39), especially in young children that may not be able to follow instructions to "spit" after gargling.

## Case Resolution

Educate the parents about the diagnosis of hand, foot and mouth disease. Reassure them it is a common viral illness in children < 5 years of age. It usually is mild in nature with a low grade fever and rash lasting about 1 week. There is no specific treatment but taking over the counter medication for pain and fever may help. Encouraging your child to drink liquids is important to prevent dehydrated.

## Clinical Application

Given the questionable efficacy over placebo demonstrated in this study, along with the potential to cause harm, it may be time to rethink the use of topical lidocaine for painful mouth ulcers in this population.

**WHAT DO I TELL MY PATIENT?**

There appears to be evidence that topical lidocaine is not better than a placebo for increasing oral intake (and preventing dehydration) in children with painful mouth ulcers. Supportive care with analgesic therapy, along with encouragement by parents and/or ED staff are useful adjuncts.

## References

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Selbst, S.M., and Clark, M. (1990). Analgesic use in the emergency department. Ann Emerg Med, 19(9): 1010-1013. PMID 2393166

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**Guest Skeptic: Meghan Groth (@EMPharmGirl).**
Meghan is the emergency medicine pharmacy specialist at Fletcher Allen Health Care in Burlington, Vermont and an adjunct professor of pharmacy practice at the Albany College of Pharmacy and Health Sciences. Her professional interests include resuscitation and acute neurologic emergencies. In her free time, you can find her teaching Les Mills BodyPump classes at the local gym.

# 82

# MELT WITH YOU
## TARGETED TEMPERATURE MANAGEMENT

### CASE SCENARIO:

*A 72 year old man has a witnessed arrest at the Goderich beach. By-standard CPR is started and he shocked out of ventricular fibrillation by emergency medical services but does not regain consciousness. We know from SGEM#54 that cooling in the field does not improve survival. His temperature on arrival to the emergency department is 36°C.*

### Q:

DOES COOLING TO A TARGET TEMPERATURE OF 33°C IMPROVE SURVIVAL TO HOSPITAL DISCHARGE AND NEUROLOGICAL OUTCOME IN UNCONSCIOUS SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST OF PRESUMED CARDIAC CAUSE?

### BOTTOM LINE

There is no advantage of cooling to a targeted temperature of 33°C when compared to cooling to 36°C for survival of out-of-hospital cardiac arrest.

# Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest.

## Nielsen et al. NEJM 2013

**P** 939 patients from 36 intensive care units (ICUs) in Europe and Australia with OHCA with more than 20 consecutive minutes of spontaneous circulation after resuscitation.

**I** Cooling to 36 degrees Celsius for 36 hours, <37.5 for 72 hours post-arrest

**C** Active cooling to 33 degrees Celsius

**O** Primary: Mortality at the end of the trial.

Secondary: Mortality, Cerebral Performance Category (CPC) 3-5 or Modified Ranking (mRS) 4-6 at 180 days

### Author's Conclusion:

*"In conclusion, our trial does not provide evidence that targeting a body temperature of 33°C confers any benefit for unconscious patients admitted to the hospital after out-of-hospital cardiac arrest, as compared with targeting a body temperature of 36°C." (Nielsen et al., 2013)*

### Background

Therapeutic hypothermia post cardiac arrest has received a great deal of attention over the last decade. Two randomized control trials showed that hypothermia post cardiac arrest resuscitation was neuroprotective. One trial (n=273) in NEJM 2002 used cooled air mattress to demonstrate good outcome at 6 months (55% vs. 39%). The smaller Australian study (n=77) also published in NEJM 2002 showed good neurologic outcome at time of hospital discharge (49% vs. 26%).

Dr. David Newman has calculated the NNT=6 for mild therapeutic hypothermia for neuroprotection following cardiopulmonary resuscitation. The Cochrane Collaboration updated their review on hypothermia for neuroprotection in adults after CPR in 2012. They concluded:

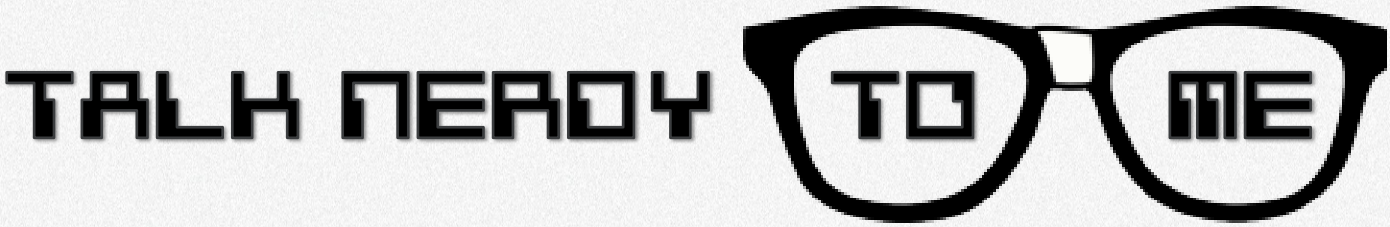
*"Conventional cooling methods to induce mild therapeutic hypothermia seem to improve survival and neurologic outcome after cardiac arrest. Our review supports the current best medical practice as recommended by the International Resuscitation Guidelines."*

The SGEM was skeptical after it covered the issue in Episode#21: Ice, Ice Baby. We looked at the paper by Bernard SA et al. called Induction of therapeutic hypothermia by paramedics after resuscitation from out-of-hospital ventricular fibrillation cardiac arrest: a randomized controlled trial, Circulation. 2010;122:737-742. The question was whether pre-hospital therapeutic hypothermia improves patient outcomes after successful resuscitation? The study had 234 patients and used large volumes of ice-cold lactated Ringer's. The primary outcome was about 50% of patients survived to functional hospital discharge and there was not a benefit to cooling.

The SGEM covered the larger pre-hospital cooling paper by Kim F et al. in JAMA earlier this year. The bottom line was: Scoop and run after cardiac arrest with no cooling required in the field.

## Results

No difference in mortality. No difference in Cerebral Performance Category (CPC), modified Rankin Score (mRS) or mortality at 180 days.




## Commentary

This is a well conducted multisite randomized controlled trial on targeted temperature management after out-of-hospital cardiac arrest. They excluded very few patients from the trial. The main reasons for exclusion:

- Interval from return of spontaneous circulation to screening of >4 hours
- Unwitnessed arrest with asystole as the initial rhythm
- Suspected or know acute intracranial hemorrhage or stroke
- Body temperature of <30°C

A strength of the study was the multiple sites where the trial was conducted and the various sizes of hospitals.

Another strong feature of this study was that temperature was managed in different ways depending on the site's preferences. The different methods of cooling did not seem to influence the results. This makes the result applicable to different practice settings depending on local protocols.

There was a risk of bias because of the inherent difficulty of blinding the treating physician to the intervention, but this is unlikely to affect mortality.

**CONCLUSION VS COMMENTARY**

## COMPARISON

Agree with author's conclusions.

## Case Resolution

The 72 year old man with the out-of-hospital cardiac arrest arrived at 36°C. He was actively cooled to maintain this temperature but was not cooled further to 33°C. You plan to check in on him in the intensive care unit on your next shift.

## Clinical Application

I will start cooling patients to 36°C and admit them to the intensive care unit for further management based on our own local protocols.

## WHAT DO I TELL MY PATIENT?

I will tell the patient's wife that her husband had a cardiac arrest. We were able to bring him back but he is still unconscious. We are going to cool him to improve his chances of survival and a good neurological outcome.

### RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br><br>Comment: These were all out of hospital cardiac arrests. (the ED was not mentioned). Some countries, such as Sweden, have patients bypass the ED and are admitted directly to the hospital. However, it is reasonable to believe that many patients were admitted through the emergency department. | ? |
| The patients were adequately randomized | ☑ |
| The randomization process was concealed | ☑ |
| The patients were analyzed in the groups to which they were randomized | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias) | ☑ |
| The patients in both groups were similar with respect to prognostic factors | ☑ |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation<br><br>Comments: Health care professionals caring for the trial patients were aware of the intervention assignments because of inherent problems with blinding of body temperature. Physicians performing neurologic prognostication, assessors of neurologic follow-up and final outcome, study administrators, statisticians, and the authors were unaware of the intervention assignments and so were the patients and their families. Manuscript written before randomization code was broken. | |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups) | ☑ |
| All patient-important outcomes were considered<br><br>Comment: little focus on disability. Modified ranking scale 0-3 slumped together | ? |
| The treatment effect was large enough and precise enough to be clinically significant | |

## References

Nielsen, N., Wetterslev, J., Cronberg, T., Erlinge, D., Gasche, Y., Hassager, C., Horn, J., Hovdenes, J., et al. (2013). Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest. NEJM, 356(23): 2197-2206. PMID 24237006

**Guest Skeptic: Katrin Hruska** @Akutdok
A Swedish doctor, interested in patients and trying to figure out how to improve emergency care, with a fair amount of skepticism. She organized the amazing SweetBEEM conference this year.

# 83

# In Your Eyes
## Topical Tetracaine for Corneal Abrasions

### CASE SCENARIO:

*47 year old man is playing Marco Polo in the pool with his daughters. He is accidentally hit in the eye and sustains a uncomplicated corneal abrasion.*

### Q:

IS THE USE OF TOPICAL 1.0% TETRACAINE FOR 24 HOURS SAFE AND EFFECTIVE FOR THE TREATMENT OF UNCOMPLICATED CORNEAL ABRASIONS?

**BOTTOM LINE**

Tetracaine appears safe for uncomplicated corneal abrasions and provides more effective pain relief than saline eye drops.

# Topical Tetracaine used for 24 Hours is Safe and Rated Highly Effective by Patients for the Treatment of Pain Caused by Corneal Abrasions: A Double-Blind, Randomized Clinical Trial.

## Waldman et al. Acad Emerg Med 2014

**P** Patients presenting to the ED of Southland Hospital in New Zealand with Corneal Abrasions (N = 116)

**I** Acetaminophen 500mg plus 1% tetracaine hydrochloride topical eye drops

**C** Acetaminophen 500mg plus placebo (saline eye drops)

**O** Primary Outcome Safety: Repeat fluorescein/slit lamp ED examinations at 48 hours, 1-week, and 1-month telephone interviews for corneal complications
Secondary Outcomes Pain: 100-mm VAS pain scores recorded every 2 hours while awake for 48 hours and patient perceived overall effectiveness with a numeric rating scale (NRS) of 0 – 10.

### EXCLUDED:

1. Injury > 36hrs before presentation
2. < 18 years of age
3. Previous eye surgery or cataracts
4. Wear contact lenses
5. Injury to both eyes
6. Suffering from infectious or chemical conjunctivitis
7. Grossly contaminated foreign bodies
8. Suffering from an ocular infection
9. Current herpes keratitis
10. Allergy to tetracaine
11. Injury requiring urgent ophthalmologic evaluation (i.e. Penetrating eye injuries, large corneal abrasions, or injuries causing a disruption of vision)
12. Unable to attend follow up at 48 hours

### Author's Conclusion:

*"Topical tetracaine used for 24 hours is safe, and while there was no significant difference in patient VAS pain ratings over time, patient surveys on overall effectiveness showed that patients perceived tetracaine to be significantly more effective than saline." (Waldman et al., 2014)*

## Background

Corneal abrasions are very common presentations to the emergency department and very painful. We have all been warned that topical anesthetics to take home should not be given to patients with corneal injuries. The fear is that these drops could delay/decrease healing, prevent recognition of eye foreign bodies, cause keratitis or worsen corneal symptoms.

Some of this information comes from animal models or local anesthetic injected directly into the anterior chamber of the eye for cataract surgery:

- Duffin RM, Olson RJ. Tetracaine toxicity. Ann Ophthalmol. 1984;16(9)836,838.
- Judge AJ, et al. Corneal endothelial toxicity of topical anesthesia. Ophthalmology. 1997;104(9):1373–1379.
- Guzey M, et al. The effects of bupivacaine and lidocaine on the corneal endothelium when applied into the anterior chamber at the concentrations supplied commercially. Ophthalmologica. 2002;216(2):113–117.

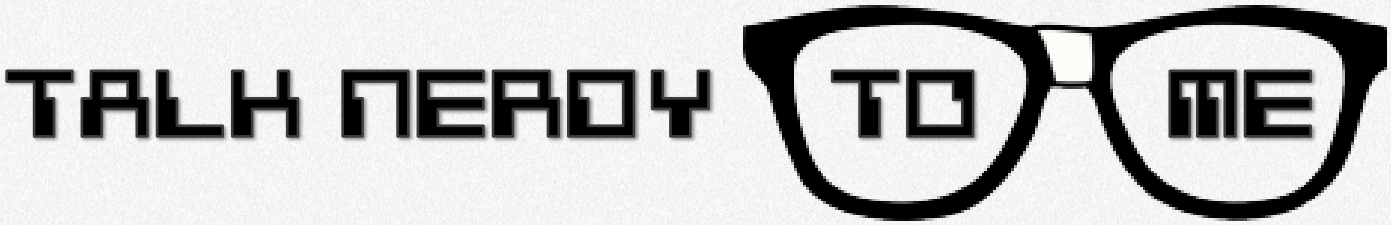
## Results

**Primary:**

- 48 hours: No statistical difference in healing identified by fluorescein uptake between the two groups
  - 20 patients had persistent symptoms (10/46 tetracaine vs. 10/47 placebo)
- 1 Week: Persistent symptoms in five patients (1 tetracaine and 4 placebo)
- 1 Month: No complications reported by either group

**Secondary:**

- No difference in 100mm VAS pain scores at a given time between the two groups
- Patient perceived effectiveness at 1 week (0- not effective and 10- completely effective)
  - Statistically difference (7.7 for tetracaine vs. 3.8 for saline group)




## Commentary

This was the largest randomized clinical trial to date (n=116) to evaluate the use of topical anesthetics for corneal abrasions. There was no significant difference in healing between the two groups. However, only 93 patients returned for the primary outcome of follow-up at 48 hours.

Another problem was the large number of patients with retained rust rings (13-tetracaine and 10-placebo). This was unanticipated and made it challenging to analyze the data.

The study was underpowered to detect a difference in efficacy between the two groups both in 100mm-VAS pain scale. This represents a common limitation to randomized control trials. They are powered for the primary outcome not for the secondary outcome. However, their goal was to look at safety and that did not show a difference at 48hrs, 1-week or 1-month.

Patients self rated their pain about 50/100 on the VAS. Within 12 hours both groups had dropped to below 10 and at 24 hours approached zero. This speaks to the amazing healing properties of the cornea and made it nearly impossible to show a clinically significant difference between the two groups at 48 hours.

In addition, the study may have been unblinded. Tetracaine causes some local irritation and patients commented on the drops burning like the tetracaine drops used in the initial ED evaluation. A placebo drop which caused mild local irritation could have been used rather than saline. This potential unblinding may have caused the secondary outcome of patient-perceived overall effectiveness to be inflated. Researchers could have simply asked participants which group they thought they were assigned.

Finally, patient compliance with drops was not recorded. This makes it unclear whether drops were used as instructed.

This data agrees with a couple other smaller studies looking at acute corneal injuries:

- Ting et al. Management of Ocular Trauma in Emergency (MOTE) Trial: A pilot randomized double-blinded trial comparing topical amethocaine with saline in the outpatient management of corneal trauma. J Emerg Trauma Shock, 2(1):10-14, Jan-April, 2009
- Ball et al. Dilute proparacaine for the management of acute corneal injuries in the emergency department. CJEM 12(5):389, September 2010

## RCT Quality Checklist

| | |
|---|---|
| The study population included or focused on those in the ED<br>Comment: These were all patients presenting to a regional ED in New Zealand | ☑ |
| The patients were adequately randomized<br>Comment: They used numbered sealed envelopes to randomize patients | ☑ |
| The randomization process was concealed<br>Comment: Both the authors and the patients were blinded | ☑ |
| The patients were analyzed in the groups to which they were randomized<br>Comment: Two arms 1% tetracaine vs. Saline eye drops | ☑ |
| The study patients were recruited consecutively (i.e. no selection bias)<br>Comment: Patient enrollment into the study could occur at any time during the day or night, 7 days a week and was dictated in part by staffing levels and demands on the department | ☑ |
| The patients in both groups were similar with respect to prognostic factors | ☑ |
| All participants (patients, clinicians, outcome assessors) were unaware of group allocation<br>Comment: Some patients commented on the fact that the drops they were using burned like the tetracaine used in the ED at their initial evaluation. This may have unblinded some physicians and some patients | ? |
| All groups were treated equally except for the intervention | ☑ |
| Follow-up was complete (i.e. at least 80% for both groups)<br>Comment: Only 70% of patients had 48 hour follow-up | |
| All patient-important outcomes were considered<br>Comment: Specifically pain relief and corneal complications | ☑ |
| The treatment effect was large enough and precise enough to be clinically significant<br>Comment: Twenty-three patients were removed from data analysis after 48 hour check up. This was due to retained rust rings, making the study underpowered to detect differences in corneal complications and pain scale evaluation. | |

## Case Resolution

You offer the Marco Polo playing dad some 1% tetracaine drips to use as needed every two hours for the next 24 hours. The drops sting and burn when used but make it much easier to get to sleep that night. He is seen in the emergency department for follow-up in 48 hours. The pain is gone and the abrasion has completely healed.

**CONCLUSION VS COMMENTARY**

**COMPARISON**

One small randomized control trial does not prove safety but it does help chip away at the myth that these drugs are toxic when used correctly.

## Clinical Application

Topical anesthetics are better at patient perceived pain relief compared to oral pain medications and saline eye drops. Evidence is not robust, but indicates when topical anesthetics are used appropriately, and for a short duration of time (24 hours) there are no corneal complications.

## WHAT DO I TELL MY PATIENT?

You have scratched your cornea. Here are some eye drops to help treat the pain. It is safe to use for 24 hours. Your vision is important so we have arranged to see you back in the emergency department in two days. Please come back earlier if you have increased pain, decreased vision or are otherwise concerned.

## References

Waldman, N., Densie, I.K., Herbison, P. (2014). Topical tetracaine used or 24 hours is safe and rated highly effective by patients for the treatment of pain caused by corneal abrasions: a double-blind, randomized clinical trial. Acad Emerg Med, 21(4): 374-382. PMID 24730399

**Guest Skeptic: Dr. Salim Rezaie**
An Assistant Professor in the Department of Emergency Medicine and Internal Medicine at the University of Texas at San Antonio. You may better know him from his website REBEL EM or twitter handle @srrezaie.

84

# SEASON TWO FINALE
## DON'T YOU FORGET ABOUT ME

This is the 42nd podcast of this year and the last for Season#2. Why only 42 episodes? Keeping with the Hitchhiker's Guide to the Galaxy, 42 seems like the right number. But don't panic, the SGEM will be back in the fall with new episodes.

The goal of the SGEM has always been to cut the knowledge translation window down from 10 years to 1 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. FOAM – Medical education for anyone, anywhere, anytime.

Season#2 has been very successful. The numbers of subscribers grew substantially. The program also improved significantly with the edition of the SGEM Journal Club and SGEM Classics.

The SGEM Classics was an excellent suggestion by Dr. Anand Swaminathan (Swami) who pointed out there are practice changing papers that were published before the SGEM started in 2012.

Swami and I did three classic papers this year including OPALS, NINDS and CRASH-2. If you have a suggestion for a SGEM Classic paper then send it to me (TheSGEM@gmail.com) to consider for Season#3.

# FIVE HIGHLIGHTS FROM SEASON 2…

1. Dr. Jeff Perry, lead author of the new Ottawa Subarachnoid HemorrhageTOOL (SGEM#48)
2. Dr. David Newman discussed Presidential Care (SGEM#47).
3. SGEM Journal Club at McGill University (SGEM#50) and McMaster University (SGEM#55)
4. Interviewing the Godfather of FOAM, Dr. Joe Lex (SGEM#77)
5. Presenting thrombolysis for acute embolic stroke controversy in Sweden

The SGEM had many guest skeptics who helped make the show much better. There were students, consultants, physiotherapist, pharmacist, nurse, residents, and a ranting paediatrician (Dr. Anthony Crocco).

Many of my guest skeptics are involved in their own knowledge translation projects. I asked a few of them to send me a audio clip of why you should listen to the SGEM and what was their favourite Season#2 episode.

| Expert | FOAM Project | Expert's Favourite Episode |
|---|---|---|
| **Eve Purdy (The Student)** | Manu et Corde | SGEM#68 – Sign, Sign Everywhere a Pediatric Vital Sign |
| **Jeremy Faust (The NYC Resident)** | FOAMCast | SGEM#72 – Tiny Bubbles (#FOAMed and #MedEd) |
| **Lauren Westafer (The Short Coat)** | The Short Coat | SGEM#77 – Take the Hashtag, Leave the Classroom |
| **Brent Thoma (The Boring EM)** | BoringEM | SGEM# 64 – OPALS; SGEM#70 – NINDS and SGEM#80 – CRASH-2 |
| **Erich Hanel (The BEEM Team)** | | SGEM#51 – Home (Discharging Patients with Acute PE Home from the ED) |

| Expert | FOAM Project | Expert's Favourite Episode |
|---|---|---|
| **Katrin Hruska** | None | Could not pick just one |
| **Salim Rezaie (The Rebel)** | REBEL EM (Rezaie's Evidence Based Evaluation of Literature in Emergency Medicine) | SGEM#54 – Baby It's Cold Outside (Pre-Hospital Therapeutic Hypothermia in Out of Hospital Cardiac Arrest |
| **Anand Swaminathan (The Swami)** | REBEL Cast | SGEM#56 – BEEM Me Up (Impact Factor in the Age of Social Media) |
| **Steve Carroll (The EM Basic)** | EMBasic (Your Boot Camp Guide to Emergency Medicine) | SGEM#57 – Should I Stay or Should I Go (Biphasic Anaphylactic Response) |
| **Chris Carpenter (The Brain)** | WashU EM Journal Club | SGEM#72 – Tiny Bubbles (#FOAMed and #MedEd) and SGEM#77 – Take the Hashtag, Leave the Classroom (Pro #FOAMed Argument) |

## FINAL THOUGHTS...

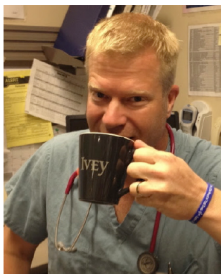
I will be taking the summer off to reflect, recharge and improve the SGEM for Season#3. Jeremy and Lauren I promise there will be no jumping of sharks.

The SGEM will return this fall with more critical reviews and classic papers. I hope to get a few new guest skeptics on the program including Rob Orman from ERCast.

I am also working on some exciting new projects that will make the SGEM even FOAMyer and cut that knowledge translation window down even further.

If you are in the northern hemisphere enjoy the rest of the summer. If you are listening in the southern hemisphere I hope you have a great winter.

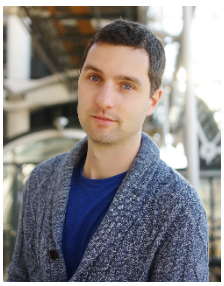
# ABOUT THE AUTHORS



**Ken Milne, MD, MSc, CCFP-EM, FCFP, FRRMS**
Dr. Milne is the Chief of Staff at South Huron Hospital in Exeter, Ontario, Canada. He has been doing research for over 30 years publishing on a variety of topics. He is passionate about skepticism, critical thinking and medical education. He is the creator of the knowledge translation project, The Skeptics' Guide to Emergency Medicine. When not working he is trying hard to be an endurance athlete. Dr. Milne is married to Barb and has three amazing children.

**Christopher Carpenter, MD, MSc, FACEP, FAAEM, AGSF**
Dr. Carpenter is the Director of EBM for the Division of EM Medicine at Washington University in St. Louis. He is the Chair of the SAEM EBM Interest Group and ACEP Geriatric Section. He is Associate Editor of Academic Emergency Medicine, as well as Associate Editor of Annals of Internal Medicine's ACP Journal Club. He co-authored the textbook "Evidence-Based Emergency Care: Diagnostic Testing and Clinical Decision Rules, 2nd Edition". Dr. Carpenter lives in St. Louis, Missouri with his wife, two children, and wonder-dog and is an avid St. Louis Cardinals fan.

## Editors:



**Robert Clayden, MSc**
Mr. Clayden is a second year medical student at University College Dublin in Dublin, Ireland. He is extremely excited to be involved with the editing of SGEM: Season 2 because he has a strong belief in the enormous impact of FOAMed for international medical students. He aspires to use future FOAMed projects to focus on remote health education projects for clinicians, students, and their communities. Outside of medicine he is an avid golfer and passionately cheers for the Toronto Maple Leafs.

**Teresa Chan, HBSc, BEd, MD, FRCPC**
Dr. Chan (@TChanMD) is an assistant professor at McMaster University, and a firm believer in the #FOAMed movement. She is a contributor and editor for a number of FOAM resources including ALiEM.com, BoringEM.org, and EMCases Journal Jam. She is also very interested in teaching evidence-based medicine. Dr. Chan's areas of interest include continuing professional development, knowledge translation & implementation science, and social media teaching & learning.