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Fall 2019 Issue

# The Fast Track

## ANTHOLOGY

# The Fast Track

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**an·thol·o·gy**
**anˈTHäləjē/**
***noun***

**a published collection of poems or other pieces of writing**

*The Fast Track* has evolved over the years, from its humble beginnings as a paper newsletter to its current interactive online platform. *The Fast Track* is a medium for all emergency medicine residents and students to share insights into the field, including recent case reports, up-to-date journal article reviews, and thoughtful opinion pieces. As *The Fast Track* transitioned to an online format, we wanted to maintain a piece of the printed history with an annual anthology, a collection of the most poignant and most viewed articles published throughout the year. In this way, the authors are commended on their dedication to the specialty, and our readership has another avenue with which to be informed of relevant topics in the field.

For those interested in joining the edification of the specialty, *The Fast Track* accepts submissions on a quarterly basis. The residents and students on the editorial committee are available to aid the writing process from brainstorming to editing. Get published in our next edition!

We present to you the second edition of *The Fast Track Anthology*, a compilation of the 2018-2019 "best of" submissions. Enjoy!

INTERESTED IN CONTRIBUTING?
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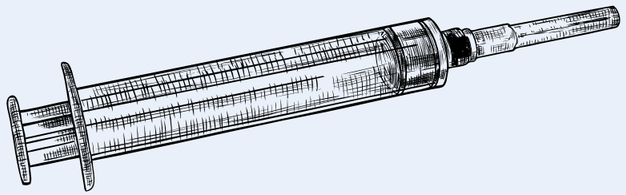
# “Just Get the Flu Shot!”

## UPDATE OF INFLUENZA PREVENTION AND TREATMENT

Andrew Leubitz, DO, MBA
Good Samaritan Hospital Medical Center



### Influenza in the Emergency Department

It happens at least once per shift, sometimes it seems like every other patient presents this way… a new patient pops up on the board, a 20 or 30-something year old whose chief compliant is “everything hurts.” It’s January and you already have a good idea of what’s going on. “Doc, I feel terrible, it started all of the sudden three days ago. I have a fever, chills, I’m nauseous… I just feel miserable.” Casting a wide differential, you order labs and start IV fluids. Of course, your flu swab comes back positive. When you inquire about vaccination status, “I don’t believe in getting the flu shot, it never works. Just a way for big pharma to get rich…” You have to fight the urge to argue with him because you have 10 other patients to see and you just finished talking to an anti-vaxxer mom without success, about the importance of antibiotics for her child’s complicated pneumonia. His labs, chest x-ray, come back normal, the power of normal saline and ondansetron win again and he is feeling better. As you prepare to discharge him with a diagnosis of influenza A, he asks for a prescription for “The Tamiflu pill I saw on TV, and an antibiotic.” You explain antibiotics are ineffective for the flu, and he is outside the window for Tamiflu. You encourage hydration and rest, and prescribe oral ondansetron for his nausea, and as he is leaving, he asks for a work note for the next couple days.

This cycle of influenza in otherwise healthy people had me thinking over this flu season. Influenza can affect people in a wide spectrum and there is definitely a time and patient population where hospital treatment for influenza is appropriate, however I cannot help but to think, “Why are all of these people not getting the flu shot?’ The focus of the anti-vaxxer movement has become popularized by a subset of people who have transformed legitimate personal questions of vaccination hesitancy into a malignant form of one of the worst public health debacles in the 21st century. It seems that we are so busy fighting for people to simply get their children the vaccinations they need, that we do not have the mental energy to argue with them when talking about their reasons not to get their annual influenza vaccination. My question is simply, “why not?” and “what would the next flu season look like if heard immunity took place, and we had a majority of people vaccinated against the next strain of influenza?”

### The Stats

Come late October, early November, emergency departments across the country prepare themselves. We know that with winter, ‘Influenza is coming.’ The true incidence of influenza cases reported annually is difficult to calculate due to the wide spectrum of disease, reporting models, and number of patients who seek medical care, however the CDC does a reliable estimate of the burden of influenza in the population. In the 2017-2018 season, an estimated 48.8 million people, about 15% of the population, in the United States contracted influenza, 22.7 million went to a health care provider, 959,000 were hospitalized and 79,416 died from complications due to influenza, including 618 pediatric patients.[1]

Most people who contract the flu know it. They feel miserable. They have the classic fever, chills, body aches, and





there is not enough chicken noodle soup in the world to warm them up. That might be rough enough on a patient alone, but according to NIOSH, employees in the United States miss approximately 17 million work days and over $7 billion a year due to influenza.[2] Surprisingly, only an estimate of a mere 37.1% of adults received the influenza vaccination annually, half of what the Healthy People 2020 model states is needed for effective prevention of the flu.[3] The goal of a 70% US adult vaccination rate estimates a reduction of roughly two million cases of influenza annually.[3]

What is it about the influenza vaccination that so many people just cannot seem to get on board with?

### Flu Vaccination

The influenza virus is an 8-segmented, single stranded RNA orthomyxovirus, containing two major surface glycoproteins, hemagglutinin (HA) and neuraminidase (NA).[3] This “Step-1” science jargon is extremely important and is what separates the flu shot from vaccinations like the MMR or Tdap vaccinations. The fact that the virus is a segmented virus is why we have to keep telling our patients to get an annual flu shot as those segments are constantly changing and certain strains will hit different geographic areas harder and at different times of the 16-week average influenza season.[5]

In order for vaccination producers to make the “right” vaccination and enough supply, data is constantly collected and reviewed by the WHO and the FDA who decide, based on surveillance data, which mix of three or four influenza viruses subtypes are likely to be most prevalent for the next year. The WHO relies on influenza research from five WHO centers located in Atlanta, London, Melbourne, Tokyo, and Beijing. Each year in February, the WHO takes the data and reports a recommendation for specific viruses for inclusion, then each country makes their final recommendations. In the United States, the FDA’s advisory committee makes the final decision- manufactures have approximately 6-months to ramp up vaccination production, be it in chicken eggs or in cell cultures.[6]

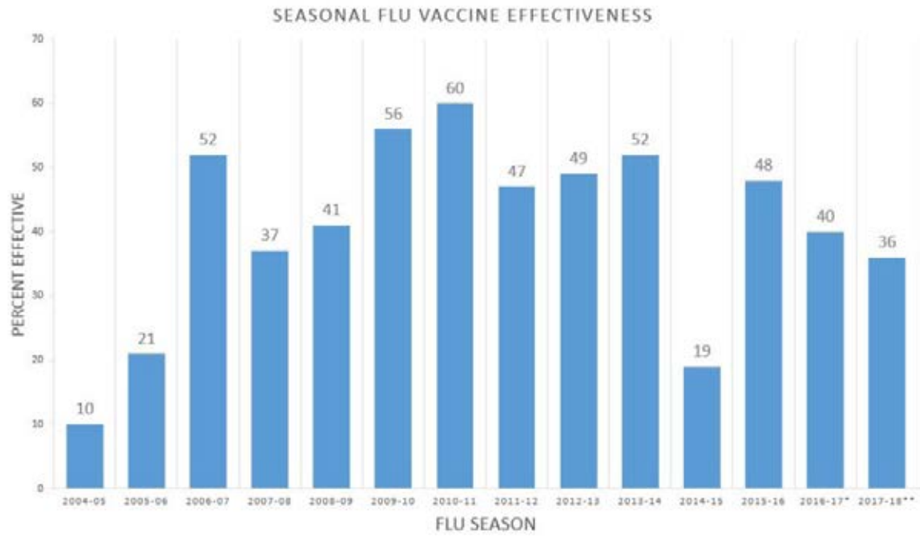



**Figure 1:** Seasonal Influenza Vaccine Effectiveness, 2004-2018, Centers for Disease Control and Prevention

## Marketing of the Flu Vaccination

To many patients, it sounds like through our best efforts, we are still playing a game of Whack-a-Mole with influenza every year. Unlike other pediatric vaccinations, the effectiveness of the seasonal influenza vaccination fluctuates yearly. From a mere 10% effectiveness in 2004-2005, to 60% in the 2010-2011 season.[7] With these statistics in mind, it is no wonder that people are skeptical of getting an annual shot that may not actually help them prevent the flu. Why go through the hassle?

**TO MANY PATIENTS, IT SOUNDS LIKE THROUGH OUR BEST EFFORTS, WE ARE STILL PLAYING A GAME OF WHACK-A-MOLE WITH INFLUENZA EVERY YEAR. UNLIKE OTHER PEDIATRIC VACCINATIONS, THE EFFECTIVENESS OF THE SEASONAL INFLUENZA VACCINATION FLUCTUATES YEARLY.**

It is simply very hard to prove a negative and to change the minds of a concrete-thinking patient who says to you (and these are real things patients have said to me): "Vaccines contain aborted fetuses. Vaccines do not work. Vaccines can cause paralysis." And of course, "I don't want to hurt my child with a shot."

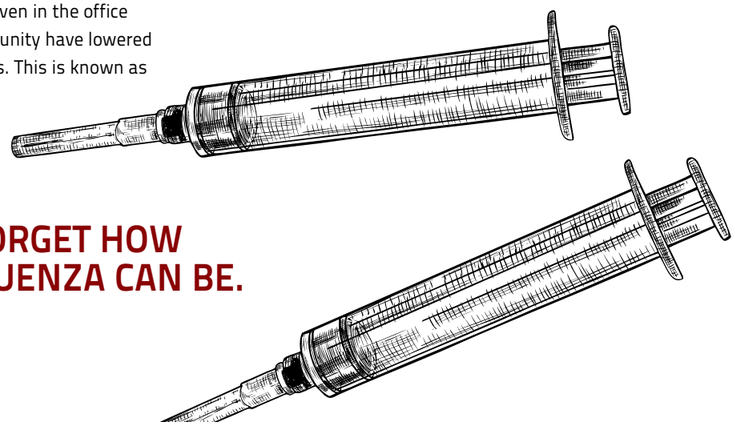
It has been 100 years since the 1918 Spanish Flu pandemic, which affected one-third of the global population, killing 20-50 million people including approximately 675,000 Americans.[8,9] So many people forget how catastrophic influenza can be.

While I do not have the answer to the question of why the flu vaccination is deemed less important than others, one theory is found in an economics 101 book. In our efforts to make the flu shot more widely available, by having it advertised everywhere from your primary care doctor's office, to the corner drug store, the grocery store, and even in the office breakroom, we as the public health community have lowered its value in the perceptions of our patients. This is known as the "scarcity principle," low supply equals higher demand, and the reverse, high supply equals lower demand, and thus a perception of less importance. It is possible that the solution to make this life-saving public health miracle more available, has actually hurt its own cause?

On a side note but related economic interest, the 2019-2020 cost per influenza vaccination is between $16-24, and it is usually free to the patient depending on their insurance.[9]

## An Update in Treatment for Influenza

For years, oseltamivir, or the brand name, "Tamiflu" a neuraminidase inhibitor and approved by the FDA in 1999, was the only game in town. In a 2014 systematic review of the drug, it reduced time of symptoms by an average of 16.7 hours in adults and 29 hours in children.[10] Unfortunately, the limitations are that it is only shown to be effective if taken within the first 48 hours of symptoms. However, there was a concern for many patients with significant side effects of increased nausea, vomiting, headaches, and neuropsychiatric symptoms.[10,11] The price of the drug is also not in the generic $4 list that we try to use with antibiotics if we can, because, like it or not, for our patients, price is often the limiting factor on whether they pick up their prescription. Per GoodRx, the price of oseltamivir ranges from $48.88-126.74 depending on retailer, insurance, and coupon code.



**SO MANY PEOPLE FORGET HOW CATASTROPHIC INFLUENZA CAN BE.**





The new kid in town, Baloxavir Marboxil is in its phase 3 trail, or CAPSTONE-1 trail and was recently featured in the New England Journal of Medicine. The trail is showing that the viral count of influenza in the baloxavir population went to zero approximately 48 hours faster when compared to the oseltamivir population. Additionally, symptomatic relief of influenza was decreased by about 24 hours in the baloxavir group, compared to the standard oseltamivir group.[12] It will be interesting to see how the third phase of the trail turns out and if the side effect profile can be improved.

## Final Thoughts

Influenza will continue to be a headline disease in the emergency department every winter. While it is appropriate for most patients to be discharged with a prescription for a day or two of rest and their grandmother's chicken noodle soup, there is a significant number of patients where antiviral therapy is appropriate and should be discussed with shared medical decision-making.

The current and upcoming influenza antivirals on the market are far from perfect and guidelines are changing, but currently it is still recommended that only those presenting within 48 hours should be prescribed the drugs and even then, they still have significant side-effect profiles.

The best thing we can do for our patients is to try and encourage disease prevention with vaccinations. Whether that's working with public health departments to push for vaccination programs, administration of the flu vaccination in the ED in the months leading up to flu season, or simply talking about disease prevention in the discharge instructions, all of these procedures can help to alleviate the burden of disease from influenza in your community and emergency department come next flu season.

## Citations

1. "Influenza (Flu)." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 18 Dec. 2018, www.cdc.gov/flu/about/burden/2017-2018.htm#table1.

2. "CDC – Seasonal Influenza (Flu) in the Workplace – NIOSH Activities – NIOSH Workplace Safety and Health Topic." Centers for Disease Control and Prevention, *Centers for Disease Control and Prevention*, www.cdc.gov/niosh/topics/flu/activities.html.

3. "2 Million More Flu Cases Could Be Avoided by Hitting National Target." *Healio*, April 17, 2018. www.healio.com/infectious-disease/influenza/news/online/{afee050d-cae8-4c61-ae78-8d357b760f32}/2-million-more-flu-cases-could-be-avoided-by-hitting-national-target.

4. Gao, Qinshan, et al. "A Seven-Segmented Influenza A Virus Expressing the Influenza C Virus Glycoprotein HEF." *Journal of Virology*, American Society for Microbiology Journals, 1 July 2008, jvi.asm.org/content/82/13/6419.

5. "Influenza Picking Up Speed Across US." *Medscape*, 31 Dec. 2018, www.medscape.comviewarticle/907108?nlid=126950_1361&src=WNL_mdplsnews_190104_mscpedit emed&uac=214678BR&spon=45&impID=1852145&faf=1.

6. "Influenza (Flu)." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 4 Sept. 2018, www.cdc.gov/flu/about/season/vaccine-selection.htm.

7. "Influenza (Flu)." *Centers for Disease Control and Prevention, Centers for Disease Control and Prevention*, 8 Mar. 2019, www.cdc.gov/flu/professionals/vaccination/effectiveness-studies.htm.

8. "Spanish Flu." *History.com*, A&E Television Networks, 12 Oct. 2010, www.history.com/topics/world-war-i/1918-flu-pandemic.

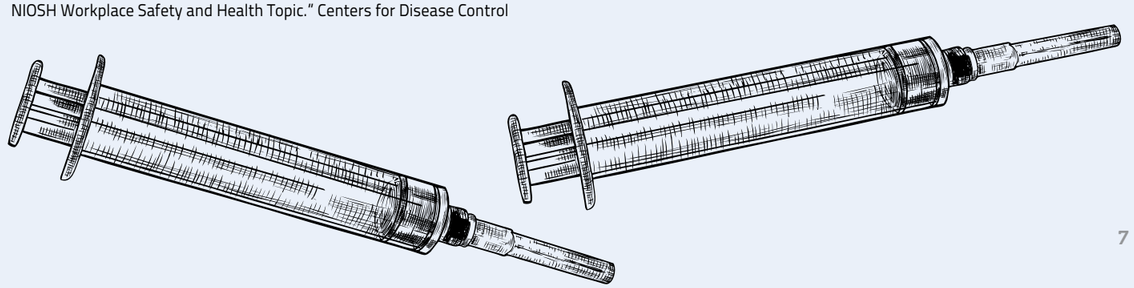
9. "Remembering the 1918 Influenza Pandemic | Features | CDC." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, www.cdc.gov/features/1918-flu-pandemic/index.html.

10. "Vaccines for Children Program (VFC)." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 1 Mar. 2019, www.cdc.gov/vaccines/programs/vfc/awardees/vaccine-management/price-list/index.html.

11. Jefferson T et al. Oseltamivir for Influenza in Adults and Children: Systematic Review of Clinical Study Reports and Summary of Regulatory Comments. BMJ 2014. PMID: 24811411

12. Rezaie, Salim. "The Tamiflu Debacle." *REBEL EM – Emergency Medicine Blog*, 24 Oct. 2018, rebelem.com/the-tamiflu-debacle/.

13. "Baloxavir Marboxil for Uncomplicated Influenza in Adults and Adolescents | NEJM." *New England Journal of Medicine*, www.nejm.org/doi/full/10.1056/NEJMoa1716197.



# Ultrasound
## in The Emergency Department

### Stones and Abdominal Groans

Scott M. Goodwin, OMS-4, ENS, MC, USNR
West Virginia School of Osteopathic Medicine


**Figure 1.2**[2] Demonstrates the short axis view of a curve-linear probe in the mid-axial line of a 26-year-old female with acute onset of flank pain. Notice the dilation of the renal collecting system or hydronephrosis (arrow) associated with an obstructing ureteral calculus.

## CASE

A 26-year-old female, G1P1, presents to the ED with right flank pain of three hours duration. The pain radiates to the right lower quadrant and is intermittent and sharp in nature. The pain is associated with nausea and two episodes of vomiting. However, the patient denies any fever or chills. She denies any dysuria, vaginal bleeding, trauma, or any possibility of being pregnant. The patient has no past medical history including any previous abdominal surgeries and admitted only to the use of a contraceptive implant. She denies the use of tobacco and illicit drugs, but admits to the use of ethanol on occasion. On physical examination, the patient appears to be in moderate distress and has reproducible right flank pain. Initial labs including CBC, CMP, and B-hCG are unremarkable with the exception of microhematuria on UA. The findings of a bedside ultrasound are displayed in figures 1.1-1.2

## DISCUSSION

In previous years, ultrasound has merely been an ancillary imaging study for most ED physicians. However, with the development of fellowships across the country, ultrasound is quickly becoming standard of care amongst the emergency medicine community, particularly as an initial diagnostic modality. Advantages include availability at the bedside, low cost, no radiation exposure, and no known side effects. Major disadvantages include user reliability. As related to nephrolithiasis, ultrasound has its highest utility in detecting complications of stones such as hydronephrosis (sensitivity 78% for stones < 5mm and 90% for stones >5mm). It is also successful at detecting large stones as well as stones in the proximal and distal ureter. There are limitations visualizing small stones as well as stones in the middle third of the ureter.[2]


**Figure 1.1**[1] Demonstrates the suprapubic transverse view of a curve-linear probe in a 26-year-old female with acute onset flank pain. Notice the highly echogenic structure on the left side of the image representing an 8.7cm distal ureteral calculus (thin arrow) just proximal to the bladder (star). Notice also the echogenic shadowing (thick arrow) of the associated stone located just lateral to the uterus(circle).

One study which compared ultrasound performed by emergency medicine physicians to a standard dose abdominopelvic CT scan demonstrated a 54% sensitivity of ultrasound to detect stones vs. an 88% sensitivity of CT scan. However, the rate of importantly missed diagnoses resulting in complications was comparable between the two groups and the cumulative radiation exposure after six months was approximately 70% higher with initial CT. [3]

Ultimately, the utility of ultrasound is in its ability to rapidly detect pathology and assist physicians in early clinical decision making. Although ultrasound does have limitations compared to CT scan, when used as a screening tool in conjunction with CT imaging, it can be a safe and cost-effective tool for emergency physicians. Specifically, with regards to renal calculi, ultrasound should be first utilized to inspect for hydronephrosis and large stones in the proximal and distal ureters, and be used with the understanding that further testing with CT scans may be warranted due to its limited ability to detect smaller stones and other subtle findings.

When considering the disposition of patients with nephrolithiasis, it's imperative for the emergency physician to consider the absolute indications for admission including signs of AKI and sepsis, intractable pain and vomiting, single or transplanted kidney, advanced age and hypercalcemic crisis. [4]

## DISPOSITION

In the ED, the patient receives 1L of Normal Saline and a CT scan is not performed. Additionally, she is given IV pain medication including 30mg Toradol and 50mcg Fentanyl as well as 4mg Zofran IV for her nausea. Upon reevaluation, in the ED the patient is pain-free and capable of tolerating PO and is discharged home with oral Norco and a urology follow-up. Appropriate return precautions are addressed including the development of fever, continued or worsening vomiting and pain.

## REFERENCES

1.Morales-Torres, J. Doctors Hospital Images. Columbus, OH. May 2018.

2.Manthey, D. Nicks, B. Urologic Stone Disease: Tintinalli's Emergency Medicine A Comprehensive Study Guide. 8th Edition. McGaw-Hill Education; 2016. Page 611

3.Curhan, G. Aronson, M. Preminger, G. (2018). Diagnosis and Acute Management of Nephrolithiasis in adults. Lam, A. Lee, S. UpToDate. Retrieved Oct 3, 2018 from https://www.uptodate.com/contents/diagnosis-and-acute-management-of-suspected-nephrolithiasis-in-adults?search=Ultrasound%20emergency%20medicine%20kidney%20stones&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

4.Manthey, D. Nicks, B. Urologic Stone Disease: Tintinalli's Emergency Medicine A Comprehensive Study Guide. 8th Edition. McGaw-Hill Education; 2016. Page 613

# DEATH
## AS A HEALTHCARE PROVIDER

Taylor Klein, OMS-II, NRAEMT
AZCOM

**I'd be surprised to encounter someone working in healthcare who doesn't remember their first experience with death. We are taught that it's inevitable; we can't save everyone. We know that we will eventually encounter patients who are beyond the help of medical intervention. We are told to internalize that it isn't our fault. Guidelines exist for delivering the sad news to family members. We know how we are supposed to react, but we don't really know how we will react.**

I can tell you the exact date of the first patient I lost. I can also tell you about how overwhelmingly unprepared I felt. I was an EMT-Basic student on my first shift riding along on the rig and toned out for the second call of that shift. It was my second call ever! We knew we were en route to a pulseless, non-breathing patient. I vividly remember one of my preceptors turning to ask me if I knew CPR. I remember being assigned to chest compressions while my preceptors worked on more advanced interventions. I can still hear the IO drill, see the image of the vocal cords on video laryngoscopy, and remember the unsettling feeling of being relieved from my task by an automated CPR device.

I don't think I became aware of the patient's family until my hands were idle, but suddenly there they were. They were asking us repeatedly if their loved one was dead. I don't remember who eventually answered them, but it certainly wasn't me. I was shocked to silence, listening to one of our firefighters explaining that we were doing everything possible. I have two other striking recollections of this call. One, sitting in the captain's chair en route to the hospital watching the capnography reading. I was ventilating the patient when I was struck with the notion that the patient was not going to survive. Next, looking out the garage door of the ambulance bay watching as a family friend brought the patient's school-aged children. I hadn't even noticed them at the time; they were in the room during the entire incident. At this point, the patient had already been pronounced dead by the physician. We had continued life-saving efforts long enough for a nurse to bring in the patient's wife to say goodbye. The patient's wife was present for the time of death, and I had witnessed the hospital staff counsel her. It wasn't until seeing those children, at that moment, that the weight of being a part of the story of one of the worst days of that family's life settled over me.

**IT WASN'T UNTIL SEEING THOSE CHILDREN, AT THAT MOMENT, THAT THE WEIGHT OF BEING A PART OF THE STORY OF ONE OF THE WORST DAYS OF THAT FAMILY'S LIFE SETTLED OVER ME.**

Unfortunately, this wasn't the last patient I lost. I can no longer tell each individual story. Each has helped me improve on the skill set necessary to respond to such a situation. I've had mentors, colleagues, and experiences to learn from. While I now feel more confident in managing such a situation and my own reactions, I feel like I've never reacted perfectly. Now, as a medical student, it has become increasingly common to hear my peers discuss concerns about their own ability to handle such a situation and apprehension about their own possible reactions.

Delivering bad news is a common source of apprehension and different physicians have different preferred methods, but almost all use some components of the "ABCDE" method (Vandekieft , 2001) outlined in Figure 1.

| | |
|---|---|
| A | Advance Preparation |
| B | Build a Relationship |
| C | Communicate Well |
| D | Deal with Family Reactions |
| E | Encourage and Validate Emotions |

**Figure 1.** ABCDE Mnemonic for breaking bad news (Vandekieft, 2001)

For students learning this method, it provides an excellent outline for communication with families and setting expectations for such an encounter. However, it provides little in the way of how to manage your personal reaction to the loss.

As future or current healthcare professionals, we have a responsibility to manage our own reactions in such a way that we can continue with our daily tasks and provide the best possible care to our other patients. Finding yourself in this situation for the first time can be hard. Especially for those new to healthcare, it is not uncommon to hear how they should not be so affected by a patient's death as they were neither friend nor family. While perhaps we wish that were true, it fails to consider the compassion that we feel for our patients and their families. It is impossible for me to look at my peers now and predict just how hard it will be for each individual. Grief looks different on every person. The best advice I can give to anyone is to forgive yourself for being human. Your grief does not make you bad at your job, and it does not mean you are failing. It means that you care. Try not to forget about your responsibility to take care of yourself. Also, don't underestimate the value of talking and asking questions of your colleagues and mentors if you find yourself needing guidance. Learning how to handle your personal feelings in the way that is best for you can be a challenge but is a necessity in order to continue providing the best care possible to your patients.

## References

Vandekieft, G. K. (2001). Breaking Bad News. American Family Physician, 64(12), 1975–1979. American Academy of Family Physicians. Retrieved July 2, 2018, from https://www.aafp.org/afp/2001/1215/p1975.html

# Substance-Induced Psychosis
## IN THE EMERGENCY DEPARTMENT

Kara Smith, OMS IV

### CASE PRESENTATION

**A 32-year-old Caucasian man is brought to the emergency department by EMS after being found hiding naked in a tunnel of a nearby playground. EMS reports he would not let anyone touch him en route. During your interview, the man stops tells you he shed his clothes because the FBI had put a tracer in the fabric. He is very fidgety and quickly becomes irritated when a nurse attempts to start an IV. On physical examination you note slight tremors, dilated pupils, and tachycardia.**

By combining the 2010 census populations of California, Washington State, Oregon, Hawaii, and Alaska, you approximate how many adult patients with psychiatric or behavioral emergencies in the United States accounted for emergency department visits between 1992 and 2001. The answer: 53 million. Two decades later, that number just keeps climbing. In North Carolina alone, from 2008-2010, the annual number of emergency department visits for mental health-related complaints increased by 17.7%.

Psychosis has been defined within the *Diagnostic and Statistical Manual of Mental Disorders, fifth edition* (DSM-5) as requiring the presence of hallucinations (without insight into their pathologic nature), delusions, or both hallucinations without insight and delusions. In the cause of the psychosis, however, lies one of the many nuances of medicine. When initially evaluating a psychotic patient, the starting diagnostic differential is extensive. An episode of psychosis may be due to a medical condition (most commonly) such as a vitamin or nutritional deficiency, central nervous system tumor, or endocrine abnormality, substance or medication induced, delirium or dementia, mood disorder-induced, or a true psychosis including such disorders as brief psychotic disorder or a disorder within the schizophrenia spectrum. All of these can be divided into primary causes (or "true" psychiatric disorders) or secondary causes (the "everything else" category). As a physician, understanding the potential underlying causes of a psychosis can lead to quicker diagnoses and more effective and efficient treatment for the patient.

The prevalence of psychosis in the emergency department ranges between 6%-25% based on reported prevalence of substance-induced psychosis, post-partum psychoses, and true psychotic disorders such as disorders on the schizophrenia spectrum. In some hospitals, the substance-induced psychosis rates are as high as 20% of all emergency department presentations. Illicit drug users show high prevalence of co-occurrence of mainly independent mood and anxiety psychiatric disorders which can, in turn, increase the likelihood of experiencing an episode of superimposed psychosis during their lifetime. Given this high prevalence, it is important to review the important substances and medications that are the most frequent causes of this psychosis.

**IN SOME HOSPITALS, THE SUBSTANCE-INDUCED PSYCHOSIS RATES ARE AS HIGH AS 20% OF ALL EMERGENCY DEPARTMENT PRESENTATIONS.**

**Alcohol –** While alcohol intoxication is not typically associated with psychosis, moderate to severe withdrawal can present with visual and tactile hallucinations—better known as Delirium Tremens. Delirium Tremens occurs in approximately 5% of alcoholics and is associated with a high mortality rate if not adequately identified and treated[5]. Additionally, long term effects of alcohol on the brain lead to syndromes such as Wernicke encephalopathy (acute, reversible depletion of intracellular thiamine) and Korsakoff psychosis/dementia (focal acidosis and cell death due to unresolved depletion of thiamine over time leading to irreversible damage to short term memory). Although both disorders are well described and frequently reviewed in medical education, acute psychosis has been reported as a result of Wernicke encephalopathy in unique circumstances such as post-gastric bypass surgery.

**Hallucinogens –** By definition, hallucinogens cause distortion, illusion and frank hallucinations. These hallucinations and distortions can be associated with panic, paranoia and delusional states. Approximately 7% of college students try marijuana at some point during their college career. In one study, of those that reported trying marijuana, approximately 15% reported going to or considering going to the emergency department. While rare, psychotic symptoms present as a result of cannabis intoxication in approximately 1% of users. In addition to the short-term consequences, recent reports show increased risk of persistent cognitive defects and schizophrenia-like psychoses as a result of long-term cannabis use. One Danish study goes so far as to suggest up to 44% of patients diagnosed with cannabis-induced psychoses later develop a schizophrenia-spectrum disorder.

**Dissociative drugs –** Phencyclidine (PCP), and its cousin Ketamine, cause dissociative and delusional symptoms which often lead to the characteristic violent behavior of intoxication. These symptoms, in additional to the disordered speech and disorientation that accompanies PCP intoxication, have been noted to mirror the positive and negative symptoms, as well as the cognitive defects of schizophrenia. It has been suggested that continuing use of PCP after intoxication with psychotic features is associated with higher incidence of psychosis with repeated use.

**Steroids –** After Cortisone's introduction in the early 1940s, first reports of psychiatric side effects began to emerge in the 1950s. Acute onset psychosis associated with corticosteroids commonly declares itself within the first week of treatment but can occur at any time. Prior psychiatric diagnoses have shown to be a predicting factor in those who develop steroid-induced psychotic symptoms. One study showed as high as 50% of patients with posttraumatic stress disorder had worsening of depressive aspects after corticosteroid use. Other evidence suggests a rate of 20-40% incidence of psychiatric features presenting with a mood disorder. Additionally, corticosteroid use was noted in many patients who presented with bipolar mood disorder and it has been suggested that the corticosteroid treatments activate the underlying mood disorder as later non-steroid induced episodes occurred.

**Amphetamines –** Most commonly seen with methamphetamines, temporary paranoid delusional states can be achieved after prolonged use; these may last weeks to years. Long term amphetamine use can lead to alterations of brain structure and function including concentration, memory, and sometimes psychotic symptoms. When evaluated over a lifetime, prevalence of substance-induced psychosis occurs in as high as 42% of cases. Methamphetamine psychosis can very closely resemble that of schizophrenia with an inability to determine if the auditory hallucinations are real.

**Inhalants –** The most commonly abused substance for school-aged children is the average household inhalant. In 2005, 72% of new volatile substance abusers were younger than 18 years old with a mean age of 16 years. Inhalants provide a quick-onset, short-duration high with minimal hangover or withdrawal symptoms. The most common symptoms associated with inhalant abuse include dizziness, diplopia, ataxic gait, and slurred speech. Visual hallucinations can occur with prolonged use and may be the symptom that brings these patients to the emergency department. Physical exam findings may also include mucous membrane involvement or irritation. Prolonged exposure to inhalants can lead to a demyelination of neurons leading to muscle weakness, tremor, dementia/memory loss, and mood changes. Diligent history taking is vital as a detailed substance use history from the patient may be one of the only indicators that suggest prolonged inhalant use.

Initial management of acute psychosis relies primarily on the presenting level of agitation. A review of treatment by Hillard in 1998 offered a succinct algorithm for the treatment of acutely psychotic patients that has remained applicable. As patient and provider safety are top priorities, Hillard first proposes verbal de-escalation of the patient. If this is unsuccessful, physical restraints may be utilized to allow for a thorough physical exam as cause of psychosis will ultimately determine treatment and disposition. If the patient continues to be agitated/hostile, a history of psychosis or use of antipsychotic medication should be considered. History directs the provider to consider use of antipsychotics prior to the use of benzodiazepines. If no history of psychosis exists, and the patient is not elderly, brain damaged, intoxicated with sedative hypnotics or has a known allergy to benzodiazepines —benzodiazepines may be used for sedation. If any of the previously mentioned conditions exist, the algorithm directs the provider to consider antipsychotics as the first line treatment.

Psychosis presents in many forms and can be the result of many causes. When treating psychosis in the acute setting, patient and provider safety are top priorities, followed closely by adequate evaluation to discover the cause of the psychosis. Many psychiatrists will admit that all too often, the most accurate psychiatric diagnoses are products of extensive history and development as symptoms continue to declare themselves over time. Evidence shows that psychiatric patients often receive less monitoring and care for their medical illnesses. Our patients deserve our best efforts each day, even if they have one of these potentially developing psychiatric diagnoses. There are many causes of psychosis—most of which are not a "true" psychiatric illness. As such, it is important to keep in mind other potential causes, including medications and substances of abuse.

**MANY PSYCHIATRISTS WILL ADMIT THAT ALL TOO OFTEN, THE MOST ACCURATE PSYCHIATRIC DIAGNOSES ARE PRODUCTS OF EXTENSIVE HISTORY AND DEVELOPMENT AS SYMPTOMS CONTINUE TO DECLARE THEMSELVES OVER TIME.**

Psychiatric patients aren't simply "mad people." According to the Cheshire Cat from Alice in Wonderland, "we're all mad here. I'm mad. You're mad." However, Lewis Carroll also reminds us that "the best people usually are."

## References

1. Larkin GH, Claassen CA, Emond JA, et al. Trends in US emergency department visits for mental health conditions, 1992 to 2001. Psychiatr Serv 2005;56:671–7.

2. Hakenewerth AM, Tintinalli JE, Waller AE, et al. Emergency department visits by patients with mental health disorders–North Carolina, 2008-2010. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm6223a4.htm. Accessed March 4, 2019

3. American Psychiatric Association DSM-5 Task Force. Diagnostic and statistical manual of mental disorders, 5th Edition (DSM-5). Washington, DC: American Psychiatric Association, 2013.

4. Fernandez-Quintana, A.; Novo-Ponte, A. ; Quiroga-Fernandez, C. ; Garcia-Mahia, M.D.C.; Substance-induced psychotic disorders in an emergency department; European Psychiatry, April 2017, Vol.41, pp.S203-S203

5. Thomas E Andreoli, Ivor Benjamin, Robert Griggs, Edward Wing. Cecil Essentials of Medicine, 8th Ed. Saunders Elsevier; Philadelphia PA, 2010.

6. G.L. Larkin, C.A. Claassen, J.A. Emond, A.J. Pelletier, C.A. Camargo. Trends in U.S. emergency department visits for mental health conditions, 1992 to 2001. Psychiatr Serv, 56 (2005), pp. 671-677

7. Sara G, Lappin J, Dobbins T, Dunlop AJ, Degenhardt L. Escalating patterns of emergency health care prior to first admission with amphetamine psychosis: A window of opportunity? Drug Alcohol Depend. 2017 Nov 1;180:171-177. doi: 10.1016/j.drugalcdep.2017.08.009. Epub 2017 Sep 6.

8. Marta Torrens, Gail Gilchrist, Antonia Domingo-Salvany, the psyCoBarcelona Group. Psychiatric comorbidity in illicit drug users: Substance-induced versus independent disorders. Drug and Alcohol Dependence. Volume 113, Issues 2–3, 15 January 2011, Pages 147-156

9. Thomson AD, Marshall EJ. The natural history and pathophysiology of Wernicke's encephalopathy and Korsakoff's psychosis. Alcohol and Alcoholism. 2005 Dec 29;41(2):151-8.

10. Worden RW, Allen HM. Wernicke's encephalopathy after gastric bypass that masqueraded as acute psychosis: a case report. Current surgery. 2006 Mar 1;63(2):114-6.

11. Arendt M, Rosenberg R, Foldager L, Perto G, Munk-Jørgensen P. Cannabis-induced psychosis and subsequent schizophrenia-spectrum disorders: follow-up study of 535 incident cases. The British journal of psychiatry. 2005 Dec;187(6):510-5.

12. Mathews EM, Jeffries E, Hsieh C, Jones G, Buckner JD. Synthetic cannabinoid use among college students. Addict Behav. 2019 Feb 11;93:219-224.

13. Krebs MO, Kebir O, Jay TM. Exposure to cannabinoids can lead to persistent cognitive and psychiatric disorders. Eur J Pain. 2019 Feb 21.

14. Arendt M, Rosenberg R, Foldager L, Perto G, Munk-Jørgensen P. Cannabis-induced psychosis and subsequent schizophrenia-spectrum disorders: follow-up study of 535 incident cases. The British journal of psychiatry. 2005 Dec;187(6):510-5.

15. Morris BJ, Cochran SM, Pratt JA. PCP: from pharmacology to modelling schizophrenia. Current opinion in pharmacology. 2005 Feb 1;5(1):101-6.

16. Zukin, S.R., and Zukin, R.S. Phencyclidine. In: Lowinson, J.H., Ruiz, P., Millman, R.B., and Langrod, J.G., eds. Substance Abuse: A Comprehensive Textbook. Baltimore: Williams & Wilkins, 1992. pp. 290–302.

17. Boland EW, Headley NE. Management of rheumatoid arthritis with smaller (maintenance) doses of cortisone acetate. J Am Med Assoc 1950;144:365–72.

18. Clark LD, Bauer W, Cobb S. Preliminary observations on mental disturbances occurring in patients under therapy with cortisone and ACTH. N Engl J Med 1952;246:205–16.

19. Brown ES, Suppes T, Khan DA, Carmody TJ. Mood changes during prednisone bursts in outpatients with asthma. J Clin Psychopharmacology 2002;22:55–61.

20. Dubovsky AN, Arvikar S, Stern TA, Axelrod L. The neuropsychiatric complications of glucocorticoid use: steroid psychosis revisited. Psychosomatics. 2012 Mar 1;53(2):103-15.

21. Sirois F. Steroid psychosis: a review. General hospital psychiatry. 2003 Jan 1;25(1):27-33.

22. Lecomte T, Dumais A, Dugré JR, Potvin S. The prevalence of substance-induced psychotic disorder in methamphetamine misusers: A meta-analysis. Psychiatry Res. 2018 Oct;268:189-192.

23. Substance Abuse and Mental Health Services Administration. Results From the 2005 National Survey on Drug Use and Health: National Findings. Rockville, MD: Substance Abuse and Mental Health Services Administration Office of Applied Studies; 2006. Publication No. SMA 06–4194. Available at: http://oas.samhsa.gov. Accessed March 4, 2019

24. Lorenc JD. Inhalant abuse in the pediatric population: a persistent challenge. Curr Opin Pediatr. 2003;15:204–209

25. Brouette T, Anton R. Clinical review of inhalants. Am J Addict. 2001;10:79–94

26. Williams JF, Storck M, Committee on Substance Abuse, Committee on Native American Child Health. Inhalant abuse. Pediatrics. 2007 May 1;119(5):1009-17.

27. Hillard JR. Emergency treatment of acute psychosis. J Clin Psychiatry. 1998;59 Suppl 1:57-60; discussion 61.

28. Stefan S. Emergency department treatment of the psychiatric patient: policy issues and legal requirements. New York: Oxford Press; 2006.

29. Newcomer JW. Metabolic considerations in the use of antipsychotic medications: a review of recent evidence. J Clin Psychiatry 2007;68(Suppl 1):20–7.



The Fast Track

Fall 2019

# Interviewing The Interviewers

Christina Powell, DO
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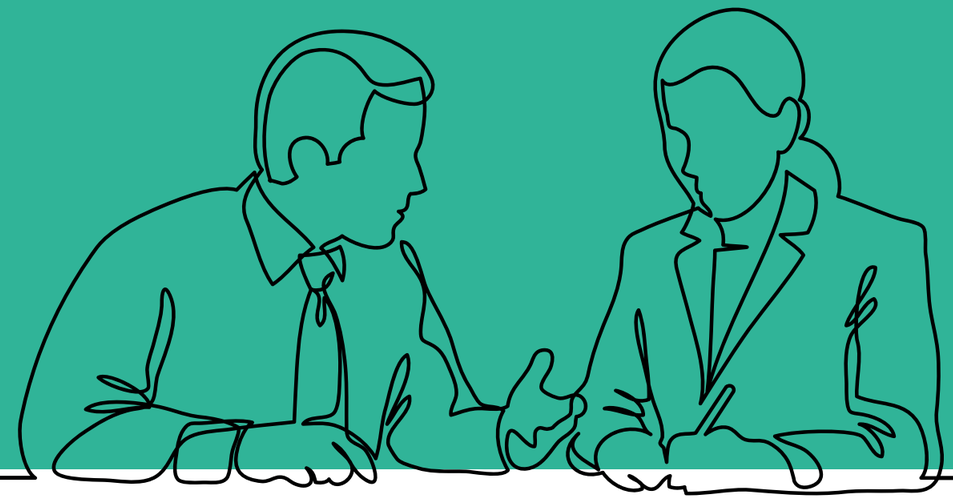
University of Maryland Medical Center, Class of 2022



**As we transition to yet another cycle of daunting applications, painfully edited personal statements, and hours waiting anxiously by the phone for interview offers to enter the email inbox, I thought it may be helpful to review the process for our budding fourth year medical students interested in applying to the competitive specialty of emergency medicine. I have interviewed Dr. Kaitlin Bowers, Chief Resident of Doctors Hospital Emergency Medicine residency program in Columbus, Ohio and Dr. Andy Little, producer of the infamous EM Over Easy podcast and core faculty at Doctors Hospital, on the interview process from last year's application season. Both physicians conducted interviews and were actively involved in the application process for their program. However, this time I'll be the one doing the interviewing...**

**Christina: Many students find the application and interview process daunting and overwhelming. Previous statistics show that applicants who rank 9 programs have a ~90% chance of matching in EM, and those with 12+ rankings have a 95-99% chance of matching.[1] Do you find these statistics to be true in your daily experience? How many programs do you advise your mentees to apply to in order to capture the 12 interviews necessary to meet these statistics?**

**Dr. Kaitlin Bowers (K):** This is a hard question to answer because there are a lot of variables that go into it. I agree you ultimately want around 10-12 interviews to feel confident that you will match. How many programs you should apply to get there depends on how good of an applicant you are and the type of programs you are applying to. Twenty-five to thirty programs you think you have a solid chance at getting an interview from is probably a good starting point. If you are applying to any "reach" programs I wouldn't count those in your numbers since getting an interview there would be an added bonus. Just keep in mind that if you end up getting 12+ interviews, be sure to decline any you are no longer interested in early so that other candidates can take your interview spot.

**C: Does the "early bird get the worm"? How important are early application submissions for interview invitations?**

**K:** The earlier a completed application is submitted, the sooner it will be reviewed. It is always advantageous to be on the earlier end of this process as there will be more interview spots and dates available. I would recommend writing your personal statement in January of your third year, it can be a long review process and seems to be a common hold up for not submitting the day ERAS opens. If your personal statement is done early there is a lot less for you to do in June when you are likely studying for boards and preparing for auditions. Also, remember that most programs will review your application, and some will even offer interviews prior to getting all of your SLOEs.

**Dr. Andy Little (A):** The adage holds true here. But remember that it is okay to submit an incomplete application. Many programs put applicants into piles. An interview now, a review once complete, and then interview applicants they like as soon as they get everything in. Many programs will also offer you an interview even if your application isn't complete, as they know it may take time for your SLOE's to get done and uploaded.

**C: What are some of the more important aspects of an individual's application that you look for when determining who will be interviewed, and who will not?**

**K:** Every program has their minimums that they filter applications by. Unfortunately, with the number of applicants that apply to our specialty this is unavoidable. Outside of that, we look a lot at applicants' experiences in emergency medicine. Has the applicant conducted any relevant EM activities (research, work experience, EMIG involvement, national conferences, shadowing, etc.)? If your application has red flags, be sure to explain them in ERAS or your personal statement. Lastly, a lot of medical schools encourage students to apply to a "back-up" primary care specialty. If you are going to do this, do not apply to two programs in the same hospital/health system, programs can see this and it makes us question if you are really interested in emergency medicine.

**A:** This is very program-specific, but the simple answer is YES. ERAS allows programs to filter your application via hundreds of different data points. Most will start with a minimum Comlex/USMLE score and go from there. The next factors again are very specific to the program, but usually include: SLOE comments, personal statements, and experience (whether it be research or real life).

**C: Are there any hard STOPS on an application or red flags that students should avoid?**

**A:** Failing exams, failing rotations. With how competitive EM has become, failing is no longer tolerated. That's not saying that you can't rebound, but say you fail a STEP, it better be seen as a "blip" followed by high (upper percentile) scores on any other test you take, and then you'll have to pray a program is willing to take a chance on you.

**K:** I know it isn't necessarily "on your application" but remember EM is a small world. Don't talk bad about other programs/faculty/residents as you never know who may be listening. Come prepared, show up early to shifts and stay late, be prepared for didactics, and take advantage of any extra opportunities on audition rotations. Also, work hard on off-service rotations, just because you aren't interested in that specialty doesn't mean you can't learn something, and this comes up in dean's letters. All of these things can negatively influence an application.

**C: Where do you get your interview questions from? What motivations reside behind some of the questions asked?**

**K:** Outside of the standard interview type questions most students expect to be asked, a majority of us come up with our own questions. Our program tends to ask a lot of questions about hobbies and wellness to get to know the candidates better. Remember getting an interview is the hardest step, once you make it to the interview it is just a matter of if you would be a good fit for the program. Relax and be yourself!

**A:** There are good resources from CORD and SAEM on possible interview questions as well as hands-off questions we encourage folks to look at. Otherwise we let faculty/residents ask what they want.

**C: What is one of the more humorous interview answers that you've received? Did it help this candidate to use humor, or did it harm their application?**

**K:** This is a tough question. The best thing you can do in an interview is BE YOURSELF! If humor is genuinely a part of who you are, then it will come across in your interview. It's human nature for people to try to use humor when they are nervous, and interviewers can sense that. The downfall is if you are just trying to be funny and crack jokes non-stop instead of taking the interview

questions seriously. There are certain scenarios like that where it can hurt you.

**A:** I had a student answer "where would you go right now if you could snap your fingers and go anywhere?" with the immediate answer being, "to Sprinkles, my cat, I miss my cat Sprinkles so much." Most other students mention going somewhere tropical (it was December in the Midwest) or historical. I wasn't ready for a cat answer. It made for a great post interview story, I don't think it helped or hurt the person.

**C: Personal statements: friend or foe? Are they important any longer? What advice do you have for individuals getting ready to prepare them this application cycle?**

**A:** I think people spend a lot of time trying to "wow" programs with their personal statement. I'm of the mind frame that we should remember that the favorite type of ice cream is vanilla. So, spend time making your personal statement about you, tell me something I can't find in the rest of your application.

**C: What does a traditional interview day look like at your program?**

**K:** A traditional interview day starts by going to dinner the night before with some of our residents. This is a great opportunity to really feel out the program, get some of your questions answered in an informal setting and likely gain insight into what you can expect on interview day. On interview day our applicants attend a portion of our didactics and a program overview lecture by either our PD or APD. After didactics there is a lunch with the residents and faculty that will be interviewing that day. The afternoon consists of multiple interviews with faculty and residents as well as a tour of our campus. We do have a slightly abbreviated format we use for end of rotation interviews.

**In 2018, the American College of Osteopathic Emergency Physicians Resident Student Organization (RSO) piloted on-site residency interviews. These interviews were offered as an alternate to the traditional interview days located at the host residency program. "On-site" interviews were held at ACOEP's Fall Scientific Assembly in Chicago. Residency programs were given a list of fourth year medical students who were registered to attend the conference. The programs could elect to offer those students a conference "on-site" interview during a specific block of time. Doctors Hospital participated in the "on-site" interview process. The following questions reflect the "on-site" interview process.**

**C: Did you feel like this form of "on-site" conference interview hindered the applicant in anyway? Does it benefit the applicant in anyway?**

**K:** Interviewing at ACOEP doesn't hinder the applicant in anyway. However, it is a very abbreviated interview day. Applicants only meet 2-3 representatives from our program and miss out having dinner with residents as well as observing our didactics. Also, if you have never been to Doctors Hospital or the city of Columbus you miss out on seeing where you may be spending your next four years. There are definitely financial benefits of not having to travel to the interview day. However, it seems most of conference interviewees end up coming for a second look day which would cancel out the initial financial benefit. If you would otherwise not be able to interview or if you have visited a program before and had interactions with their faculty/residents at conferences, then this may be a great opportunity for you. If not, you probably need to make the trip to gain insight into the program you will need when making your match list.

**C: Would you consider participating in on-site residency interviews again? Why or why not?**

**K:** We are considering participating again but won't make a final decision until our interview committee meets for the upcoming applicant cycle. As we've mentioned, this type of interview day tends to appeal more to applicants who have rotated at a program and don't want the added expense of flying back to interview. Now that we offer end-of-rotation interviews during the last week of rotations, most of those applicants will have already interviewed. This leaves a smaller pool of applicants to interview on-site at conference, many of whom want to visit our program and opted to interview in Columbus.

## References

1. National Resident Matching Program, Charting Outcomes in the Match for U.S. Osteopathic Medical Students and Graduates, 2016. National Resident Matching Program, Washington, DC. 2016.Emerg Med J. 2009 Apr;26(4):278-82.







# DON'T MISS THIS FRACTURE!

Brittany McShane, DO
Norman Regional Health System, Norman, OK


**13-year-old male fell on an outstretched hand skateboarding. He has tenderness at the base of his right thumb in the anatomic snuffbox.**

### What fracture would you be concerned about with the above history?

- You should be worried about a possible scaphoid fracture with tenderness in the anatomic snuffbox after falling on an outstretched hand.[1]

### What radiographic imaging should you get?

- Scaphoid series. Includes posteroanterior, oblique, lateral, and angled posteroanterior views.
- The PA and PA angled view should have the hand positioned in ulnar deviation to remove the scaphoid from the radius.[2]

### Why are scaphoid fractures at risk for avascular necrosis?

- Branches of the radial artery are the major blood supply entering the scaphoid from distal to proximal. Thus, a proximal fracture can easily damage the blood supply to the proximal scaphoid leading to avascular necrosis[1,2]

### How do you manage in the ED?

- Thumb spica splint holding the wrist in dorsiflexion and radial deviation.
- Orthopaedic follow up[1,2]

### What if you don't see a fracture on X-ray, but are still suspicious for a scaphoid fracture?

- 10% of initial radiographs fail at detecting a scaphoid fracture.[1] So if a patient has a normal X ray, but there is high suspicion you should place them in thumb spica and repeat imaging in about 2 weeks. You can also consider CT or MRI.[1,2]

## References

1. Tintinalli, J., Stapczynski, J., Ma, O., Cline, D., Meckler, G., & Yealy, D. *Tintinalli's emergency medicine* (8th ed., pp. 1801-1809). McGraw-Hill Education.

2. Knipe, Henry, and R Bronson. "Scaphoid Fracture | Radiology Reference Article." *Radiopaedia.org*, 2016, radiopaedia.org/articles/scaphoid-fracture.

# Bupropion:

## The "Poor Man's Cocaine"? A Case Report

Ryan A. Anderson, D.O.
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### CASE

**A 33-year-old male is brought to the emergency department after being found down in his bathroom. He is slightly confused but has normal vital signs. A white powder was found at the scene, and the patient claims he was snorting crushed up Wellbutrin pills.**

### DISCUSSION

Physicians are prescribing bupropion for several different indications, and it is becoming more ubiquitous in the community. It is marketed as an antidepressant (Wellbutrin®), smoking cessation aid (Zyban®), and dieting agent (Contrave®). It is also quickly becoming a popular drug of abuse. Some users describe the high similar to cocaine or methamphetamine, but with less intensity. This isn't surprising given the chemical structure of bupropion closely resembles that of methamphetamine. Bupropion is the only synthetic cathinone (a class of drugs commonly known as "bath salts") approved by the FDA. (Figure 1). Its mechanism of action is achieved through inhibition of norepinephrine and dopamine reuptake, and antagonism at nicotinic receptors. Due to its relatively low cost and ease with which it may be obtained, bupropion has been named the "poor man's cocaine."

The hallmark of bupropion toxicity is seizures. Seizures occur in a dose-dependent fashion and are even seen at therapeutic drug concentrations. Some poison databases have shown bupropion to currently be the most common cause of medication-induced seizures. Wellbutrin® comes in immediate-release (IR), sustained release (SR), and extended-release (XR). Both SR and XR formulations may cause delayed seizures and most patients require a 24-hour observation period following an intentional ingestion.

Insufflation or "snorting" bupropion is a recently described phenomenon, although it has already been seen within the Lehigh Valley community in Pennsylvania. Reported effects may include euphoria, tachycardia, agitation, hallucinations, and seizures. The nasopharynx contains a highly vascularized surface area that allows for drugs to readily enter systemic circulation. It is a common route of administration for other commonly abused drugs such as cocaine, heroin, and methamphetamine.

Lewis JC et al performed an observational study in 2014 describing 67 cases of isolated bupropion insufflation over an 11-year period using the California Poison Control System. The mean dose was 1500mg. The most common finding was tachycardia, with agitation and tremors also being commonly observed. Thirty percent of the patients in this study sustained prehospital seizures. Seizures typically occurred within eight hours which is more rapid than the delayed seizures reported following oral ingestions. The crushing of pills destroys the properties that enable a pill to be sustained-release or extended-release. Bupropion overdoses may cause significant cardiotoxicity as well, although this hasn't been yet reported with insufflation. All patients with bupropion exposures should have an EKG obtained.

### CASE CONCLUSION

The patient's partner arrives and is able to confirm that the patient experienced a tonic-clonic seizure approximately 15 minutes after bupropion insufflation. His mental status returns to baseline and he has a normal glucose, EKG, vital signs, and neurological examination. He is observed in the ED for eight hours and then discharged home with resources for drug counseling.

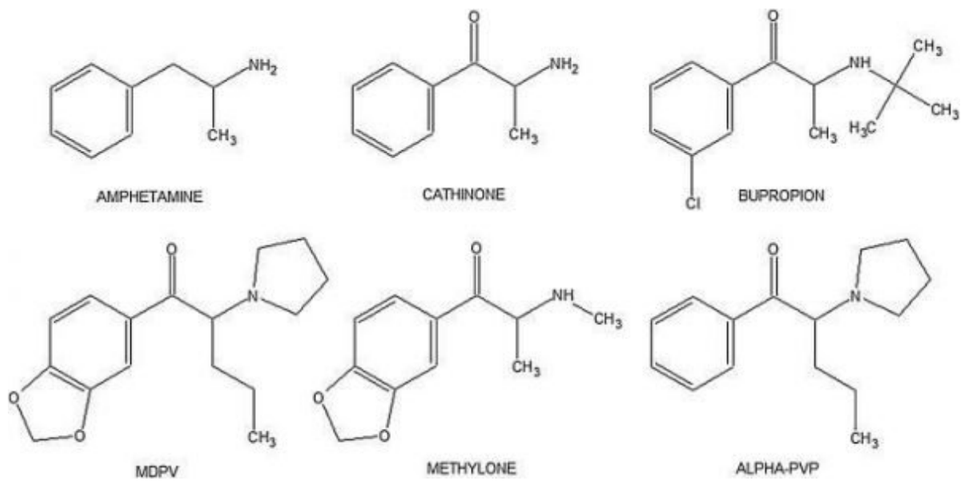


**Figure 1**

### References

British Columbia Drug and Poison Information Centre (BC DPIC), www.dpic.org/article/professional/focus-bupropion-toxicity-and-abuse.

Kriikku P, Ojanperä I. The relationship between bupropion and suicide in post-mortem investigations. Forensic Sci Int. 2016;266:343-348.

Hill S, Sikand H, Lee J. A case report of seizure induced by bupropion nasal insufflation. Prim Care Companion J Clin Psychiatry. 2007;9(1):67-9.

Welsh CJ, Doyon S. Seizure induced by insufflation of bupropion. N Engl J Med. 2002;347(12):951.

Thundiyil JG, Kearney TE, Olson KR. Evolving epidemiology of drug-induced seizures reported to a Poison Control Center System. J Med Toxicol. 2007;3(1):15-9.

Lewis JC, Sutter ME, Albertson TE, Owen KP, Ford JB. An 11-year review of bupropion insufflation exposures in adults reported to the California Poison Control System. Clin Toxicol (Phila). 2014;52(9):969-72.

# Ischemic Stroke in Pregnancy: Thinking Outside the Womb?

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## INTRODUCTION

The incidence of stroke is common—someone in the United States has a stroke every 40 seconds. In the management of stroke, expediency is key. Like the majority of hospitals, Kent Hospital has a stroke protocol in place, but this does not include an approach to stroke in the pregnant patient. Should the protocol be any different?

## CASE

A 37-year-old female who is eight weeks pregnant was brought in by ambulance to our community emergency department at 8:15am with slurred speech, right-sided facial droop, and right-sided arm and leg weakness. We had report from EMS that the patient was a Los Angeles Motor Scale (LAMS) of 5. The patient had been walking to the bathroom at 6:30am that morning when she experienced sudden-onset right-sided weakness and fell to the floor. The patient's last known normal was 6:30am. Emergency medical services (EMS) was notified by the patient's mother, who calls the patient every morning and was surprised to hear her 3-year-old granddaughter answer the phone.

The patient was eight weeks pregnant by last menstrual period and had a confirmed intrauterine pregnancy (IUP) by ultrasound. The patient had a past medical history notable for a complicated premature delivery of a fetus with trisomy 21 who expired at 6-weeks-old and a miscarriage six months prior to this pregnancy.

Her vital signs on arrival were temperature of 36.6 degrees, heart rate 86 beats per minute and regular, respiratory rate 16 breaths per minute, blood pressure 100/66 mmHg, and oxygen saturation 100% on room air. The patient was assessed immediately upon arrival, had dysarthria, right upper and lower facial weakness, right-sided upper and lower extremity weakness. Initial National Institute of Health Stroke Scale (NIHSS) was 7. Patient's fingerstick blood glucose was 86 mg/dL, other labs were within the limits of normal.

A code stroke was called, and the patient was rushed to have a computed tomography scan (CT) of her head without contrast and a CT for large vessel occlusion (CT ELVO) which includes a CT angiogram CTA of the head and neck. We contacted our region's comprehensive stroke center due to the patient's symptoms suggestive of a possible large vessel occlusion. As our patient was undergoing her CT scan, an interventional neurologist at the comprehensive stroke center was reviewing the images. CT head without contrast had no evidence of intracranial hemorrhage. The patient was found to have a possible M2 branch occlusion on CTA per the interventional neurologist and he advised us to transfer the patient immediately to his center 15 minutes away for evaluation and potential mechanical thrombectomy.

Our patient returned from CT scan and had a mild but noticeable improvement in her neurological deficits. She was transferred to the comprehensive stroke center and on arrival had drastic improvement in her neurological exam. The interventional neurology team decided against mechanical thrombectomy and IV thrombolytic therapy due to the patient's rapidly improving symptoms. The patient was started on low molecular weight heparin. Patient was discharged home with complete resolution of her neurological deficits and a viable IUP.

## CASE DISCUSSION

The pregnant patient is at an increased risk of stroke due to venous stasis, hypercoagulability in pregnancy, and pregnancy-related diseases including HELLP syndrome, eclampsia, and pre-eclampsia. Patients are at an even greater risk of stroke during the postpartum period. Management of stroke in the pregnant patient is complicated by concern for both the mother and the developing fetus, but the health of the mother should take precedent. The approach to such a patient should be multi-disciplinary including specialists from emergency medicine, obstetrics and gynecology, maternal-fetal medicine, neurology, and interventional radiology. American guidelines are scarce due to current evidence existing primarily in the form of case reports. The Heart and Stroke Foundation of Canada is the only group to have published consensus statements on acute management of stroke in pregnancy and prevention of recurrent stroke in pregnancy.

**THE PREGNANT PATIENT IS AT AN INCREASED RISK OF STROKE DUE TO VENOUS STASIS, HYPERCOAGULABILITY IN PREGNANCY, AND PREGNANCY-RELATED DISEASES INCLUDING HELLP SYNDROME, ECLAMPSIA, AND PRE-ECLAMPSIA.**

## DIAGNOSIS

**What would be your differential diagnosis for this patient?**

- Ischemic stroke
- Hemorrhagic stroke
- Eclampsia
- Pre-eclampsia
- HELLP
- Cerebral venous thrombosis (CVT)
- Hypoglycemia
- Complex migraines
- Carotid dissection
- Postpartum angiopathy

**What would you do first in this patient?**

- IV, O2, monitor, fingerstick blood glucose
- Vitals are extremely important to look for hypertension, which would increase your concern for eclampsia/pre-eclampsia.

Initial Labs: BMP, CBC, PT/INR, AST, ALT, Bilirubin, Serum hCG.
*None of these labs should hinder you from getting the patient to the CT scanner, including serum hCG.

## DIAGNOSTIC WORKUP

CT Head without contrast +/- CTA of the head and neck for severe disabling strokes where the symptoms are concerning for a large-vessel occlusion.[1] It is essential to advocate for a CTA if the patient may be a candidate for mechanical thrombectomy. Magnetic resonance imaging (MRI) can also be considered a first-line imaging modality in pregnant patients, but timely completion of the study is often a limiting factor. A European review recommends MRI without gadolinium as the preferred imaging modality for stroke in pregnancy as it has a greater sensitivity for detecting small infarcts, CVT, and cavernomas. Gadolinium should particularly be avoided in the first trimester due to its teratogenic effects. The time-of-flight series (non-contrast MR angiography or venography) would provide us with the most information but multiple societies agree that CT imaging should not be withheld if MRI cannot be performed in a timely fashion.[1,2] Each center is aware of their capabilities, and their stroke protocol should reflect that with a goal door-to-needle time of 60 minutes.

But what about the risk of radiation and contrast?

Exposure to a cumulative dose of less than five rads during pregnancy has not been shown to affect the outcome of a pregnancy compared to control populations.[3] One CT scan of the head is equal to <0.050 rads; therefore, it is of negligible risk to the developing fetus.[3] CTA exposes the fetus to <0.050 rads, but it does requires the use of IV contrast.[3] Contrast does cross the placenta but in such small amounts that no teratogenic effects have been reported to date.[1]

A great article to reference when discussing the risks of radiation can be viewed here.[3]

## TREATMENT

**1. Thrombolytics for Treatment of Ischemic Stroke in Pregnancy**

- IV Alteplase: 0.9 mg/kg
- 10% bolus over 1-2 minutes, 90% infusion over 1 hour

American Stroke Association: consider Alteplase in pregnancy when the anticipated benefits of treating moderate to severe stroke outweigh the risks of uterine bleeding [Class 2b; Level of evidence C].[4]

Canadian Stroke in Pregnancy Guidelines: consider Alteplase IV in a pregnant patient with disabling ischemic stroke who meets existing criteria for thrombolysis, in consult with a stroke specialist.[1]

Despite these guidelines, according to the American Heart Association/American Stroke Association (AHA/ASA) Get with the Guidelines database, we give IV tPA less frequently in pregnant/postpartum women compared to non-pregnant women, 4.4% vs. 7.9%, respectively.[5]

## AREAS OF DEBATE

**Maternal intracranial hemorrhage**

- AHA/ASA database higher rate of spontaneous intracranial hemorrhage in pregnant and postpartum women compared to non-pregnant women NOT statistically significant.[5]
- No difference in rate of in-hospital death, discharge to home, or independent ambulation at home.[5]

**Fetal hemorrhage**

- Alteplase is a large molecule and does not cross the placenta, therefore unexpected to cause fetal hemorrhage.

**Placental abruption**

- No reports of placental abruption in case studies – one case of intra-uterine hematoma which required surgical drainage and was followed by medical termination of the pregnancy.[5]
- Patients are at risk of placental abruption with or without alteplase and close monitoring is recommended.[1]

**Early postpartum period maternal postpartum hemorrhage**

- Akazawa et al. collected data on 13 cases of systemic thrombolytic therapy given in the early post-partum period (< 48 hours after delivery) for different indications (primarily pulmonary embolism and one case of ischemic stroke).[6] Twelve of the thirteen cases required significant blood transfusions due to bleeding, 5/13 cases (38%) required laparotomy to control bleeding, and 2/13 resulted in hysterectomy. All laparotomies occurred in patients whose mode of delivery was a caesarean section.[6]

**2. Mechanical Thrombectomy**

In theory, mechanical thrombectomy is a safe option for the pregnant patient, but it has only been reportedly performed in four case reports.[7,8] All women in these cases were in their third trimester and had a high NIHSS score, except for one case in which the patient was transferred to the center intubated and the NIHSS couldn't be assessed. Three women had a good neurological outcome with a modified rankin score (mRS) of 0-1, and the woman intubated without a calculated NIHSS had an mRS of 2. There were no maternal complications reported (ie. sICH, placental abruption). Fetal mortality was 0% with three healthy babies delivered and the fourth pregnancy still ongoing. These studies advocate for mechanical thrombectomy to be considered first-line treatment for proximal large-vessel thromboembolic occlusions.

Canadian Stroke in Pregnancy Guidelines: pregnancy is not a contraindication to angiography and endovascular thrombectomy. For patients with large vessel occlusions eligible for and with rapid access to endovascular thrombectomy, proceeding directly to without administering intravenous alteplase could be considered.[1]

Most of our evidence is derived from case reports, thrombolytic use for indications other than ischemic stroke, and a retrospective review of the Get with the Guidelines AHA/ASA database, which is a voluntary observational database rather than a clinical outcomes database.

## CASE CONCLUSION

Our patient had evidence of a suspected large-vessel occlusion. In her case, it was appropriate to order a CTA of the head and neck as she was a potential candidate for mechanical thrombectomy. We would not have been able to perform an MRI + MR angiography/venography at our institution in a timely fashion. Our patient's CT head without contrast showed no evidence of intracranial hemorrhage so we knew that she was not having a massive hemorrhagic stroke. The CTA identified a possible M2 lesion. It was a crucial step to consult with our area's comprehensive stroke center upon patient arrival to facilitate her rapid transfer.

**OUR PATIENT HAD EVIDENCE OF A SUSPECTED LARGE-VESSEL OCCLUSION. IN HER CASE, IT WAS APPROPRIATE TO ORDER A CTA OF THE HEAD AND NECK AS SHE WAS A POTENTIAL CANDIDATE FOR MECHANICAL THROMBECTOMY.**

The recommendation from the interventional neurology team not to administer tPA prior to transfer could be debated; the decision was justified by her short transfer time of 15 minutes and the fact that tPA administration would have delayed the transfer. Our patient was evaluated and out the door to our comprehensive stroke center in 48 minutes. She should receive a full hypercoagulable workup as case reports suggest that women with ischemic stroke or transient ischemic attacks are more likely to have an inherited thrombophilia.[9] Her work-up should also include an echocardiogram. Pregnant patients including our patient should be initiated on low dose aspirin 81 mg and must continue to take it throughout the pregnancy.

## REFERENCE

1. Stroke C, Practices B, Committees QA. CANADIAN STROKE BEST PRACTICE Stroke in Pregnancy. 2018;(July).

2. M. C, A. R, C. N-P. Management of stroke and pregnancy. Eur Stroke J. 2018;3(3):227-236. doi:10.1177/2396987318769547 LK – http://resolver.ebscohost.com/openurl?sid=EMBASE&issn=23969881&id=doi:10.1177%2F2396987318769547&atitle=Management+of+stroke+and+pregnancy&stitle=Eur.+Stroke+J.&title=European+Stroke+Journal&volume=3&issue=3&spage=227&epage=236&aulast=Cauldwell&aufirst=Matthew&auinit=M.&aufull=Cauldwell+M.&coden=&isbn=&pages=227-236&date=2018&auinit1=M&auinitm=

3. Ratnapalan S, Bentur Y, Koren G. Doctor, will that x-ray harm my unborn child? CMAJ. 2008. doi:10.1503/cmaj.080247

4. Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Vol 49.; 2018. doi:10.1161/STR.0000000000000158

5. Leffert LR, Clancy CR, Bateman BT, et al. Treatment patterns and short-term outcomes in ischemic stroke in pregnancy or postpartum period. Am J Obstet Gynecol. 2016. doi:10.1016/j.ajog.2015.12.016

6. Akazawa M, Nishida M. Thrombolysis with intravenous recombinant tissue plasminogen activator during early postpartum period: a review of the literature. Acta Obstet Gynecol Scand. 2017. doi:10.1111/aogs.13116

7. Aaron S, Shyamkumar N, Alexander S, et al. Mechanical thrombectomy for acute ischemic stroke in pregnancy using the penumbra system. Ann Indian Acad Neurol. 2016. doi:10.4103/0972-2327.173302

8. Bhogal P, Aguilar M, AlMatter M, Karck U, Bäzner H, Henkes H. Mechanical Thrombectomy in Pregnancy: Report of 2 Cases and Review of the Literature. Interv Neurol. 2017. doi:10.1159/000453461

9. Kupferminc MJ, Yair D, Bornstein NM, Lessing JB, Eldor A. Transient focal neurological deficits during pregnancy in carriers of inherited thrombophilia. Stroke. 2000. doi:10.1161/01.STR.31.4.892

# IMAGE CHALLENGE

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## CASE

**A 70-year-old female with a past medical history of severe COPD presents complaining of dyspnea and right-sided chest pain for four days. Triage vital signs include a blood pressure of 201/95 mmHg, heart rate of 87 beats/minute, temperature 36.4 degrees Celsius, respiratory rate of 24 breaths/minute, and oxygen saturation of 97%. Physical examination reveals regular heart beats without murmur. Decreased breath sounds on the right. Strong radial pulse is present. A chest radiograph is obtained (Figure 1).**

**Figure 1.** Initial PA chest radiograph.

## DIAGNOSIS

Spontaneous Tension Pneumothorax. Pneumothorax occurs when air gets trapped in the pleural space, the space between the lung and chest wall. There are various types and etiologies (Figure 2), but a tension pneumothorax occurs when the intrathoracic pressure rises more than 15-20 mmHg compressing the heart and mediastinum restricting cardiac preload and thereby reducing cardiac output.

This classically causes shifting of the trachea and mediastinum to the contralateral side on chest radiography, but chest radiography can miss up to 17% in the upright and 80% in the supine positions. Ultrasound evaluation for lung sliding is more sensitive than chest radiography, but computed tomography is most sensitive often finding occult pneumothoraces that require no intervention.

Several ways exist to estimate the size of a pneumothorax, but a 2 cm interpleural distance at the level of the hilum roughly correlates with a size of 50% lung volume. A small vs a large pneumothorax can be determined by an interpleural distance of < or > 2 cm. Figure 3 displays another large tension pneumothorax occurring after chest compressions post cardiac arrest.

While clinically stable, small pneumothoraces <20% lung volume may be treated with oxygen and observation, immediate needle decompression followed by chest tube placement should be performed for tension pneumothorax with clinical instability. Small-bore catheters are a viable option but may not be able to handle the air flow from a large air leak; therefore, a larger chest tube may be needed.







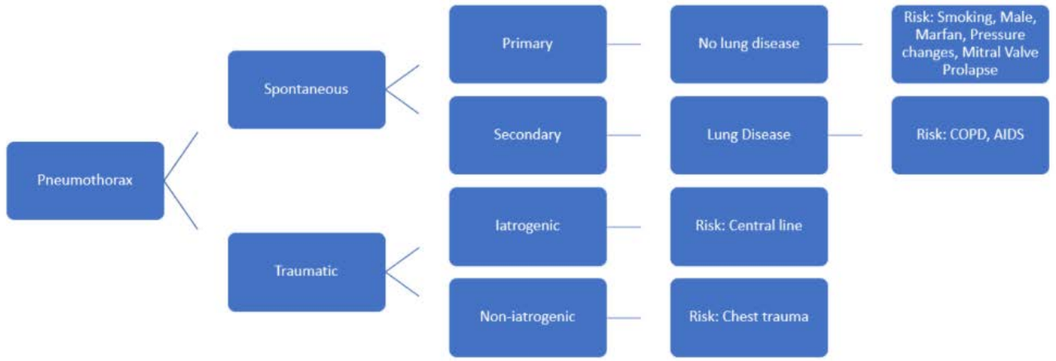


**Figure 2.** Categorization of pneumothorax etiology and risk factors.

## CASE CONCLUSION

The patient is clinically stable; therefore, an 8 French pig-tail catheter is placed primarily with successful re-expansion of the lung seen on repeat chest radiograph (Figure 4).

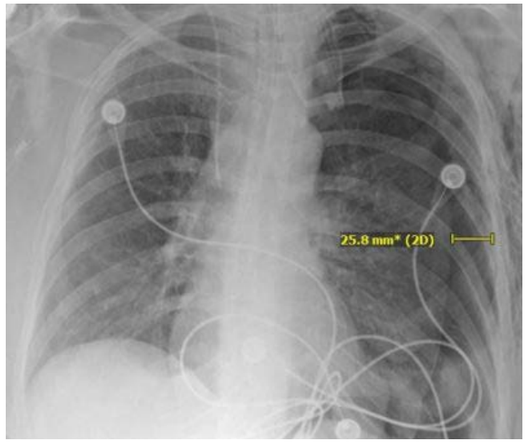


**Figure 3.** A large tension pneumothorax on AP chest radiograph with an interpleural distance of 2.58cm.

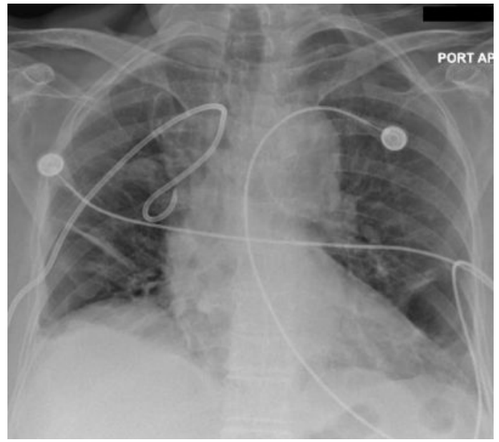


**Figure 4.** Repeat AP chest radiograph after placement of an 8 French pig-tail catheter with resolution of the tension pneumothorax.

The patient has an uncomplicated hospital course without recurrence of her pneumothorax. The pig-tail catheter is removed on hospital day three and she is discharged.

## REFERENCES

Tintinalli JE, et al. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. Eighth edition. New York: McGraw-Hill Education, 2016. Chapters 68 & 261.

# A Case and Discussion of Accidental Hypothermia in the Setting of Trauma

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## CASE

**A 22-year-old male presented as a trauma alert completely unresponsive. He was found down by a bystander, unresponsive with significant facial trauma presumed to be from assault. Upon arrival, the patient had apneic respirations being assisted by emergency medical service personnel with bag-valve-mask ventilations. He had bilateral breath sounds, a weak, bradycardic pulse, and was unresponsive with a Glasgow Coma Scale of 3. The patient was intubated with rapid sequence intubation and a left femoral vein introducer was placed emergently due to inadequate peripheral access. His initial vital signs were BP 90/palp, HR 43 BPM, SpO2 99%, and temperature 27 °C. The secondary survey revealed multiple facial contusions and a large laceration to the left chin. His electrocardiogram is displayed in Figure 1.**





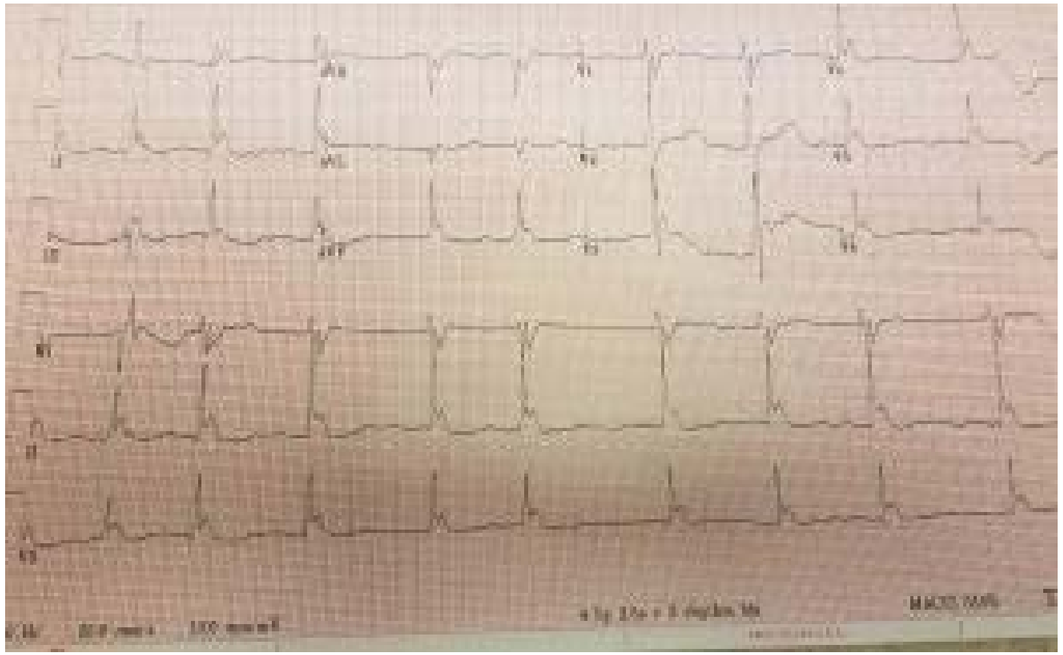

**Figure 1** displays the patient's electrocardiogram revealing atrial fibrillation with a junctional escape rhythm and Osborn or J waves.

**Table 1 Rewarming Interventions**

| CATEGORY | EXAMPLES |
|---|---|
| Passive External | Blankets, removal of wet clothing |
| Active External | Heating pads, forced warm air |
| Active Internal | Heated IV infusions, bladder lavage, peritonal and pleural cavity lavage |
| Extracorporeal | Hemodialysis, extracorporeal membrane oxygenation |

## DISCUSSION

Accidental hypothermia is common among trauma patients, occurring up to 49.6% of cases[1]. Although the etiology of hypothermia can vary, the most common mechanisms include convective and conductive heat loss from exposure to cold air and water [2]. While several systems exist to stage hypothermia, the "Swiss System" is commonly used (Figure 2)[2-4].Patients in higher stages of hypothermia often require more invasive rewarming interventions, but it is best to take a stepwise approach from least invasive to more invasive (Table 1)[2].

Cardiac irritability in the setting of hypothermia can cause various types of dysrhythmias and electrocardiographic abnormalities. Severe bradycardia can occur, though cardiac pacing is usually not needed. However, if pacing is needed, transcutaneous pacing is preferred over transvenous due the risk of the wire touching the irritable heart and inducing a ventricular dysrhythmia[2,6]. Atrial fibrillation and atrial flutter can also occur, but usually resolve with rewarming. When ventricular dysrhythmias and asystole occur in the setting of hypothermia, advanced cardiac life support interventions such as defibrillation and vasopressors may be ineffective until rewarming has occurred. Other electrocardiographic changes include J point elevation, otherwise known as Osborn or J waves. Usually seen in the precordial leads, the height of the J wave is related to the severity of hypothermia[2].

Accidental hypothermia in the setting of trauma raises particular concern compared to the atraumatic hypothermic patient. From a physiological standpoint, coagulopathy can by exacerbated and the inflammatory response suppressed, making bleeding and infection a greater concern[2,5]. If central

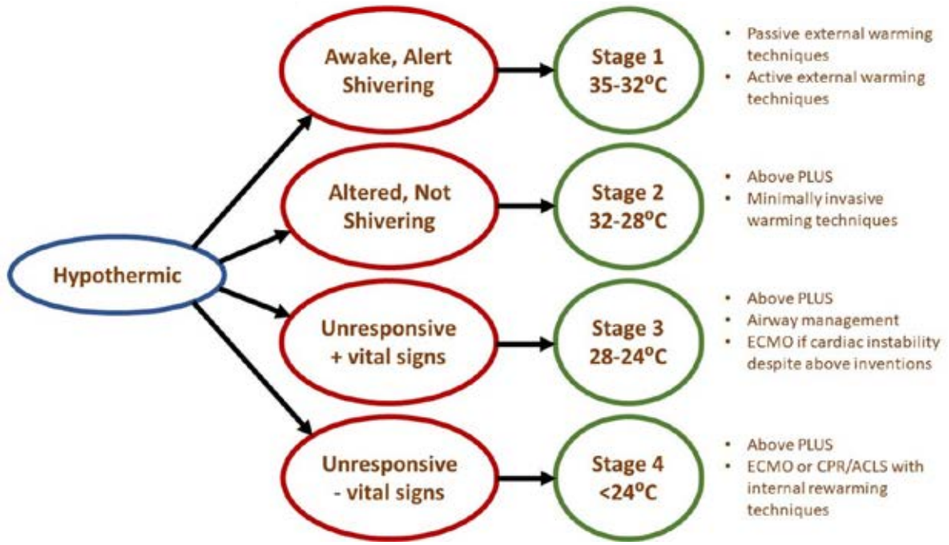


**Figure 2** displays a variation of the Swiss System of staging hypothermia with levels of interventions that may be required at each stage 2-4.

venous access is needed, femoral lines are preferred as internal jugular and subclavian lines that physically touch the irritable, hypothermic heart may cause ventricular dysrhythmias. Left-sided chest tubes carry a similar risk of dysrhythmias. Lastly, while hypothermia causes peripheral vasoconstriction to retain heat, peripheral vasodilation can occur during rewarming causing a phenomenon known as core temperature afterdrop. Core temperature afterdrop causes a decrease core temperature after initiation of rewarming, which is associated with hypotension and acidemia[2]. These physiological changes may create diagnostic uncertainty in a previously stable trauma patient and may worsen hemodynamics in an already unstable trauma patient. Core temperature after drop may be mitigated by rewarming the core first, then the extremities (ie. placing a warming blanket over the core while leaving the extremities exposed)[2].

## CASE CONCLUSION

Computed tomography scans revealed a small traumatic subarachnoid hemorrhage and multiple facial fractures including an open fracture to the left mandible. Laboratory studies revealed a lactic acid of 6.3 and a potassium level of 2.9. His hypothermia resolved within about 3 hours with a combination of warm saline infusion, a forced air warming blanket, and warm saline bladder lavages every ten minutes. The following day, the patient went to the operating room for debridement and open reduction internal fixation of his open mandible fracture. Two days after presentation he was extubated with no neurological deficits.

## References

1. Helm, et al. Accidental hypothermia in trauma patients. Is it relevant to preclinical emergency treatment? *Anaesthesist.* 1995;44(2):101-7.

2. Zafren K and Mechem CC. "Accidental hypothermia in adults." UpToDate. https://www.uptodate.com/contents/accidental-hypothermia-in-adults#H1. Accessed: 11/27/18.

3. Durrer B, Brugger H, Syme D. The Medical On-site Treatment of Hypothermia: ICAR-MEDCOM Recommendation. *High Alt Med Biol.* 2003;4(1):99-104.

4. Brown DJA, Brugger H, Boyd J, Paal P. Accidental Hypothermia. *N Engl J Med.* 2012;367(20):1930-1938.

5. Vardon F, et al. Accidental hypothermia in severe trauma. *Anaesth Crit Care Pain Med.* 2016;35(5):355-361.

6. Ho JD, Heegaard WG, Brunette DD. Successful transcutaneous pacing in 2 severely hypothermic patients. *Ann Emerg Med.* 2007;49(5):678.



CALLING CONSULTS, PART 1

# A Resident's Perspective

Christopher Swyers, DO, PGY-3

**Whether it's simply ensuring good follow up, getting a patient to surgery, or getting a sub-specialist's expertise, calling a consult is a critical skill. Experience is often the best teacher, and while trial and error can hone a physician's skill, knowing when to call and how to structure your conversation can increase your efficiency and get the patient the care he or she needs.**

Here are some important things to consider when calling a consult, based on one resident's experience:

### 1. Know your audience

This idea is easier said than done, especially at a new or unfamiliar facility. Some general ideas apply across the board, though. First, consult calls may vary in information, length, and content based on the type of consultant. An orthopedics consult, for example, may be more focused on fracture patterns, neurovascular status, etc., while a consult to admit a patient may have more detail on history, physical findings, and the like. As you develop a working relationship with consultants, nuances of their practice patterns will become more obvious.

### 2. Know your patient

This point is seemingly obvious, but bears repeating. Being able to summarize your patient's chief complaint, pertinent findings, and course of care is critical to having a productive discussion with your consultant. This includes noting trends (i.e. trends in lab values over time, changes in vital signs in the ED, new or changed medications noted in your history-taking).

### 3. Don't bury the lede

In journalism, "burying the lede" is the idea of obscuring one's key point(s) in other, often extraneous, details. Leading off with a specific reason for consultation can lead to a more precise–and shorter–call.

### 4. Practice before you preach

Consult calls can feel like something between a casual conversation and an academic discussion. Practicing with a attending physician or a colleague prior to placing the call can help with any pre-call jitters. It also gives an opportunity for peer review and attending feedback.

### 5. Consider a system

Consults are as much an art as a science; but there are multiple systems (SBAR, the 5C method[1]) for more effective and concise communication. If you're having trouble, consider using one of these systems.

## References

1. http://rebelem.com/how-to-call-a-consult/

# Acute Lower Extremity Paralysis

## A SIGN OF DECOMPENSATED HYPERTHYROIDISM

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Kent Hospital Emergency Medicine Residency

### Introduction

**This case describes a young male who presented to the emergency room (ER) with a chief complaint of sudden onset bilateral lower extremity paralysis. He was found to have thyrotoxic periodic paralysis (TPP), which is a subset of hypokalemic periodic paralysis. TPP occurs mainly in Asian males with decompensated hyperthyroidism. Among the Chinese and Japanese population, it occurs in 2% of patients with hyperthyroidism, in contrast to North America where there is a 0.1% incidence.[1] It is hypothesized that the mechanism behind this phenomenon is an increase in activity of cellular Na-K ATpase and a mutation in Kir[2.6], a potassium channel protein[2].**

### History

A 30-year-old Chinese American male presented to the ER via EMS with a chief complaint of leg weakness. Six hours prior to his presentation, he awoke from sleep with acute paralysis of the bilateral lower extremities. For one week leading up to the presentation, he had intermittent myalgias in the arms and legs, but denied weakness. He also described watery diarrhea for 1-2 days during a trip to China one month prior. The patient's past medical history was significant for Grave's disease; however he was no longer on medications. He denied weight change, heat intolerance, fatigue, hyperactivity, diaphoresis, swelling, dyspnea, palpitations, or recent illness.

### Physical exam

**Vitals:** Temp 98.0 HR 90 RR 12, BP 122/51, SPO2 96 RA

**General:** In bed awake, no acute distress, alert and oriented x3.

**Neck:** Supple, no goiter/thyromegaly

**Pulmonary:** Normal effort, clear to auscultation bilaterally

**Cardiovascular:** Regular rate and rhythm. S1 s2 present, no murmurs/rubs/gallops

**Abdomen:** Soft, nontender, nondistended, no masses, NABS

### Neurologic Exam

**Mental Status:** Alert and oriented x4, fluent speech, no dysarthria

**Cranial nerves:** PERRL and 3 mm bilaterally, no nystagmus, EOMI, facial sensation intact, symmetric smile, 5/5 SCM and trap muscles

**Motor:** Normal tone and bulk for age, no fasciculations/atrophy. No pronator drift.

**UE:** 5/5 strength on flexion and extension of arms and shoulders, grip strength 5/5.

**LE:** Unable to engage hip flexors, unable to perform hip adduction/abduction, unable to perform knee flexion/extension, legs/hips unable to resist gravity (in summary, 1/5 strength). 3/5 dorsiflexion/plantar flexion.





### Diagnostic results

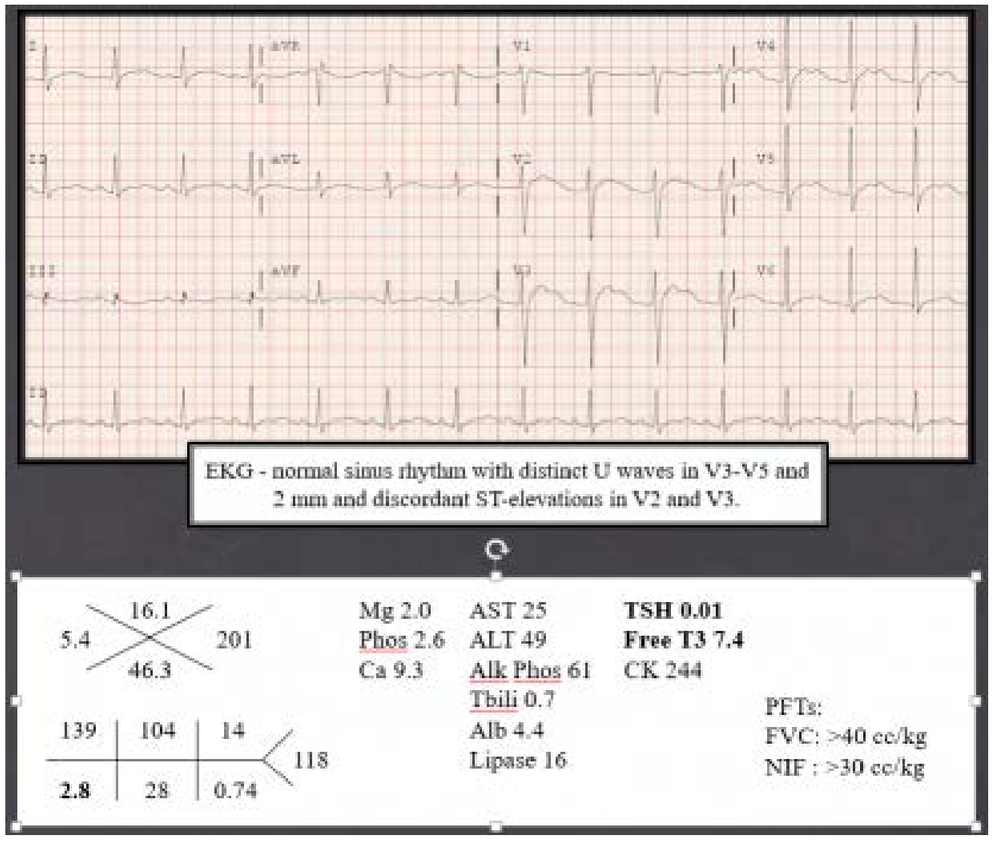


**Figure 1**: Diagnostic Results

### ER course

Shortly after presentation, the patient developed ascending weakness involving the truncal muscles; he needed to hold onto the bed rails to sit up in bed. The patient was administered oral potassium and transferred to the care of his endocrinologist at another facility. Follow up at one month revealed that the patient's thyrotoxicosis was treated with intravenous propranolol and patient had regained full motor function within 24 hours. Chart review revealed that he had also had a similar presentation to an outside hospital in 2012, when he was diagnosed with TPP.

**Trunk:** Apparent truncal weakness—unable to sit up in bed without using his arms to grab the rails. Is able to flex his abs.

**Reflexes:** Brachioradialis and biceps reflexes 2+, areflexic in the lower extremities throughout, Babinski sign absent.

**Sensory:** Mild diminished sensation to pain below knee, otherwise completely intact throughout

**Coordination:** Finger to nose intact bilaterally

## Thyrotoxic Periodic Paralysis

**EPIDEMIOLOGY**

- Among the Chinese and Japanese population, it occurs in 2% of patients with hyperthyroidism, in contrast to North America where there is a 0.1% incidence
- Over 95% of thyrotoxic PP cases occur in men
- Peak in incidence 20 and 39 years of life

**SYMPTOMS**

- Subacute onset lower extremity muscle weakness over 1-2 day

**MECHANISM**

- Subset of hypokalemic periodic paralysis
- Mechanism of hypokalemia: thyroid hormones stimulate the Na+-K+ ATPases on cell membrane, leading to disproportionate efflux of Na+ outside of cells and influx of K+ into cells. As a result, the serum K+ falls.
- However, total body potassium is normal or even higher than normal, they are displaced into the intracellular space.
- In addition, a mutation to Kir2.6, a potassium channel protein, leads to further disproportionate influx of potassium into cells and out of the serum.

**DIAGNOSIS**

- Hypokalemia and periodic paralysis in the setting of low TSH or high free T3 levels.

**TREATMENT**

- Treat hyperthyroidism acutely with propranolol (2 mg IV bid) and methimazole 20 mg daily

Slowly replete K (30 meq q4 hrs with max dose of 90 meq, oral) with frequent BMP to avoid rebound hyperkalemia

## Discussion

Hyperthyroidism is a fairly common condition that affects approximately 1.2% of the US population, and is therefore a well-studied phenomenon.[3] However, our patient denied typical symptoms of hyperthyroidism, which include palpitations, heat intolerance, and weight loss.[4] The only symptoms he reported from his thyrotoxicosis were generalized myalgia and lower extremity paralysis. Another remarkable finding was the patient's hypokalemia, which was only moderate at 2.8. Further literature review reveals that in those with hyperthyroidism, the average potassium level seen in TPP is 2.0, based on a 10-year analysis of TPP in 135 patients.5 Most patients with TTP develop weakness primarily in the lower extremities, as seen in our case.6 This case demonstrates that hyperthyroidism must be considered as a cause in focal weakness, and if not readily recognized, it can lead to dangerous arrhythmia as evidenced by EKG changes in the setting of moderate hypokalemia.

## References

1. Kung AW. Clinical review: thyrotoxic periodic paralysis: a diagnostic challenge. J Clin Endocrinol Metab (2006) 91(7):2490–5.10.1210/jc.2006-035

2. Vijayakumar A, Ashwath G, Thimmappa D. Thyrotoxic periodic paralysis: clinical challenges. J Thyroid Res 2014; 2014:649502

3. R. A. Nordyke, F. I. Gilbert Jr., and A. S. M. Harada, 'Graves' disease. Influence of age on clinical findings," Archives of Internal Medicine, vol. 148, no. 3, pp. 626–631, 1988.

4. Bahn RS, Burch HB, Cooper DS, Garber JR, Greenlee MC, Klein I, et al. American Thyroid Association American Association of Clinical Endocrinologists. Hyperthyroidism and other causes of thyrotoxicosis: management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. Endocr Pract 2011;17: 456–520.

5. Chang CC, Cheng CJ, Sung CC, et al. A 10-year analysis of thyrotoxic periodic paralysis in 135 patients: focus on symptomatology and precipitants. Eur J Endocrinol. 2013;169:529-36.

6. Pompeo A, Nepa A, Maddestra M, Feliziani V, Genovesi N. Thyrotoxic hypokalemic periodic paralysis: An overlooked pathology in western countries. Eur J Intern Med. 2007;18:380–390

7. Li J, Yang XB, Zhao Y. Thyrotoxic periodic paralysis in the Chinese population: clinical features in 45 cases. Exp Clin Endocrinol Diabetes. 2010;118:22-6.

8. Pothiwala P, Levine SN. Analytic review: thyrotoxic periodic paralysis: a review. J Intensive Care Med 2010; 25:71.

9. Chan A, Shinde R, Chow CC, et al. Hyperinsulinaemia and Na+, K(+)-ATPase activity in thyrotoxic periodic paralysis. Clin Endocrinol (Oxf) 1994; 41:213.





# Mass Casualty Shootings and the Implications of the Impact if Left Unchecked

Lindsey Roden, MPH
ACOEP Staff

**August 3, 2010, eight people killed in Manchester, CT. June 17, 2015, nine people killed in Charleston, SC. December 2, 2015, 14 people killed in San Bernardino, CA. June 12, 2016, 49 people killed in Orlando, FL. October 1, 2017, 58 people killed in Las Vegas, NV. February 14, 2018, 17 people killed in Parkland, FL. May 31, 2019, 12 people killed in Virginia Beach, VA. August 3, 2019, 22 people killed in El Paso, TX. August 3, 2019, nine people killed in Dayton, OH. These shootings combined resulted in the deaths of 615 people including two unborn children. Since 1949, there have been 37 of the deadliest single-day mass casualty shootings within the United States, 23 of which occurred within the past decade and still climbing. The magnitude of these unfortunate occurrences has terrorized communities, families, and health care providers.**

Firearm-related injuries have the potential to be lethal and account for 7.1% of premature deaths and loss of life before the age of 65. Ownership of a firearm has been identified as a risk factor for firearm violence, and there are more than 50 million firearm owners in the U.S., approximately

**FORMER DIRECTOR OF THE CDC, DAVID SATCHER ONCE SAID, "IF IT'S NOT A PUBLIC HEALTH PROBLEM, THEN WHY ARE SO MANY PEOPLE DYING FROM IT?"**

35% whom are men and 11% whom are women (Wintemute, 2015). Furthermore, Fowler et al, indicates that on average 645 people lose their lives to firearm violence, while 1,565 other people are treated for a firearm related injury per week. Annually, these numbers account for a little over 36,000 deaths per year (Fowler et al., 2015; Gani et al., 2017).

Death by firearm is the second-ranking injury related cause of death in the U.S. following poisoning and preceding motor vehicle accidents. In comparison to other high-income countries, the U.S. is reported to have the highest rates of deaths associated with firearms. This in part, may be due to guns being easily accessible in the U.S. Several studies suggest that men are disproportionately affected by firearm violence for both fatal and nonfatal injuries incurred. While few studies have accounted for mortalities due to firearm violence, there is little to no acknowledgement of the impact that it has on nonfatal injuries to victims or why men are disproportionately impacted by this problem. Gun violence has caused significant physical, psychological, and financial costs to individuals, families, and society. Moreover, this epidemic has the potential to perpetuate a vicious cycle of terror among both bystanders and victims. Long-term effects of firearm violence can include retaliation, risk of disability, and/or the development of a mental illness.

Given the grave scenario we are facing, what can be done to change the narrative? In 1996, the Centers for Disease Control and Prevention (CDC) barred funding for research on firearm injuries. Since that time, the sparse research available indicates that the U.S. has experienced an increase in mass casualty shootings, accidental shootings, and fatal and nonfatal injuries due to firearm and gun violence. In order to begin to see a change in this cycle, the U.S. must avoid turning a blind eye to this public health crisis, as well as implement micro and macro levels of change in our communities and systems.

Some of these changes may include gun reform, peaceful protests, or boycotts to change gun laws and regulations. Furthermore, evaluation of the problem at stake as well as intervening with preventive measures to alleviate the burden and enforcing protocols to adequately address victims' needs is critical, as well as resourcefully utilizing supplies and medical equipment.

In January of 2013, President Obama ushered in 23 executive actions to federal agencies, such as the CDC and other scientific organizations, to improve our law enforcement, schools, and health services systems' knowledge about firearm violence. These orders sought to implement courses of interventions to prevent these incidents, and to continue to put efforts toward finding resolutions to minimize the suffering we face. Although this was intended to bring about change, very little has been done to follow through on these orders. This may be in part due to the politically polarizing nature of the firearm violence debate. Although there are approximately 20,000 laws governing firearms, clear guidelines have not been established to understand the issue at hand.

Former Director of the CDC, David Satcher once said, "if it's not a public health problem, then why are so many people dying from it?" The few studies that examine gun violence are heterogenous and biased. To have a more comprehensive understanding of this epidemic collaboration from various health professionals, such as public health practitioners and emergency department doctors, must have input on reform that government agencies and communities plan to implement. Aside from establishing a standard and concise definition of the problem, the next step would be to follow through with the initial executive actions drafted by Vice President Biden on behalf of President Obama.

While many plans have been proposed to prevent mass casualty shootings, few funds exist to expedite implementation. Therefore, it is imperative to call upon our government to secure a budget dedicated to the prevention of mass casualty shootings. A budget specifically for this issue will give institutions and emergency departments the resources to create interventions, sufficiently supply our EDs, provide adequate treatment and follow up, outsource nonfatal patients to other healthcare services such as physical therapy and mental health services, as well as mandate a protocol to prepare ED staff for mass casualty situations or any other type of firearm related violence. A specific budget would also allow for data on firearm related violence to be stored and accounted for, and not merely rely on fatalities tell the tale. The differentiation of information will help to derive data that can then be utilized for interventions.





Across the country, people are calling for action to combat this epidemic. We have experienced the triumph of these tragedies, the rallies that follow, and in some instances, injustice from court cases and lack of gun law reform. A precedent to put a higher value on life and understand that firearm violence has no boundaries regarding geographic region, ethnicity, gender, race, socioeconomic status, or age needs to be understood. Firearm violence is preventable, and until we begin to push Congress to vote on legislation that impacts this cause, we will not see violence nor tragedy decrease. President Barack Obama explained, "we don't benefit from ignorance. We don't benefit from not knowing the science of this epidemic of violence. (The White House,

**LONG-TERM EFFECTS OF FIREARM VIOLENCE CAN INCLUDE RETALIATION, RISK OF DISABILITY, OR THE DEVELOPMENT OF A MENTAL ILLNESS.**

2013, p.5)". Gun violence prevention is a critical task and one we should work harder to implement to protect the American people.

## References

Cable News Network (CNN) (2018, April 1). *Deadliest mass shootings in modern US history fast facts.* Retrieved from https://www.cnn.com/2013/09/16/us/20-deadliest-mass-shootings-in-u-s-history-fast-facts/index.html

Centers for Disease Control and Prevention (CDC). (2017). *National Center for Health Statistics: FastStats Homepage: All Injuries.* Retrieved from https://www.cdc.gov/nchs/fastats/injury.htm

Curtis, C. (2013, January 16). *President Obama announces new measures to prevent gun violence. the White House.* Retrieved from https://obamawhitehouse.archives.gov/blog/2013/01/16/president-obama-announces-new-measures-prevent-gun-violence

Fleegler, E.W., Lee, L.K., Monuteaux, M.C., Hemenway, D., & Mannix, R. (2013). Firearm Legislation and Firearm-Related Fatalities in the United States. *Journal of American Medical Association Internal Medicine*, 173(9), 732-740. doi: 10.1001/jamainternmed.2013.1286.

Fowler, K. A., Dahlberg, L. L., Haileyesus, T., & Annest, J. L. (2015). Firearm injuries in the United States. *Journal of Preventive Medicine*, 79, 1-27. doi: 10.1016/j.ypmed.2015.06.002.

Gani, F., Sakran, J.V., and Canner, J.K. (2017). Emergency department visits for firearm-related injuries in the United States, 2006-14. *Journal of Health Affairs*, 36(10), 1729-1738. doi: 10.1377/hlthaff.2017.0625.

Giffords Law Center To Prevent Gun Violence. (2018). Statistics on Gun Trafficking & Private Sales. Retrieved from: https://lawcenter.giffords.org/gun-traffickingprivate-sales-statistics/

Howard, J. (2018). *Gun deaths in the US reach highest level in nearly 40 years, CDC data reveal.* Cable News Network (CNN). Retrieved from: https://www.cnn.com/2018/12/13/health/gun-deaths-highest-40-years-cdc/index.html

Karaca, M.A., Kartal, N.D., Erbil, B., Ozturk, E., Kunt, M.M., Sahin, T.T., and Ozmen, M.M. (2015). Evaluation of gunshot wounds in the emergency department. *Turkish Journal of Trauma and Emergency Surgery*, 21(4), 248-254. doi: 10.5505/tjtes.2015.64495.

Livingston, D.H., Lavery, R.F., Lopreiato, M.C., Lavery, D.F., Passannante, M.R. (2014). Unrelenting violence: An analysis of 6,322 gunshot wound patients at a Level I trauma center. *Journal of Trauma and Acute Care Surgery*, 76(1), 2-11. doi: 10.1097/TA.0b013e3182ab19e7.

Manley, N. R., Fabian, T. C., Sharpe, J. P., Magnotti, L. J., & Croce, M. A. (2017). Good news, bad news: An analysis of 11,294 gunshot wounds (GSWs) over two decades in a single center. *Journal of Trauma and Acute Care Surgery*, *84*(1), 58-65. doi: 10.1097/TA.0000000000001635.

Ranney, M. L., Fletcher, J., Alter, H., Barsotti, C., Bebarta, V. S., Betz, M. E...Shah, M. N. (2017). A consensus- driven agenda for emergency medicine firearm injury prevention research. *Annals of Emergency Medicine*, 69(2), 227-240. doi: 10.1016/j.annemergmed.2016.08.454.

Wintemute, G.J. (2015). The Epidemiology of firearm violence in the Twenty- First Century United States. *Annuals Review of Public Health, 36*, 5-19. doi: 10.1146/annurev-publhealth-031914-122535.

The White House: Office of the Press Secretary. (2013a, August 29). *Fact sheet: New Executive actions to reduce gun violence.* Retrieved from https://obamawhitehouse.archives.gov/the-press-office/2013/08/29/fact-sheet-new-executive-actions-reduce-gun-violence

The White House: Office of the Press Secretary. (2013b, January 16). Presidential Memorandum- *Engaging in public health research on the causes and prevention of gun violence.* Retrieved from https://obamawhitehouse.archives.gov/the-press-office/2013/01/16/presidential-memorandum-engaging-public-health-research-causes-and-preve

The White House: Office of the Press Secretary. (2013c, January 16). *Remarks by the President and Vice President on gun violence.* Retrieved from https://obamawhitehouse.archives.gov/the-press-office/2013/01/16/remarks-president-and-vice-president-gun-violence

The White House: Office of the Press Secretary (2016, January 4). *Fact Sheet: New Executive Actions to Reduce Gun Violence and Make Our Communities Safer.* Retrieved from: https://obamawhitehouse.archives.gov/the-press-office/2016/01/04/fact-sheet-new-executive-actions-reduce-gun-violence-and-make-our

Willingham, A. and Ahmed, S. (2017). Mass shootings in America are a serious problem– and these 9 charts show just why. Cable News Network (CNN). Retrieved from: https://www.cnn.com/2016/06/13/health/mass-shootings-in-america-in-charts-and-graphs-trnd/index.html

# HOW TO APPROACH THE RESIDENCY FAIR:

## Advice From Your GME Chair

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LECOM- Bradenton

### What to Wear

Business casual is recommended.

### What to Expect

This year the ACOEP Residency Fair will be expecting 25-30 ACGME residency programs from various parts of the country that are traditionally "DO-friendly". Each program will send a combination of representatives, including residents and program directors who will be at each table to meet you and answer any questions that you may have. Programs typically offer brochures and free goodies to entice students to their booth.

### Do Your Research

If there is a specific program that you are interested in, it's a great idea to research that program online ahead of time before introducing yourself at the Residency Fair. This way, questions can be directed and more personal. For example, if a student reads that an EM residency hospital takes in a high volume of pediatric patients, the student may then inquire about the program's connections (if any) to pediatric fellowship programs.


### Examples of Questions to Ask Programs

- What is your ACGME status?
- Do you have any fellowship opportunities? If so, what are they?
- What types of institutions do residents typically work at after completing your program?
- What is the percentage of pediatric patients seen?
- Are there skills labs offered?
- Are there resident-run lectures?
- Does the program have a budget for attending conferences?
- Does the program provide childcare?
- Are there any wellness workshops?
- What is the patient population?
- Are there adequate interpreter services?
- How are the relationships with ER doctors and other specialties in the hospital?
- If there are other residencies at the institution, are procedure priorities given to those residents?






### Specific Advice for Each Medical Student Level

#### 1st Year

Take the time to soak it all in! Check out some programs and start to network and develop relationships. This is the time to start getting excited about your future in emergency medicine!

#### 2nd Year

If this is your first year attending the fair, take it all in and observe those around you, especially the third years. You can also take the time to start building relationships with programs that you are interested in. To give you some extra motivation for doing well on your first set of boards, ask programs about target USMLE Step 1 or COMLEX Level 1 scores that usually grant students an interview.

#### 3rd Year

This is an important year to continue building relationships with programs that you have interest in. It's also a good time to discuss audition rotation opportunities that would be available to you during your 4th year. Determine if programs accept VSAS or if they prefer to be applied to independently.

#### 4th Year

As your applications are already sent in with ERAS, this is the time to really network and sell yourself to programs.

Sometimes, programs may take a second look at your application if you have not yet been offered an interview. If you have been offered an interview, make sure to also stop by and introduce yourself! It can ease some nerves to develop a good rapport before a formal interview in the near future. Networking is an important skill, so make sure to impress!

### Some Advice for All Students

This is not the interview: ...So try not to stress! This is a more informal way to really get to know the programs that you are interested in with a relaxed environment.

And above all... be yourself! I cannot stress this enough! At the end of the day, program directors and residents want to work with people who they like. As a future resident you also want to work with people who you will get along with. Staying true to yourself is the best way to shine as a candidate and as a human being.

# The DIY Ultrasound-Guided IV Access Phantom

Developed and created by Campbell University's Emergency Medicine Club

Andrew Langille, Kansas City University, OOMS IV
Contributors: Zachary Mauro, OMS IV; Jeffrey Davis OMS IV; Brian Conner, OMS IV

**Intravenous (IV) access is an essential procedure that can be difficult under certain circumstances in the emergency department. Providers are now using ultrasound to better visualize vasculature to gain IV access in patients that are difficult sticks. Acquiring this skill requires an experienced educator and a realistic yet safe model. Moreover, creating effective and clinically relevant events can be costly and outside of budget for clubs run by medical students. Campbell University's emergency medicine club has recently developed a cost-effective and realistic US guided IV access phantom for a hands-on clinic. With these instructions, you can now quickly build phantoms for less than $4.00 each and learn a skill that applies to all fields of medicine.**

## Making a Phantom

### What you need:

- 4 longitudinal latex balloons
- 1 L of tap water
- 1 bottle red food coloring
- 1 block of firm or extra firm tofu
- 1 chopstick or wooden dowel
- 1 Chux absorbent pad
- IV catheters (3-5 cm preferred)
- Ultrasound machine with linear array transducer

### Instructions for construction:

1. Prepare a solution of 1 L tap water and 3 mL of red food coloring.
2. Fill each balloon with approximately 8 cc of prepared solution. Avoid over-filling. Tie off the end and tie again at half the length of the balloon (allows for 2 attempts).
3. Place the end of the chopstick into the cuff of the balloon and hold balloon parallel to the chopstick.
4. Locate a space approximately 1-2 cm from tofu edge and insert the balloon and chopstick through the tofu.
5. Once the end of the balloon is visible on the other side, grasp the balloon with your other hand and retract the chopstick.
6. Cover and store in a refrigerator until ready to use. Tofu will become firmer and less fragile overnight.

For video instructions click here or follow the link below!
**https://youtu.be/9FgExnhFoHo**





**Figure 1:** Perpared tofu phantom showing transducer in longitudinal viewing plane.

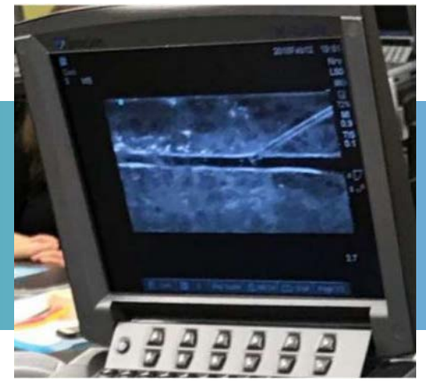

**Figure 2:** Ultrasound monitor showing tofu phanton; vessel in longitudinal plane with IV catheter in situ.

### How it Works:

Under ultrasound visualization, tofu displays a non-uniformly echogenic background, much like that of human tissue. The fluid-filled balloon is largely anechoic simulating that of vasculature. The balloon allows for proper compressibility testing as well as tenting and "bullseye" sign when performing the procedure.

### Steps to IV placement:

1. A prepared phantom is placed at each US machine.
2. Visualize the vessel both in a transverse and longitudinal view.
3. In a transverse plane, center the vessel to the probe and screen.
4. The depth of the vessel is determined, and the catheter is inserted at a 45 degree angle that same distance away from the probe.
5. Advance the IV catheter and follow with the US probe until tenting of the vessel is witnessed.
6. Continue a few millimeters until a "bullseye sign" is seen. At this point you should have "flash" and the catheter can be advanced.

(This technique can also be applied using the longitudinal plane; however, advancing the US probe with the catheter is not required since you are able to visualize the entire needle.)

When performing the skill on patients, be sure to use a tourniquet, clean insertion area with an alcohol pad, and secure with a saline lock.

| COST FOR 1 BLOCK: Item | Price |
|---|---|
| Block of tofu | $2.50 |
| Balloons | $0.40 per 4 balloons ($10.00 / 100 ct.) |
| Chop Stick | $0.10 |
| Chux Pads | $0.25 each |
| Red Food Coloring | $0.20 per 3 mL ($8.00 / 4.5 oz.) |
| Tap Water | Free |
| US Machine | Use at home institution |
| 3-5 cm IV Catheters | Varies Donation of expired supplies |
| **Estimated Total Cost** | **$3.45** |

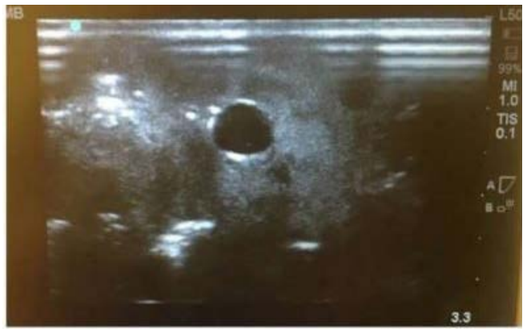


**Figure 3:** Tofu phantom demonstrating echogenic background with strongly anechoic vasculature.

**Figure 4:** Human antecubital fossa demonstrating variably echogenic background with anechoic brachial vein. Neurovasculature and muscle tissue present.

# WHAT IS THE Etiology OF THIS Electrocardiogram Finding?

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LECOM-Erie

## CASE

**An elderly male with a past medical history of dementia, on warfarin for a remote history of pulmonary embolism, presented via ambulance from a skilled nursing facility due to the facility's reports of altered mental status and decreased oral intake. On the day of presentation, he had completed a course of amoxicillin/clavulanate for aspiration pneumonia and was given a dose of ceftriaxone for a suspected urinary tract infection diagnosed the same day. His vital signs included a temperature of 32.9 degrees C, heart rate of 68 beats per minute, respiratory rate of 41 breaths per minute, blood pressure of 116/74 mmHg, SpO2 96% RA. He was agitated, tugging his Foley catheter with a normal cardiopulmonary and abdominal examinations. His chest radiograph revealed left basilar infiltrates (Figure 1) and he had an elevated lactic acid at 3.1 mmol/L. Troponin and calcium levels were normal. An electrocardiogram (ECG) was obtained and compared to his prior ECG (Figures 2 and 3).**

What classic finding can be seen on the electrocardiogram and what is the etiology?

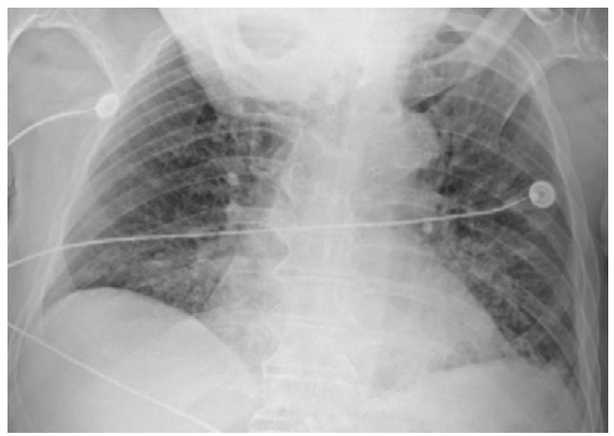

**Figure 1** displays the chest radiograph of the patient.

## DISCUSSION

*Osborn or J waves due to hypothermia.* The phenomenon is named after John Osborn who described the finding in 1953 on ECGs of canines with induced hypothermia, though descriptions of the wave were reported earlier in the literature[1-2]. This unique deflection of the J point is most commonly caused by hypothermia, but has many other etiologies (Figure 4). It can also be mistaken for the J point elevation seen in Brugada syndrome; however, Osborn or J waves usually present in the inferior or lateral leads, while Brugada J point elevation usually presents in the right precordial leads (Figure 5)[1,3]. The





**Figure 2** displays the electrocardiogram of the patient at presentation.

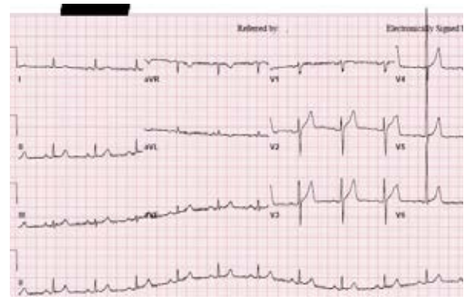

**Figure 3** displays the prior electrocardiogram of the patient.

arrhythmogenicity of Osborn or J waves is unclear, but the underlying causes, such as critical hypothermia, are likely the culprit[1,5,6].

## CONCLUSION

The patient was admitted to the intensive care unit on vancomycin, cefepime, and azithromycin. The lactic acidosis resolved, and his mental status improved. He was discharged on hospital day four back to his nursing home.

## REFERENCES

1. Maruyama M, Kobayashi Y, Kodani E, et al. Osborn Waves: History and Significance. *Indian Pacing Electrophysiol J.* 2004;4(1):33–39.

2. Osborn JJ. Experimental hypothermia: Respiratory and blood pH changes in relation to cardiac function. *Am J Physiol*1953;175:389-398.

3. Brugada J, Campuzano O, Arbelo E, Sarquella-Brugada G, Brugada R. Present Status of Brugada Syndrome: JACC State-of-the-Art Review. *J Am Coll Cardiol.* 2018 Aug 28;72(9):1046-1059.

4. CardioNetworks: Googletrans (5/10/12, 17:19). De-Brugada. Wikimedia Commons. Creative Commons Attribution-Share Alike 3.0 Unported license. Accessed: 1/31/19. https://commons.wikimedia.org/wiki/File:De-Brugada_(CardioNetworks_ECGpedia).png

5. Zafren K, Mechem CC. "Accidental hypothermia in adults." UpToDate. Accessed: 11/27/18. www.uptodate.com/contents/accidental-hypothermia-in-adults#H1

6. Nikolla DA. A Case and Discussion of Accidental Hypothermia in the Setting of Trauma. The Fast Track. Winter 2019. Published Online: 1/15/18. www.acoep-rso.org/the-fast-track/a-case-and-discussion-of-accidental-hypothermia-in-the-setting-of-trauma/


**Figure 4** displays the differential diagnosis of Osborn or J waves.

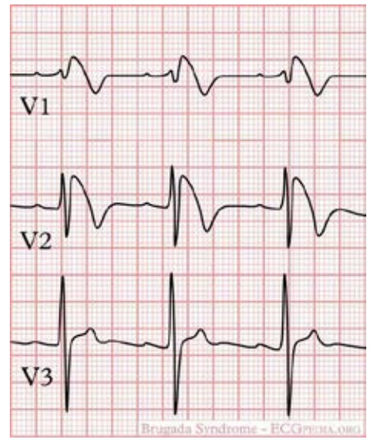


**Figure 5** displays the typical J point elevation with a coved-type ST segment elevation seen in Brugada syndrome[3,4].

# TRICKS OF THE TRADE
# The ED 3-Minute Walk Test

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## INTRODUCTION

**Emergency physicians often have difficulty dispositioning patients presenting to the emergency department (ED) with acute dyspnea caused by exacerbations in either chronic obstructive pulmonary disease (COPD) or congestive heart failure (CHF). This may be due to a lack of clear and consistent guidelines, but also likely due to the high frequency of ED and hospital readmissions despite treatment [1-3]. Readmission rates in 30 days can be as high as 10-20% in COPD and 35.5% in CHF, and predicting those who return can be challenging [4-5]. While much data exists on the use of various walk tests to prognosticate COPD and CHF outpatients [6-7], limited data exists on the ED walk test for patients in COPD and CHF exacerbation to aid in disposition decisions.**

**THE PRIMARY PURPOSE OF THE 3MWT IS TO DETERMINE PATIENTS AT RISK OF SERIOUS ADVERSE EVENTS DESPITE ED TREATMENT. SERIOUS ADVERSE EVENTS INCLUDE DEATH WITHIN 30 DAYS OF THE ED VISIT, ADMISSION TO A CRITICAL CARE UNIT, INTUBATION, NONINVASIVE VENTILATION, MAJOR PROCEDURE, OR MYOCARDIAL INFARCTION [2-3].**

## THE EVIDENCE

Although different variations of the walk test exist, the best evidence is likely for the 3-minute ED walk test (3MWT). The primary purpose of the 3MWT is to determine patients at risk of serious adverse events despite ED treatment. Serious adverse events include death within 30 days of the ED visit, admission to a critical care unit, intubation, noninvasive ventilation, major procedure, or myocardial infarction [2-3].

## ALL COMERS

In a prospective cohort study of 40 adult ED patients with COPD, CHF, or stable chest pain, 30% of patients had a poor outcome. 41.7% of those with a poor outcome could not complete the 3MWT compared with 3.6% of those with a good outcome [1].

## CHF EXACERBATION

Failure of the 3MWT, including being too ill to partake, tachycardia ≥110bpm, and hypoxemia SpO2<90% during the test, has been associated with serious adverse events in CHF exacerbations [3,8]. A study of 559 patients with heart failure showed that among the 65 patients who experienced serious adverse events, 32.3% of them failed the 3MWT. Only 10.7% of the 494 patients who did not experience adverse events failed [3]. A prospective cohort study of 1,100 CHF patients across 6 EDs revealed that of the 170 patients who experienced serious adverse events, 70.3% failed the 3MWT, compared to 53.1% of those without serious adverse events [8].

## COPD EXACERBATION

Failure of the 3MWT, including being too ill to partake, tachycardia ≥120bpm, and hypoxemia SpO2<90% during the test, has been associated with serious adverse events in COPD exacerbations [2]. In a study of 945 COPD patients, 74 had serious adverse events and 41.9% of those failed the 3MWT compared to only 13% of those without serious adverse events [2].

## HOW IS IT DONE

The 3MWT is performed after ED treatment and prior to discharge. Baseline heart rate and SpO2 are obtained prior to test. The patient is instructed to walk at their own pace in the ED for three minutes, covering any distance they can within the time-frame. Assistance with walking aids is permitted; however, the patient may not be assisted by any person. Additionally, no supplemental oxygen is given to the patient

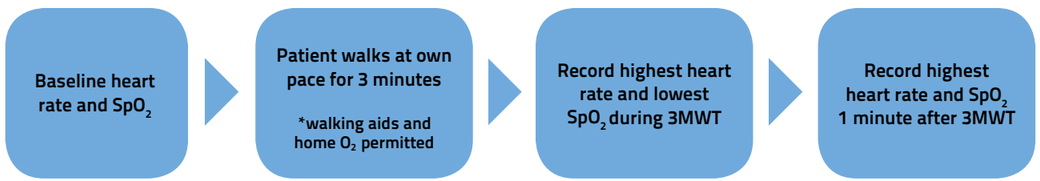


**Figure 1** displays the steps to the 3MWT.

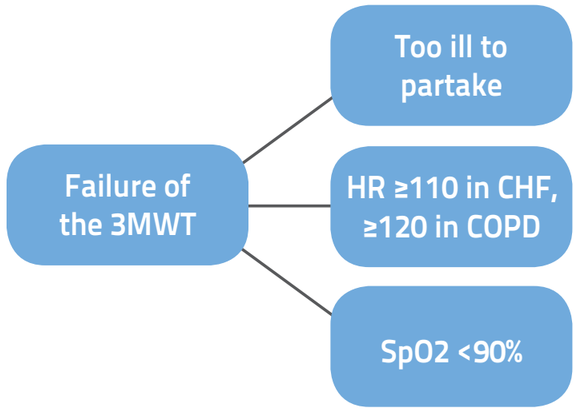


**Figure 2** displays the ways patients can fail the 3MWT.

apart from their baseline home oxygen supplementation. During the walk, the highest heart rate and lowest SpO2 are documented. After walking for three minutes, the heart rate and SpO2 are measured one minute after completion (Figure 1)[3]. The patient fails the 3MWT with any of the previously described criteria (Figure 2).

## CONCLUSION

While the 3MWT should not be used in isolation, failure of the 3MWT by CHF and COPD exacerbation patients in the emergency department may help the clinician better predict their risk of serious adverse events and assist with disposition.

## REFERENCES

1. Pan AM, Stiell IG, Clement CM, Acheson J, Aaron SD. Feasibility of a structured 3-minute walk test as a clinical decision tool for patients presenting to the emergency department with acute dyspnoea. Emerg Med J. 2009 Apr;26(4):278-82.

2. Stiell IG, Clement CM, Aaron SD, et al. Clinical characteristics associated with adverse events in patients with exacerbation of chronic obstructive pulmonary disease: a prospective cohort study. CMAJ. 2014 Apr 1;186(6):E193-204.

3. Stiell IG, Clement CM, Brison RJ, et al. A risk scoring system to identify emergency department patients with heart failure at high risk for serious adverse events. Acad Emerg Med. 2013 Jan;20(1):17-26.

4. Simmering JE, Polgreen LA, Comellas AP, Cavanaugh JE, Polgreen PM. Identifying patients with COPD at high risk of readmission. Chronic Obstr Pulm Dis.2016;3(4):729-738.

5. Bergethon KE, Ju C, DeVore AD, et al. Trends in 30-Day Readmission Rates for Patients Hospitalized With Heart Failure: Findings From the Get With The Guidelines-Heart Failure Registry. Circ Heart Fail. 2016 Jun;9(6). pii: e002594.

6. Zeng GS, Chen LC, Fan HZ, et al. The relationship between steps of 6MWT and COPD severity: a cross-sectional study. Int J Chron Obstruct Pulmon Dis. 2018 Dec 28;14:141-148.

7. Ingle L, Cleland JG, Clark AL. The relation between repeated 6-minute walk test performance and outcome in patients with chronic heart failure. Ann Phys Rehabil Med. 2014 Jun;57(4):244-53.

8. Stiell IG, Perry JJ, Clement CM, et al. Prospective and Explicit Clinical Validation of the Ottawa Heart Failure Risk Scale, With and Without Use of Quantitative NT-proBNP. Acad Emerg Med. 2017 Mar; 24(3):316-327







# How Can YOU Save a Life?

## *PulsePoint: Empowering Superheroes*

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**My uncle believed he was a healthy man. Surviving cancer at a young age caused him to live a very positive and compassionate life. It was no surprise he signed up for a 100-mile bike ride supporting our veterans. He completed the two-day journey and contacted our family to share his joy and sense of accomplishment. Within minutes of sending his final text, he suffered a Sudden Cardiac Arrest (SCA). Emergency Medical Services (EMS) were called immediately, but they arrived on the scene too late. He had passed at only 48 years old. Stories like this are far too common; however, there is a mobile app combating this paradigm.**

Approximately 395,000 cases of cardiac arrest occur outside of a hospital setting in the U.S. each year, in which less than 6 percent survive[1].

PulsePoint works with local public safety agencies to establish communications with cardiopulmonary resuscitation (CPR) certified citizens. The use of location-aware mobile devices allows the people to respond to a SCA and begin CPR as well as automated external defibrillation (AED) administration before EMS arrive. The mission of PulsePoint is to empower the community and allow its citizens the opportunity to save the lives of SCA victims.

The national average arrival time of EMS is about 8 minutes, but 14 minutes in rural areas[2]. Survival from SCA is close to 90 percent if defibrillation is performed within the first minute. Survival decreases by 7 to 10 percent for every additional minute defibrillation is postponed. Survival is less than 5 percent in adults with a 10-minute delay of treatment[3].

**How it works:**
When 911 is contacted and alerted of a possible SCA, the local dispatcher sends out a PulsePoint notification simultaneously with the dispatch of advanced medical care. The location-aware application will alert users in the vicinity of the SCA. The app also directs these potential rescuers to the exact location of the closest AED.

You have nothing to lose, while someone else has everything to gain! Download PulsePoint and potentially save a life in your community!

PulsePoint is a non-profit foundation and is free to download. There is no penalty should you decline the ability to respond to the SCA. PulsePoint is not yet available in all counties but is expanding steadily.

For additional information go to **PulsePoint.org**.

## References:

1. IOM (Institute of Medicine). 2015. Strategies to improve cardiac arrest survival: A time to act. Washington, DC: The National Academies Press.

2. SCAA (Sudden Cardia Arrest Association). About AEDs. Retrieved from http://www.suddencardiacarrest.org/aws/SCAA/pt/sd/news_article/43774/_PARENT/layout_details/false

3. Seaman, A. 2017, July 19. Be prepared for ambulance wait times. Retrieved from https://www.reuters.com/article/us-health-emergency-response-times/be-prepared-for-ambulance-wait-times-idUSKBN1A42KQ

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