

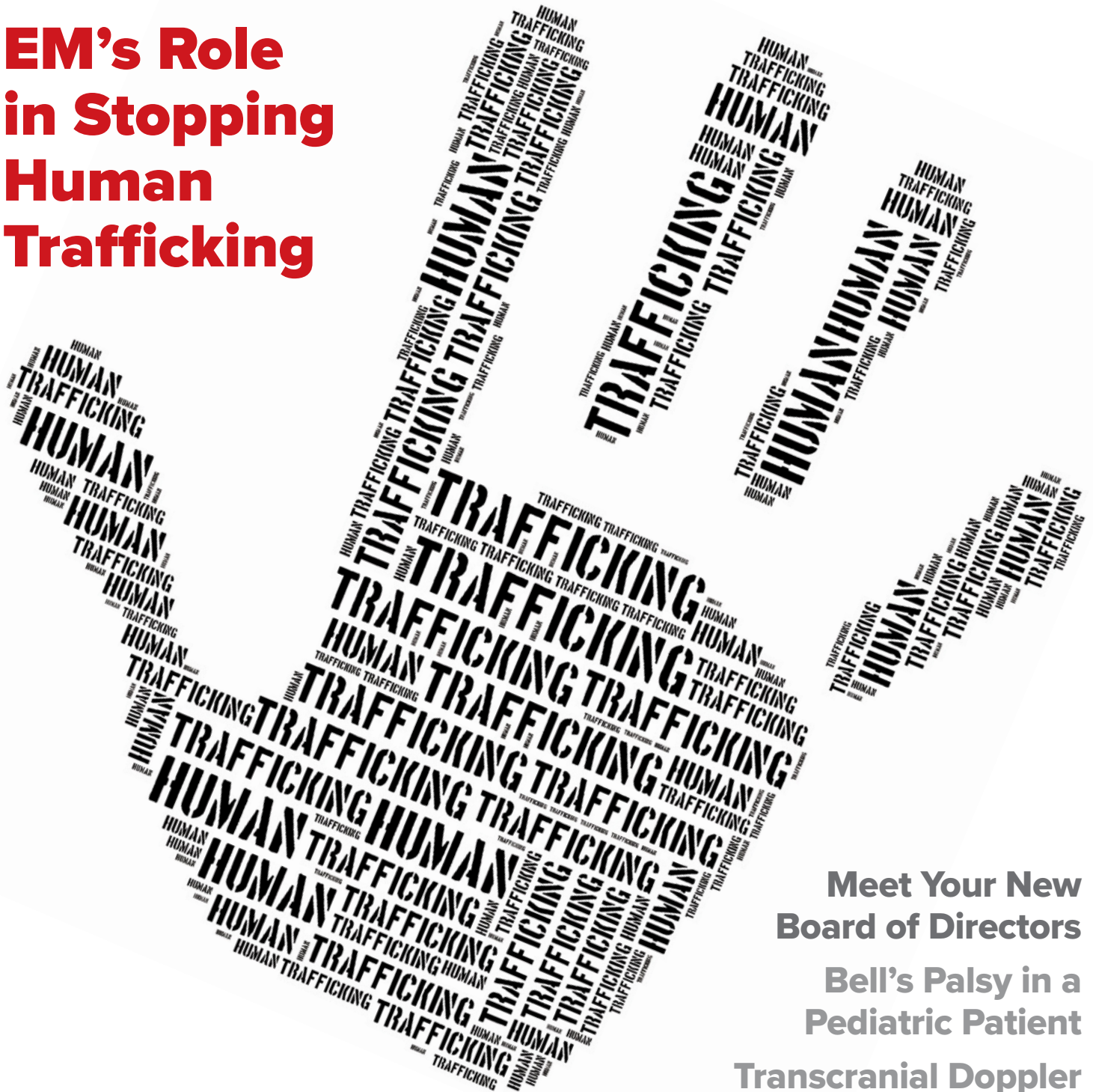
EM Resident

Official Publication of the Emergency Medicine Residents' Association

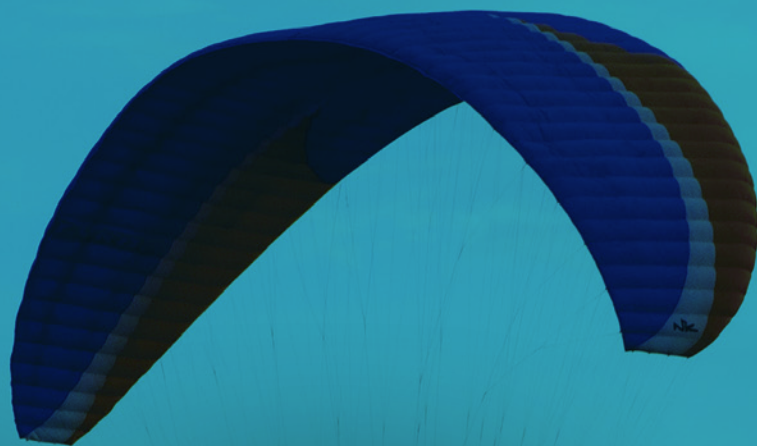
December 2020/January 2021

VOL 47 / ISSUE 6

EM's Role in Stopping Human Trafficking



Meet Your New
Board of Directors
Bell's Palsy in a
Pediatric Patient
Transcranial Doppler
in the ED



→ **ELEVATE
YOUR HEALTHCARE CAREER**

Looking for a clinical opportunity that helps reach your career goals while empowering you to deliver outstanding patient care?

Explore new clinical careers through SCP Health at scp-health.com/explore





Celebrating New Beginnings

Priyanka Lauber, DO
Editor-in-Chief, EM Resident
Lehigh Valley Health Network
[@PriyankaLauber](#)

Hello EMRA Family,

I am in awe that this time last year was the first time I wrote for *EM Resident* as your new Editor-in-Chief. I cannot believe a year has flown by since I have been elected to the EMRA Board of Directors and have been with *EM Resident*. I am so thankful for all the wonderful articles we have published together as a team. I am grateful to all the authors who contribute to *EM Resident*, and to the Editorial Team who work tirelessly to bring you all the best content. (Please take note of the names on p. 2; these physicians work behind the scenes to help our authors succeed and readers excel.)

Beginning my second year on the Board also means a new election took place for the outgoing Board members. EMRA Board of Directors positions alternate between even-year and odd-year elections (except for the president-elect position, which is elected every year) to help maintain some institutional memory as new residents become elected. Thus, we are excited to introduce our new Board members to [#EMRAFamily](#)! Remember — YOU, as our Representative Council, have helped propel these candidates to the position of a Board member so they can work for YOU. Please take a moment

to read their profiles in this edition of *EM Resident* as they work with the rest of the Board to represent residents, medical students, and alumni on a national scale.

As I look onto our recently elected Board members, I can't help but reflect on change. ***“We all face changes every day — whether it is a simple change in the weather, our schedule, or expected change of seasons. Change affects us all, and we each deal with change differently. Thus, the only constant in life, the only thing we can be sure will happen is change.”***

This quote is ever more relevant today as we are again at the brink of another COVID-19 surge, and our hospitals and residencies are reacting. We are encountering a change in staffing, how we perceive population health, how we dress for our patients and interact and greet people. And, of course, change in how newly graduating senior residents are entering the job market.

However, with every change, we also have an opportunity for a new beginning. Even though I am a current practicing Christian, I grew up celebrating Diwali, a religious holiday widely practiced around the world by Hindus, Sikhs, and Jains. I grew up in India until the age of 12, which is also the last year I practiced the holiday. Looking back at my childhood, Diwali was a time that brought a lot of joy and comfort in my life. There were

glimpses of delicious food, laughing with cousins, and memories of bright clothes and colorful fireworks. Since my move to America, much of these memories have faded as I struggle to hold onto them.

This year, I felt like it was vital for me to understand who I am and explore my childhood culture with increased resolution. I understood the symbolic nature behind the oil-light candles. I understood the meaning behind each of the 5 days that surround Diwali and the importance each day held. However, the one that felt the most serendipitous was that Diwali was a celebration of both light's victory over darkness and a celebration of new beginnings. I spent 2 of the 5 days with my brothers and a few select friends reflecting on what change meant for them — reflecting on the benefits and downsides of change. Celebrating new beginnings rather than allowing change to become a paralyzing fear.

I know we are all entering another change. For some, it's with relationships, moving for work or fellowships, or how we experience the stress of work as our patients continue to roll in, sicker by the day in this pandemic. I implore us all to take a day or two to reflect with our loved ones on the benefits of change. Celebrate, if you can, new beginnings. Lean into the change and new beginnings, and make your own days of Diwali to celebrate them both. ★

TABLE OF CONTENTS

EDITORIAL STAFF

EDITOR-IN-CHIEF

Priyanka Lauber, DO
Lehigh Valley Health Network

EDITORS

Erich Burton, DO
Greenville Health System

Marc Cassone, DO
Geisinger Medical Center

Nicholas Cozzi, MD, MBA
Spectrum Health/Michigan State University

Sean Hickey, MD
Icahn SOM at Mount Sinai

Whitney Johnson, MD
UCSF-Fresno

Amie Kolimas, DO
University of Illinois Hospital – Chicago

Emily Luvison, MD
ChristianaCare

Devan Pandya, MD
UC Riverside

Sarah Ring, MD
Icahn SOM at Mount Sinai

Jason Silberman, MD
University of Tennessee

Samuel Southgate, MD, MA
Regions Hospital

MSC Editor

David Wilson
Thomas Jefferson University

ECG Faculty Editor

Jeremy Berberian, MD
ChristianaCare

Anesthesia

Daniel Bral, DO, MPH, MSc
URMC Anesthesia Residency

PEM Faculty Editor

Yagnaram Ravichandran, MBBS, MD, FAAP
Dayton Children's Hospital/Wright State

Toxicology Faculty Editor

David J. Vearrier, MD, MPH, FACMT,
FAACT, FAAEM
University of Mississippi

- 4** Get to Know Your President
NEW BOARD
- 5** New Board Members
NEW BOARD
- 8** Human Trafficking and the ED
SOCIAL EM
- 11** Cutaneous Larva Migrans
WILDERNESS MEDICINE/
DERMATOLOGY
- 12** MRI Confirmed Bell's Palsy Presenting with Multiple Cranial Nerve Involvement
NEUROLOGY/PEDIATRICS
- 14** Can Transcranial Doppler Be Useful in the ED?
ULTRASOUND
- 18** Nonketotic Hyperglycemic Hemichorea
NEUROLOGY/METABOLIC DISORDER
- 20** Utility of Follow up Skeletal Surveys in Suspected Child Maltreatment
PEM, SOCIAL EM
- 22** The Riot Trauma
SOCIAL EM
- 24** The Physician's Role in Providing EMS Feedback
PREHOSPITAL/DISASTER MEDICINE
- 25** Lefamulin
INFECTIOUS DISEASE,
CRITICAL CARE
- 26** Subarachnoid Hemorrhage
CRITICAL CARE, TRAUMA
- 28** Septic Arthritis in a Patient with a Confounding History
RHEUMATOLOGY,
INFECTIOUS DISEASE
- 30** Coincident VZV Encephalitis and Otomastoiditis
DERMATOLOGY, NEUROLOGY
- 31** Updates in the Airway
RESEARCH/AIRWAY
- 36** OUD
SOCIAL EM
- 38** A Case Report of Spontaneous Nasal Septal Abscess
ENT
- 40** Popliteal Artery Occlusion
ULTRASOUND
- 42** 8 Tips to Finding a Job During a Global Pandemic
CAREER PLANNING
- 43** The Case for a Universal Emergency Medicine Clerkship
MEDICAL STUDENTS/EDUCATION
- 44** Turning Medical Students into Medical Educators
MEDICAL STUDENTS/EDUCATION
- 46** First 60 Days
WELLNESS
- 47** I Answered
HEART OF EM
- 48** News & Notes
ABEM, ANNALS NEWS
- 49** ECG Challenge
CARDIOLOGY
- 53** Board Review Questions
PEER ASSISTANCE

EM Resident (ISSN 2377-438X) is the bi-monthly magazine of the Emergency Medicine Residents' Association (EMRA). The opinions herein are those of the authors and not of EMRA or any institutions, organizations, or federal agencies. EMRA encourages readers to inform themselves fully about all issues presented. *EM Resident* reserves the right to edit all material and does not guarantee publication.



**FOR SOME OF OUR MOST ELITE SOLDIERS,
THIS IS THE FRONT LINES.**

As an officer working in Emergency Medicine for the U.S. Army health care team, you'll be on the front lines of medical innovation, practicing in world-renowned hospitals, clinics and health care facilities with access to the most sophisticated medical equipment in the field. With over 90 medical career specialties to choose from, you'll have the opportunity to participate in humanitarian efforts, learn innovative techniques and make a real difference in the lives of Soldiers and their families.

To see the benefits of being at the forefront of Army medicine call 800-431-6717 or visit healthcare.goarmy.com/aqdl



Get to Know Your President

RJ Sontag, MD

OhioHealth • Residency: UT Health San Antonio •
@RJSontagMD

RJ Sontag came to emergency medicine after working first in public service and advocacy, and he has merged his interests in medicine and policy. As a previous chair of EMRA's Health Policy Committee, Dr. Sontag focused his president-elect year on supporting and facilitating the growth of EMRA's community of committees. He now turns his attention to strengthening the EM community as a whole by strengthening and supporting the trainees' experience.

What's your first priority as an EMRA board member?

EMRA has your back always, and COVID-19 can't stop us from supporting you. Our goal of helping you become the best doctor you can be, the best leader you can be, and to help emergency medicine become the best specialty we can be must not cease during this era. We're working to get medical students clear, consistent information about the application cycle so you can match to the residency of your dreams. We're helping residents get strong education without dilution from other learners. And we're partnering with organizations like ACEP to help our graduating residents keep the jobs they've signed contracts for.

Where do you want EMRA to be at this time next year?

When I close my eyes, this is what I imagine: I see us hanging out together, vaccinated and safely mask-free, spending time growing as young physicians-in-training. We'll see the smiles that have been trapped behind masks, both on-shift and off. We'll have spent this time building a more diverse workforce that reflects our patient population. We'll have job offers that our future employers will honor, wherever we want to live — urban, suburban, or rural — without fear that we'll be replaced by non-physicians.

How can EMRA members participate in our progress?

EMRA Committees are an amazing way

for you to learn more about the subjects you're passionate about. They're also an excellent path for leadership development. Joining is free and easy, and more than 6,000 EMRA members have already joined committees ranging from Admin & Ops to Wilderness Medicine.

How will you evaluate your success as EMRA President?

We thrive as a profession when we're engaged and diverse. We hope that we create exciting new ways to help you thrive, rather it's with the electronic version of the EMRA Antibiotic Guide on MobileM, or through an EMRA Committee, or with our wildly successful year-round virtual programming. We need to continue to diversify as a specialty, rather than continuing to become more white and more male. That takes action, like mentoring underrepresented medical students, developing diverse leaders, and recognizing the efforts of those who meet this mission.

What is the best advice you've ever received?

It's never too late to reinvent yourself. When I turned 30, I had a professional crisis. I was working in politics with an impossible goal to truly make the world a better place. But when my boss lost re-election, I became jaded by a political process that allowed good people to lose. Rather than work for his opponent, I quit my job, finished my pre-reqs, and applied for med school. I'm now 40, and I wouldn't change a thing about my path. I strive to make a world of difference on an individual level with every patient encounter. I also gained experience in political advocacy and policy development, which helps my patients and my profession.

How do you recharge after a tough shift?

Conversation is the very best way for me to get my mind off of a stressful shift. I try not to burden my husband with the truly traumatic things we encounter on a daily basis, so I often turn to my co-residents or



EMRA friends to talk it out. If everyone's asleep, I like to bury my emotions in junk food and get lost in episodes of *Schitt's Creek* or *Arrested Development*. It's a nice mix of healthy and unhealthy coping mechanisms!

What is something people don't know about you?

I studied theatre in college. I got a scholarship to major in physics and pre-med, but fell in love with the stage and decided to switch majors. My parents flipped. Absolutely freaked out. Unfazed, I even tacked on a minor in film. It took me a while to realize I was lousy on stage, but I honed my organizational management skills by working behind the scenes to support those who actually could perform. EMRA is a continuation of that path; I love working behind the scenes to support young physicians as they follow their dreams.

1 skill you want but don't have (yet):

Singing. I wish I could belt out a tune, or even get near the right pitch when I'm singing. I love medicine now, but if I actually had a decent voice, I never would have left the theatre. A great voice is also one of my favorite qualities in other people, and it's one of the first things that made me fall in love with my husband.

1 skill you could do without:

Sarcasm. I love to make people laugh, and my sense of humor tends toward the dry and dark. I'm always quick with a joke, but it gets me in trouble. Not everyone shares my sense of humor. It's worse during this pandemic, when the smirk that gives away that I'm joking is hidden behind a mask. ★

President-Elect Angela G. Cai, MD, MBA

Kings County/SUNY Downstate • @angelagcai

Angela Cai sought out EMRA to connect with colleagues interested in health policy. As Director of Health Policy for the past 2 years, Dr. Cai oversaw EMRA's legislative interests, launched a robust monthly update geared toward residents and medical students, and worked with the ACEP Young Physicians Section to transition the ever-popular Health Policy Primer held in-person at ACEP LAC into a valuable virtual event.

What's your first priority as an EMRA board member?

One of my priorities serving on the EMRA Board will be to maximize resident satisfaction with their first job search. Just as EMRA's bedside books and MobilEM app are the "go-to" on-shift guides, we could build "go-to" guides to help residents understand EM practice and ownership models and how to read and negotiate your first contract. From a big-picture perspective, EMRA should work with other EM associations

to examine market challenges faced by our newest grads, including decreasing demand from low post-pandemic ED volumes and increasing supply from the growth of EM residencies. By building top-notch resources and continuing to study our workforce needs and solutions, EMRA can help every EM grad land a great job.

What is the best advice you've ever received?

Accept your best, and do not take on the burden of what you cannot control.

How do you recharge after a tough shift?

Post-night breakfast with my co-residents (plus or minus a massage)

What is something people don't know about you?

I spent a year in China during and after college working in a lab, volunteering at a migrant children's library, participating in a cultural exchange, and working as a secretary for a university.



1 skill you want but don't have (yet):

After many formal and informal lessons, I still can't quite figure out how to salsa.

1 skill you could do without:

Collecting notebooks and not writing in them

Does pineapple go on pizza? Sure.

Favorite comfort food (or drink):

Dad's Chinese-style pork bone broth noodle soup *

**Thank You
for Your Dedication
and Resilience in 2020**

 American College of
Emergency Physicians®
ADVANCING EMERGENCY CARE 

We've never been more proud.

Vice Speaker of the Council
Ashley Tarchione, MD
Maricopa Medical Center • @ATarchione

What's your first priority as an EMRA board member?

Increase EMRA town halls for residents and medical students! There are so many issues facing residents and health care providers, and we have an important voice in deciding how to fix them.

What is the best advice you've ever received?

Do what energizes you! Also, don't eat the yellow snow (courtesy of my sister).

How do you recharge after a tough shift?

Look at dog adoption websites

What is something people don't know about you?

I follow competitive eating closely.

1 skill you want but don't have (yet):

I wish I was good at trivia.

1 skill you could do without:

My extensive knowledge of reality TV

Does pineapple go on pizza?

Does gravy go on chicken?

Favorite comfort food (or drink): Fried chicken for food. Gravy for drink. *



Director of Health Policy
Maggie Moran, MD
San Antonio Military Medical Center



What's your first priority as an EMRA board member?

Making policy more accessible to medical students and residents

What is the best advice you've ever received?

"Know what you know, and know what you don't, and know when to ask for help."

How do you recharge after a tough shift?

Taking the dog for a jog or throwing tennis balls in the back yard

What is something people don't know about you?

I have a twin brother and we were born in Panama.

1 skill you want but don't have (yet):

Conversational American Sign Language

1 skill you could do without:

I have a great sense of direction made completely useless by Google Maps.

Does pineapple go on pizza?

Yes

Favorite comfort food (or drink): Shredded cheddar cheese microwaved on top of tortilla chips *

Director of Leadership Development
**Capt. Yev Maksimenko, MD, MA,
DIMM, FAWM, FP-C**

Boston University Medical Center • @O7ManUnited

What's your first priority as an EMRA board member?

Identify areas for improvement in how we develop leadership skills of our committee leaders, as well as reinvigorating our Leadership Academy.

What is the best advice you've ever received?

Don't stop because someone said no, keep going until someone says yes.

How do you recharge after a tough shift?

Bike ride home, have a beer, and spend time with my wife and daughter.

What is something people don't know about you?

I used to work at SUBWAY® and Quiznos at the same time in high school, taking the "Sandwich Artist" game to the next level.

1 skill you want but don't have (yet): To be a better public speaker

1 skill you could do without: Inability to sit still/restlessness

Does pineapple go on pizza?

Nope

Favorite comfort food (or drink): Pho ★



EMRA Representative to ACEP
Nicholas Cozzi, MD, MBA

Spectrum Health/Michigan State University College of Medicine •
@NickCozziMDMBA



What's your first priority as an EMRA board member?

I hope to gain the trust and confidence of EMRA members, fellow board members and staff, and ACEP Board of Directors. Cultivating meaningful relationships take time, effort, and intentionality.

What is the best advice you've ever received?

Write one handwritten thank-you note each day and mail it. Repeat daily. Doctor's orders.

How do you recharge after a tough shift?

A hot fresh cup of French press coffee

What is something people don't know about you?

I lived on a Michigan apple orchard as well as an island on the Mississippi River.

1 skill you want but don't have (yet): Golf

1 skill you could do without: Zoom Mastery

Does pineapple go on pizza? Pineapple is for dessert.

Favorite comfort food (or drink): Chicago's Portillos ★

Human Trafficking and the ED

Concealed but Not Forgotten

Lindsay Davis, MPH, NRP

Lincoln Memorial University –
DeBusk College of Osteopathic Medicine
Class of 2021

Bryce Taylor, DO, MS

Emergency Medicine Resident PGY1
Carilion Clinic –
Virginia Tech Carilion School of Medicine

Emergency physicians are in a unique position to recognize human trafficking, as the emergency department may be the first or only contact a victim has with the medical community. This is why it is important to quickly recognize signs of human trafficking, gain victims' trust, and respond appropriately to provide effective aid.

Human trafficking occurs across gender, race, age, and nationality, but primarily exploits those who are most at risk and vulnerable in our society. Due to being a world shrouded in secrecy, data collection on the magnitude and outcomes of human trafficking is scarce, however trafficking has proven to be robust in our society and should always be regarded as a possibility while working with patients in the emergency department.

Definitions

- **Human trafficking:** A violation of basic human rights in which an individual is controlled and forced to engage in sex work or labor by trafficker. The trafficker may coerce a victim into trafficking through physical force, fraud, threats, monetary incentives, and substance dependency.¹
- **Sexual trafficking:** A subset of human trafficking in which the trafficker moves and manages an individual to sell them for sex work. Commonly, the trafficker will procure and facilitate the meeting of individuals that will pay for sex work with their victims, and then benefit financially by taking some or all of the payment offered. This can occur in any setting; however, it is frequently seen in illegal brothels, escort services, massage parlors, adult clubs, and common venues with prostitution such as bars and specific intersections or roads.¹
- **Labor trafficking:** A subset of human trafficking in which the

trafficker recruits and moves an individual to sell them into forced labor. This forced labor can include any form of domestic or commercial work, ranging from domestic work in a single household up to commercial work in large industries such as sweat shops and agricultural settings such as migrant farm work. Traffickers coerce victims into forced labor through physical punishment, fraud, debt bondage, false promises of a better life, and slavery.¹

Statistics

The prevalence of human trafficking is difficult to fully quantify, as many victims go unnoticed. In 2018, the National Human Trafficking Hotline received the most calls from California, followed by Texas and Florida. It is also estimated that 50,000 people are trafficked into the United States each year, most often from Mexico and the Philippines.¹ In 2018, 1,649 human trafficking victims were cited in criminal cases with approximately half being adult and half being children. Child-only sex trafficking encompasses 52% of cases

and females make up 94% of all human trafficking victims identified. The internet was used to facilitate trafficking in 88% of the cases. It is estimated that only 0.04% of victims and survivors of human trafficking cases are identified.² Although there is no true profile of a human trafficking victim, individuals who were at one time homeless and runaway youth have been shown to make up greater than 50% of prostitutes. Foreign nationals and individuals who have experienced trauma and violence in the past are also noted to be at increased risk of exploitation through human trafficking.¹

Studies have shown that 50%-90% of human-trafficking victims have sought medical care while being trafficked.^{3,4} This population suffers from increased morbidity and mortality, both while being trafficked and after surviving trafficking.³ Victims that are forced into prostitution have an increased rate of being murdered⁵ and increased overall mortality when compared to the general population.⁶ Mortality rates for victims of child- and labor-trafficking are more difficult to ascertain as these victims are often concealed by their perpetrators.

Patient Presentations

Patients may present with a wide variety of signs and symptoms that can have similarities with victims of other types of psychological and physical trauma. When considering whether a patient may be a victim of human trafficking consider the physical, behavioral and other features of their overall presentation to gain a clearer picture. If a provider observes suspicious injuries or injury patterns, overly involved companions, scripted stories, and conflicting information, it is important to consider trafficking. If a patient that is unaware of their location, city, or region, at the time of evaluation, despite being fully alert and oriented, this may be a sign that they are being trafficked between different areas against their will.⁷

Physical signs and symptoms that trafficking victims may present with can be broad and nonspecific. Reproductive health concerns, including multiple sexually transmitted infections, recurrent pregnancies, and multiple pregnancy terminations that may be against their

wishes are common among human-trafficking victims.⁷ Somatization, such as headaches, abdominal pain, and pelvic pain are also signs that may be exhibited by those that are being trafficked as well as victims of sexual abuse.⁷ If a patient presents with physical injuries, it is important to consider signs of non-accidental trauma, which may include mechanisms inconsistent with the type or degree of injury, broad and nonspecific injury patterns, multiple fractures with heterogeneous stages of healing, and cigarette burns or other burn patterns that appear intentional.⁷ Other important physical signs to evaluate are conspicuous tattoos (often used for branding), as well as signs of malnutrition and poor dentition.⁷

Behavioral signs and symptoms that victims of human trafficking may exhibit include depression or having a depressed or flat affect, anxiety, panic attacks, anger, and poor mental status.⁷ Victims may be chronically sleep-deprived or intoxicated by mind altering substances. If a patient presents in a seemingly altered mentation, it is important to further evaluate the patient's circumstances, even if the

TAKE-HOME POINTS

- Human trafficking is a human rights violation that exists on both a national and global scale. It is prevalent in every state and territory. Most trafficking victims have sought medical treatment; they can be of any socioeconomic status and any age.
- Establishing trust is of utmost importance. Every patient should be made to feel safe and heard. Even if the victim does not want to press charges or separate from their trafficker, it is important they know the ED is a safe place to turn.
- EM teams are mandatory reporters. If there is a suspected case involving the abuse or trafficking of a minor, it must be reported. Refer to your facility's protocols and local laws regarding the agencies and processes involved in reporting.

people accompanying them claim that to be their baseline. Aggression towards the healthcare team or law enforcement, either by the patient or by someone accompanying them, may indicate a fear of repercussions or an attempt at concealment.⁷ People that are victims of human trafficking frequently experience a phenomena known as traumatic bonding, otherwise known as "Stockholm Syndrome," through sustained abuse and infliction of trauma.¹ In these cases, with time the victim may believe their trafficker to be acting in their best interest, often identifying them as a friend or an ally. It will likely be difficult in these cases to gain the victim's trust, as they may feel protective of their trafficker, and the trafficker might influence them to perceive those attempting to help them as threats.¹

How to Respond

Always be compassionate and empathetic. Ask yourself, "**How can I create a situation in which the victim feels safe, makes his or her own choices, and feels understood?**"⁸

- If possible, see the patient in a private room, and ask open-ended questions in a nonjudgmental tone and manner.
- Try to sit at or below the level of the patient; standing over them can be perceived as being threatening or intimidating.
- Use body language that can be interpreted as open and accepting.
- Offer to bring in a chaperone of the same gender as the victim for the entire interview and exam, as this may equalize any power differential the victim may perceive.

Health care should always be interdisciplinary and patient-centered, so make sure the patient is involved in every decision that is made and knows they are in control of their care. Use a medical interpreter if the patient does not speak English; this not only is the standard of care, but it also mitigates the possibility of details being lost in translation and helps the patient feel heard. Separate the victim from the trafficker if possible, but approach this cautiously as the trafficker may react with violence toward the patient or staff if they perceive a threat. It is important to remain calm and non-

confrontational. Ask the suspected perpetrator to step out of the room to allow the patient to change and for the physical exam. Never confront the suspected perpetrator, regardless of their behavior. Involving your hospital's security and law enforcement if the situation escalates is essential. Provide resources for patients, such as referrals to counseling services or social work. If your department has a domestic violence intervention team, it may be beneficial to involve them if the patient allows. Depending on the situation, offer to involve police, but do not force it as this may discourage the victim from seeking medical help in the future. Do not forget that if you suspect trafficking and your patient is a minor, mandated reporting laws likely apply; know and follow your hospital's reporting procedures and local laws.

Providers should consider asking the following questions to all patients, regardless of complaint or circumstance: "Do you feel safe at home?" "Can you leave your work if you wanted to? Have you ever been hurt or threatened?" "Do you know how to get help if you needed it?" Answers to these questions can help guide you in finding the right resources to help the patient. For the physical exam consider having a sexual assault nurse evaluation performed if indicated. Consider ordering a skeletal survey, especially in cases of non-accidental trauma. Follow evidence collection protocols for your jurisdiction and institution. If your hospital does not have these, consider developing them. Contact the U.S. National Trafficking Hotline: 1-888-3737-888 or text 233733; this resource can help victims find the resources in their area to help them receive trauma-informed services.^{8,9,10}

Considerations for the Emergency Physician

Learn how to identify potential victims of human trafficking and help them access the resources they need. Consider holding a departmental or residency training with social services and victim-resource agencies to learn about how they can assist in helping victims and obtaining the best patient outcomes. Learn the differences between mandatory reporting in adult and child victims in your jurisdiction. Mandated reporting laws and criteria vary somewhat by state but typically require all cases of abuse of children to be reported. Your local child and adult protective services agencies can be a resource on local mandating laws and resources. Even if the patient does not disclose they are a victim of trafficking, it is important that they feel able to return. ★

Human Trafficking Checklists

<p>Nicole E. McAmis Frank H. Netter MD School of Medicine Quinnipiac University Class of 2021</p> <p>Angela C. Mirabella Frank H. Netter MD School of Medicine Quinnipiac University Class of 2022</p>	<p>Elizabeth M. McCarthy Frank H. Netter MD School of Medicine Quinnipiac University Class of 2023</p> <p>Cara A. Cama, MBA Frank H. Netter MD School of Medicine Quinnipiac University Class of 2021</p>
--	---

<p>Risk Factors</p> <ul style="list-style-type: none"> ● Pregnant, post-partum ● Poverty ● Racial/ethnic minority status ● Marginalized individuals: LGBTQ, runaway youth, Native Americans, indigenous people ● Rural location ● Lack of education ● Disability ● Inadequate family support and protection ● Migration <p>Red Flags + Indicators</p> <ul style="list-style-type: none"> ● Someone else is speaking for the patient and refuses to let the patient have privacy ● Exhibits fear, anxiety, or tension ● Reluctant to explain his/her injuries or shared a scripted/inconsistent history ● Tattoos or other forms of branding are visible ● Reports an unusually high number of sexual partners, STDs, pregnancies, miscarriages, or terminations ● Uses language [or slang] common in the commercial sex industry ● Possess specific knowledge of sexual language inappropriate for stated age <p>When Approaching Questions</p> <ul style="list-style-type: none"> ● Conduct the assessment in a comfortable, private location with a social worker or advocate present whenever possible ● Conduct the interview in the potential victim's native language and use a professional, neutral interpreter if needed ● Ask others present to leave for the interview and examination ● Use an approachable tone, demeanor, and body language that remains neutral and is non-judgmental ● Refrain from taking notes while in the room to promote active listening ● Assure confidentiality, unless the situation invokes state mandatory 	<p>reporting laws (i.e. persons in grave danger, minors under the age of 18 years, or persons with disabilities)</p> <ul style="list-style-type: none"> ● Victims may find it easier to speak with a provider who is of the same sex, ethnicity, or age range ● Reference existing institutional protocols for victims of abuse ● Before you begin, do a safety check: <ul style="list-style-type: none"> — Is it safe for you to talk with me right now? — Do you feel safe right now? — Do you feel like you are in any kind of danger for speaking with me? <p>Appropriate Questions + Screening Tools</p> <ul style="list-style-type: none"> ● Have you ever been punched, slapped, or kicked? ● What are your working or living conditions like? ● Have you ever been deprived of food, water, sleep, or medical care? ● Can you leave your job or situation if you want? ● Can you come and go as you please? ● Who is the person who came with you today? Can you tell me about them? ● Have you ever been threatened or intimidated? ● Has anyone threatened to hurt you or your family if you leave? ● Do you have a debt to someone you cannot pay off? ● Is someone holding your identification documents (passport, visa, driver's license)? ● Did you ever feel pressured to do something that you didn't want to do or felt uncomfortable doing? ● Have you ever been forced to have sex with people you don't want to have sex with? ● Have you been forced to engage in sexual acts for money or favors? ● Does anyone take all or part of the money you earn? ● Do you have to meet a quota of money each night before you return home? ★
--	---

Cutaneous Larva Migrans

A CASE REPORT

Hussain Shakir, MD, FAAP

Pediatric Emergency Medicine Fellow
St. Christopher's Hospital for Children
Temple University Hospital-Jeanes Campus

Louis King, MD

Assistant Professor, Clinical Emergency Medicine
Temple University Hospital

A 59-year-old male without any past medical issues presents with a pruritic rash for 2 weeks. He saw his family doctor when it did not respond to an over-the-counter athlete's foot cream. He was referred to the ED for IV antibiotics due to concerns of an infection spreading up his foot. The serpiginous erythematous rash did not fit the layout of any of his foot veins. Additionally, a macerated rash extended beneath the little toe and scabs were present on the dorsum of 4th and 5th toes.

The diagnosis was clinched by an experienced clinician with one question: Where did you vacation recently?

What is Your Diagnosis and Treatment?

Discussion

Cutaneous larva migrans (CLM) or erythema larva migrans is a dermatitis due to the migration of parasitic larvae within the epidermis.¹ Humans are accidental hosts who often acquire this infestation while walking barefoot on soil that contains the infectious form of the larvae.² A skin scab typically marks point of entry and then the characteristic serpiginous skin rash develops.¹ The rash develops over days and months. Typical symptoms include rash, pruritis, and secondary bacterial infection due to frequent itching. As humans are not natural hosts, these larvae die within several weeks to several months because they are unable to penetrate the host dermis and migrate deeper.² However, CLM parasites have been known to survive in a human host for years.^{3,4}

Another condition that is rare but presents with similar symptoms is Cutaneous pili migrans that is caused by hair migrating through the dermis.⁵

The most common hookworms are *Ancylostoma carinum* (dog hookworm) and *Ancylostoma braziliensis* (cat hookworm) especially in southern United States, Central and South America, and the Caribbean.^{2,4} Other hookworms known to cause CLM are *Cinaria stenocephala*, *Ascaris* spp., *Necator americanus*. The adult worm lay eggs in the intestine of their natural hosts (cats/dogs), which are then excreted in stools. The eggs follow their natural cycle forming first the noninfectious rhabditiform larvae which then molts into the infectious filariform larvae in about 1 week.⁴ These then burrow into the skin. This may also attach to clothes and then burrow into the skin of hosts.²

Oral treatment with anti-helminthic agents like ivermectin, albendazole, mebendazole, and thiabendazole is recommended. Ivermectin is used at 200 mcg/kg daily for 1-2 days. Cure rates with ivermectin are between 94-100%.^{6,7} Alternatively, albendazole 400 mg once daily with fatty meal for 3 days can also be prescribed.^{6,7} The pruritis usually resolves in a few days, followed by the rash. Associated cutaneous folliculitis will require 5-7 days of therapy at the same dosage level. Topical agents albendazole 10% cream and thiabendazole 15% cream are also available, though they are less effective.⁷ Antihistamines should be used for pruritis. Steroids are typically not recommended.

Our patient had vacationed in the Caribbean during the summer of 2019, frequently walking barefoot on the beaches there. He initially thought his rash was due to athlete's foot, and his family doctor considered thrombophlebitis. Further history in the ED revealed the rash started about 1 week after his vacation and had slowly progressed. A relative who was with him for the vacation had similar lesions. He was prescribed albendazole 400 mg once daily for a 3-day course. He was subsequently lost to follow up. ★



Image 1



Image 2

TAKE-HOME POINTS

1. Visual diagnosis is important. The rash does not follow the veins.
2. A temporal relationship to walking barefoot on surfaces that contain larva is often elicited.
3. Treatment is effective with either Ivermectin or Albendazole by mouth. Antihistamines should be prescribed to alleviate itching that is frequently distressing.

MRI Confirmed Bell's Palsy Presenting with Multiple Cranial Nerve Involvement

Gabrielle Ransford, MD

Eastern Virginia Medical School

Vipin Philip, MD

Children's Hospital of the King's Daughter

Joel M. Clingenpeel, MD, MPH, FACEP

PEM Fellowship Director

Children's Hospital of the King's Daughter

Bell's Palsy, also called idiopathic facial nerve palsy, is the paralysis of facial motor function without an identifiable cause. It typically presents with sudden onset unilateral facial paralysis and may be associated with ipsilateral hyperacusis, decreased taste, and decreased lacrimation.¹ It is a diagnosis of exclusion, and the emergency physician should thoroughly investigate other more serious etiologies, such as cerebral vascular accident (CVA).

Introduction

Unilateral facial paralysis is differentiated by whether it is forehead-sparing (an upper motor neuron lesion) or non-forehead-sparing (a lower motor neuron lesion). This distinction prompts investigation into intracranial versus extracranial etiologies. Facial nerve paralysis that is associated with other signs or symptoms (such as headache, fever, other cranial nerve involvement, extremity weakness, etc.) further complicates this distinction and broadens the differential. We present the case of a 13-year-old female with MRI confirmed Bell's Palsy (facial; facial paralysis) with associated involvement of cranial nerves 5 (trigeminal; decreased sensation), 9/10 (glossopharyngeal/vagus; difficulty swallowing), and 12 (hypoglossal; tongue deviation).

Case

A 13-year-old African-American female presented to the emergency department with one week of worsening left-sided facial paralysis. It began with slight asymmetry when smiling but eventually progressed to difficulty

holding liquids in her mouth and dysphagia. She denied odynophagia. She also reported blurry vision and retrobulbar pain when looking straight ahead. Additionally, 2 days before presentation she developed pain over her left zygoma that radiated to above her left ear.

The patient was otherwise healthy; she had no past medical history, did not take daily medications, had no known drug or environmental allergies, and was up to date on her vaccinations. She lived with her mother and brother in an urban environment. She denied recent illness, travel, trauma, or insect or tick bites. She could not identify a precipitating event or new exposure. Family history was noncontributory and negative for any diseases that could increase her risk of stroke, such as Sickle Cell disease or clotting disorders.

On physical examination, vital signs were within normal limits. She had a down-turned smile on the left, inability to raise her left eyebrow, and inability to fully close her left eye. She spoke out of the right side of her mouth while her left side pulled toward midline. She had decreased sensation over her left forehead, temple, maxilla, and mandible. Her tongue and her uvula deviated to the left. Hearing was grossly symmetrical. Extraocular movements were intact without pain and she did not have nystagmus. Visual fields and acuity were intact. The Romberg test was negative, and pronator drift was absent. Strength was intact throughout. Gait was normal. All other systems were unremarkable and age appropriate. Head CT demonstrated scattered punctate parenchymal calcifications that were of undetermined etiology or significance.

This was further evaluated with MRI, which identified enhancement of the left facial nerve and re-demonstrated the calcifications, noting no associated signal abnormalities that would raise concern for clinically significant pathology. CBC and CMP were within normal limits and the pregnancy test was negative. In conjunction with neurology consultation, the patient was discharged with an eye shield, eye lubricant, and instructions to follow up with neurology.

Discussion

It is classically taught that Bell's Palsy is an isolated facial nerve paralysis that lacks an identifiable cause and is not associated with other cranial nerve deficits. However, there are reports of other cranial neuropathies associated with facial nerve paralysis, though this is uncommon.^{2,4,5,6} One prospective study found that of 51 patients with Bell's Palsy, and 15 had at least one other associated cranial nerve palsy: ipsilateral sensory deficit (17 cases), contralateral sensory deficit (1 case), ipsilateral tongue weakness (1 case), decreased gag reflex due to palatal sensory deficit (2 cases).²

Because of the rarity of associated cranial nerve palsies, it is imperative that serious diagnoses be excluded prior to making the diagnosis of Bell's Palsy. In particular, a CT and/or MRI must be included to evaluate for cerebrovascular accident (CVA). Imaging should also be obtained if facial twitches or spasms preceded paralysis, as this may indicate a tumor compressing the facial nerve.¹ If other symptoms are prominent or certain risk factors are present, the workup should be expanded. According to one study of adult patients, emergency physicians have low rates of misdiagnosing Bell's Palsy (0.8%); the most common incorrect diagnoses are

CVA, herpes zoster, Guillain-Barre, and otitis media.⁷

Once Bell's Palsy has been diagnosed, severity and prognosis can be determined using the House-Brackmann

or Stony Brook facial grading systems. However, these tools are infrequently utilized in the emergency department and therefore not discussed further here.⁸ Neurology consult in the ED may

be appropriate. Indeed, neurology was consulted in the management of this case. Additional consults or follow-up with ophthalmology or ENT should be considered if there is severe eye or throat involvement, respectively, or if symptoms persist beyond 4 weeks.³

Complete resolution of symptoms can be expected, and approximately 70% of cases resolve spontaneously.³ Although there are conflicting reports, nerve enhancement on MRI, as seen in this patient, may suggest poor prognosis.^{9,10,11,12} Treatment with corticosteroids has been shown to decrease incomplete recovery by 30-40% and has a Number Needed to Treat of 10.^{8,13} Though it is presumed that HSV is the underlying cause in the majority of cases, there is controversy regarding the use of antivirals, such as acyclovir. A recent Cochrane review does not support treating Bell's palsy with antivirals alone or in conjunction with corticosteroids.¹³ Therefore, it is widely accepted that all patients receive 1 week of 60-80 mg prednisone, and only those with severe cases additionally receive 400 mg acyclovir every 6 hours for 5 days.^{3,8} Additionally, all patients should receive an eye patch and eye lubricant to prevent injury and vision loss, which are the most feared and most common complications of Bell's Palsy.³

Conclusion

Bell's palsy is a diagnosis of exclusion. It can present with other cranial nerve involvement, which should prompt evaluation with CT and/or MRI to rule out more serious pathology. Most cases resolve spontaneously, but corticosteroids facilitate resolution, and eye care is paramount to prevent injury and vision loss. ★

TAKE-HOME POINTS

- Facial nerve palsy can present with other cranial nerve involvement.
- CVA must be ruled out with MRI when facial paralysis involves other neurological findings.
- Peripheral causes of facial paralysis present with forehead involvement.
- Treatment of Bell's Palsy includes corticosteroids, an eye shield, and eye lubricant.

TABLE 1. Cranial Nerve Functions and Examination Maneuvers and Findings^{14,15,16}

Cranial Nerve	Motor Function	Sensory Function	Exam Maneuvers & Findings
I, Olfactory	—	Smell	Occlude 1 nostril and sniff coffee grounds or cinnamon → deficit on affected side
II, Optic	—	Vision	Visual fields, visual acuity → deficit on affected side
III, Oculomotor	Superior rectus, inferior rectus, medial rectus, inferior oblique, levator palpebrae, pupillary sphincter, ciliary muscles	—	H-test of ocular movements → inability to move eye superiorly, superomedially, medially, inferiorly, inferolaterally Light reflex → dilated pupil without constriction. Ptosis on affected side
IV, Trochlear	Superior oblique muscle	—	H-test of ocular movements → inability to move eye inferomedially
V, Trigeminal	Muscles of mastication	Sensation of face, mouth, cornea	Pinprick test, corneal reflex → deficit on affected side Palpate clenched jaw and open jaw against resistance → jaw will deviate toward affected side
VI, Abducens	Lateral rectus muscle	—	H-test of ocular movements → inability to move eye laterally
VII, Facial	Muscles of facial expression	Taste of anterior 2/3 of tongue	Eyebrow raise, eyelid squeeze, smile → deficit on affected side; taste deficit on affected side
VIII, Vestibulocochlear	—	Hearing, orientation of head in space	Whisper into ear while occluding the opposite ear → deficit on affected side Assess nystagmus → beats away from affected side or vertigo
IX, Glossopharyngeal	Stylopharyngeous and pharyngeal constrictor muscles	Taste of posterior 1/3 of tongue, sensation of tongue, oropharynx, middle ear, and ear canal	Say "ah" → affected side of oropharynx will not lift; uvula deviates away from affected side
X, Vagus	Pharyngeal, soft palate, and laryngeal muscles	Visceral innervation of thoracic and abdominal organs; taste of base of tongue and epiglottis	Say "ah" → affected side of oropharynx will not lift; uvula deviates away from affected side; hoarseness
XI, Accessory	Sternocleidomastoid and trapezius muscles	—	Turn head and shrug shoulder against resistance → difficulty on affected side
XII, Hypoglossal	Genioglossus, genioglossus, hyoglossus, and styloglossus muscles of the tongue	—	Protrude tongue → Deviation toward affected side

A Review of the Literature Can Transcranial Doppler Be Useful in the ED?

Mikaela Biavati, OMS-III

University of North Texas Health Science Center at Fort Worth-Texas College of Osteopathic Medicine Class of 2022

Daniel Hubbard, OMS-III

University of North Texas Health Science Center at Fort Worth-Texas College of Osteopathic Medicine Class of 2022

Jake Freudenberger, OMS-IV

EMRA Ultrasound Committee Vice Chair University of North Texas Health Science Center at Fort Worth-Texas College of Osteopathic Medicine Class of 2021

Akash Desai, MD

EMRA Ultrasound Committee Chair Mount Sinai Medical Center

Tim Montrief, MD, MPH

EMRA Critical Care Committee Vice Chair Fellow, University of Pittsburgh

Transcranial Doppler (TCD) ultrasound was first utilized in 1982 as a noninvasive way to evaluate cranial blood flow, particularly of the middle, anterior, and posterior cerebral arteries (MCA, ACA, and PCA, respectively).¹ Since then, it has gained momentum as a tool to evaluate intracranial emergencies including post-aneurysmal hemorrhage, middle cerebral artery (MCA) vasospasm, cerebral ischemia/arterial occlusion, and midline shift.^{2,3} While TCD is at a disadvantage to CT in definitive diagnostic ability, it boasts distinct advantages that CT cannot replicate. Neurologic emergencies rely heavily on speed of provider recognition and appropriate escalation of care. TCD has the ability to provide dynamic, real-time information on intracranial processes in a way that a single snapshot in time, as obtained by CT, cannot. While it can be difficult to obtain a good acoustic window in 5-20% of patients,⁴ TCD allows us an opportunity to diagnose and treat intracranial pathologies when other modes of brain imaging are not available. A comparison of the advantages and disadvantages can be seen in **Table 1**.

In addition to the aforementioned clinical uses, cranial ultrasound has been

TABLE 1. Advantages and Disadvantages of TCD in the ED

Advantages	Disadvantages
Safe, non-invasive, no radiation	Highly user dependent
Provides real-time information on status of cerebral arteries	Not as accurate as current gold standard brain imaging
Beside technique that is easily repeatable	Reduced acoustic view in 5-20% of patients ⁴
Less expensive than CT	Time intensive

shown to have emerging roles in the evaluation of pediatric skull fracture and other cranial pathologies.⁵ In the scope of emergency medicine practice, four promising applications for TCD have been increasingly recognized in the literature for their potential to aid providers in the care of neurologic emergencies. Here, we will review the relevant anatomy in TCD, followed by a review of the literature on four promising applications of emergency TCD: rule-in vasospasm, MCA occlusion, midline shift, and pediatrics. While we will focus on these four aspects, there are many more indications for TCD as detailed in **Table 2**.

I: TCD Basics

Understanding the current and future applications of TCD in the emergency department first requires a review of basic concepts. In this section, we will review the anatomy, probe locations, as well as basic concepts and definitions.

Anatomy

FIGURE 1. The Circle of Willis is of Central Importance in TCD³

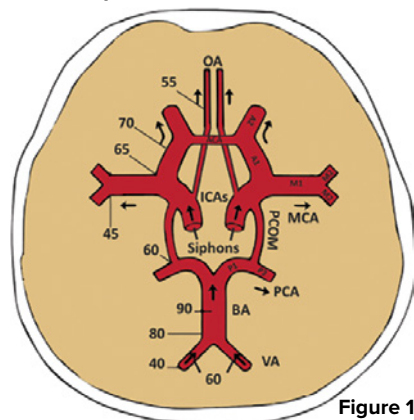


Figure 1A

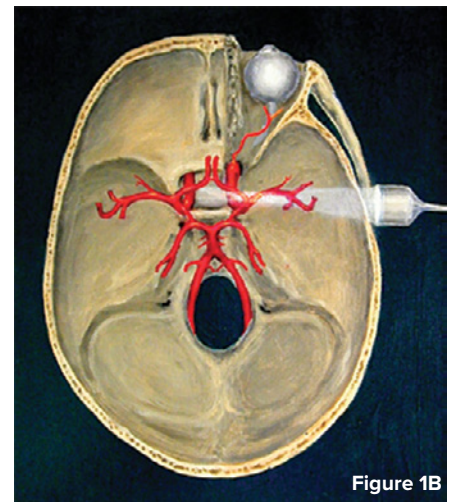


Figure 1B

1A) A review of the major intracranial arteries in the Circle of Willis. Also shown is flow direction of various arteries and depths of insonation (in mm) for an average human skull. OA: ophthalmic artery, ICA: internal carotid artery, MCA: middle cerebral artery, BA: basilar artery, VA: vertebral artery, PCA: posterior cerebral artery, PCOM: posterior communicating artery, ACA: anterior cerebral artery.³

1B) View of Circle of Willis and right MCA from transtemporal positioning of 2Mhz probe.

Probe Placement

Now that we have reviewed the relevant anatomy, let's review the transducer placement, which is key to obtaining a good acoustic window. There are four primary probe locations in TCD: transtemporal, suboccipital, orbital, and submandibular, as detailed in **Table 3**.



FIGURE 2. Ultrasound Transducer Windows

Four sonographic TCD windows depicted using 2MHz ultrasound probe. A) transtemporal window B) submandibular window C) suboccipital window D) transorbital window³

TABLE 2. Indications for Transcranial Doppler

Cerebral vasospasm (including post subarachnoid hemorrhage) ^{6,7}
CVA/Stroke ^{8,9}
Identification of midline shift ^{10,11}
Elevated intracranial pressure ¹²
Evaluation of thrombolysis efficacy ¹³
Determination of brain death ¹⁴
Pediatric skull fracture ^{15,16}
Monitor cerebral perfusion pressure during resuscitation ^{17,18}
Syncope or positional vertigo ^{19,20}

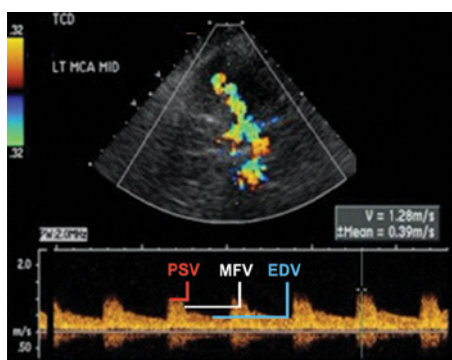


FIGURE 3. TCD Velocities and Measurements

Common measurements taken in TCD evaluation using transtemporal window [3]: PSV (peak systolic velocity in cm/s). EDV (end diastolic velocity in cm/s). Note how EDV is 38% (25.3/65.9) of PSV. MFV (mean flow velocity in cm/s). Note pulsatility index (PI) of 1.05 and depth and angle of insonation (3.5cm).

II: Rule-in Vasospasm

Cerebral vasospasm is a common phenomenon following aneurysmal subarachnoid hemorrhage that can lead to worsened and irreversible cerebral ischemia, with early detection proving critical to improving patient outcomes.²² Utilizing the temporal view described above, TCD and Transcranial Color Doppler (TCCD) sonography have proven to be useful as a screening tool in identifying middle cerebral artery (MCA) vasospasm.^{3,23} Evidence for the usefulness of TCD/TCCD in detecting vasospasm in other cerebral arteries is lacking at this time. Vasospasm is identified by measuring an abnormally high mean flow velocity (MFV) in the affected vessel while surrounding vasculature remains in the low to normal velocity range.² Per a meta-analysis authored by Mastantuono et al.,²⁴ TCD and TCCD detection of MCA vasospasm had a pooled sensitivity of

66.7% and 81.5% with a pooled specificity of 89.5% and 96.6%, respectively, when compared to the “gold standard” of angiography. A meta-analysis by Lysakowski et al. showed a pooled sensitivity and specificity of 67% and 99%, respectively.²⁵ Given these data, TCD/TCCD has been validated as a useful screening tool to rule-in MCA vasospasm, not to rule it out. The advantages of this technique include lack of radiation and contrast agent, as well as real-time evaluation of intracranial flow dynamics. However, the use of TCD/TCCD relies heavily on operator experience and skill-level due to the complexity and tortuous nature of cerebral vasculature as well as the numerous factors that affect cerebral blood flow.^{3,23} The primary factors affecting cerebral blood flow are age, gender, hematocrit, viscosity, carbon dioxide, temperature, blood pressure, and mental or motor activity.²³

TABLE 3. Transducer Windows and Clinical Application³

Window	Location of Probe	Clinical Application
Transtemporal (most common)	Ultrasound probe (with indicator pointed towards the patient's face) placed over temporal area, slightly above zygomatic arch and immediately in front of tragus of the ear (Figure 2A)	Evaluation of MCA measurements useful in observing cerebral vasospasm and ischemic stroke
Suboccipital	Side bend and rotate head to one direction and place probe just below and medial to mastoid process, directing transducer slightly medially towards bridge of the nose or contralateral eye (Figure 2C)	Determination of flow signals from ipsilateral vertebral artery
Submandibular	Probe placed laterally under the jaw, anteromedially to SCM with indicator pointing slightly upwards and medial (Figure 2B)	Evaluation of distal ICA
Transorbital	Probe gently placed over closed eyelid and aimed slightly superomedially (Figure 2D)	Evaluation of ipsilateral ophthalmic artery and ICA siphon

Of note, cerebral vasospasm typically occurs 3-14 days after SAH,²⁴ so it may be difficult to use TCD for vasospasm monitoring in the emergency setting. That being said, progressive increases in MFV early in the setting of SAH were shown to be predictive of vasospasm.²⁴

III: Change in Midline Shift

Midline shift (MLS) following a traumatic brain injury or cerebrovascular incident can lead to rapid deterioration of the patient's condition and is indicative of poor prognosis.²⁶ TCD may be used to identify this midline shift, especially in cases when immediate CT may not be an appropriate or available option. According to Montrief et al.³ and Blanco et al., MLS can be most reliably calculated through the operator's visualization of the transtemporal window to measure the distance from each temporal bone to the midline of the third ventricle (see Figure 4 below). Additionally, the operator should measure the distance between the temporal bones to ensure that it is equal to the sum of the 2 temporal bone-to-midline measurements; this checks the reliability of the measured distances. The following equation is then utilized to calculate the midline shift:

$$\text{Midline shift} = \frac{(\text{distance A} - \text{distance B})}{2}$$

Note: A=distance from ipsilateral temporal bone to third ventricle midline, B=distance from contralateral temporal bone to third ventricle midline

If the calculated MLS is positive, then MLS is away from the ipsilateral side toward the contralateral side, with

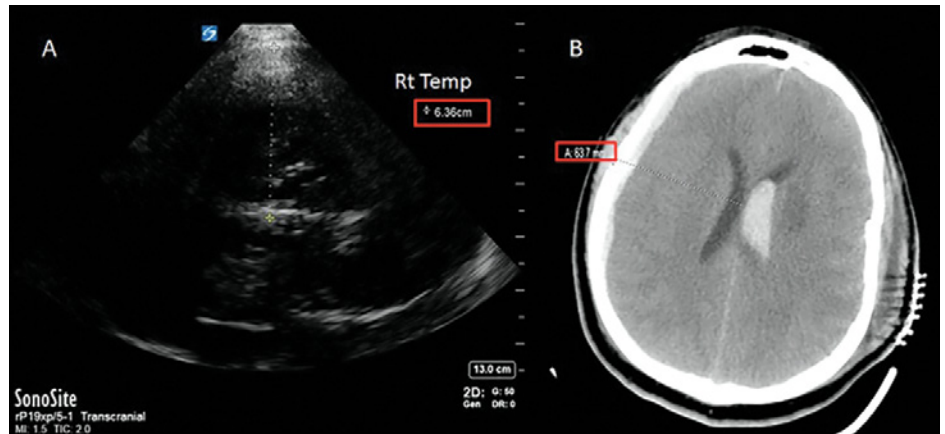


FIGURE 4. TCD Used to Identify Midline Shift

A) insonation from right temporal bone (via transtemporal window) to third ventricle shows distance of 6.36 cm. **B)** Follow-up CT scan confirming shift observed with TCD.³

the inverse being true in the case of a negative MLS. TCD identification of significant MLS using this calculation has been shown to have a high degree of repeatability and reasonable correlation with CT findings (r^2 ranged from 0.58 – 0.87).^{3,27,28}

If a CT scan is not immediately available, using TCD to identify patients with deteriorating neurological status and concerns for mass effect could save valuable minutes, especially in locations that would need to transfer the patient to a tertiary care center for definitive treatment.

IV: MCA Occlusion

TCD can be utilized to assess for occlusion in cerebral arteries resulting in acute ischemic stroke, with the best evidence for use in the case of MCA occlusion. Signs of occlusion include

decreased or absent arterial signal using doppler and sonographic evidence of collateral flow. To check for signs of primary stenosis, look for increased MFV at the site of luminal narrowing. Secondary stenosis can be observed as abnormal flow or decreased flow velocity distal to the lesion or increased pulsatility proximal to the lesion.²⁹ MCA occlusion identification with TCD has reported sensitivities and specificities of, 93-100% and 92-98%, respectively.^{30,31,32} A limited number of studies have additionally shown utility in ICA occlusions.^{3,30}

TCD is also a useful tool in monitoring MCA occlusions post thrombolytic therapy. TCD has a high positive predictive value (91%) for determining complete reperfusion of the MCA via comparative Doppler pulse wave velocity measurements which utilize the non-occluded contralateral artery flow rate as a standard. Full restoration of flow rates in the MCA without any distal signals of continued occlusion correlated well with TIMI grade III flow on CT angiography (complete reperfusion).³³ Partial or no restoration of flow rates via TCD can be a good clinical indication for additional angiography and can aid in decision making for local thrombolytic therapy such as intra-arterial thrombolysis or mechanical thrombectomy.^{2,3,9,33}

There is some evidence that TCD monitoring post thrombolytic therapy may act synergistically with tissue plasminogen activator (tPA) to achieve an ultrasound-enhanced thrombolytic

TABLE 4. Defines Common Terminology and Formulas Used in Evaluation of TCD³

Term	Definition	Clinical Application
Peak Systolic Velocity (PSV in cm/s)	Initial peak on TCD waveform during each cardiac cycle	Rapid upstroke indicates lack of severe stenotic or occlusive lesion between observed cerebral artery and heart
End Diastolic Velocity (EDV in cm/s)	Should be between 20% and 50% of PSV value	Indicates low resistance intracranial arterial flow, a normal finding
Mean Flow Velocity (MFV in cm/s)	MFV = EDV + .33 (PSV – EDV)	MCA should have highest MFV in all cerebral arteries observed
Pulsatility index (PI)	PI = (PSV-EDV)/MFV	Used to measure resistance to intra-arterial flow. Value >1.2 represents high resistance to flow
Resistance Index (RI)	RI = (PSV-EDV)/PSV	Another measurement of flow resistance, this time distal to the area insonated. Normal <0.75
Lindegaard Ratio (LR)	LR = ipsilateral MCA MFV/ ipsilateral	Ratio used to detect cerebral vasospasm. Ratios of 3-6 indicate mild to moderate vasospasm. >6 = severe vasospasm ²¹

TABLE 5. Summary: 4 TCD Indications Discussed, their Technique, and Clinical Applications

Indication	Technique	Clinical Application
Rule-in Vasospasm	<ul style="list-style-type: none"> Measure MFV (>200 cm/s is severe; <80cm/s is normal)²⁹ 	<ul style="list-style-type: none"> Serial measurements to monitor for post-SAH vasospasm screen for post-SAH vasospasm
Midline shift	<ul style="list-style-type: none"> Measure distance from temporal bone to third ventricle on ipsilateral and contralateral side and divide by 2. If difference is positive, MLS is towards the ipsilateral side. If difference is negative, MLS is towards the contralateral side. 	<ul style="list-style-type: none"> serial monitoring in patients with subdural or other form of chronic intracranial bleed reliable measurement of worsening neurologic status and useful when CT is not immediately available (patient unstable, repairs, CT in use, rural or international medicine).
MCA occlusion	<ul style="list-style-type: none"> measure signal coming from MCA using doppler ultrasound. Similar to DVT or arterial occlusions, decreased or absent signal could indicate occlusion. 	<ul style="list-style-type: none"> primarily useful for rapid identification of MCA occlusion when CT is unavailable. potential use for ultrasound enhanced thrombectomy to improve recanalization
Pediatrics	<ul style="list-style-type: none"> multiple techniques depending on specific indication 	<ul style="list-style-type: none"> evaluation of skull fracture, fetal anemia, intracranial and intraventricular hemorrhage, and ischemic stroke

effect.³⁴ Through inducing mechanical pressure waves, ultrasound is believed to increase the surface area of thrombus exposed to intra-arterial tPA.³⁴ When tPA was combined with TCD insonation in treatment of CVA, recanalization rates were higher (37.2%) than those treated with tPA alone (17.2%).³⁴


However, recent publications have been inconsistent in demonstrating if there are true improvements in 90-day mortality and morbidity associated with TCD used adjunctively with intravenous thrombolytics.^{13,35} More research is certainly indicated before this treatment modality becomes a standard of care.

V: Pediatrics

Cranial ultrasound is used frequently in pediatric practice to assess infants and neonates at risk for intracranial pathology. The use of cranial ultrasound in this population takes advantage of the relatively large acoustic windows formed by open fontanelles, while reducing exposure to ionizing radiation and need for sedation during imaging. Traditionally, this imaging is conducted by ultrasound technicians and the studies are interpreted by radiologists.³⁶

Recent cases and studies have shown an emerging role for cranial ultrasound in evaluating for pediatric skull fracture (PSFx), traumatic intracranial hemorrhage, and intraventricular hemorrhage using point-of-care ultrasound (POCUS) performed by emergency physicians. PSFx may be the most promising area of application for transcranial POCUS. While clinical decision tools such as PECARN have helped to reduce unnecessary imaging in children,³⁷ their comparative effectiveness

continued on page 19



Designed with Your Program In Mind

Resident education is evolving; so we created this effective and engaging learning environment that incorporates asynchronous learning and makes your residency program education requirements easier to manage.

Supports Asynchronous Learning

Measure Performance

Unique Learner Modality

Extensive EM Content

Real-time Discussions


Diverse Expert Educators

Affordable

My Residency Learning Portal is a single entry point for high-quality, EM on-demand education. It offers robust, peer-reviewed content presented by world-renowned educators in Emergency Medicine, and boasts over 150 hours of course selections.

Get the tools you need to keep your residents on track during this time of social distance learning... and beyond!

EMR_1220_MCS28_1120



ADVANCING EMERGENCY CARE

Learn more and get started today at
acep.org/MyResidencyLearningPortal

Nonketotic Hyperglycemic Hemichorea

A Bad Case of the Wiggles

Ideen Zeinali, MD

Assistant Professor
Baylor College of Medicine

Matthew Edwards, MS

Case Western Reserve University
School of Medicine
Medical Student

Giuliano De Portu, MD

Assistant Professor
University of Florida College of Medicine

One of our nation's greatest health challenges is the management of type 2 diabetes mellitus (T2DM). Its incidence is projected to increase by more than 50% in the next 15 years.¹ Many of these diabetic patients will lack both primary and specialty physician care and will instead seek treatment for complications secondary to this disease in the ED. Despite efforts aimed at providing medications and education on the risks of T2DM, the medical community has largely been unsuccessful at curbing the number of patients with uncontrolled T2DM arriving to the ED. It is therefore critical that emergency physicians be adept at recognizing and treating the complications of this disease. Nonketotic hyperglycemic hemichorea (NHH) is a rare manifestation of diabetes typically first seen in the ED and easily treated with prompt recognition. Despite being a rare clinical syndrome, it was reported as early as 1960. While studies have been primarily from journals of neurology, endocrinology, and radiology, description in emergency medicine literature has remained sparse.^{2,3,4} Therefore, we present a case of diabetic hemichorea and discuss features of its presentation and treatment relevant to the emergency clinician.

Case Report

A 66-year-old male with a past medical history of coronary artery disease, hypertension, hyperlipidemia, and T2DM presented to the ED with the complaint of one month of involuntary

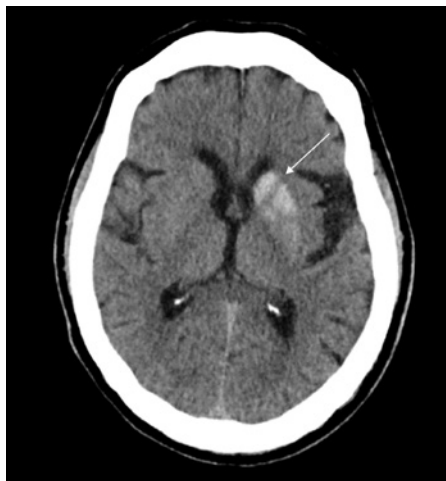


FIGURE 1. Axial brain CT without IV contrast showing increased attenuation of the left caudate nucleus and putamen (arrow) with sparing of the internal capsule.

jerking of his right upper and lower extremities. He characterized these movements as rapid twitches that were continuously present and involved the entire limb. The patient stated that the movements progressed from his right leg to his right arm, but had not spread to his other limbs or face. His primary physician had diagnosed his symptoms as restless legs syndrome (RLS). Outpatient computed tomography (CT) scan of his head was performed due to multiple recent falls and evaluation for traumatic brain injury. He was told to seek further evaluation in our hospital after the CT scan demonstrated concern for an intracranial hemorrhage (ICH). The patient also complained of a recent mild headache but denied any visual changes, limb weakness, slurred speech, chest pain, dyspnea, or flu-like symptoms. He reported no head trauma prior to the start of these movements, history of seizures, or use of neuroleptics, steroids, or anticoagulants. The patient had been prescribed insulin lispro,

however, he had not taken this for the past six months and was not performing home glucose monitoring.

On presentation the patient was mildly obese, vital signs included blood pressure of 127/66 mmHg, heart rate of 83 beats per minute, respiratory rate of 14 breaths per minute, and normal oxygen saturation with no apparent respiratory distress. Neurological examination was notable for quick, irregular, non-purposeful jerking movements and dysmetria of the right upper and lower extremities. Muscle strength and deep tendon reflexes were normal. The patient had a steady gait, good rapid alternating movements of the upper extremities, and no pronator drift. The physical examination was otherwise unremarkable.

Laboratory evaluation showed elevated blood glucose (255 mg/dL), mild hyponatremia (133 mmol/L, corrected for hyperglycemia 135-137 mmol/L), chloride (95 mmol/L), and creatinine (0.57 mg/dL). Other laboratory findings were within normal limits, including potassium (4.0 mmol/L), calcium (9.6 mg/dL), urea nitrogen (15 mg/dL), CO₂ (25 mmol/L), anion gap (16 mmol/L), and venous pH (7.39). A repeat CT scan of the head without intravenous (IV) contrast revealed hyperdensity of the left basal ganglia with increased attenuation throughout the left caudate nucleus and putamen, sparing of the internal capsule, and no acute hemorrhage, findings most consistent with NHH (Figure 1). Neurology was consulted in the ED and recommended better glucose control to manage the patient's disease. Magnetic resonance imaging (MRI) of the brain was deferred until correction of the patient's hyperglycemia. He was treated in the ED with risperidone for choreiform movements, fioricet for headaches, IV normal saline, and a single treatment of insulin aspart for hyperglycemia.

Discussion

Hemichorea-hemiballismus is a rare hyperkinetic movement disorder characterized by unilateral, involuntary, and rapid jerking movements of one or both limbs.⁵ Basal ganglia infarction accounts for most cases, but NHH is now recognized as the second most common etiology.⁵ The exact pathogenesis of this disease is unknown, but is thought to entail a delayed hyperglycemic ischemia involving interrupted or depleted thalamic gamma-aminobutyric acid (GABA) input, striatal microhemorrhages, and cerebral malperfusion.⁶ The prevalence of NHH is estimated at less than 1 in 100,000, has an average age at onset of 70 years, and is described most frequently in female patients of East Asian descent.⁷

A number of severe conditions other than hyperglycemia can cause hemichorea-hemiballismus and should be ruled out in the ED. These etiologies include hemorrhagic and ischemic stroke, carbon monoxide poisoning, infectious diseases, neurodegenerative disorders, and neoplasms.⁴ Diagnosis of NHH is made by CT scan findings of unilateral hyperdensity of the putamen contralateral to the symptomatic side, with or without hyperattenuation of the caudate nucleus, and sparing of the internal capsule.⁸ Contrast enhancement

is typically minimal or absent.⁸ Due to its hyperdensity on CT, the findings of NHH can be confused with other disease processes. Its unilaterality excludes microcalcification, Fahr's disease, Wilson's disease, and manganese deposition. Confinement to the basal ganglia and lack of mass effect excludes hemorrhage.⁵

Findings of NHH on MRI include unilateral hyperintensity on T1-weighted images without the corresponding hyperintensities on T2*-weighted images that characterize basal ganglia hemorrhage.⁸ Following recognition, NHH should be treated with aggressive glucose control which typically leads to resolution of the hemichorea and imaging findings.⁹ Refractory cases may require treatment with postsynaptic dopamine receptor antagonists such as haloperidol or risperidone.

Prompt identification and treatment of NHH leads to excellent patient outcomes and likely resolution of symptoms. As patients with T2DM increasingly seek care in the ED, clinicians should gain familiarity with its many complications, presentations, and be prepared to distinguish them from other acute processes. This case emphasizes the importance of including uncontrolled diabetes in the differential for new onset hemichorea-

TAKE-HOME POINTS

- ✓ The incidence of Type 2 diabetes mellitus is projected to increase by more than 50% in the next 15 years, making it important for emergency physicians to recognize and manage a range of T2DM complications.
- ✓ A number of severe conditions other than hyperglycemia can cause hemichorea-hemiballismus and should be ruled out in the ED.
- ✓ Diagnosis of NHH is made by CT scan findings.
- ✓ Prompt identification and treatment of NHH leads to excellent patient outcomes.

hemiballismus. It further highlights the value of diabetic patient education in the ED and outpatient follow-up in mitigating the burden of critical complications.¹⁰

Case Conclusion

The patient was provided diabetes education and discharged home following improvement of labs and symptoms. He was provided outpatient follow-up in neurology's movement disorder clinic with orders for repeat neuroimaging. Unfortunately, the patient did not return for his clinic visit and was lost to follow-up. ★

Can Transcranial Doppler Be Useful in the ED?

continued from page 17

has been questioned.³⁸ The addition of POCUS evaluation may augment the use of clinical decision tools, especially in situations with diagnostic uncertainty. Multiple studies report that POCUS in the ED for PSFx in children has sensitivities and specificities of 82-100% and 85.2-95%, respectively.^{39,40,16} In addition to PSFx, a pediatric ED case study indicates the potential utility of POCUS in traumatic intracranial hemorrhage.⁵ Additionally, cranial ultrasound is currently a popular modality used for newborn perinatal hemorrhage screening in the NICU setting.⁴¹ As with all POCUS studies, there is inherent variability due to physician experience and training levels.

Conclusion

Whenever we encounter a new technology or diagnostic approach, we must weigh the benefits versus the costs. Due to the repeatability of TCD, many of these applications are useful in the ICU environment where serial monitoring is vital. TCD can be reliably used for pediatric patients with skull fractures, and increased evidence is pointing towards usage for pediatric ischemic and hemorrhagic strokes. At this point, the data indicates that TCD has a high degree of utility in ICUs, pediatric, rural, and international EDs. However, for many of us who practice in trauma centers with CT consistently and readily available, the evidence currently

recommends continued usage of CT/MRI for intracranial pathologies in the acute setting.

TCD is indeed an exciting field with a lot of potential and opportunities. As emergency physicians, we are trained to excel in providing timely, cost-effective treatment, and TCD has the potential to be widely beneficial. Regardless of the possibilities for this mode of diagnosis, it is imperative that we as an emergency medicine field decrease the variation in user ability. If we focus on increasing the level of experience and education for our medical students and physicians regarding POCUS, TCD is just one of many examples of the incredible potential that we could reach. ★

Utility of Follow up Skeletal Surveys in Suspected Child Maltreatment

Shahfar Khan, MD, FAAP

Pediatric Emergency Medicine Fellow
St. Christopher's Hospital for Children

Brian Novi, DO

Resident, Department of Pediatrics
St. Christopher's Hospital for Children

Norrell Atkinson, MD, FAAP

Child Abuse Pediatrician
Section Chief of Child Protection
St. Christopher's Hospital for Children

Emergency physicians are responsible for making the first clinical decisions when treating patients; however, the natural history of a disease in a patient that presents for care is not always witnessed. In cases of suspected child maltreatment, the initial evaluation in the emergency department may not be conclusive in assessing for occult injuries in an infant that presents for care by the time of discharge. However, it is vital to ensure a safe disposition for the child as further harm is compounded if child maltreatment goes unrecognized. The following case and discussion emphasize the significance of a follow up skeletal survey (FUSS) in cases of suspected non-accidental trauma (NAT).

Data from the United States Department of Health and Human Services' Child Maltreatment Report found that in 2018, 15,605 children and adolescents were confirmed victims of physical abuse in the United States. The data showed that 84.5% of victims suffered a single type of maltreatment, with 60.8% of these patients neglected, 10.7% physically abused, and 7% sexually abused; 15.5% of patients were victims of 2 or more maltreatment types. Children under the age of 1 year are the most vulnerable to maltreatment and comprise 26.7% of total victims¹ and approximately 23% of the child maltreatment fatalities.

With all cases of suspected non-accidental trauma, emergency physicians should initiate a work-up to assess for other injuries. In young children, this

evaluation often includes a detailed history and a physical examination, radiographs, and laboratory testing including a CBC with differential, AST, ALT, lipase level, and a urinalysis.² Depending on the type of injuries observed (ie, bruising, fractures, intracranial injury), further testing may be indicated. In cases of bruising, a hematological work up (PT/PTT/INR, Fibrinogen, vWF Ag, VWF activity, Factors 8 and 9) should be considered to rule out any bleeding disorders confounding exam findings. Head imaging should be obtained in the event the child is less than six months old, or there is evidence of head/facial trauma, or if the patient has an abnormal neurologic exam. An abdominal CT may be indicated if laboratory values or physical exam are concerning for occult hepatic or pancreatic injury.² Finally, in non-skull fractures, calcium, phosphorus, Vit D, intact PTH, and alkaline phosphatase levels should be obtained. A skeletal survey (SS) should be obtained in all children less than 2 years of age with a suspicious injury. The use of skeletal surveys in children 2-5 years of age varies widely, with some cases reporting 36-45% of these patients receive a skeletal survey in the case of suspected non-accidental trauma.³ This is likely due to the fact that most sources recommend that the decision about obtaining a SS in the 2- to 5-year-old age group must be made individually on the basis of the specific clinical indicators of abuse, such as bruises in the TEN 4 FACES region, as well as any high specificity fractures, such as classic metaphyseal lesions (CMLs), rib fractures (especially posteromedial), scapular fractures, spinous process fractures, and sternal fractures.⁵⁻⁷ Multiple fractures, fractures of different ages, and complex skull fractures are of moderate specificity for NAT, but again

may necessitate the need for a skeletal survey on a case-by-case basis.⁷

During the course of evaluating for NAT, a skeletal survey may reveal occult injuries such as rib fractures or CMLs. These fracture types have a high specificity for abusive injury in infants; however, acutely, they may not be radiographically apparent. The AAP recommends follow up skeletal surveys 2-3 weeks after the initial survey, as these fracture types are more radiographically apparent once they start to heal. Multiple studies have documented the utility of follow up skeletal surveys. In one study, secondary data from the ExSTRA (Examination of Siblings To Recognize Abuse) Study evaluated the

Torso
Ears
Neck

4

Any bruise in a child <4 mo
>4 bruises in a child

Frenulum
Auricular area
Cheek
Eyes
Sclera
Patterned bruising

FIGURE 1. Body region- and age-based bruising clinical decision rule to identify children who are at high risk for abuse and require further evaluation.⁴



IMAGE 1. Linear Non Blanching Red-Purple Lesions, Consistent with Bruising

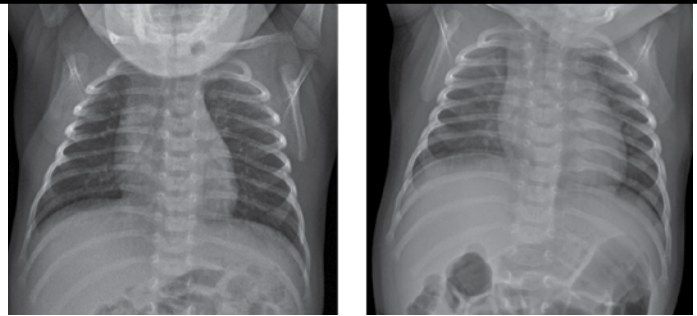


IMAGE 2. AP Chest Radiograph

A. Normal. B. Follow up, demonstrates healing changes with callus formation from the left second through eighth costovertebral junction

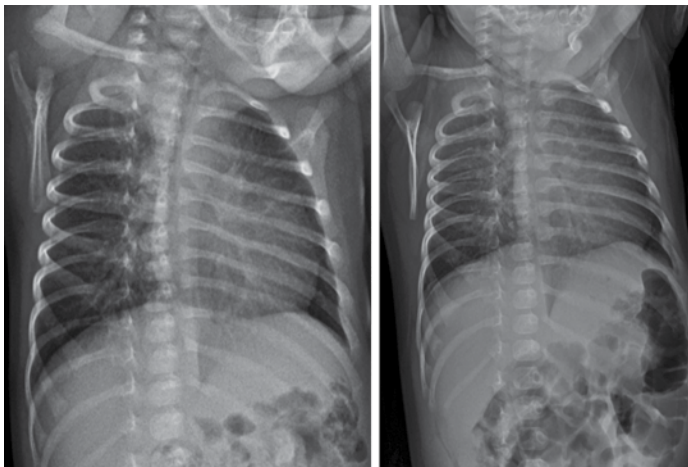


IMAGE 3. Oblique Views of Left Ribs

AP chest radiograph. A. Normal. B. Follow up, demonstrates healing changes with callus formation from the left second through eighth costovertebral junction.

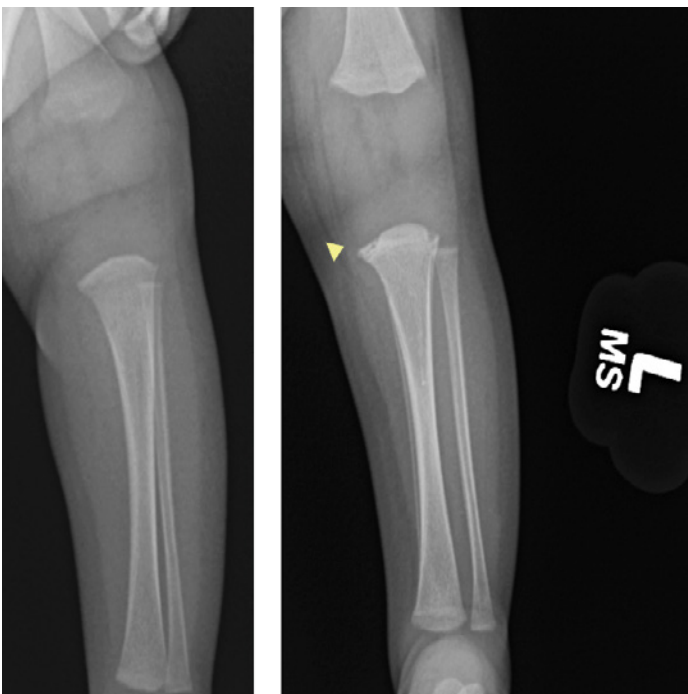


IMAGE 4. Frontal View of Left Tibia and Fibula

A. Normal. B. Follow up. Irregularity of proximal tibial metaphysis, concern for healing classic metaphyseal lesion.

rates of FUSS in suspected NAT and the yield of new information. 2049 children were included in the study who had an initial SS. 38.8% of these children underwent a FUSS. A total of 174 (21.5%) subjects had new information identified by FUSS, including 124 (15.6%) with at least 1 new fracture; resulting in an increased estimated likelihood of abuse in 41 (33%) cases. Of those with new fractures found on FUSS, the most common were of the ribs, long bones and metaphyseal lesions. In addition, an initial negative SS followed by a positive FUSS occurred in 7.1% (n = 18) of cases.⁸

Case Discussion

A 3-week-old boy presented to the ED for increased fussiness. Mother stated that the patient had been increasingly fussy over the past two nights and became inconsolable. On the morning of presentation, she noticed a new “rash” on his right upper arm. His mother reported she was the primary caretaker with help from a family member who last helped 2 days prior, and the morning of arrival. The patient was born via vaginal delivery at 36 weeks gestational age due induction of labor for maternal preeclampsia, otherwise without complication. He received Vitamin K at birth. The remainder of history and review of symptoms were normal.

The physical examination revealed well demarcated, linear, non-blanching red-purple lesions on anterior surface of the right forearm, consistent with bruising. Similar lesions were found on the posterior right shoulder, the back, and scattered areas on the right upper arm. The remainder of the physical exam was normal for age.

Due to the presence of unexplained bruising in this 3-week-old, a NAT work-up was initiated. CT scan of the head, skeletal survey, and screening trauma labs (CBC, AST, ALT, Lipase, UA) were obtained. Due to presence of bruising, additional hematological studies (PT/PTT/INR, Fibrinogen, vWF Ag, VWF activity, Factors 8 and 9) were also ordered. The patient was subsequently admitted for further evaluation and a report was filed with the local child protective services (CPS) agency, with consultation by the hospital’s child abuse team.

The patient’s head CT and all laboratory studies resulted as normal. The initial skeletal survey did not show any radiographic evidence of injury. A follow-up skeletal survey was recommended by the child abuse team.

A safe plan of discharge was identified for the patient by CPS while their investigation was in place with child abuse team follow-up. A FUSS was completed 2 weeks later. ★

The Riot Trauma

What Injuries Should You Expect From “Non-Lethal” Police Weapons and Protests?



Sriram Venkatesan

Sri Ramachandra Medical College & Research
Institute/University of Colorado-Denver
Class of 2022
@SriramVenkatMD

Yevgeniy Maksimenko, MD, MA, NRP, Capt. — USAF, MC

Boston Medical Center
EMRA Board Director of Leadership Development
@O7ManUnited

2020 has been quite the historic year for emergency medicine. First, the novel coronavirus SARS-CoV-2 burgeoned into a global pandemic, overwhelming medical systems worldwide. As the country first began to ease restrictions, massive protests broke out after yet another avoidable and unnecessary death of an unarmed black man, George Floyd, who died after a white police officer knelt on his neck for nearly 9 minutes. Violent protests and more deaths ensued. The year continued with a drawn-out presidential election and another, potentially worse, wave of COVID-19 outbreaks.

Protests have become a more common occurrence.

Police respond with standard anti-riot measures, which often include a multitude of weapons, such as tear gas, pepper spray, rubber bullets, batons, riot shields, and TASERS®. On the other hand, weapons employed or improvised by the protestors, such as rocks, sticks, knives, guns, and Molotov cocktails add potential for increased severity and mortality from the use of said weapons. Emergency physicians are seeing an increase in riot-related injuries in their hospitals.

In this article, we will review some of the more common weapons in the riot police arsenal, as well as those used by protesters, and the injuries with which

they are associated, in order to prepare our student doctors and emergency physicians in training to handle said patients.

While these riot-control agents are termed “non-lethal” or “less lethal” by their manufacturers and the police, it has the potential to result in significant harm. In some instances, it can lead to long-lasting disabilities or even death.² As protests percolate throughout the country, an increasing number of news outlets are reporting serious injuries caused by exposure to these weapons. In Boston, the Emergency Department at the Massachusetts General Hospital (MGH) temporarily set-up a HAZMAT tent outside their hospital to help decontaminate and help treat people injured during these riots.¹

The Mucosal Irritants: Tear Gas & Pepper Spray

- **Tear gas:** composed of chloroacetophenone (CN) and chlorobenzylidene malononitrile (CS) that is released into the air as fine droplets or particles.³ On exposure through skin, eye, or nasopharyngeal, these agents work as an irritant within seconds of exposure. The most common immediate symptoms seen include intense lacrimation, blepharospasm, and burning sensations in the oro/nasopharynx.⁴
- **Pepper spray:** composed of oleoresin capsicum, an extract from peppers, a strong irritant to mucosal membranes. This extract, capsaicin, is the same chemical that is used as an adjunctive therapy for cannabinoid hyperemesis syndrome and in pain relief creams.¹⁰ For additional information, please see a dedicated article in this issue.

Clinical Pearls: Tear Gas & Pepper Spray

- **Symptoms:** Lacrimation, burning sensation of all mucosal surfaces, cough, nausea/emesis, vision changes/blindness
- **Treatment:** Copious irrigation with water, pain control, consider ophthalmology consult if vision affected
- **Disposition:** Likely discharge

Conducted Energy Weapons: TASER®

Stun guns like TASER® work a little differently but have an equal or stronger potential to cause serious injury. Also referred to as Conducted Energy Weapons (CEWs), they are the most common weapon used by law enforcement agencies to quickly incapacitate violent or combative individuals. These devices use a high voltage, low amperage current to override the subject’s ability to control their peripheral nervous system and thereby causing pain to induce compliance. Some models may have barbed probes attached to thin wires that can be shot at the subject from even 35 feet away to deliver a 5-second burst of stimulation.⁵ Patients with stun-gun injuries most commonly present to the ED with marks at the site of probe contact called signature marks.

The most common cause of injury from these devices including marks/puncture wounds from the probs, muscle strain and rhabdomyolysis, injuries from falls, ventricular fibrillation, and Excited Delirium Syndrome (ExDS).⁶ ExDS is an ill-defined syndrome that presents with agitation, hyperthermia, tachycardia,

metabolic acidosis, and death. This condition is most commonly associated with the concurrent use of cocaine or other stimulants and CEWs.

Clinical Pearls: TASER®

- **Symptoms:** Muscle spasm, local wound, impaled barbs (skull/intracranial injury, eye injury, pneumothorax, pharyngeal perforation), testicular torsion, blunt trauma from falls, cardiac arrhythmias, unresponsiveness, sudden death¹¹
- **Treatment:** Treatment of all life threats, careful removal of barbs, wound irrigation, evaluation of Creatinine Kinase (CK) level, ED observation, EKG
- **Disposition:** Depends on presentation, most presentations benign and dischargeable

Kinetic Impact Projectiles: Rubber Bullets

Similarly, kinetic impact projectiles (KIPs), commonly referred to as rubber or plastic bullets, are designed to incapacitate individuals by inflicting pain and sublethal injury. Some KIP guns target an individual with one projectile, while some release a group of multiple scattering projectiles.

There are more than 75 varieties of launchers and bullets sold all over the world, but they still face very limited regulation over the development of these weapons, and not much public information is released on the design or guidelines for use.⁷ Patients most commonly present to the emergency department with abrasions and hematomas, but when fired on in close range, patients can suffer traumatic brain injuries, bone fractures, and serious abdominal injury, including injuries to the spleen, bowel, and major blood vessels.

KIPs also have the potential to cause very severe injuries to the eyes, including orbital fractures, globe ruptures, and retinal damage. To this effect, the American Academy of Ophthalmology (AAO), has issued a statement strongly condemning the use of rubber bullets by domestic law enforcement to control and disperse crowds.

Clinical Pearls: Rubber Bullets

- **Symptoms:** Blunt force trauma to the affected area, in particular danger to eyes, trachea, blunt abdominal trauma
- **Treatment:** Examination of affected area (ocular pressures, visual acuity), advanced imaging (CT scan) if abdominal trauma
- **Disposition:** Unlikely to require admission, unless injuries found requiring admission

Burns and Explosions: The Molotov Cocktail

Another type of weapon commonly seen in protests, employed not by law enforcement but rather instigators of violence, is Molotov cocktails. Also referred to as a petrol bomb, alcohol bomb, or a poor man's grenade, this weapon is a simple, improvised incendiary device that can be made easily using household materials. It usually consists of a stoppered glass bottle filled with a combustible liquid, such as gasoline, high-proof alcohol, diesel, or jet fuel, and a fuel-soaked rag stuffed at the neck of the bottle. The instigator activates the device by lighting the fuel-soaked rag, which acts as a fuse, and then throwing the whole device at their target. When the bottle breaks on impact, spraying the fuel, the flame ignites it and produces a fireball explosion. Sometimes additives like motor oil, detergent, or rubber cement make the mixture stick better to the target or cause thick smoke.⁸

Patients exposed to these explosions may suffer severe, disfiguring second to third-degree burns, and need to be transported as soon as possible to the nearest Level 1 trauma or burn center for immediate care, after ensuring that the ABCs (Airway, Breathing, and Circulation) are intact.

Clinical Pearls: Molotov Cocktail

- **Symptoms:** Lacerations, burns, potential for blunt trauma from falls or secondary trauma from projectiles
- **Treatment:** Stop the burning process, wound care, trauma assessment for hidden injuries, estimation of burn area size and location, pain control
- **Disposition:** Burn center evaluation for critical areas, depending on severity, admission to hospital

Blunt Force Trauma: Batons, Riot Shields, Rocks, Trampling etc.

Blunt trauma is another cause of injury. During protests, given the large number of people, additional dangers can exist. Aside from the discussed weapons, blunt force trauma covers the multitude of other injuries a bystander, media member, protestor or police officer can face. Riot shields are used by riot police to protect the officers from potential injury in case a protest becomes violent. They can be used as an offensive weapon to push a crowd into a specific direction, which could potentially cause trauma from direct force, or by destabilizing the crowd and causing trampling to occur. Batons are a common non-projectile defensive weapon that can inflict pain and if used with enough force, a bone fracture. Straight-stick batons often used by riot police are stronger and have a weight distribution that makes the striking edge create more kinetic force in order to have a maximal impact¹². Use of rocks and other projectiles by protestors can cause injury to any part of the body of an unprotected officer, hence why riot police are equipped with helmets, face shields, riot shields, and specialized riot uniform. Combined, these tools can create a wide variety of injuries, similar to assaults seen not so infrequently in the daily operations of a trauma center and most emergency rooms. Proper trauma assessment and availability of X-rays and CT imaging will be crucial to make a correct diagnosis and improve chances of survival.

Clinical Pearls: Batons, Riot Shields, Rocks, Trampling etc.

- **Symptoms:** Fractures, contusions, lacerations, traumatic brain injury, blunt chest, and abdominal trauma
- **Treatment:** Trauma assessment, appropriate imaging (X-Ray vs CT), pain control
- **Disposition:** Admission vs discharge depending on severity of injuries, trauma center transfer if necessary ★

The Physician's Role in Providing EMS Feedback

Courtney Shay, MD

Maricopa Medical Center

I was awaiting the arrival of a pediatric trauma code. My mind ran through the systematic algorithms I had learned to apply in my sterile, controlled trauma bay. The respiratory therapist was bedside, equipment in hand, techs lined up waiting to do compressions as the pulseless patient arrived. We ran like clockwork through our ABCs, ROSC was achieved, the patient was stabilized, and then sent to the OR. I updated the family and returned to the ED, only to meet a shaken EMS crew with more questions than answers.

These were the paramedics called to the scene of a pulseless 7-year-old child in a cage of twisted steel with a nearby mother in hysterics. Compressions were initiated, intubation was attempted but deferred for an LMA when it proved to be difficult. The first few rounds of epinephrine were administered. They were anxious to hear what else they could have done.

I could empathize with how they were feeling. I spent 5 years in the fire department prior to entering medical school. I remember feeling desperate for those answers and some sense of closure. I spent many sleepless nights wondering if I had made the right call, given the right medication, or told the patient the right thing. I was always grateful to those doctors who took the time to teach me and make me a better paramedic.

She is in the operating room now. That LMA was working perfectly. I don't think there is anything else you could have done.

They thanked me. I thanked them. Then they left to return to service.

As resident doctors, we are tasked with leading resuscitations, explaining our thought processes, and debriefing our team. All too often our pre-hospital peers are forgotten members of this team.

According to a study by Cash et al. of more than 15,000 responses from

pre-hospital providers, only two-thirds of paramedics and EMTs reported receiving feedback regarding patient care when asked about interactions over a month's span. Most of this feedback (70.9%) came from crew members, while only 57.4% came from receiving facility staff.¹ Meanwhile, in a study by Lena et al, EMS personnel did not recognize sepsis nearly 40% of the time in patients who were later confirmed septic in the ED.² While this can be attributed to the fact that EMS does not have nearly the diagnostic tools or the clinical acumen that a well-staffed ED does, it highlights the fact that there are many opportunities to explain diagnoses or follow up with crews regarding patient outcomes.

When I first encountered these shaken medics in the trauma bay, I was a new intern who had just run my first pediatric code. I was wildly unprepared to lead a debrief. But to the paramedics, I was the higher level of care and, therefore, a teacher.

Assessing the need and providing feedback to prehospital providers should be a vital part of our training in residency. This can be as simple as updating them on the subsequent activities in the trauma bay. Other times it may be prudent to give feedback to correct an error, explain a diagnosis, or suggest ways they could improve their procedural skills. Distressing and traumatic scenarios should always warrant some sort of follow-up whenever possible.

There are many systems constraints that make providing feedback in the ED difficult. While ambulance ride-alongs are a component of most residency programs, these experiences are often insufficient for developing insight into EMS's role in patient care, their level of training, or their protocols. This prevents us from adequately teaching prehospital providers. Even when we are knowledgeable enough to offer some education, we are often juggling multiple patients and do not have the time to circle back around. There is



seldom an appropriate space to have this conversation even when we do find the time.

We can bridge this gap by making an effort to be involved in EMS training and taking the time to build relationships with area fire departments. On a hospital-wide scale, there can be efforts made to facilitate this feedback process including creating physical spaces for discussion. Paramedics should be encouraged to follow-up to receive patient updates, and there should be a streamlined way for them to reach the hospital providers to ask questions. This can be as simple as giving the paramedic the hospital phone number and encouraging them to call and check in on their patient.

Take the time to thank our pre-hospital brethren. Tell them what happened to the abdominal pain patient they dropped off at their last shift. Show them why you are concerned about the ST elevation in aVR. Point out the pneumothorax on a chest x-ray and show them where you would do the needle decompression. Correct them if you notice medication errors. If they made the right call and you would have done nothing differently, let them know. Make an effort to educate yourself and others about their training level and their environmental constraints. We can all play a role in helping our EMS peers grow to provide better care for the sake of all of our patients. ★

(The author would like to thank Geoff Comp, DO, FAWM, of Maricopa Medical Center for his mentorship, as well as Jeffrey Tomaszewski, RN, of the Mayo Clinic for his insight.)

LEFAMULIN

Potential Role of a New Antibiotic in Community Acquired Pneumonia

Mortatha Al-Bassam, MD

University of Central Florida/HCA Consortium

Vir Singh, MD, MBS

University of Central Florida/HCA Consortium

@ballinMDMBS

Bobby Desai, MD

PD, Professor of EM

University of Central Florida/HCA Consortium

Emergency Medicine Residency, Ocala

Latha Ganti, MD

Vice Chair for Research & Academic Affairs,

Professor of Emergency Medicine and Neurology

University of Central Florida

Community acquired pneumonia (CAP, or CABP for community acquired bacterial pneumonia) is commonly encountered in the ED, with >1.2 million visits in the U.S. annually.¹ Antibiotics with appropriate coverage for typical and atypical bacterial pathogens the mainstay of treatment, but antibiotic resistance and side effects are a concern.

Pharmaceutical companies incentivized to invest in more lucrative drug classes are not producing sufficient new antibiotics, according to the WHO.² One novel antibiotic that may play a role in ED management of CABP is lefamulin.

Lefamulin: A New Antibiotic with a Novel Mechanism of Action

In 2019, the FDA approved the semi-synthetic pleuromutilin drug, lefamulin, for the treatment of community acquired bacterial pneumonia.³ Lefamulin is active against some of the most common causes of CABP, including multidrug resistant *S. pneumoniae*, *S. aureus*, *M. pneumoniae*, *H. influenzae* with no cross resistance to other classes.⁴ Lefamulin owes its efficacy to its novel binding mechanism to the bacterial 50S ribosomal subunit.⁵

The LEAP II trial was a phase III double-blind, double-dummy, parallel-group, noninferiority, randomized controlled trial that compared lefamulin to moxifloxacin in the management of CABP. The primary endpoint was “early clinical response at 96 hours after administration of the first dose” in the intention to treat population. Secondary endpoints included “investigator assessment of clinical response at test of cure” in the

modified intention to treat population and in the clinically evaluable population. In both endpoints, lefamulin was shown to be non-inferior to moxifloxacin in the management of community acquired bacterial pneumonia. The incidence of treatment-emergent adverse events was 32.6% with lefamulin and 25% with moxifloxacin, with the majority of these events being nausea, vomiting, and diarrhea and self-reported to be mild or moderate in severity. Both groups reported low treatment emergency adverse cardiac and hepatobiliary events. The mean change in QtcF interval was 9.5ms with lefamulin vs 11.6 with moxifloxacin, though one patient discontinued lefamulin due to QT prolongation. Two major limitations of this study are that patients with confirmed or suspected MRSA and patients at risk for cardiac dysfunction and/or having significant hepatic disease were excluded.⁶

CABP: Brief Review

The Infectious Disease Society of America and American Thoracic Society updated their clinical practice guidelines for adults with CAP in August 2019.⁷ They discussed the best evidence for diagnosis and treatment by separating guidelines into 16 research questions and answers. Question 8 asked, “In the outpatient setting, which antibiotics are recommended for empiric treatment of CAP in adults?” They break this down into recommendations for healthy adults and for adults with comorbidities. For healthy adults, amoxicillin and doxycycline have a “strong recommendation,” and macrolides such as azithromycin are “conditional recommendation.” For adults with significant comorbidities, combination therapy or monotherapy options were provided. For combination therapy, amoxicillin/clavulanate or a cephalosporin, with a macrolide (strong recommendation for combination therapy) or doxycycline (conditional recommendation for combination therapy) were recommended. For monotherapy, a respiratory fluoroquinolone is a strong recommendation. As a monotherapy

in uncomplicated outpatient CAP. This was due to increasing levels (>30%) of resistance of *S. pneumoniae* to macrolides. Also notable was the continued strong recommendation of fluoroquinolone monotherapy.⁷ Fluoroquinolones first received an FDA black box warning in 2008 for risk of tendonitis and tendon rupture. This warning has been updated multiple times, with risks including aortic dissection and glucose homeostasis dysregulation.⁸ For many, fluoroquinolones have become a “never use” drug. Studies have shown a decline in fluoroquinolone use in the ED in nationally.⁹

Does Lefamulin Fit in ED??

Lefamulin is FDA approved and being marketed for use as a single agent for CAP coverage. Its PO formulation may be an option in the future for outpatient prescription. It is not mentioned in the IDSA/ATS guidelines it may be prohibitively expensive (a 5-day course can cost ≥ \$1,350), and it may require ID specialist prescription for insurance coverage. Its side effect profile (similar in “serious” adverse effect rate to moxifloxacin in LEAP-2) has been documented through phase III study only, whereas a medication’s side effect profile is often refined and better understood after post marketing surveillance. In patients with multiple drug allergies, such as penicillin, cephalosporin, and/or macrolide, there’s room to grow in the emergency physician’s arsenal for outpatient treatment of CABP. Future study will show if lefamulin plays a role. ★

TAKE-HOME POINTS

- Lefamulin is a new (2019) FDA approved IV and PO medication for use as a single agent for CAP coverage.
- IDSA/ATS guidelines for CAP were published in August 2019. Azithromycin’s strength of recommendation was downgraded due to increasing resistance. Fluoroquinolones are still a first-line option, though they have fallen out of favor.
- Lefamulin, though extremely expensive, may be an option for CAP, but further knowledge will come with post-marketing surveillance and study.

SUBARACHNOID HEMORRHAGE

Can't-Miss Diagnosis and Management

Blake Briggs, MD

Assistant Professor,

Department of Emergency Medicine

University of South Alabama

@emboardbombs

Marlena Wosiski-Kuhn, MD, PhD

University of Cincinnati



A 52-year-old male presents to the ED with a sudden onset headache. He states it's "all over" his head and radiates to his neck, and it began 7 hours ago. He denies this occurring before. His vitals on arrival are as follows: HR 97, BP 175/96, RR 12, Temperature 37°C.

Introduction

Subarachnoid hemorrhage (SAH) is a terrifying, relatively frequent cause of intracranial bleeding. It has a significant degree of morbidity and mortality. SAH makes up ~10% of all strokes. SAH can be aneurysmal (more common) or non-aneurysmal. The average age of aneurysmal rupture causing SAH is ~50 years old.¹

An aneurysm is a protrusion from an artery that is prone to rupture. Saccular (berry) aneurysms have a thin-walled tunica media that protrudes from an artery due to a defected elastic lamina. Fusiform aneurysms are a circumferential dilatation of the entire section of a particular artery.² Non-aneurysmal causes of SAH include trauma, arteriovenous malformation, vasculitis, amyloidosis, bleeding diathesis, or sympathomimetic abuse.³

The two biggest risks for aneurysm formation and subsequent SAH are smoking and hypertension. Family history of specific traits, such as Ehlers-Danlos and polycystic kidney disease are risks as well, although the majority of SAH are nongenetic.^{4,5}

As disturbing as they are to patients, most cerebral aneurysms do not rupture. Their lifetime prevalence is about 3% in the U.S. alone.⁶ About 85% of them are located in the anterior circulation, mainly

on the Circle of Willis; 20-30% of patients have multiple aneurysms.²

Sometimes unruptured aneurysms can cause headaches. These headaches often mimic SAH. There is no major consensus on which aneurysms need to be managed surgically. It is agreed that aneurysms >7 mm grow faster and have a higher rate of rupture (eg, 5-year rupture rates for 7-12 mm risk was 2.5%; 13-24 mm, 14.5%).⁷

We prefer to stay out of this debate (for obvious reasons). However, here's a summary where there is decent support for intervention: symptomatic unruptured aneurysms of all sizes, asymptomatic aneurysms >7-10 mm, remaining aneurysms of all sizes in those with SAH.

Triggers of rupture are not always identifiable. Some can occur during sleep.² There is often some element of exertional event tied with many other confounding variables including consuming caffeine, sexual intercourse, or competitive athletics.

The pathophysiology of SAH includes rupture of the vessel, resulting in blood rapidly entering the subarachnoid space. There is a subsequent increase in intracranial pressure with symptoms of an intense headache.

Presentation

The most common presenting symptom is a sudden, severe headache, found in basically all cases (97%).⁸ The

headache is nonspecific and intense, with nausea and vomiting in about 77% of patients. Loss of consciousness is seen in half of patients.

Seizures are uncommon, (~10% of patients), but they are arguably the most concerning symptom if present early on.⁹

Sudden death due to SAH occurs in about 10-15% of patients.

EKG can show nonspecific changes suggestive of ischemia, such as ST depression, QT prolongation, or deep T wave inversions.¹⁰

The Ottawa Subarachnoid Hemorrhage Rule may be used in neurologically intact patients presenting with acute, nontraumatic headaches that reach max intensity within one hour. The clinical decision rule is 100% sensitive, with a specificity of 15%. Clearly this is a one-sided rule, and caution should be noted when a positive rule is obtained.¹¹

Diagnosis

The first test is always a CT head without contrast. Blood is found in the subarachnoid space 92% of the time if scan is performed within 24 hours. If the CT head scan is done in <6 hours, the sensitivity is virtually 100%.¹² Therefore, if a patient's symptoms truly began <6 hours prior and the CT scan is negative, SAH workup is complete and no further diagnostic workup is warranted.

The critical caveats we must mention: 1) the CT scan is reviewed by expert radiologists, 2) the CT scanner is a modern model (multidetector CT).¹³

Lumbar puncture should be performed if there is negative head CT and patient presentation is >6 hours with a concerning story.¹⁴ Sensitivity is 100% and NPV 100% with a specificity of 65%. Classic findings from the LP include an elevated opening pressure but is not always reliably present. RBC count can be >2000 in CSF.¹⁵ Classically, the elevated RBC count does not decrease from tubes 14. If the RBC count does diminish, this still does not mean it was a “traumatic tap”! Always have a high index of suspicion!

Xanthochromia (yellow tint from Hgb breakdown) is the most specific finding and in the setting of a severe headache is virtually diagnostic of SAH. If unsure, compare the vial of CSF to a vial of tap water against a white background. Xanthochromia is rarely found <2 hours after symptom onset.¹⁶

The absence of RBCs in the final LP tube and absence of xanthochromia >2 hours after symptom onset rules out SAH with a sensitivity of 100%.

Aside from SAH, Xanthochromia can be seen in hyperbilirubinemia >10 mg/dL, and severely traumatic taps where there is typically >100k RBCs.

CTA and MRA can both equally detect aneurysms ~3-5 mm or larger. New, multidetector CTA has improved to >97% sensitive/specific for SAH. In many institutions CTA has been seen as a reasonable alternative to LP (the main drawbacks of CTA are cost and radiation). LP is thousands of dollars cheaper however can be painful, time-consuming, and not without risk. Post-LP headaches are a rare but a substantial source of patient suffering. In short, the traditional approach is still CT, followed by LP if there is concern for SAH and the patient presents >6 hours from symptom onset. Board exams want you to choose LP over CTA.¹⁷

Management

Once diagnosed, consultation with a neurosurgeon should be immediate.

All SAH patients should be admitted to an ICU. Definitive management includes surgical clipping and endovascular coiling,

but many patients will require critical care in the ED. Nearly 35% of these patients have worsening neurological functioning after admission.¹⁸

While in the ED, especially as we deal with high national rates of ICU boarding, you must be ready to deliver high-level neurocritical care to these patients.

Be ready to intubate many of these patients, especially those with a declining GCS. Intubation also allows for better critical care monitoring in the setting of elevated ICP, hemodynamic instability, and/or need for heavy sedation/paralysis.¹⁹

When intubating, hypoxia and hypotension are associated with increased mortality in brain injured patients, so care must be taken to avoid these complications during intubation.²⁰ The goal is to prevent sympathetic reflex response to intubation, therefore perform the usual optimization techniques you would normally do for first-pass success in intubation, with extra attention to preventing rapid shifts in BP, heart rate, and oxygenation status. Consider using fentanyl 3-5 mcg/kg to prevent reflex sympathetic responses <5 minutes prior to intubation, but literature is lacking. Ketamine, etomidate, or propofol are fine induction agents. Rocuronium is preferred over succinylcholine, as the latter may increase ICP and fasciculations which may cause oxygen consumption in those with brain injury.

In terms of blood pressure control, guidelines are controversial. A goal of SBP <160 is reasonable. Labetalol, nicardipine, clevidipine are preferred agents. The benefit of lowering blood pressure might be offset by the risk of infarction (remember, CPP = MAP – ICP). If ICP is high, then the only variable maintaining perfusion is MAP. The patient’s consciousness might be a helpful marker: alert and oriented, aim for SBP ~140. If GCS is impaired, aim for SBP ~160.²¹⁻²³ Arterial lines can be very helpful in optimizing BP range.

Seizure prophylaxis is widely debated with no consensus. It is agreed that those who do seize should be started on an anticonvulsant agent.²⁴

While in the ED, monitor for electrolyte changes and aggressively

correct abnormalities. Fever and hyperglycemia are associated with poorer outcomes.²⁵

Consider ventriculostomy for direct ICP monitoring if enlarged ventricles, consider craniectomy in select patients. This discussion should be held with neurosurgery.

Bottom line: any change in clinical status warrants a stat CT head scan!

Complications

Overall, SAH has a high mortality rate, with the average being around 30%. The majority die within 30 days.²⁶

Perhaps the most well-known and feared complication is cerebral vasospasm, which is a form of delayed cerebral ischemia. The pathophysiology is unclear, but it is a form of inflammatory complication where lysis of clots and endothelial damage cause smooth muscle contraction. It is associated with poor neurologic decline and high mortality. The complication is not seen in the ED, as it presents with neurological decline nearly 3 days later. In order to prevent this, all patients should receive nimodipine as early as possible.²⁷ Nimodipine can be started in the ED early in the patient’s disease course.

Other complications include rebleeding, with the highest risk being in the first 24 hours. Hydrocephalus is caused by obstruction of the CSF by blood products. It is both an early and late complication, so neurosurgery will consider drain placement. Hyponatremia is common and likely due to hypothalamic injury. Target euvolemia and normal electrolyte balance. Isotonic saline is the crystalloid of choice (this is one of the few times we support the use of normal saline as the preferred crystalloid!).

Prognosis

The most important prognostic factors for good outcome are as follows: consciousness and neurologic exam on initial evaluation, younger age, and the amount of blood on initial CT. Long term complications for survivors include neurocognitive disability, epilepsy, and lasting focal deficits. Unfortunately, those with SAH have a small risk of recurrence of SAH, despite successful repair. Family members have a five-fold risk of SAH compared to the rest of the population. ★

Septic Arthritis in a Patient with a Confounding History

Loren Touma, DO, MS

Jefferson Health Northeast

Michael Samodio, DO

Faculty and Simulation Director, Jefferson Health
Northeast Emergency Medicine Residency
Jefferson Health Northeast- Frankford Campus
Emergency Department Director

Anually, there are 20,000 cases of septic arthritis in the United States.³ In some cases the diagnosis can be confounded by multiple factors in the patient's history.

Case

A 40-year-old male with no significant past medical history

presented to the ED complaining of erythema, pain, and edema of the left wrist for 2 weeks along with pain and edema of the right knee for 1 week. The patient stated he had been weeding on a recently purchased outdoor property in rural Pennsylvania. The patient's fiancée noticed a small, target-like lesion on his back a few weeks prior and thought it was a fungal infection. The patient began using an antifungal cream, which seemed to have resolved the rash. Upon further questioning, the patient stated he was having pain and swelling in multiple joints over

the past 5 months but decided to come to the ED now because of worsening symptoms, particularly in his right knee. The patient reported a family history of rheumatoid arthritis in his father. He endorsed chills but denied fevers, vision changes, shortness of breath, chest pain, abdominal pain, vomiting, diarrhea, penile discharge, pain with urination, or genital lesions. He did not have a history of gout, skin lacerations, trauma to any of the joints, or intravenous drug use. Both the patient and his fiancée confirmed a monogamous relationship and at present were not concerned for any sexually transmitted infections (STIs); however, the patient did report a remote history of chlamydia. He was questioned about his sexual history without his fiancée in the room, and he again reported only having sexual relations with his fiancée.

Upon arrival, the patient was found to be febrile 100.5°F and tachycardic 105 BPM. Otherwise, the patient was hemodynamically stable but in obvious distress secondary to pain. On physical examination, the left wrist was mildly erythematous and edematous without tenderness to palpation or pain with passive or active range of motion. The right knee was grossly edematous with mild erythema and severe pain during active and passive range of motion.

X-ray of the left wrist was negative for fracture or effusion. X-ray of the right knee was significant for a large suprapatellar effusion but no fracture. Chest X-ray was unremarkable. CBC was significant for a white blood cell count of 14.6. The BMP was unremarkable, and lactate was 1.3. Inflammatory markers included CRP 19 and ESR >100. Uric acid was 2.6.

A knee arthrocentesis was performed which revealed a cloudy yellow aspirate with WBC 95,300, RBC 110,000, segmented neutrophils 88%,





lymphocytes 4%, monocytes 8%, and no crystals.

The ED team consulted orthopedic surgery, who was not entirely convinced the patient's symptoms were consistent with septic arthritis based on involvement of multiple joints and 5-month duration of symptoms. However, they agreed the patient needed IV antibiotics and surgical intervention. The patient was admitted for presumed septic arthritis, and orthopedic surgery completed a washout of the right knee the following morning.

Discussion

Septic arthritis is a rheumatologic emergency, which may lead to permanent joint damage and a mortality rate of 10-15%.^{1,2} Annually, there are 20,000 cases of septic arthritis in the United States.³ *Gonococcus* was the leading cause of septic arthritis in young adults in the past, but it now makes up less than 1% of septic arthritis cases.⁴

Joint infection can occur via direct inoculation, hematogenous spread, or spread from contiguous infection. Large joints are more often affected, and the most common joint involved is the knee.⁵ If left untreated, non-gonococcal septic arthritis can destroy articular cartilage, causing permanent joint damage.¹

The essentials for diagnosis of septic arthritis include fever, painful joint, joint effusion, and arthrocentesis findings.⁶ The pain is acute or subacute with associated erythema, swelling, and limitation of motion in the affected joint. Definitive diagnosis is established by identification of an organism in the synovial fluid. Blood cultures often can be positive even when joint cultures are negative. The joint fluid analysis typically demonstrates high leukocyte counts, usually over 50,000, but you should maintain clinical suspicion for inflammatory or infectious process when the count is above 7500. The higher the white cell count in the joint fluid the more likely for it to be of bacterial or fungal origin. Smear and cultures should be obtained from the synovial fluid sample to determine the causative organism.

In gonococcal arthritis, Gram stain smears and bacterial cultures are negative in 50-75% of cases. Treatment for disseminated gonococcal infection (DGI) is ceftriaxone 1 g IV every 24 hours plus azithromycin 1 g orally as a single one-time dose (preferred initial regimen). Alternative regimens include IV cefotaxime or ceftazidime 1 g every 8 hrs with a one-time dose (2 g) of azithromycin.

This case had a multitude of

confounding factors that could have explained the patient's migratory polyarthralgias. The patient had a recent history of weeding in Pennsylvania, a family history of rheumatoid arthritis, and a remote history of chlamydia. In the ED, while it may not be pertinent to determine the causative organism in an inflamed joint, it is important to have a high index of suspicion for septic arthritis in order to complete the proper tests and procedures, consult orthopedics early, and admit for IV antibiotics and further treatment.

Septic arthritis should be considered in all individuals with non-traumatic joint pain. It may be difficult to diagnose DGI during the initial ED evaluation because many patients will not report high-risk behaviors such as multiple partners, men having sex with men, or history of prior STI. Individuals with suspected DGI should undergo testing for other STIs such as HIV, chlamydia trachomatis, and syphilis.

Case Conclusion

Upon admission, the patient had an extensive workup to determine the etiology of his migratory polyarthralgia. His Lyme titer was negative. Cyclic citrullinated peptide AB <16 (normal). Rheumatoid factor screen negative. HLA-B27 Negative. RPR reactive. FTA-ABS reactive. HIV non-reactive. The key lab result was the culture of the right knee aspirate which grew *Neisseria gonorrhoeae*. Finally, the patient's echocardiogram was negative for endocarditis. Unfortunately, despite clinical improvement after being started on appropriate antibiotic coverage, the patient signed out Against Medical Advice on day 4 of his hospital stay. ★

TAKE-HOME POINTS

- When assessing a painful swollen joint, it is important to:
 - Obtain a thorough history
 - Review vitals for signs of sepsis
 - Complete a comprehensive physical exam
 - Establish a broad differential diagnosis
 - Perform an arthrocentesis when applicable
 - Consult orthopedic surgery early and admit the patient for IV antibiotics
- It is imperative to establish a non-judgmental environment and open rapport with the patient as it may be difficult to obtain the information required when questioning about STIs.

Coincident VZV Encephalitis and Otomastoiditis

Aaron Tiffie, MD, FACEP

Our Lady of Lourdes Regional Medical Center

Kinnari Modi

William Carey University
College of Osteopathic Medicine

Christina Chanthanivong

William Carey University
College of Osteopathic Medicine

We present the case of varicella-zoster virus (VZV) reactivation without typical skin findings in a 66-year-old patient who presented with mastoiditis and encephalitis.

Case

A 66-year-old male with no relevant past medical history presented to the ED with worsening confusion and altered mental status. He was intubated secondary to his worsening GCS and combativeness. After intubation, physical exam was notable for right-sided erythematous, flat 3 cm linear rash limited to the submandibular and mastoid regions with erythematous and purulent right-sided ear discharge. Later the patient said he was diagnosed with otitis externa a few days ago. CT demonstrated right otitis externa with otomastoiditis, paranasal sinus mucosal thickening, and mild involutational changes of the brain. Lumbar puncture in the ED was positive for clear CSF with an opening pressure of 22cm H₂O. CSF demonstrated moderately elevated protein and neutrophilic count. Ceftriaxone, acyclovir, vancomycin, hydrocortisone, and IVF were started, and he was sent to ICU.

Discussion

Approximately 1 in 3 people will be affected with herpes zoster, also known as shingles, during their lifetime.² Once infected, VZV remains dormant in the dorsal root ganglia for a lifetime. According to the CDC, children who get the varicella vaccine have a lower risk of reactivation of VZV compared with those who were infected with wild-type VZV.² Approximately 99.5% of people born before 1980 in the US have been infected with wild-type VZV.² Hence, the lack of prior immunization and the decreased

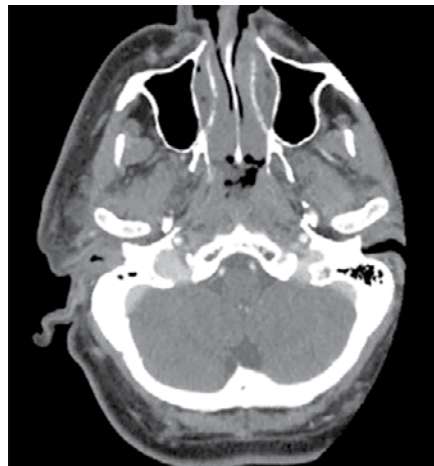


FIGURE 1. CT IAC with contrast, right otitis externa with otomastoiditis

immunity in older patients places them at a greater risk of developing herpes zoster.

CNS manifestations associated with VZV reactivation include aseptic meningitis, encephalitis, cerebral infarction associated with granulomatous vasculitis, myelitis and cranial neuropathy.³ CT findings in patients with VZV encephalitis often shows involvement of the temporal lobe.³ VZV-encephalitis is most often a complication reported in immunocompromised patients of VZV infection. In immunocompetent patients, VZV most commonly presents with a disseminated rash⁴ and rarely with encephalitis. Our patient had a right-sided erythematous, non-raised, non-pruritic 3 cm linear rash limited to the submandibular area. Encephalitis from varicella-zoster involves large vessel vasculopathy that often occurs in immunocompetent patients while small vessel mediated encephalitis is seen in immunosuppressed patients.³ Large vessel mediated encephalitis presents with acute focal deficits, similar to a stroke, and is fatal in up to 25% of patients.³ Patients with small-vessel mediated encephalitis present with headache, fever, vomiting, mental changes, seizures, and focal deficits.⁵

Studies show VZV encephalitis in immunocompetent patients is associated with an underlying vasculitis⁵. This patient

presented with encephalitis notable for delirium and combativeness. The importance of lumbar puncture in ED was critical in the absence of typical VZV vesicular rash or a history of prior episodes.

Some case studies have identified VZV encephalitis in patients following a malignant otitis externa infection.^{6,7} This superimposed otomastoiditis infection combined with old age possibly made this nondiabetic patient susceptible to a more severe manifestation of an independent VZV reactivation causing VZV encephalitis.

No controlled studies of antiviral therapy for complications of varicella (encephalitis, pneumonia) have been recorded.⁸ However, information derived from clinical experience and case reports suggests that IV acyclovir (10-15 mg/kg q8hrs) may be beneficial.⁸ Antiviral therapy is appropriate for adolescents and adults upon rash presentation due to the greater risk of complications.⁸ Acyclovir is most effective when initiated within 72 hours of the rash appearance.⁸

Case Conclusion

*In the ICU, CSF PCR was positive for VZV encephalitis and ear cultures grew P. aeruginosa. Ceftriaxone, ampicillin, and acyclovir were added 24 hours after the patient's arrival. Ciprofloxacin-dexamethasone drops were used to treat otitis externa. He was extubated on hospital day 6 and transferred to an LTAC facility. **

TAKE-HOME POINTS

1. VZV encephalitis should be considered in an immunocompetent patient with AMS and atypical rash, though rashes may not always appear.
2. Otomastoiditis coincident with an independent VZV reactivation can lead to a more severe manifestation of the VZV infection, causing VZV encephalitis.
3. The threshold for lumbar puncture should be lower in an acute setting in an altered patient with limited history and no other source of infection identified.



Updates in the Airway

Cameron Upchurch, MD

Oregon Health and Science University
@CamUpchurch

Joshua Kornegay, MD

Assistant Professor of Emergency Medicine
Associate Program Director,
Emergency Medicine Residency
Oregon Health and Science University

The year of 2019 ushered in an abundance of interesting, practice-informing, and excellently conducted research regarding airway and peri-intubation management that is potentially applicable to the emergency physician caring for critically ill patients. Some of these studies investigated the efficacy of commonly practiced interventions, others challenged long-standing dogma, while some embodied novelty and innovation foreshadowing the possible future standards in airway management to come. A selection of articles we felt particularly fit these characteristics are outlined below, with several other great article suggestions published in 2019 to also read. Trials are presented in “PICO” format — population, intervention,

comparison, and outcome — followed by observational studies, which are descriptively summarized.

PrePARE: Peri-intubation Crystalloid Bolus to Prevent Hypotension¹

Hypotension is common in critically ill patients undergoing emergent intubation and is associated with worse outcomes such as significantly higher mortality.² Administration of a fluid bolus has been proposed to combat this peri-intubation hypotension. PrePARE sought to determine the effectiveness of fluid boluses in preventing peri-intubation hypotension.

- **P:** Critically ill adults (≥18 years old) undergoing urgent/emergent intubation
- **I:** 500 mL intravenous (IV) crystalloid bolus prior to induction
- **C:** No fluid bolus
- **O:** Composite primary outcome: cardiovascular collapse, defined as systolic blood pressure (SBP) less than 65 mmHg or new/increased

vasopressor use in the period between induction and 2 minutes post-intubation, cardiac arrest within one hour after intubation, or death within one hour after intubation

Study design

Multicenter (nine sites: six medical intensive care units [ICU], one trauma ICU, one neurological ICU, and one ED), parallel-group (with PreVent³, see below), non-blinded, pragmatic randomized controlled trial (RCT)

Results

337 patients were enrolled; 168 randomized to the fluid bolus (intervention) group and 169 randomized to the no fluid bolus (control) group. The trial was stopped early due to medical futility after a planned interim analysis (originally planned for 500 patient enrollment). The two groups were balanced well in baseline characteristics and protocol compliance was high. The majority of patients were intubated for hypoxic respiratory failure (51% of patients in

the intervention group and 41% in the control group), followed then by altered mental status (28% in the intervention group vs 31% in the control group). There was strong compliance with the protocol for each group. The primary composite outcome of cardiovascular collapse occurred in 20% of patients in the fluid bolus group as compared to 18% in the no fluid bolus group (absolute difference: 1.3% [95% confidence interval (CI): -7.1 to 9.7], $p=0.76$). Interestingly, in the subgroup of patients receiving positive pressure ventilation by non-invasive positive pressure ventilation (NIPPV) for preoxygenation or bag valve mask (BVM) after induction, there was a trend towards less incidence of cardiovascular collapse in the fluid bolus group.

Takeaway

In critically ill adults being intubated, the routine use of a peri-intubation crystalloid bolus does not significantly decrease rates of cardiovascular collapse. However, in patients who have an indication for crystalloid (e.g., hypovolemic patients) or patients receiving positive pressure ventilation for preoxygenation with subsequent reduced preload, a peri-intubation crystalloid bolus could be considered to aid in preventing cardiovascular collapse.

PreVent: BVM after Induction to Prevent Hypoxemia³

Rapid sequence intubation (RSI) has been used primarily for critically ill patients undergoing emergent intubation, to allow the shortest apnea time, to abate hypoxemia, and to theoretically lower the risk of aspiration. Given the risk of aspiration induced by BVM is likely much lower than the potential for preventing hypoxemia with BVM use after induction, the PreVent trial aimed to assess the effectiveness of BVM after induction in preventing hypoxemia as compared to a more traditional RSI technique.

- **P:** Adults undergoing urgent/emergent intubation in the ICU
- **I:** BVM (≥ 15 L/min oxygen, with positive end expiratory pressure [PEEP] valve at 5-10 cm H₂O, for 10 breaths per minute) from time of induction to laryngoscopy

- **C:** No BVM use, unless after a failed intubation attempt, for treatment of hypoxemia, or if deemed clinically necessary by the treating clinician
- **O:** Primary outcome: lowest peripheral oxygen saturation (SpO₂) between induction and two minutes post-intubation. Secondary outcome: severe hypoxemia, defined as SpO₂ < 80% during the same interval

Study design

Multicenter (7 ICUs: 5 MICUs, 1 trauma ICU, and 1 neurological ICU), parallel-group (with PrePARE1), non-blinded, pragmatic RCT

Results

401 patients were enrolled; 199 were randomized to the BVM (intervention) group and 202 to the no BVM (control) group. Baseline characteristics were well-balanced between groups, and protocol compliance was high. The primary indication for intubation in both groups was hypoxemic respiratory failure (59% of patients in the BVM group vs 57% in the no BVM group) followed by altered mental status (37% vs 38%, respectively). Of note, preoxygenation with BVM was significantly more common in the BVM group, and preoxygenation with heated high flow nasal cannula (HFNC) or NIPPV was more common in the no BVM group. Importantly, the SpO₂ at the time of induction (99%) was not different between groups. For the primary outcome, the median lowest SpO₂ was 96% in the BVM group and 93% in the no BVM group (mean difference: 3.9% [95% CI: 1.4-6.5], $p<0.05$). Results were similar, showing significantly higher lowest SpO₂ in the BVM group, in post-hoc analysis adjusting for method used for preoxygenation. For the secondary outcome, 10.9% of the BVM group vs 22.8% of no BVM group (relative risk [RR]: 0.48 [95% CI: 0.30-0.77]) had severe hypoxemia. Operator-reported aspiration occurred in 2.5% of the BVM group vs 4% in the no BVM group (RR: 0.63 [95% CI: 0.21-1.91]), and the incidence of new post-intubation opacity on chest x-ray was 16.4% vs 14.8% (RR: 1.11 [95% CI: 0.7-1.77]), respectively.

Takeaway

In critically ill adults undergoing intubation, use of BVM after induction, as compared to no BVM use, was associated with statistically significant higher lowest SpO₂ and statistically significant lower rates of severe hypoxemia, with no difference in aspiration rates. In these patients, and specifically, patients with pulmonary shunt physiology, one may consider the use of BVM to prevent hypoxemia after induction during urgent/emergent intubation.

Caveat: *While this study is very well-designed and carried out, with intriguing data, the application of its results to an exclusively ED patient population—whom virtually none are nil per os (NPO)—must be carried out with caution as ED patients may be at higher risk of aspiration than the patient population in this study, which may be potentiated with BVM use.*

FLORALI-2: NIPPV vs HFNC for Preoxygenation⁴

Severe hypoxemia and subsequent cardiovascular collapse are prevalent in critically ill adults undergoing emergent intubation, and preoxygenation is the primary strategy to prevent this. HFNC and NIPPV can provide higher inspired oxygen than conventional devices and may be more effective in preoxygenating patients. Furthermore, HFNC can remain in place during laryngoscopy (read: apneic oxygenation) and thereby may better prevent hypoxemia associated with intubation. FLORALI-2 aimed to determine if NIPPV was more effective than HFNC for preoxygenation.

- **P:** Adults in the ICU undergoing intubation for acute hypoxemic respiratory failure
- **I:** NIPPV preoxygenation for 3-5 minutes: facemask connected to the ventilator with pressure support mode to obtain tidal volumes of 6-8 mL/kg predicted bodyweight with PEEP of 5 cm H₂O and FiO₂ of 100%, removed just prior to laryngoscopy
- **C:** HFNC (60 L/min and 100% FiO₂) for preoxygenation for 3-5 minutes prior to induction and continued during laryngoscopy

- **O:** Primary outcome: severe hypoxemia, as defined as $SpO_2 < 80\%$ for at least 5 seconds in duration, during the period from induction to five minutes post-intubation. Pre-study defined subgroups included patients with moderate-severe hypoxemia ($P/F \leq 200$ mmHg)

Study design

Multicenter (28 ICUs in France), parallel-group, non-blinded RCT

Results

313 patients were analyzed; 142 randomized to NIPPV (intervention group) and 171 to HFNC (control group). Baseline characteristics were similar between groups. Protocol compliance was high. The primary etiology of respiratory failure was pneumonia in both groups (35% of patients in both groups). The P/F was similar in both groups at enrollment (142 mmHg in the NIPPV group vs 148 mmHg in the HFNC group). The SpO_2 at the end of preoxygenation was similar between groups (97% vs 96%, respectively, absolute difference: 1.0 [95% CI: 0 to 2.0], $p=0.08$). The primary outcome of severe hypoxemia occurred in 23% of patients in the NIPPV group vs 27% in the HFNC group (absolute difference: -4.2% [95% CI: -13.7 to 5.5], $p=0.39$). In the subgroup analysis of moderate-severe hypoxemic patients ($n=117$ in NIPPV group and $n=125$ in HFNC group), the primary outcome occurred in 24% of the NIPPV group vs 35% in HFNC group (absolute difference: -11.3% [95% CI: -22.3 to 0.3], $p=0.0553$). Of note, the SpO_2 at the end of preoxygenation in this subgroup was 97% in the NIPPV group vs 96% (absolute difference: 1.0 [95% CI: -0 to 2.0], $p=0.02$).

Takeaway

NIPPV, as compared to HFNC (continued throughout laryngoscopy), for the preoxygenation of patients intubated for acute hypoxemic respiratory failure was not associated with less episodes of severe hypoxemia. However, there were trends towards less episodes of severe hypoxemia with the use of NIPPV, and especially in patients being intubated with moderate-severe hypoxemia. This suggests that NIPPV may be most beneficial in preoxygenating patients with significant pulmonary shunt physiology. In light of this study and PreVent³, one may consider the use of positive-pressure ventilation of some sort (NIPPV or BVM with PEEP valve) for preoxygenation and after induction to prevent hypoxemia in patients being intubated with pulmonary shunt physiology.

Caveat: Another well-designed study, with thought-provoking results. There was no difference in new infiltrates on CXR or ventilator-associated pneumonias after intubation between groups. Again, however, these patients were not ED patients, and there remains clinical equipoise regarding both the efficacy and safety of positive pressure ventilation prior to and after induction of ED patients undergoing urgent/emergent intubations.

IRIS: Cricoid Pressure vs Sham Procedure During RSI⁵

In emergency scenarios, patients requiring intubation are at higher risk of aspiration given their high prevalence of a non-fasting state, abdominal pathology, severe illness, and more. Traditionally, cricoid pressure has been used in attempt to reduce the risk of aspiration, though opposing data has suggested it is not effective and may

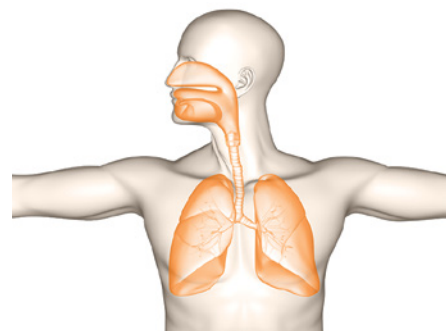
even increase the risk of aspiration while making intubation more difficult^{6,7}. IRIS hypothesized that the absence of application of cricoid pressure would not lead to increased aspiration rates.

- **P:** Adults intubated in the operating room (OR) for surgery requiring RSI due to their non-fasting state, or at least one risk factor for aspiration (emergency conditions, body mass index > 30, previous gastric surgery, ileus, within 48hrs postpartum, diabetic gastroparesis, gastroesophageal reflux, hiatal hernia, pre-operative nausea/vomiting, and/or pain)
- **I:** Cricoid pressure group: via planned 30N force applied using the first three fingers on the cricoid cartilage (blinded by use of opaque cover over the neck). All investigators providing this intervention were trained specifically on this maneuver
- **C:** Sham group: opaque cover applied over neck (in both groups, to facilitate blinding) and investigator simulated (placed their hand behind the cover near the cricoid so that the intubator was unable to tell if cricoid pressure was applied or not) but did not apply cricoid pressure
- **O:** Primary outcome: pulmonary aspiration, either reported as witnessed by the intubator as gastric fluid in the vocal cords during laryngoscopy, or evidence of gastric fluid on endotracheal aspiration performed just after intubation. Secondary outcomes assessed intubation difficulty and Cormack-Lehane grade

Study design

Multicenter (10 centers), double-blinded, noninferiority RCT. The sham

Recent practice-informing, high-yield research into airway and peri-intubation management is potentially applicable to the emergency physician caring for critically ill patients.



procedure was considered noninferior if the incidence of aspiration was not more than 50% higher (RR of 1.5) as compared to the cricoid group (i.e., if the upper limit of the 95% CI < 1.5, then noninferiority is accepted).

Results

3,471 patients were analyzed; 1,736 randomized to the sham group and 1,735 to the cricoid pressure group. The groups were well-balanced in regard to baseline characteristics and difficult intubation risks/features. The majority of patients were intubated for abdominal surgery, and the majority of the patients' risk factor for aspiration was emergency condition (65% and 66%, respectively), with the second most common risk factor being ileus (31% and 32%, respectively). The primary outcome of pulmonary aspiration occurred in 0.5% of patients in the sham group and 0.6% in the cricoid group (RR: 0.90 [95% CI: 0.33-2.38]). There was a trend towards more difficult intubation in the cricoid group, and requested interruption by the intubator of the cricoid/sham procedure occurred more frequently in the cricoid group (14% of patients) as compared to the sham group (5% of patients), which also resulted more often in an improvement in Cormack-Lehane grade (62% of the time), as compared to the sham group (33% of the time).

Takeaway

Sham procedure, as compared to cricoid pressure, for adults at higher risk for aspiration undergoing RSI for surgery, was not shown to be noninferior. Limitations of this study include the non-ED based population, whose rates of aspiration are low and likely lower than patients being intubated emergently in the ED. The pre-specified noninferiority margin was not met, but the overall incidence of aspiration was lower in the sham group, and intubation trended more difficult in the cricoid group with significant improvement in laryngoscopy views after removal of the cricoid pressure. While noninferiority was not met, there is little evidence to suggest cricoid pressure is effective at preventing aspiration and may actually have downsides such as making intubation more difficult. It is

important to remember, however, that cricoid pressure is a different technique with different intended purposes than external laryngeal manipulation.

Use of the Intubating Laryngeal Mask Airway⁸

This was a 10-year retrospective review at one institution of the use of the intubating laryngeal mask airway (ILMA) in the ED. The ILMA is used often in the OR and can be used as a primary extraglottic airway device to oxygenate/ventilate, but it can also be used as a rescue device and to help facilitate blind intubation with an endotracheal tube through its lumen. In this study, the ILMA was used on 218 patients over the ten-year period; 118 patients as a primary airway device and in 100 patients as a rescue device after failed intubation. The ILMA provided effective oxygenation/ventilation in 98% of patients (99% of patients when used as primary airway device and 96% as a rescue device). Blind intubation through the ILMA was successful in 81% of attempts. The ILMA was used to facilitate intubation in seven patients who could not be intubated with video-assisted laryngoscopy nor endoscopic techniques, who likely would have undergone surgical airway otherwise.

Takeaway

Consider the ILMA as a primary airway device, especially in cardiac arrest to avoid compression interruptions and help facilitate blind intubation for a secure airway later, or as an effective rescue device for patients who fail endotracheal intubation with other conventional techniques.

End Tidal Oxygen to Assess Preoxygenation Status⁹

End tidal oxygen (ETO₂) has been used frequently in the OR, but not often in the ED, to assess preoxygenation effectiveness prior to intubation attempts. The goal is an ETO₂ > 85% which suggests adequate preoxygenation in critically ill patients being intubated per anesthesia guidelines.¹⁰ This study was a prospective observational cohort study in two EDs where patients being intubated were preoxygenated for at least three minutes with either BVM (with the use of assisted

breaths and PEEP as deemed necessary by the provider), or non-rebreather (15 L/min, 19 L/min or flush rate at the discretion of the provider). ETO₂ was recorded by a separate independent observer (data blind to the treating clinicians). 100 adult patients were included. The median ETO₂ at the start of preoxygenation was 53% (interquartile range [IQR]: 43-65), and 78% (IQR: 64-86) at the start of induction. Only 26% of patients were able to achieve an ETO₂ > 85%. Median ETO₂ levels were similar between NRB (80%, IQR: 59-87) and BVM (77%, IQR: 65-86) groups. NRB at flush rate demonstrated the highest median ETO₂ (86%, IQR: 80-90), and NRB at 15 L/min demonstrated the lowest median ETO₂ (57%, IQR: 53-60). SpO₂ levels were higher during intubation in patients with higher ETO₂ at induction.

Takeaway

ETO₂, while frequently used in the OR to assess preoxygenation, has not been adopted in the ED, and may be helpful in assessing adequacy of preoxygenation prior to intubation, though further research is needed in the ED setting. While a separate gas analyzer would be needed in the ED to measure ETO₂, the setup is similar to continuous capnography monitoring and could be adopted into ED practices if found to be beneficial.

Post-intubation Sedation¹¹

This was a retrospective analysis of prospectively collected data from the National Emergency Airway Registry (NEAR)—a multicenter ED airway monitoring database—to evaluate post-intubation sedation in the ED. 11,748 patients intubated in the ED were included over a one-year period. 77.5% of patients received post-intubation sedation within 15 minutes after intubation. Of patients who received post-intubation sedation, the majority (93%) underwent RSI, whereas of those patients who did not receive post-intubation sedation, only 47% underwent RSI. Of patients that did not receive post-intubation sedation, the majority were intubated for cardiac arrest (57%, as compared to 7% of patients that received post-intubation sedation), whereas patients that received post-intubation

sedation predominantly were intubated for trauma or altered mental status/ overdose. 37% of patients that did not receive post-intubation sedation were hypotensive, whereas only 14% of patients that received post-intubation sedation were hypotensive. In regression analyses, pre- and post-intubation hypotension and cardiac arrest were associated with significantly less odds of receiving post-intubation sedation, while medical indication for intubation (as compared to trauma), RSI (as compared to non-RSI), and succinylcholine use (as compared to long-acting neuromuscular blockade) were associated with significantly increased odds of receiving post-intubation sedation.

Takeaway

While the study is at risk for recall bias, this large study indicates post-intubation sedation in the ED is provided more often than historically thought, and that patients that are hypotensive, in cardiac arrest, or do not undergo RSI are less likely to receive post-intubation sedation. Those who receive short-acting

neuromuscular blockade are more likely to receive post-intubation sedation, likely due to their subsequent movements prompting clinicians to provide sedation, as compared to their counterparts that received long-acting neuromuscular blockade and are still paralyzed but not sedated. This is important information for the emergency physician to be cognizant of when intubating patients, to prompt them to provide post-intubation sedation as medically appropriate in their patients.

Other High-yield Articles to Review

- Driver BE, Klein LR, Prekker ME, et al. Drug Order in Rapid Sequence Intubation. *Acad Emerg Med.* 2019;26(9):1014-1021.
- Driver BE, Scharber SK, Horton GB, Braude DA, Simpson NS, Reardon RF. Emergency Department Management of Out-of-Hospital Laryngeal Tubes. *Ann Emerg Med.* 2019;74(3):403-409.
- Carlson JN, Zocchi M, Marsh K, et al. Procedural Experience With Intubation: Results From a National Emergency Medicine Group. *Ann*

Emerg Med. 2019;74(6):786-794.

- Vourch M, Baud G, Feuillet F, et al. High-flow Nasal Cannulae Versus Non-invasive Ventilation for Preoxygenation of Obese Patients: The PREOPTIPOP Randomized Trial. *EClinicalMedicine.* 2019;13:112-119.
- Sakles J, Augustinovich C, Patanwala A, Pacheco G, Mosier J. Improvement in the Safety of Rapid Sequence Intubation in the Emergency Department with the Use of an Airway Continuous Quality Improvement Program. *Western J Emerg Med.* 2019;20(4):610-618.
- Guihard B, Chollet-Xémard C, Lakhnati P, et al. Effect of Rocuronium vs Succinylcholine on Endotracheal Intubation Success Rate Among Patients Undergoing Out-of-Hospital Rapid Sequence Intubation. *JAMA.* 2019;322(23):2303.
- Guitton C, Ehrmann S, Volteau C, et al. Nasal high-flow preoxygenation for endotracheal intubation in the critically ill patient: a randomized clinical trial. *Intensive Care Med.* 2019;45(4):447-458. ★

Because someone always takes it one step too far.



You're there for them, we're here for you.

emCareers.org

ACEP AND EMRA'S OFFICIAL ONLINE CAREER CENTER

POWERED BY HEALTH ECAREERS

ODU

The Silent Opportunistic Infection

Kyla Rakoczy

University of Miami School of Medicine
Class of 2023

Kasha Bornstein, MSc Pharm, EMT-P

University of Miami School of Medicine
Class of 2021

Suzanne Bialeck, MD, RDMS

Director of Clinical Ultrasound, Department of
Emergency Medicine
Assistant Professor, Department of Surgery
Jackson Memorial Hospital

The COVID-19 pandemic has overshadowed other prevalent and growing public health concerns, notably the Opioid Use Disorder (OUD) crisis. ***Opioid use disorder is the leading cause of overall death of Americans under the age of 50.***

The new cohort of trainees is just a few months from their medical school education and their degree gives them the authority to prescribe various drugs, including morphine, fentanyl, and oxycodone- notorious contributors to the opioid crisis in our country. Conversely, the same group are, legally, unable to prescribe lifesaving Medication Assisted Treatment (MAT) such as buprenorphine and methadone for addiction treatment. This mandate stems from the Controlled Substances Act of 1970 which defined such prescription drugs as Schedule III narcotics, indicating abuse potential.¹

In response to growing OUD prevalence in the 1990s, The **Drug Addiction Treatment Act of 2000 (DATA 2000)** created a mechanism for clinicians to treat opioid addiction prescribe buprenorphine and other similar medications. It required DEA registration, course completion, and patient panel size limits. Progressive at the time, DATA 2000 initially expanded access to opioid agonist therapy. However, the consistent growth of the opioid epidemic requires we reevaluate previous efforts to stem the tide of overdose mortality. While increasing the number of physicians who can prescribe MAT, DATA 2000 introduced additional barriers into MAT prescription, including requiring providers complete an additional



training course and gain certification via an “X Waiver.” These barriers contribute to a major treatment gap, with only 10% of patients seeking long-term OUD treatment able to receive it.²

Only a third of the over 2 million Americans diagnosed with OUD each year receive substance use treatment.³ As a result, many patients with OUD will end up receiving repeat care in emergency departments for overdose, injection related infections, and other sequelae of chronic or hazardous opioid use.^{4,5} A 2015 study found only 2.2% of American physicians are waived to prescribe controlled substances, such as BUP. Psychiatry comprises the specialty with the most waived physicians comprising 40% of all waivers. An “X Waiver” is not required to administer BUP treatment acutely in the ED. However, the “X Waiver” and mandated training from the Substance Abuse and Mental Health Services Administration (SAMHSA) is required for a physician to write a prescription for take home doses. “The 72 Hour Rule” does allow patients seeking opioid withdrawal related treatment to return to the ED for BUP doses every day for up to 3 days after they were initially seen, however, evidence suggests this seventy-two-hour interval is insufficient to stabilize a patient with OUD on the road to long

term maintenance and to avoid remission of hazardous opioid use.⁸ A 2015 study found only 2.2% of American physicians are waived to prescribe controlled substances, such as BUP. Psychiatry comprises the specialty with the most waived physicians comprising 40% of all waivers. An “X Waiver” is not required to administer BUP treatment acutely in the ED. However, the “X Waiver” and mandated training from the Substance Abuse and Mental Health Services Administration (SAMHSA) is required for a physician to write a prescription for take home doses. “The 72 Hour Rule” does allow patients seeking opioid withdrawal related treatment to return to the ED for BUP doses every day for up to 3 days after they were initially seen; however, evidence suggests this 72-hour interval is insufficient to stabilize a patient with OUD on the road to long term maintenance and to avoid remission of hazardous opioid use.⁸ Additionally, this short time interval decreases the ability of the ED team to effectively bridge the patient to long-term outpatient or inpatient OUD treatment therapy, especially in the setting of a global pandemic. This does a further disservice to a marginalized patient population already challenged by the limited number of physicians waived to prescribe MAT with buprenorphine to begin with.

The natural follow-up question remains: If MAT saves lives, allows people to regain purpose and functionality in society, why is it difficult to obtain certification to prescribe?

Medications

There are 3 current FDA approved medications for OUD addiction treatment: methadone, buprenorphine, and naltrexone. Buprenorphine (BUP) is a long-acting mu-opioid partial agonist used in managing opioid withdrawal, in long-term replacement therapy for OUD, and in chronic pain control. BUP can also be prescribed as a combination formula buprenorphine/naloxone under the brand name Suboxone. Naloxone is inert and only becomes active if the oral Suboxone form is crushed and attempted to use for abuse purposes. When deciding to initiate BUP acutely in the emergency department (ED) for opioid withdrawal a Clinical Opiate Withdrawal Score (COWS) should be calculated (Figure 1).⁶ A diagnosis of OUD, as defined by the Diagnostic and Statistical Manual, Fifth Edition (DSM-V) as well as a COWS score of at least 8 are needed to consider BUP initiation. As a partial agonist, BUP may precipitate withdrawal in a patient dependent on full opioid agonists. Thus, you want the patient to be in withdrawal already. Methadone is a long-acting full mu agonist, dangerous in overdose in certain populations, and requires high engagement and patients to present daily to the clinic. Methadone also causes QTC prolongation. Naltrexone in the depot form had the brand name Vivitrol and is an opioid antagonist. It is already available for alcohol withdrawal. Most ED patients experiencing acute opioid withdrawal will have their symptoms adequately controlled with a sublingual dose of 8-16mg BUP.⁷ Controlling patient withdrawal symptoms in the ED is critical to initiating long-term OUD recovery by increasing the patient's comfort and willingness to be consulted about ongoing treatment options.

Be Kind

Motivational interviewing in the form of nonjudgmental communication and open patient education are key to determining the patient's last opioid usage to avoid precipitation of acute withdrawal. Some patients will not be ready to enter treatment.

Communicate that the emergency department will always be a safe place for them to return and that they can obtain resources when they are ready.

However, psychiatrists are one of the least accessible specialists in rural areas of the United States.⁹ SAMHSA reports that drug-related deaths are 45 percent higher in rural areas than in urban areas, and rural US residents are twice as likely to die from opioid overdose as their urban counterparts.¹⁰ Clearly, there is room for improving access to this much needed care in these vulnerable areas.

Future Legislation

Twenty years have passed without modification to the "X Waiver" bill. However, the COVID-19 pandemic may offer an opportunity to reevaluate OUD care and training. In March 2020, the Drug Enforcement Administration waived a requirement that patients seeking BUP treatment have an in-person consultation with a waived provider to start treatment.¹¹ Temporarily, the use of telemedicine can be used in lieu of in-person evaluation. Additionally, all stable patients currently in MAT Programs have been granted a temporary allowance of up to a 28-day take-home dose allowing patients to receive treatment and minimize unnecessary exposure to COVID-19.¹² These minor changes are significant in that they represent an opportunity for the appraisal and the modification of MAT restrictions and legislation, especially in the context of a national emergency and global pandemic.

Paradigm Shift

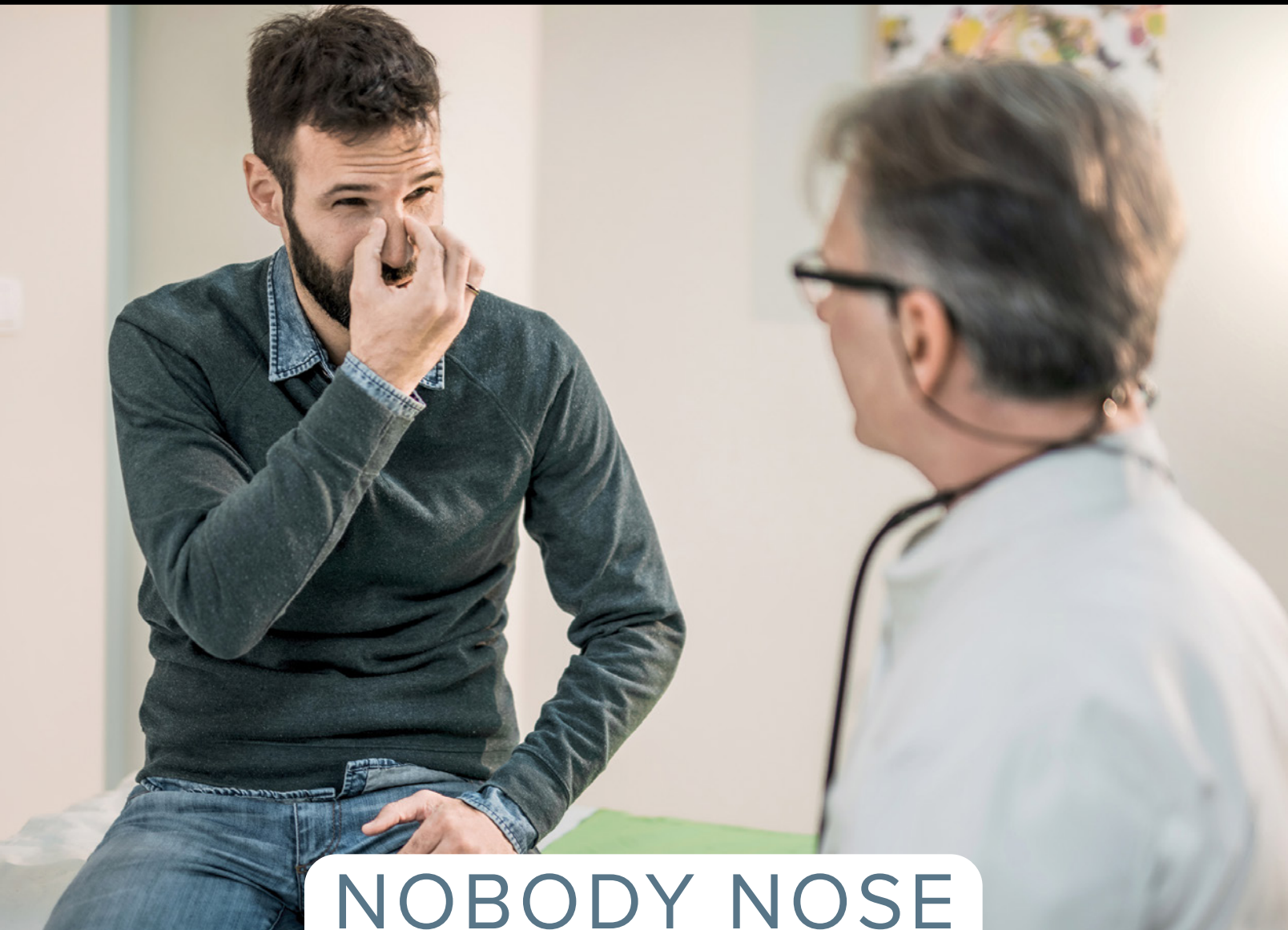
One historical comparison would be the CPR training movement. Traditionally, CPR was taught requiring mouth-to-mouth resuscitation in a cardiac arrest response. Further evaluation of this teaching revealed significant hesitance of lay bystanders to initiate cardiac arrest response for fear of mouth-to-mouth infection and disease transmission. Organizations like "National 2 Step CPR" are actively working towards removing this barrier to lifesaving care by advocating for "hands only" (compression only) CPR, which improves time to initiation and delivery of CPR by eliminating excess stresses on the cardiac arrest bystander, improving bystander performance and confidence in providing lifesaving care.

Now, imagine if we removed the barriers between medical professionals and their access to lifesaving care in the form of MAT. Other countries such as France have already modified regulations and may serve as a paradigm for change; Following expansion of buprenorphine prescribing access in 1995, the country saw a 79% decrease in opioid-related mortality over the succeeding 3 years.¹³ United States emergency physicians should engage in the conversation to reduce barriers to MAT prescription and to increase ED-initiated buprenorphine. A 2015 randomized clinical trial published in *JAMA* found that ED-initiated buprenorphine treatment in the United States, compared with brief intervention and referral, was found to significantly increase engagement in formal addiction treatment and reduce self-reported illicit opioid use.¹⁴

A 2020 *JAMA* study from Yale School of Medicine assessing readiness to prescribe MAT among EM attendings, residents, and advanced practice providers found that only 3.5% (9 of 258) were waived, and 21% (56 of 258) felt ready to prescribe buprenorphine. Barriers to prescription included lack of training, lack of experience in treating opioid use disorder, as well as concerns about ability to link to ongoing care.¹⁴ Establishing a MAT curriculum for medical students and allowing current emergency medicine residents to successfully complete the 8-hour "X-Waiver" training during protected learning time could be the first steps in removing barriers to providing this lifesaving care. The COVID-19 pandemic has been characterized by fear, uncertainty, and has ultimately changed each of our lives. These effects are magnified for patients experiencing OUD. Social isolation can worsen comorbid anxiety and depression and may increase the risk of unwitnessed overdoses leading to more preventable deaths. We have the duty to recognize that this pandemic may also be the igniting force we need to mobilize essential improvements in medical education and training regarding OUD treatment.

Free Training

ACEP and Providers Clinical Support System (PCSS) have partnered to provide free virtual 8-hour training sessions required for X-waiver application. For more information and to sign up, visit [acep.org/education/ed-x-waiver-training-corps](https://www.acep.org/education/ed-x-waiver-training-corps). ★



NOBODY NOSE

A Case Report of Spontaneous Nasal Septal Abscess

Ashley Werbin, DO

Emergency Medicine Resident
San Antonio Uniformed Services
Health Education Consortium

Andrew Schaffrinna, MD

Emergency Medicine Attending
San Antonio Uniformed Services
Health Education Consortium

Case

A 31-year-old otherwise healthy male patient presented to the ED for 9 days of nasal pain. The pain was described as being localized to his left nare with associated feelings of nasal obstruction and complaints of difficulty breathing through his nose. He reported Afrin use – 2 sprays once daily for 2 days – without symptomatic relief. He had never had this pain previously. He denied nasal substance ingestion, nasal trauma, previous nasal surgery, and recent dental surgery.

Additionally, he denied recent illness to include fever/chills, eye drainage, eye swelling, rhinorrhea, sinus pain, and cough. He did report using clippers to trim his nose hair.

On arrival to the ED, the patient's vital signs were stable and he was afebrile sitting at 99% on room air. On physical exam, there was no appreciable swelling or tenderness to palpation of the dorsum and lateral margin of the external nose. On further inspection of the nasal cavity, the patient's septum on the left side (involving the inferior

nasal turbinate and nasal vestibule) demonstrated significant mucosal swelling and mild purulent drainage with scant blood. Despite the absence of similar swelling on the right side of the septum, the patient did have tenderness to palpation of the septum bilaterally. Labs and imaging were deferred given the clinical stability of the patient.

Attempts at expressing purulence from his septum were performed at bedside with some success, but complete drainage was largely limited by the patient's pain. Given the limitations of successful drainage and duration of symptoms, otolaryngology on call was paged for further evaluation and management.

Discussion

Nasal septal abscesses are an uncommon diagnosis in emergency medicine with limited analysis and discussion in the otolaryngology literature. Traditionally, nasal septal abscesses are the result of traumatic facial injuries with 75% occurring as a direct complication of nasal trauma.¹ Nearby extension of a dental or sinonasal infection is the second most common cause.² While a handful of cases of spontaneous nasal septal abscesses are reported in patients with chronic asymptomatic HIV and uncontrolled diabetes mellitus, incidence in immunocompetent adults is exceedingly rare. Only three published case reports are found in the PubMed database in the last 35 years.

The nose is a mixed bony and cartilaginous structure with a midline septum dividing the nasal cavity into right and left sides. The septum's lack of direct vascularity highlights the

physiologic importance of the vascular rich mucoperichondrium that lines the septal cartilage. The sphenopalatine artery, the anterior and posterior ethmoid arteries, the superior labial artery, and the greater palatine artery travel through this mucoperichondrium providing the cartilaginous septum its blood supply via diffusion.^{3,4} When the interface between the septal cartilage and its source of blood supply is interrupted, septal ischemia ensues leading to tissue necrosis and possible infection.¹ Pressure from a small traumatic hematoma or a small abscess can in this way impair blood flow and enable large abscess formation.

The urgency of this diagnosis is supported by the following complications. As tissue necrosis results — secondary to ischemia either from a traumatic hematoma or abscess — the pressure it generates can lead to septal perforation and subsequent saddle nose deformity — a structural problem.⁴ It is the destruction of this cartilage that permits a unilateral nasal septal abscess to become bilateral while promoting the expansion of infection to surrounding areas — a functional concern. Orbital cellulitis, impaired development of the nose and maxilla in children, cavernous sinus thrombosis, subarachnoid empyema, intracranial abscess, and bacteremia leading to sepsis have all been documented complications given the anatomical proximity of the septum to these areas.^{5,6} The potential for these complications to become life-threatening reinforce the importance of prompt recognition and intervention.

The most common presentation of a nasal septal abscess is nasal obstruction and pain with associated swelling and

erythema of the dorsum of the nose and nasal septum.^{6,7} If not properly or thoroughly examined, this diagnosis could be mistaken as nasal septal deviation or inferior nasal turbinate hypertrophy.⁶ A CT scan is the imaging modality of choice for differentiating nasal septal abscess from superficial cellulitis. The decision to include a CT brain with contrast and/or CT soft tissue head and neck with the CT scan of the maxillofacial region depends on the clinical presentation and associated symptoms of the patient's complaint.

When a patient presents to the ED with an exam concerning for nasal septal abscess, incision and drainage for culture and gram stain and parenteral antibiotics should be initiated without delay. If having difficulty with bedside drainage or there appears to be obliteration of the septum, call otolaryngology on call for operative drainage and reconstruction with initiation of antibiotics in the interim. While staphylococcus aureus is the most common pathogen to cause nasal septal abscesses, determining your patient's risk factors for methicillin-resistant staphylococcus aureus (MRSA) is imperative if severe complications from bacterial dissemination are to be avoided.⁸

Case Conclusion

Our patient was taken directly to the operating room by the otolaryngology resident for incision and drainage and discharged home with Augmentin for ten days, Bactroban twice daily to the left nare, and ocean spray three to four times daily. He was evaluated in their clinic two days following drainage, at which point his packing and doyle splint were removed from the left nare. There was no active purulent drainage after the incision site was explored and his pain was noted to be improving. The patient's culture resulted as a pan-susceptible staphylococcus aureus, so his antibiotic regimen was continued. Additionally, the patient was counseled on the possibility of underlying immunodeficiency and future structural complications from his treated abscess. The patient had a negative HIV blood test in 2013. The patient was evaluated one additional time by the subspecialist and released from their care after an uneventful recovery. ★

TAKE-HOME POINTS

- Nasal septal abscesses are a potentially life-threatening diagnosis that can be mistaken for nasal turbinate swelling or septal deviation highlighting the importance of a thorough physical exam.
- While common symptoms include nasal pain and nasal obstruction, ask patient's about systemic signs of infection.
- Statistically, non-traumatic nasal septal abscesses occur in immunocompromised or immunosuppressed individuals making it important to ask patients about family history and sexual history.
- The treatment of nasal septal abscesses includes incision and drainage, parenteral antibiotics, and pain control.
- It is important to counsel patients on the structural complications and cosmetic defects that can result from nasal septal abscesses.

POCUS FOR THE WIN

Popliteal Artery Occlusion

Katie VanNatta, DO, MBA, MS

EMRA Ultrasound Committee Vice Chair
Midwestern University/Franciscan Health
[@vannatta_katie](#)

Jacob Freudenberger

EMRA Ultrasound Committee Vice Chair
UNTHSC-Texas College of Osteopathic Medicine
Class of 2021

Akash Desai, MD

EMRA Ultrasound Committee Chair
Icahn School of Medicine
at The Mount Sinai Hospital

POCUS for the Win is a case series for ultrasound enthusiasts to showcase the ability of ultrasound in making diagnoses at the bedside, often before formal imaging. If you have a case with accompanying imaging/video, please email pocusftw@gmail.com.

Case

A 45-year-old female with a history of peripheral artery disease and a stable abdominal aortic aneurysm presents to the Emergency Department for right leg pain. Patient notes sudden onset of right lower leg pain while walking at the grocery store several hours prior to

arrival. She denies trauma to the leg. The review of systems is otherwise negative. The physical exam is significant for full strength and intact sensation to the right leg. Patient had decreased pulses in the dorsalis pedis but normal pulses in the posterior tibialis. At the community hospital where this patient presented, ultrasound was not available overnight. Ultrasound was brought in to perform at bedside to rule out DVT in the leg.

Diagnosis: Acute Right Popliteal Artery Occlusion

In the ultrasound images above, the patient had a compressible popliteal vein but no color flow through the popliteal artery or vein. The patient was accepted for transfer to a tertiary care center based on the ultrasound imaging. The accepting hospital asked for a CT angiogram of the leg prior to transfer to begin focused interventional planning while the transfer process was initiated. The diagnosis of acute right popliteal artery occlusion was confirmed on CT angiogram. A heparin drip was started, and the patient was transferred out.

Ultrasound Review: DVT Exam

Deep Venous thrombosis (DVT) affects approximately 1 per 1,000 annually. Due to a combination of high disease incidence as well as the morbidity and mortality associated with the progression from DVT to pulmonary embolism (PE), it is important to be able to rule in or rule out a DVT in the emergency department.¹ Learning how to perform a bedside DVT exam is essential, especially in the many facilities (such as the one described in the case above) that lack access to 24-hour ultrasound.²

Technique

To perform a lower extremity venous ultrasound, a high resolution (5-10 MHz) linear transducer is required. Physicians can quickly assess for a DVT by performing the 2-point compression technique. Performing the 2-point compression technique does not assess clots in the calf and ankle. Color and Doppler modes can be utilized to differentiate between vascular and non-vascular structures, and for blood flow

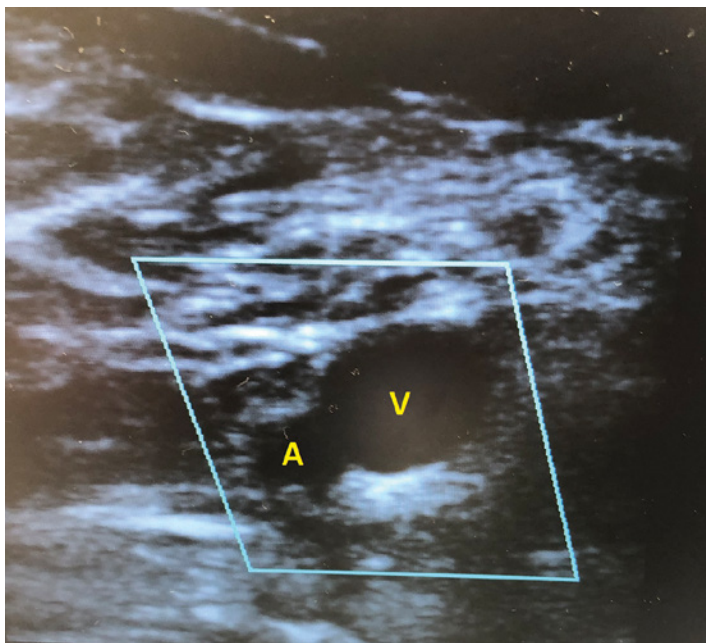


FIGURE 1. Bedside ultrasound of patient's right popliteal fossa with popliteal artery (A) and vein (V) visualized with color flow on.

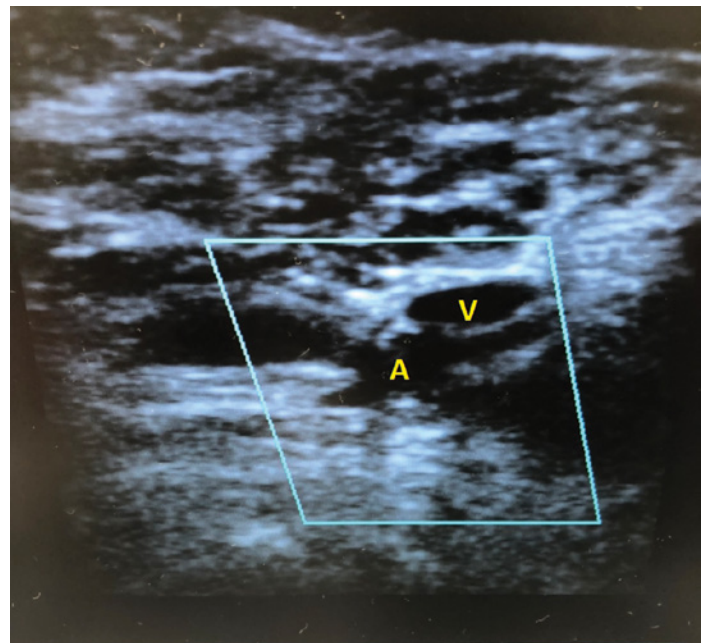


FIGURE 2. Bedside ultrasound of patient's right popliteal fossa while compressing popliteal artery (A) and vein (V) with color flow on.

FIGURE 3. Positive DVT study that shows a thrombus (indicated by the green arrow) in the femoral vein (V). The femoral artery (a) is seen adjacent to the vein (v) and also the greater saphenous vein(s) is in view. The image on the right demonstrates that the vein does not collapse with compression which indicates a positive DVT study.³

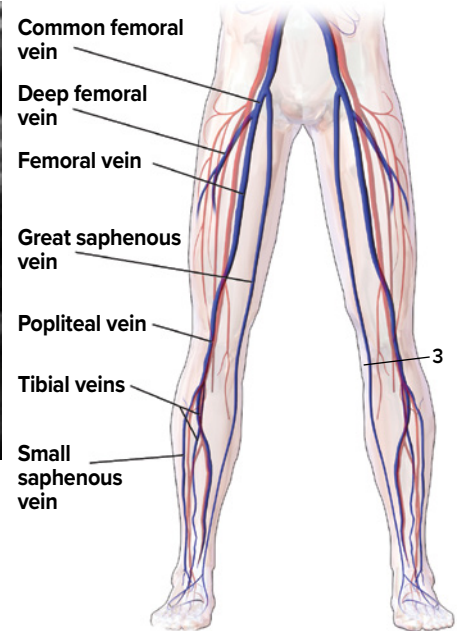
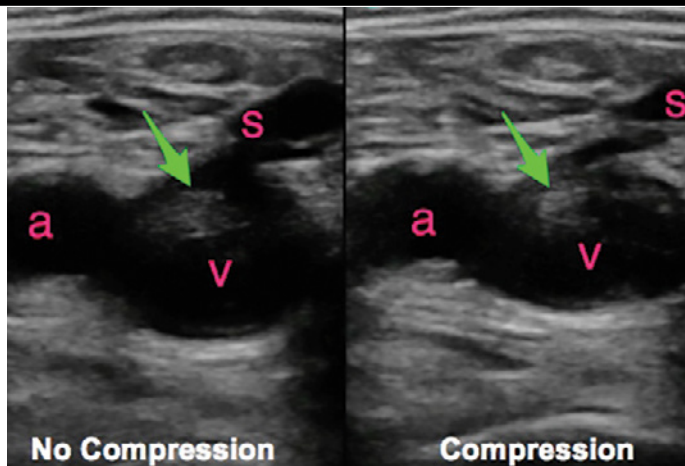


FIGURE 4. Lower extremity venous vasculature⁴

— this feature was critical in making the correct diagnosis in the case above.

1. Place the patient supine with 20-30° of reverse Trendelenburg position for maximal distension of the leg veins.
2. Externally rotate the hip with the knee slightly flexed, to allow for optimal exposure of the junction of the common, deep, and superficial femoral veins as well as the popliteal fossa.^{1,2}
3. With the probe in transverse orientation, apply direct and even pressure at the anatomical positions depicted below in Figures 4 and 5 to assess for compressibility. The complete exam is described in further detail in the following section.
4. If the vein fully compresses, then a DVT can be ruled out. An appropriate amount of pressure will result in complete collapse of the vein and only a slight change in the caliber of the artery. If the vein does not fully compress, a DVT is most likely present.² The lumen of the vein must disappear completely in order to exclude the presence of a clot. While a clot may be seen as echogenicity within the lumen, in many cases the only evidence of DVT will be the inability to compress the vein fully.¹ See Figure 3 below for an example of a positive DVT study.

Femoral Vein

To begin examining the femoral vein, the linear probe is placed in the transverse plane at the level of the inguinal ligament. The probe indicator should be pointed to the patient's right. In this orientation, the vein will be imaged in cross-section with the femoral artery lateral to the femoral vein. Fan the probe

proximally or distally until the confluence of the femoral vein and greater saphenous is visualized. Then advance the probe up to 5 cm distal from the confluence of the greater saphenous and common femoral veins until the common femoral vein gives rise to the deep and superficial femoral veins. Both are considered deep veins and should be evaluated.²

Popliteal Vein

The probe is again placed in a transverse plane relative to the long axis of the popliteal veins. Starting at the posterior medial aspect of the knee, first locate the superficial popliteal artery and vein. Due to the posterior location of the probe, the popliteal vein sometimes will appear more superficial than the popliteal artery. Once the structures are in view, direct pressure should be applied to

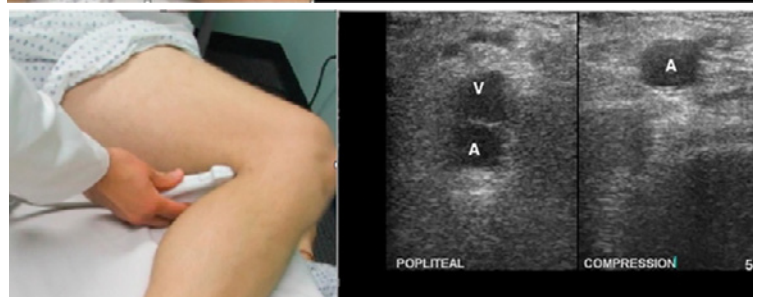
assess the compressibility of the popliteal vein. The probe then should be fanned through the popliteal vein until it gives rise to the anterior, posterior, and tibial veins. The compressibility of the proximal portion of each of the veins involved in the trifurcation must also be evaluated. Total collapse of the veins rule out the presence of a DVT.²

Check out this video for a walkthrough of the DVT exam at coreultrasound.com/dvt ★

FIGURE 5 (top). Transducer location to evaluate the femoral artery and vein. Normal ultrasound images showing common femoral artery (A) and femoral vein (V) as well as a fully compressible femoral vein (V).³



FIGURE 6 (bottom). Transducer location to evaluate the popliteal vein. Normal image showing a popliteal artery (A) and vein (V) as well as a fully compressible vein (V).³



8 Tips to Finding a Job During a Global Pandemic

Deena Khamees, MD

EMRA Board Director of Education

Medical Education Fellow, University of Michigan



The job hunt for a graduating resident and fellow, or the physician seeking a new opportunity, is rife with uncertainty and anxiety at any time. Now a pandemic has introduced us to unprecedented numbers of hiring freezes, suspended bonuses, and scaled-back continuing medical education (CME) funds and stipends. Lower patient volumes mean less need for the emergency physician. The unclear future of COVID, and fear of a significant second wave, give both hiring groups and individual physicians pause. Those who are near retirement or perhaps planning relocations or career changes now instead prefer the safety of continued employment in the face of turbulent times.

What does a job search look like in these conditions?

8 JOB SEARCH TIPS

Pay extra attention to your curriculum vitae (CV) and cover letter. With anticipated tighter competition this year, these materials are under a special spotlight as any employer's first impression of you. Do not be shy – distribute these to trusted colleagues and mentors widely for feedback and polishing. Tailor your cover letter to each specific institution, particularly your top 2-3 choices. Highlight any connections to the institution or area, such as family or your partner's job or even a strong commitment to the city in your cover letter.

Don't fear the cold email. Many positions are not posted online or otherwise publicly accessible. Compose a brief, concise email to the department chair to express your interest, and attach a cover letter and CV. The email should state your current position and institution, your qualifying training and interests, and your intention to apply for an available position and request for an interview. Include a statement that indicates you intend to follow up as you know they are busy.

Cast a wide net. While there may be 1-2 frontrunner institutions, consider as many institutions as could potentially fit your needs, such as geography, proximity to family, partner-related needs, etc. Think in terms of what's "comfortable for the next 1-3 years" instead of "lifelong." As most, if not all, communication and interviewing will be virtual, this is likely to be a cost-effective process even with 15-20 (or more) identified potential employers.

Flex connections. Make sure your colleagues know where you're applying. In a market that promises to be tighter than usual, allow your contacts to help you get a foot in the door. Remember, EMRA is a key connection! Take full advantage of [emCareers.org](https://emcareers.org) and your EMRA network.

Be persistent. The typical hiring timeline in academic EM usually sees interviewing and hiring from early fall to winter for a July start date. In a pandemic-stricken market, hiring freezes and possibly related and intentional delays in retirement or job changes mean fewer positions available in the fall and winter. As the pandemic hopefully begins to resolve, so too may this relative stalemate, especially as patient volume rises in its wake. While it is impossible to make such a prediction definitively, it is reasonable to follow up your cold emails to check in on a regular basis. Where there was once no opening, there may be one 4-7 months later, at which point employers are unlikely to remember your previous single email.

Prepare an "elevator pitch." A brief summary statement of who you are, how you're qualified, and what you want will be key in communicating with potential employers, both in writing and over phone or video calls.

Talk compensation, not money. While it is important that you seek a fair and reasonable monetary compensation, compared to similar jobs in your region, consider that this piece of your negotiations may be a particularly sensitive point in a climate of budget freezes and cuts. Instead, consider negotiating terms of buy-down, number of night and total shifts per month, ability to internally and externally moonlight, CME funds, and formal titles. These can add incredible value to your position without causing friction with potentially finance-wary employers.

Be honest. It is tempting in such a stressful process to attempt to inflate your interest in an employer with exaggerations of family ties or professional experiences. Do be mindful that it is a small world and word travels! A genuine show of enthusiasm and demonstration of fit between you and the employer should suffice. ★



The Case for a Universal Emergency Medicine Clerkship

Nicholas H. George, MD

PGY-2 EM Resident

University of Pittsburgh Medical Center

@georgenh_

Emergency medicine (EM) is often absent from undergraduate medical training. In a recent poll, researchers found that only 52% of U.S. medical schools require an EM rotation.¹ The lessons learned through an EM clerkship are unique, practical, and necessary. It is time to make EM the newest core third-year clerkship.

Since the first EM residency program was established in Cincinnati in 1970, more than 250 allopathic/osteopathic residency programs have been founded around the United States. As of 2014, there were 45,140 emergency medicine physicians practicing in the U.S.² In 2016 and 2017, 33 and 21 new programs, respectively, were accredited by the ACGME.³ The popularity of the field, and the need for newly minted emergency physicians, is well-established.

There are many compelling arguments for making EM a mandatory third-year clerkship. EM rotations forge better, more confident medical students. Additionally, patients generally enjoy having students in the clinical setting. Finally, almost every specialty will interact with the emergency department at some point — as the front line and safety net of care, emergency medicine is central to the health care system in America.

Student Experience

EM rotations make medical students better, more confident students. A 2002 study from the *Journal of Emergency Medicine* details how early exposure to emergency medicine and the “undifferentiated patient” can help medical students in their preparation for any specialty.⁶ Emergency medicine offers a one-of-a-kind setting where students are exposed to every medical specialty, from radiology to psychiatry, and everything in between.

Patient Experience

Patients enjoy having medical students in the ED setting. Students have been shown to increase patient satisfaction and have *never* been found to decrease patient satisfaction scores.⁷⁻⁹

Career Experience

Emergency medicine is a unique, increasingly popular, and important educational field. It is time for a paradigm shift here. The fact that almost half of U.S. medical students are not required to complete an EM clerkship prior to graduation is, at best, precarious.

Next time you pass the red “EMERGENCY” sign that sits above the ambulance bay, try to think of a specialty that doesn’t interact with the emergency department. You will be hard-pressed to come up with a good answer. At some point in a physician’s career, they will be exposed to emergency medicine. It is time our medical students are as well. ★

Turning Medical Students into Medical Educators

**Justin Doroshenko, M.Ed.,
Paramedic, MS4**

University of New England
College of Osteopathic Medicine
Class of 2021
jdoroshenko@une.edu
@dorJustin

Shelby Crowley, BS, MS4

University of New England
College of Osteopathic Medicine
Class of 2021
scrowley3@une.edu



Note: Photo taken prior to COVID-19 outbreak

Each spring semester, the University of New England College of Osteopathic Medicine (UNE COM) hosts a student-designed and delivered continuing education program called Clinical Anatomy for the Advanced Provider (CAAP). In this program, medical students are given the unique opportunity to teach health care providers outside the structured didactics and case presentations of preclinical medical education. The UNE COM Emergency Medicine (EM) Club recognized the need for such opportunities for students during the preclinical years and had the resources on campus to provide the community with this educational opportunity.

CAAP is a 1-day, 8-hour educational program that provides community health care providers with four hours of clinically relevant anatomy lectures, typically encompassing airway, cardiac, gastrointestinal, genitourinary, and neurology systems, taught by second-year UNE COM medical students. The afternoon consists of four hours of hands-on, small group teaching sessions during which participants rotate through stations focused on similar systems

in the UNE COM human body donor/gross anatomy lab. First-year students conduct most of the lab instruction, with the exception of neuroanatomy which is taught by second-year students. Lifelight of Maine nurses and paramedics conduct an advanced airway skills session that runs concurrent with the afternoon anatomy lab sessions. For many participants, the program is their first opportunity to visit a human body donor/gross anatomy lab to see and handle human specimens. It provides a rare setting where clinical providers from multiple areas of medicine, from nursing to paramedicine to physical therapy, literally explore the human body together.

Why CAAP?

Prior to 2017, the EM Club at UNE COM offered similar anatomy programs but focused on a tactical EMS audience. With those programs as a framework, in 2017, medical student members of the UNE COM EM Club assessed their incredible resources – the human body donor/gross anatomy lab, extensive anatomy knowledge, and the strong support of the UNE COM Anatomy Department.

The CAAP program was conceived with an objective of giving back to the medical community by offering an anatomy program with clinical focus for advanced providers, such as paramedics and nurses. The program also offers continuing education credits as a part of the event. By charging participants a modest fee, the program serves as an essential fundraiser for the EM Club while remaining a cost-effective form of continuing education for community providers. Most importantly, efforts are made to ensure the sustainability of the program, involving both first- and second-year medical students in the planning and execution of CAAP. Templates for lectures and teaching points continue to be handed down for the program's continuation in 2020 and beyond. Planning in this fashion has allowed continuity and continued success in subsequent years, along with opportunities for ongoing development and innovation. A partnership was also established with Lifelight of Maine, whose providers brought their vast clinical and educational experience to the event to teach the participants a variety of airway techniques, tips,

and tricks in what is a highlight of the program. After a successful inaugural program in 2017 with 40 participants, CAAP has continued to grow with 65 participants in 2018 and 75 in 2019. In 2019, the program raised over \$3,600 for the EM Club.

A Unique Educational Experience for Medical Students

Teaching students how to teach is not routinely a core component of preclinical and clinical medical education despite the fact that it is generally a requirement in residency and often becomes a cornerstone of a physician's career. Effective teaching begins with thorough understanding. CAAP challenges student's knowledge base beyond brute memorization so they are prepared to answer questions that arise. Sharing knowledge with those from the medical community, but outside of a direct peer group, provides a unique opportunity to begin to hone the skills necessary to communicate clearly and develop engaging presentations. There is also the hope that student involvement in CAAP will inspire students to be educators and seek out further opportunities that will assist in the development of these skills later in medical school, residency, and beyond. Through CAAP, students are afforded an early chance to present to a large group or teach in the dynamic setting of the human body donor/gross anatomy lab—an example of how medical education instruction can be uniquely taught (through practice) in medical school. Further, as the students develop the ability to apply fundamental anatomy in a more integrated approach to problem solving, it is hoped this will translate to improved clinical care.

The medical students participate in a program debrief immediately following the conclusion of the event. This open forum facilitates discussions of successes, opportunities, and—perhaps most importantly—pearls of knowledge. The results of this debrief feedback session are used to improve CAAP for the following year. There is ongoing work, evaluation, and introspection to improve the program for the participants and the learning experience for the students each year.

The Success of CAAP

One fundamental component of educational instruction is evaluation—was it effective? Accordingly, CAAP is followed by a participant survey to gather quantitative data on the perceived effectiveness of the program and qualitative feedback on what works well and what could be improved. The survey includes a 10-point Likert scale that asks about the usefulness of both the lecture and lab components (1 = not at all useful, 10 = very useful) and similar questions to determine whether a participant would attend the program again and whether they would recommend the program to friends or co-workers (1 = would not recommend, 10 = would definitely recommend). Regarding utility, the lecture portion of the program received average ratings of 8.8, 9.3, and 9.3 in 2017, 2018, and 2019, respectively. Over the same years, the lab portion received average ratings of 9.5, 9.8, and 9.8. After CAAP in 2019, 84.4% of participants indicated that they would “definitely” return and 87.5% would “definitely” recommend the program to their friends or co-workers. These numbers suggest that CAAP is perceived as useful.

Overall, the qualitative feedback each year consists of several common themes. Respondents express gratitude for the event with the student contributions and the hands-on lab portion singled out as the most useful parts of the day, representing the profound and unique experience of being in a human body donor/gross anatomy lab. Many participants describe the continually evolving curriculum and new information gleaned at CAAP as reasons for attending year after year. The participant survey indicates that having a mix of physicians, Lifeflight providers, and medical students creates an “amazing environment to learn.” Health care students and providers regularly speak to how the program “brings a lot of the pieces together” related to anatomy and their everyday practice. CAAP participants report feeling like they can draw better connections between clinical practice and anatomy, strengthening bedside care through a different perspective on anatomy.

Importantly, critiques spanning from lectures to the catered lunch choices present the opportunity to respond to constructive criticism with action and improve the program the following year. For example, the program has evolved to provide outlines and notes to the participants, increase the time spent in the human body donor/gross anatomy lab, tailor the airway skills session to the providers in the room, and streamline the registration process.

Conclusion

CAAP is a unique educational experience for medical students, as it provides an early opportunity to practice educating, which is not often a core component of medical education, yet a duty as a resident and physician. Medical students have the opportunity to teach in large group settings, interact with the local health care community, and share the UNE COM resources. It is hoped that student-run educational courses engage medical students in the methodology of teaching and inspire them to become successful medical educators. This comes with an added benefit of solidification of the preclinical anatomy, which is paramount in many aspects of the practice of emergency medicine—from ultrasound to basic procedures.

Special thanks to everyone involved in the planning and success of Clinical Anatomy for the Advanced Provider over the years, including Frank Daly, PhD, Frank Willard, PhD, Hank Wheat, Peter Tilney, DO, Michael Bohanske, MD, Duane Siberski, DO, Brad Boehringer, RN, Michael McDonough, RN, Frank Marowitz, DO, Victoria Huckestein, DO, Sean Bilodeau, DO, Jack Lewis, DO, Riley Liptak, MS4, Kaitlyn DeStefano, MS3, Brett Armstrong, MS3, AJ Halstein, MS3, and all the other amazing UNE COM student volunteers. More special thanks to Lauren Westafer, DO for her edits and support while we were writing. All photos by Kristen Insardi, MS3 with permission from UNE Anatomy Faculty. To learn more about the UNE COM Emergency Medicine Club, follow on Instagram at @unecom_em. ★

Observations from Intern Year First 60 Days

Leslie Jewett, MD
University of Oklahoma – Tulsa



What counts as the “first day”? Is it the intern welcome party? Hospital orientation? When computer access is finally granted?

The intern class of 2020 has had a very different experience. There was no party, and most of orientation was online. Regardless of those differences, the first day was the same as the year prior: The true first day is when the intern walks into the emergency department, cleans off a workspace, and signs up to see someone who has come to the hospital for a specific reason. At times the patient does not know what that reason is; all they know is something is wrong, and the emergency department is the best place to get help. The intern then interprets the story the patient tells with words and physical examination to decide what further evaluation needs to be done. At the end of the first day there are likely feelings of excitement, because an official prescription with the intern’s signature and credentials were given to the patient at discharge; relief at having survived the shift and “done no harm,” and humility, realizing there is still so much to learn.

The intervening days are similar to the first: full of excitement, curiosity, feelings of inadequacy, fatigue, and self-satisfaction. These feelings change to the extent they could be modeled with a sine wave. This constant fluctuation can be challenging because many interns have the expectation of linear growth in their

clinical aptitude. The discord between reality and expectations has a light and dark side. The dark side leads to imposter syndrome, dreading shifts, or second-guessing every decision. The light side motivates interns to study more, pay close attention to detail, and be humble enough to learn pearls and wisdom from everyone they can.

So as time ticks onward, what is an intern to do?

Show up.

It’s essential for the resident to just show up: to the ED, to ultrasound training, zoom conferences, and every patient room possible. This requires more than a physical presence; it means being mentally and physically present. When the intern is in Room 5, they are not thinking about Room 10, their dinner, or how they missed the intubation in Room 2.

In the process of balancing all of these responsibilities, Day 60 will have come and gone without a second thought because there is nothing magical about 60 days of internship. It will come and go in a blur of central lines, dizzy 80-year-olds, intubations, and sprained ankles. It will pass by while writing MDMs, consult requests, and prescriptions for ondansetron. The sine wave continues to progress with peaks and troughs, but also with an upward linear trajectory. There is no better way to have it; the intern cannot be focusing on when they’ll “know what

they are doing” because the continued pursuit to learn more, be more efficient, and understand what people are really saying is what makes a good physician.

This sine wave will be a familiar process to new interns because it is the same cycle experienced during interview season. It goes from the high of the first interview offers, to the low of not hearing back from a program the student was really interested in. Whether it’s riding the sine wave of interviews or intern year the principles are the same: When you are at a program, *be there*. **When you’re considering your rank list remember your priorities in life, not the prestige of the program. Most of all with interviews and intern year keep in mind that riding still water is boring — the waves are what make the ride fun, challenging, and worthwhile.**

With all the uncertainty for next year’s intern class, it can be a comfort to know that your first 60 days of internship will start the same: you will walk into the department, clean off a workspace, and go into a room where someone is waiting, trusting you to solve their problem. This responsibility and trust that patients place on you will feel overwhelming, and gratifying, but over the next 60 days you will develop the strength to be at peace with those responsibilities and grateful for the chance to bear them. ★



I Answered

Sharland Johnson, MD

SUNY Downstate/Kings County

I answered the phone.

I had many reasons to do this, I'm sure. I was waiting for a consultant to call back.

The clerk had answered and asked any doctor to pick up the line.

The constant ringing of the phone had been driving me to distraction.

None of these are correct. All of these are correct.

The ED is busy. It's never NOT busy, but today it is filled to the brim with people who can't breathe. People on oxygen via tanks or the wall or our own makeshift breathing devices. People whose oxygen is running out. People whose time is running out.

The room is mine, I know them all. The fear is mine, I don't know enough.

Somewhere, someone in this room is running out of oxygen. I check, and check and recheck to make sure there is enough. Won't there be enough?

Most of these people should be in the ICU, but if you think the ED is full, you should see the ICU.

So, I answered the phone.

The voice on the other end of the line is afraid. His mother is in the ED, you see. She was admitted and he needs an update. He has been calling other lines but they have been busy or rang without an answer.

But I answered the phone.

I tell him that she has been admitted and so she is not my patient. The ED is a strange place where strangers you don't know become yours. You see them, you treat them, you care for them. They are yours.

So, she isn't *mine*. But as the senior resident in the room, they are all mine. I have checked on her many times. I know her oxygen requirements. I know she wasn't doing well on a face mask, and that I put her on our own makeshift

mask to give more, to help more, because we are out of bipap machines that come from a store. So a mask and a valve and some tape are her shepherds through this illness.

I read the chart and give him an update. It is the only information I have. The voice on the other end of the line tells me he works in an ICU. He knows the monster we fight. He knows it is cruel. The voice tells me he knows what her "increasing oxygen demand" means. He knows she may need a tube to breathe. It's his mother, you understand. He wants, no, *needs*, to see her. Please.

He tells me he loves her and his voice cracks. He tells me he wants a chance to say goodbye. I want to tell him it will be okay. She is doing better on our mask. But he has read our play. He knows my lines as well as I do.

My shift ends in an hour. I have too many patients, too many of whom are unstable. I don't give my number to unknown voices at the end of a line. But my heart flashes to my father, to my mother. If they were in a hospital alone and scared, I would take it apart brick by brick to get to them.

This is not my responsibility. This is not my load to carry. But I answered the phone.

I give him my name. I take his number. I will call him, you see. As soon as my shift ends. I will video call him and let him see. Let him know. The tears and gratitude that meet this promise are too much for a phone call.

So I tend to the room. To the patients that are mine and to the ones that are not. When the work is done... well not done for it is never done, but no longer on my shoulders, I slip away to make a call.

He can barely see me. The mask, the gown, the glasses, the armor that separates me. The armor that saves me.

I warn him that she is tired, but awake. She is aware, but may not hear

him over the mask, keeping death at bay.

He holds well when he sees her. She smiles through the mask and gives him a thumbs up. I don't speak the language but the heart knows what "I love you" and "I miss you" sounds like in any tongue. He is praying, I realize, and I shouldn't be there. This is a private moment with more emotion than that can be shared. My presence is unnecessary. My presence is required.

Because I answered the phone.

He prays and he cries. And I ask his God and mine to spare her. To make her the one miracle in a room that needs it.

He isn't holding as well now. The tears flow fat and thick down his face as he says what may well be his last words to his mother. I know not how to end this call. How to tell him his time is up, so I stay there with the phone until he says he's done.

He tells me, *thank you*, and that he is grateful. He calls me beautiful, heroic words that do not fit with what I did. All I did. I had only answered the phone.

I wish him well. I tell him that I will keep checking on her. I will remember her name and remember his pain.

My shift ends, and I go home. I awake later in the day to find she has the tube now. I pray again to my God and his and any other that may be listening, because somehow she became mine and we are always selfish with what is ours.

The ED is busy and no one can breathe, until one day, not enough days later, I see the note in her chart. The darkest words each new doctor learns to mumble. Time of death.

The memory isn't mine, I rage, and I shouldn't have to carry it. But as a mentor long ago taught me, sometimes a doctor's greatest gift is the ability to bear witness.

So I wipe the tears I did not cry for the patient that wasn't mine and I answer the phone again. ★



EM Day of Service

Carilion Virginia Tech EM Residency performed community service every week during the month of August. They planted flowers at a local nursing home, cleaned out a local resident's garage, and fed the homeless while promoting residency wellness. They created a sign for the nursing home residents to enjoy in their community area to show their support and gratitude for them during this pandemic. ★

Share the Love: Nominate for an EMRA Award

EMRA wants to help you recognize the brightest stars in your circle — nominate them for one of our many awards!

The next round of nominations, due Jan. 10, encompass a range of scholarship opportunities plus the ever-popular Resident of the Year, Chief Resident(s) of the Year, program leadership spotlights (PD, APD, Coordinator), and more. Nominate yourself, your BFF, your mentor, or your mentee. **Anyone can nominate — just send it in by Jan. 10.** The nomination forms are at emra.org/be-involved/awards/#winterawards. ★

EMRA and ACEP Leadership Academy

Learn how to command the room

Looking for professional growth, personal improvement, and forming bonds with national and international like-minded leaders? Apply for the EMRA and ACEP Leadership Academy now. This 10-month leadership development track, supported by Vapotherm, will boost your confidence and presence in a clinical setting and beyond. Take a smart step in your career — apply by Dec. 31 at www.emra.org/be-involved/events--activities/leadership-academy. ★

ACMT's Toxicology Opportunities

Up to 6 Awards Available

The 2021 ACMT Annual Scientific Meeting will be virtual, April 14-16, 2021 — and up to 6 residents and medical students could attend for free. In lieu of 2 travel scholarships, ACMT is offering up to 3 tuition waivers per category for the following awards — but you must apply by Dec. 1:

- **Michael P. Spadafora Medical Toxicology Travel Award:** Reserved for residents who might be interested in pursuing a Medical Toxicology fellowship, this award honors the late Dr. Michael P. Spadafora. Up to 3 awards will be given this year. Apply at www.acmt.net/mtf/michael-p-spadafora-medical-toxicology-travel-award.html.
- **Award for Underrepresented Minority Medical Trainees:** Up to 3 recipients will be chosen for this award, which aims to increase representation in the field and is funded by the Medical Toxicology Foundation. Medical students and residents are encouraged to apply at www.acmt.net/mtf/travel-award-for-underrepresented-minority-medical-trainees.html. ★

RepCo Tackles PPE, Working Conditions, Police Brutality

The EMRA Representative Council, under the direction of Speaker Tracy Marko, MD, PhD, MS, and immediate past speaker Karina Sanchez, MD, clarified the priorities and concerns of EM trainees during a well-attended fall meeting in October. The council voted to:

- Support nourishment in the workspace
- Support easy and unconditional access to PPE for EM trainees
- Study EM resident compensation
- Recognize excessive use of force by police as a public health issue
- Recognize former ACEP executive director Dean Wilkerson for his exemplary dedication and service to residents, resident education, and EMRA

A detailed report will be posted to the RepCo page at www.emra.org/repco, and every residency's EMRA program representative will receive a slide deck summarizing the council's actions. ★

ABEM Exception for Resident Quarantine Extended



ABEM has extended the temporary reduction of resident training time required to be ABEM-board eligible to accommodate a period of quarantine. For residents under a 2-week period of quarantine, the yearly minimum of successfully completed training time is reduced from 46 to 44 weeks for this academic year. This is a 1-year extension of the exception provided to residents during the 2020 academic year. This

temporary policy should accommodate most quarantine situations without extending training.

ABEM strongly supports nontraditional learning approaches during periods of quarantine. In cases that are not covered by the revised policy, please have your program director contact ABEM.

This allowance for a 2-week quarantine period is in addition to ABEM's recently approved Policy on Parental, Caregiver, and Medical Leave. ★

ECG Challenge

Graham Clifford, DO

University of Florida – Gainesville

Jeremy Berberian, MD

Associate Director of Resident Education

Dept. of Emergency Medicine,

ChristianaCare

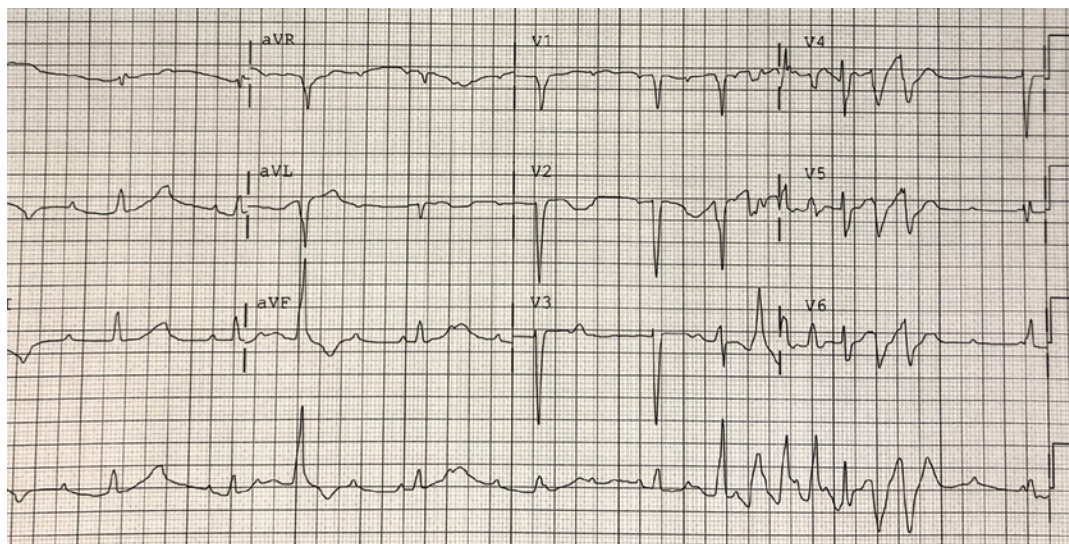
@jgberberian

CASE.

A 24-year-old male with history of intravenous drug use and tricuspid valve replacement 10 days ago presents with pain at his sternotomy site. The surgery was performed at another hospital, and the patient left there against medical advice yesterday.

What is your interpretation of his ECG?

See the ANSWER on page 50



Announcing New EMF Research Grant Opportunities – Apply Now!

2021 grant opportunities are now available!

Visit Emergency Medicine Foundation at www.emfoundation.org/grants/apply-for-a-grant to explore our new grant opportunities, including:

- New Health Disparities Research Grant
- New Climate and Emergency Medicine Research Grant
- Resident Research Grants
- Medical Student Research Grants
- ...and more!

Get started today! The deadline for application submissions is Feb. 5, 2021.



ECG Challenge

3rd degree AVB and polymorphic VT

This EKG shows a 3rd degree AV block with a junctional escape rhythm at a rate of 55 bpm, right axis deviation, prolonged QTc interval, intermittent PVCs, and a non-sustained run of an irregular wide-complex tachycardia consistent with torsades de pointes (ie, polymorphic ventricular tachycardia in the presence of prolonged QTc).

Polymorphic ventricular tachycardia (PMVT) is a form of ventricular tachycardia resulting from multiple ventricular foci causing QRS complexes with varying morphology. EKG findings include an irregular wide-complex tachycardia with beat-to-beat variation in the QRS complex morphology and/or axis. It is called torsades de pointes (TdP) if there is a prolonged QTc interval on a baseline EKG; otherwise, it is classified as non-torsades PMVT. The etiology of TdP is a prolonged QTc interval, which can be either congenital or acquired. It is typically paroxysmal and self-terminating but can degenerate into ventricular fibrillation. Non-torsades PMVT is most commonly caused by myocardial ischemia. It is often constant and frequently leads to hemodynamic compromise.

Treatment of PMVT includes

defibrillation for unstable patients regardless of etiology. For intermittent TdP, initial treatment includes IV magnesium sulfate. Electrical overdrive pacing can also be used, since increasing the ventricular rate leads to a decreased QTc interval, which lowers the risk of TdP recurring. Chemical overdrive pacing with isoproterenol should be avoided in patients with congenital long QT syndrome but can be used in patients with an acquired long QTc interval. Note that the paroxysmal nature of TdP makes direct cardioversion ineffective in preventing recurrence. For non-torsades PMVT, treatment is per ACLS protocol. All patients with polymorphic ventricular tachycardia should be seen by cardiology and admitted for further evaluation.

A 3rd degree AV block, also called a complete heart block and 3rd degree

heart block, results from absence of conduction through the AV node. This leads to the atria and ventricles functioning independently of each other, which is called AV dissociation. Both the P-waves and R-waves should march out at regular rates with the atrial rate faster than the ventricular rate. Pacing of the ventricles occurs from below the AV node. If the pacing originates from the junction, the QRS complex will be narrow in the absence of a concurrent conduction abnormality (eg, preexisting bundle branch block). If the pacing is originating from the ventricle, the QRS complex will be wide. Common causes include ischemia, hypothyroidism, hyperkalemia, medications, and structural heart disease. Treatment is per ACLS protocol and all patients will require admission for evaluation for a pacemaker.

PMVT LEARNING POINTS

- Wide complex ventricular rhythm >100 bpm with beat-to-beat variation in QRS axis and/or morphology
 - Classified as either torsades or non-torsades
- Torsades de pointes
 - Prolonged QTc interval (either congenital or acquired) on baseline EKG
 - Characteristic twisting of the peaks of the QRS around the isoelectric baseline
 - Usually paroxysmal and self-terminating but can degenerate into ventricular fibrillation
- Non-torsades
 - Absence of QT prolongation on baseline EKG
 - Often due to ischemia
 - Usually sustained and causes hemodynamic instability
- Treatment
 - Defibrillation for unstable PMVT regardless of etiology
 - ACS workup for all non-torsades PMVT
 - Identify and correct underlying cause(s) for non-torsades PMVT (eg, QT prolonging medications, hypokalemia, hypomagnesemia, hypocalcemia, elevated ICP, etc.)
 - Magnesium, electrical overdrive pacing, and electrolyte repletion (if indicated) for intermittent torsades due to congenital or acquired long QT syndrome
 - Chemical overdrive pacing with isoproterenol for intermittent torsades due to acquired long QT syndrome

3RD DEGREE AV BLOCK LEARNING POINTS

- A 3rd degree AV block, or complete heart block, is defined by the absence of conduction through the AV node leading to complete AV dissociation
 - P-waves march out (constant PP interval) and do not conduct to produce a QRS complex
 - PR intervals are variable
 - Atrial rate > ventricular rate
 - Ventricular rhythm is usually junctional or ventricular escape rhythm
- All patients require admission and evaluation for pacemaker placement

Case Conclusion

After obtaining this EKG, the crash cart was brought to the bedside and pads were placed on the patient. Treatment of the intermittent TdP was initiated with 2 g of IV magnesium sulfate, and cardiology was paged to evaluate for emergent transvenous pacemaker placement. Further inpatient workup after admission to the cardiac ICU was notable for an aortic root abscess in close proximity to the AV conduction pathway. EKGs obtained later throughout admission showed a QTc of 435 msec, suggesting a non-torsades etiology; the PMVT was likely secondary myocardial ischemia, as TTE showed reduced RV systolic function and high sensitivity troponin I was elevated at 88 (normal <20). The patient ultimately required a permanent pacemaker for a persistent 3rd degree AV block thought to be caused by the aortic root abscess and/or a complication from the tricuspid valve replacement. ★

PEER

Start Now acep.org/PEER

Try it first with our FREE pretest!



Mary Jo Wagner
MD, FACEP
Editor-in-Chief

The Answer You Need

Board prep questions, answers, and explanations to get you ready faster with less stress

"It's funny how nervous we get about the boards. I mean, we know this stuff, and yet, we all feel better when we've done everything we can to prepare in advance. So don't worry about it—prepare for it! Do it the same way I've been doing it my whole career—with PEER."

Practice & Study

Trust the preparation experience that is "closest to the boards"

Focus on Success

If you don't pass, you'll get your money back, guaranteed*

Rely on PEER

Emergency physicians have more than 68,000 times already

The American College of Emergency Physicians is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

The American College of Emergency Physicians designates this enduring material for a maximum of 150 AMA PRA Category 1 CreditsSM. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

*If you buy a PEER subscription, use it to study, but don't pass your board exam, ACEP will refund your money or give you another year of PEER for free.

Not affiliated with ABEM.

EMR_1220_MC526_1120

ACCESS ALL OF ACEP20 - ANYTIME, ANYWHERE, WITH VIRTUAL ACEP



With the Virtual ACEP component of ACEP20 Unconventional you will have access to broadcast-quality videos from presentations held during the live and on-demand portions of ACEP20. Enjoy all the education on your own time from any device.

Virtual ACEP Highlights:

- Streamlined experience on the new and improved Online Learning Collaborative
- Download PDFs of slides and MP3 audio
- Adjustable playback speeds
- Filter the catalog to find the information you need
- Complete questions to show completion for CME
- Earn CME credits through the ACEP CME Tracker

NOW AVAILABLE ONLINE

PURCHASE ONLINE AT
acep.org/acep20

UNCONVENTIONAL 2020

acep

American College of
Emergency Physicians®
ADVANCING EMERGENCY CARE

250+ HOURS OF ONLINE COURSES FROM ACEP20

Approved for AMA PRA Category 1 Credit™

EMR_1220_MC525_1120



EMRA helps make you the best doctor you can be, the best leader you can be, and helps EM become the best specialty it can be!



Emergency Medicine Residents' Association

The Emergency Medicine Residents' Association is the voice of emergency medicine physicians-in-training and the future of our specialty. With a membership of over 16,000 residents, medical students, and alumni, EMRA provides a like-minded community of your peers for a lifetime!

EMRA Takes Care of You

- Bedside Resources
- Publications
- EMRA Match
- Awards
- Podcasts
- Educational Events
- Leadership Opportunities
- Scholarships

EMRA Is Your Community

- Networking
- Mentorship
- Advising
- Friendships

EMRA For a Lifetime

- Medical Students
- Residents
- Fellows
- Alumni

#EMRAFamily



Board Review Questions



PEER (Physician's Evaluation and Educational Review in Emergency Medicine) is ACEP's gold standard in self-assessment and educational review.

For complete answers and explanations, visit the [Board Review Questions page at emresident.org](#), under "Test Your Knowledge" at [emresident.org](#)

Order PEER at [acep.org/peer](#)

1. Which medication is most likely to be associated with constipation?
 - A. Amoxicillin-clavulanate
 - B. Benztropine
 - C. Bisacodyl
 - D. Colchicine
2. Which finding is a delayed sign or symptom of acute limb ischemia?
 - A. Blistering skin
 - B. Pale skin
 - C. Paresthesia
 - D. Reduced pulse
3. A 24-year-old woman presents via ambulance with headache, dizziness, and mild shortness of breath after a house fire. She has no burns on her skin and no soot in her mouth or nares, and she is not in respiratory distress. ABG analysis with co-oximetry reveals a carbon monoxide level of 30%. Her vital signs include BP 119/74, P 95, R 15, and T 36.9°C (98.4°F). Which additional finding, if present, makes hyperbaric oxygen therapy the correct intervention?
 - A. History of asthma
 - B. Pregnancy
 - C. Repeated nausea and vomiting
 - D. SpO₂ of 94% on room air
4. A 52-year-old woman presents with fatigue and dyspnea on exertion. She has recently been taking chloroquine for malaria prophylaxis. Her SpO₂ is 86% by pulse oximetry and does not improve with supplemental oxygen administration. Her skin appears cyanotic, and a chest x-ray is normal. Which antidote should be administered?
 - A. Amyl nitrite
 - B. Hydroxocobalamin
 - C. Methylene blue
 - D. Sodium thiosulfate
5. What is a potential complication of not repairing a galeal laceration?
 - A. Loss of frontalis muscle function
 - B. Profuse delayed hemorrhage
 - C. Scalp wound infection
 - D. Wound dehiscence ★

ANSWERS
1. B; 2. A; 3. B; 4. C; 5. A

CLASSIFIED ADVERTISING

CALIFORNIA

Ventura: Newly constructed hospital and ER department functioning since December 2018. Practice with a stable ER group on the central coast of California and only 70 miles from LAX. Positions available in two facilities for BC/BE emergency physician. Main facility is a STEMI Center, Stroke Center with on-call coverage of all specialties. This is a teaching facility with residents in Family Practice, Surgery, Orthopedics and Internal Medicine. Admitting hospital teams for Medicine and Pediatrics. 24-hour OB coverage in house and a well-established NICU.

Annual volume is 48K patients with nearly 70 hours of coverage daily and 12 hours of PA/NP coverage. All shifts and providers have scribe services 24/7. Affiliated hospital is a smaller rural facility 20 minutes from Ventura in Ojai. Malpractice and tail coverage is provided. New hires will work days, nights, weekends and weekdays. Come work with a well-established high caliber group with expected volume growth potential at our new facility. Enjoy the life style of a beach community yet outside the hustle of the LA area. Please send a resume to Alex Kowblansky, MD, FACEP kowblansky@cox.net.



Talking about the issues that matter.

Listen today!
emracast.org

Supported by



LIVE. WORK. PLAY.

Patient centered. Physician centric. Quality focused. Culture driven. This is how our physicians describe us. If you're ready to join a company where your contribution as a patient-focused team member is valued, elevate your career with American Physician Partners. Now with 150+ opportunities across the country, you can **LIVE, WORK** and **PLAY** with the best.



appartners.com | 855.246.8607 | careers@appartners.com



KAISER PERMANENTE®

Kaiser Permanente Central Valley Emergency Medicine Residency



KAISER PERMANENTE
Training Physicians to Answer America's Health Care Needs

Introducing the first Kaiser Permanente sponsored Emergency Medicine program in Northern California!

Experience the best of all worlds at KPCVEM:

- 3-year ACGME newly accredited training program
- Based in Modesto, California
- Exposure to diverse patient populations
- Experience Kaiser Permanente's fully-integrated healthcare system as a foundation with dedicated County and Community rotations to boost your clinical training experience.

California's Central Valley serves a population of over 2 million people and offers an abundance of outdoor activities, amazing dining, and easy access to the Bay Area and Sierra Nevada mountains. For more information, please see visit our website: residency-ncal.kaiserpermanente.org/programs/em-central-valley



Follow us at @KPCVEM on Twitter and Instagram



UNIVERSITY of MARYLAND SCHOOL OF MEDICINE

Academic & Community

Whatever professional experience you're looking for, you can find it with the Department of Emergency Medicine, all backed by the support and prestige of the University of Maryland.

Our hospitals are located across the state of Maryland, offering cutting-edge care in rural, urban, and suburban communities.



Practice Regions and Annual Volumes

Baltimore City	32,000 - 66,000
North of Baltimore	32,000 - 65,000
The Suburbs of DC	34,000 - 60,000
The Eastern Shore	15,000 - 37,000



We offer a very generous compensation and benefits package, including:

- Additional incentive compensation
- Medical, dental, vision, and life insurance
- Employer-paid CME, PTO, and 401K safe harbor retirement plan
- Employer-paid malpractice insurance with full tail coverage

Contact us at: recruitment@umem.org or (667) 214-2060



Exciting opportunities at our growing organization

- Adult and Pediatric Emergency Medicine Faculty positions
- Medical Director
- Vice Chair, Clinical Operations
- Vice Chair, Research
- Medical Student Clerkship Director

Penn State Health, Hershey PA, is expanding our health system. We offer multiple new positions for exceptional physicians eager to join our dynamic team of EM and PEM faculty treating patients at the only Level I Adult and Level I Pediatrics Trauma Center in Central Pennsylvania.

What We're Offering:

- Salaries commensurate with qualifications
- Sign-on Bonus
- Relocation Assistance
- Retirement options, Penn State University Tuition Discount, and so much more!

What We're Seeking:

- Emergency Medicine trained physicians with additional training in any of the following: Toxicology, Ultrasound, Geriatric Medicine, Pediatric Emergency Medicine, Research
- Completion of an accredited Residency Program.
- BE/BC by ABEM or ABOEM

What the Area Offers:

We welcome you to a community that emulates the values Milton Hershey instilled in a town that holds his name. Located in a safe family-friendly setting, Hershey, PA, our local neighborhoods boast a reasonable cost of living whether you prefer a more suburban setting or thriving city rich in theater, arts, and culture. Known as the home of the Hershey chocolate bar, Hershey's community is rich in history and offers an abundant range of outdoor activities, arts, and diverse experiences. We're conveniently located within a short distance to major cities such as Philadelphia, Pittsburgh, NYC, Baltimore, and Washington DC.



PennState Health

FOR MORE INFORMATION PLEASE CONTACT:
Heather Peffley, PHR FASPR at: hpeffley@pennstatehealth.psu.edu



Emergency Medicine Residents' Association

4950 W. Royal Lane
Irving, TX 75063
972.550.0920
emra.org

PRSRST STD
U.S. POSTAGE PAID
BOLINGBROOK, IL
PERMIT NO. 467



US Acute Care Solutions experienced the same sudden and unprecedented declines in hospital & ED volumes related to COVID-19 that everyone else did. **How we reacted was different.**

We prioritized **state-of-the-art patient care**

- We provided clinical updates three times a week to educate our clinicians on the latest evidence-based management techniques during a time of ultra-rapid knowledge development.
- We created our nationwide COVID Task Force to quickly disseminate best practices nationally.
- We instituted frequent, clear, and concise communication to reduce information overload and to minimize misinformation.
- We created a clinical management tool to facilitate appropriate disposition for COVID patients.
- We created a first-in-the-industry ventilator allocation guideline, leveraging our ethics expertise.
- We provided educational points for clinicians to educate non-medical community members in their personal social media networks.

We prioritized the **safety and needs of our clinicians**

- We sourced our own national PPE backup supplies to mitigate local shortages.
- We developed a state-of-the-art N95 sterilization technique and shared this with our hospital partners.
- We created on-shift support for decontamination methods.
- We created the first-in-the-industry quarantine fund to pay clinicians for lost time.
- We maintained benefits (including our marquee 401k plan) for our clinicians and employees throughout.
- We distributed wellness resources for our clinicians and their families.
- We created a communication aid for clinicians to facilitate travel to their hospitals without delays.
- We offered first-in-the-industry free antibody testing to all clinicians and employees.

We prioritized the needs of **our hospital partners**

- We built surge ICU and hospital medicine processes and protocols, pre-ED triage tents, pop-up acute care settings, and even new hospital relationships.
- We supported telemedicine initiatives for hospitals, resulting in new patients being brought into the hospital system for appropriate care.
- We hosted webinars for hospital partners to coordinate an informed COVID response with best practices by leveraging our national footprint of 200+ acute care sites.
- We developed a clinical management tool to assign hospital observation, transfer, and inpatient admission.
- We created guidelines for a COVIDSafe Emergency Department, easing patient concerns about viral transmission and continuing to provide our trademark high-quality care for serious acute conditions.

US Acute Care Solutions is different because we are majority physician-owned and are physician-led. We have the clinical, operational, and financial resources to weather the worst of a storm. COVID is case in point. We stepped up to face this crisis as a leader in our industry and an exceptional partner for our hospitals. **We were made for this.**

Interested in partnering with USACS?
Contact **James Watson**, Chief Development Officer, watsonj@usacs.com

Interested in a clinical career with USACS?
Contact **Darrin Grella**, VP of Recruiting, dgrella@usacs.com

