EM Resident
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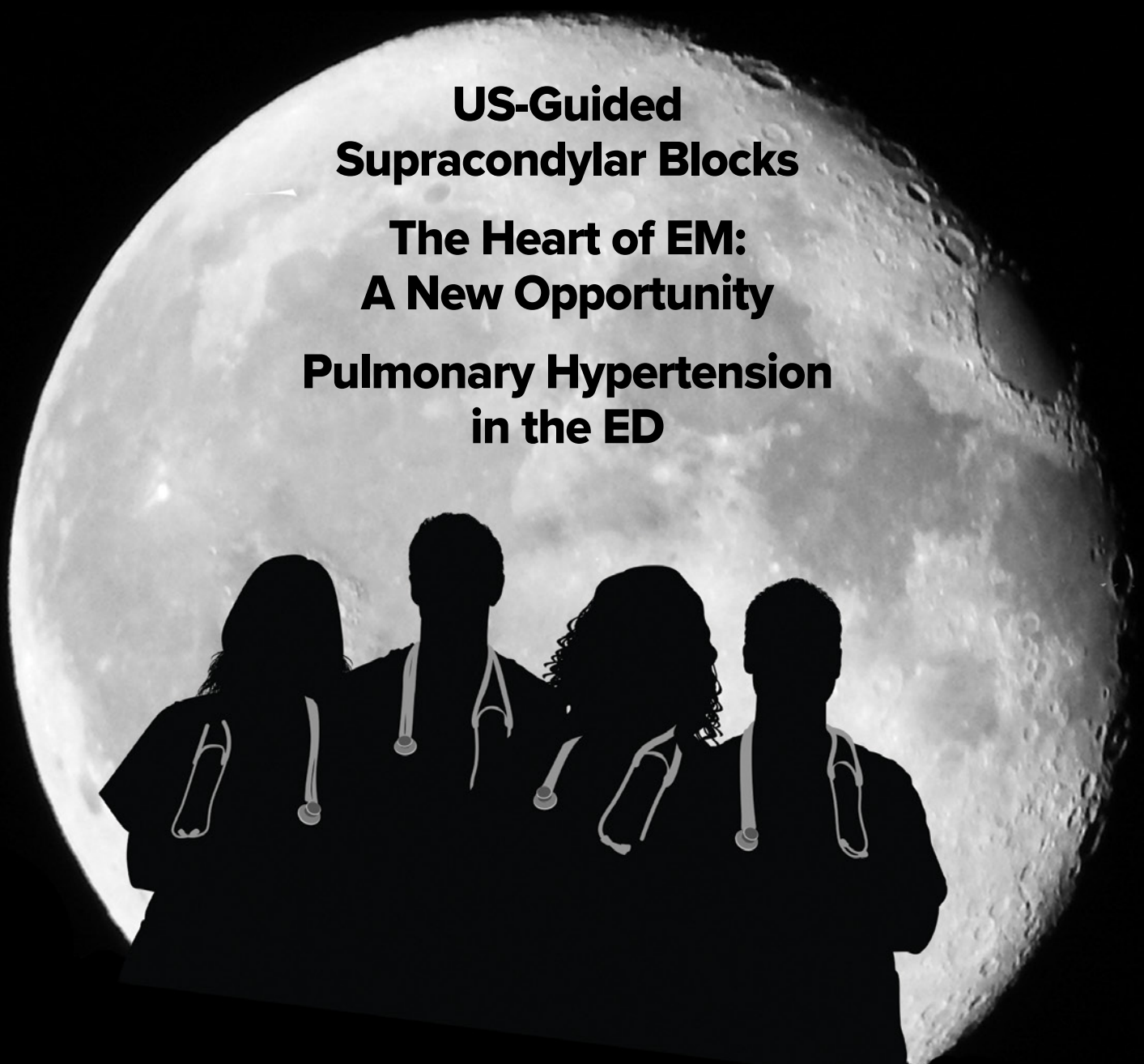
Is Moonlighting Right for You?

US-Guided Supracondylar Blocks

The Heart of EM: A New Opportunity

Pulmonary Hypertension in the ED



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The Heart of EM

Priyanka Lauber, DO
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Lehigh Valley Health Network
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Happy New Year to my EM Resident family! The holiday season is over. Christmas/Hanukkah/Kwanzaa/Diwali has passed and most of us have finally recovered from our new year's eve celebrations. Although many are a little disappointed the festivities have ended, there are people out there who are not. Studies have demonstrated that the holiday season can exacerbate the feelings of loneliness some individuals face on a daily basis. Medical students, residents, and some attendings are no strangers to feelings of desolation. We are often in a juxtaposition where, although we are surrounded by people (hospital staff, patients, mid-levels, doctors) all day, we do not encounter meaningful or quality conversations that involve us.

When I ran for the EMRA Board, my speech involved talking about this subject in the context of "mental health." Better mental health and wellness, it seems, involves increasing grit, utilizing deep breathing, and incorporating yoga from what most of us have been told repeatedly. I believe we are missing some foundational conversations involving the culture of medical training and organizational medicine — a culture that is ripe to take advantage of residents and attendings. We need to have the hard conversations: let's talk about an accurate count of duty hours, fair and appropriate treatment, and accountability when poor behavior is demonstrated by staff/consultants/etc.

The latest survey by the American Medical Association (AMA) demonstrated that 2 in 5 physicians screen positive for depression. Medical students were also noted to be 3 times more likely to die of suicide than their counterparts in the general population. ***Why is this happening? Are we good advocates for ourselves, attendings, fellow co-residents, and medical students? How can we do better?***

Over the past several years, like many of us, I've endured instances that positively and negatively affected my well-being. Times I felt supported and others not. Times I have been quiet, as not to upset the status quo, and others I have loudly spoken up for myself and others.

The times I have been the most proud, of course, are the times that I have demanded a change and actually witnessed and experienced the transformation. Through these experiences, I have realized, residents have an innate power in our hospital systems. We have the combined support of our co-residents, faculty (core and not), program directors, designated institutional officials (DIOs), ACGME, and EMRA. I have realized that when I speak up and have made intentional actions, I see a positive change that not only benefits me, but also effects positive downstream improvements unbeknownst to me.

I have always said personal stories and the written word are both incredibly powerful.

Thus, I am starting a NEW series in EM Resident where residents, medical students, and attendings can share their stories: "Heart of EM." I want to hear about your struggles, your failures, and your triumphs. Even if you tried and failed, I welcome it. Please share your experiences, even if you don't want to share your name (requests for anonymity will be honored). YOUR stories are humanizing and will help connect all of us globally through shared experiences and emotional intermediaries.

Serendipitously, we already had a submission for this edition that will help kick-start this new series ("Grab a Shovel" — and your tissues, fair warning). Take a moment to read it. Take a few more to add to the conversation.

We are always looking for relevant content, so if you a compelling case you would like to share or a personal story, email me at emresidenteditor@emra.org. I am looking forward to making our specialty feel more connected. ✶

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What Can We Do When a Residency Closes?

Hannah R. Hughes, MD, MBA
President, EMRA
University of Cincinnati
@hrh_approved

"[I] moved across the country for a program that I really liked, bought a house, [and] began setting down roots..."

As interview season ends and Match Day nears, the excitement of where to train and what that envelope will say is palpable.

"...but now this wonderful program is closing at no fault of the program itself or the hard-working residents/staff that comprise it."

Craig Jones, DO, PGY-3
Ohio Valley Medical Center

When the incoming class of EM residents open those envelopes this spring, how many will be plagued by the fear of a program's insolvency? What are we — their seniors, their peers, and organized medicine overall — doing about it?

Imagine yourself 11 months away from graduating residency when you find out your hospital is closing. Instead of gearing up for your first job interviews, you're now left trying to figure out where you can complete the rest of your training. Will you graduate on time? Will you have to sell your house? Will you still have a paycheck to cover bills?

Imagine the fear, the uncertainty, the anger.

That's what a number of emergency medicine residents went through these past few months, not just at Drexel/Hahnemann University Hospital in Philadelphia but also at Ohio Valley Medical Center.[1] The same occurred for emergency medicine residents in 2017 at Summa Health in Northeast Ohio, following failed contract negotiations.[2]

More residents will be affected if we don't take action. Enter organized medicine.

***

People often ask me why I got involved in EMRA. To be honest, I wasn't even familiar with the term "organized medicine" at my first EMRA event. So it certainly wasn't because I envisioned running for EMRA President. My answer is quite simple: I am an advocate — an advocate for increasing the diversity of emergency medicine, for pay equity, and for improving health care access for underserved communities.

Perhaps terms such as "feminist" and "social justice warrior" have taken on pejorative tones, but I am proudly both. Being surrounded by other emergency physicians-in-training who are passionate about improving the future of our specialty and medicine as a whole is my answer to "Why EMRA?"

Over the past several months with the closure of both residencies, EMRA has played an active role in advocating on behalf of residents who have faced interrupted training and financial, regulatory, and legal barriers to continuing education.

Through EMRA's Representative Council, which democratically represents all EM residencies in the country, a resolution was passed to amend our Policy Compendium and produce a Resident's Bill of Rights to address protections for residents. Similar resolutions were also passed through ACEP and AMA. The All-EM Resident Organizations and Students group (AEROS), which was convened by EMRA in 2018, released a joint statement in this issue of *EM Resident* because "having residents and fellows on staff at an institution is a privilege, not a commodity."

Despite these efforts, along with those of other organizations such as ACGME, CORD, and the Pennsylvania Medical Society, there is still plenty of work to be done, as Hahnemann residents still face a potential gap in their medical liability coverage months after displacement.

Get angry or get inspired; either way, get involved. With 20 committees and more than 120 funded leadership positions, EMRA has a place for you to make a difference. We have a voice that, when raised in unity, can lead to positive change for ourselves, our future colleagues, and our specialty.

"I never thought I would have to cold-call programs to finish my residency but, here we are," ended Craig's email to me.

His story is heart-wrenching, but this doesn't have to be the future of emergency medicine. ✶

References available online

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Emergency Medicine Residents Oppose the Sale of Graduate Medical Education Slots

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Statement

On June 30, 2019, Philadelphia Academic Health System, LLC filed for Chapter 11 bankruptcy, which left 570 residents and fellows in training at Hahnemann University Hospital scrambling for new sites to work and train.[1-2] On Sept. 5, 2019, the sale of Hahnemann's Graduate Medical Education (GME) slots for $55 million was approved by U.S. Bankruptcy Judge Kevin Gross despite disapproval by the Centers for Medicare and Medicaid Services (CMS), which considered it illegal.[3] After an appeal by CMS, on Sept. 16, 2019, a federal judge temporarily stopped the sale of Hahnemann's GME slots.[4]

Having residents and fellows on staff at an institution is a privilege, not a commodity. GME slots are scarce because of the 1997 cap on Medicare support; however, residents and fellows play a critical role in the care of underserved patients.[5-8] The care residents and fellows provide is billed for by their institution. However, the primary responsibility of residents and fellows is to train in their chosen specialty to learn to practice independently, not generate revenue. Though GME slots are linked to their institutions and may be transferred in the event of a change in hospital ownership, they are not an asset to be sold.

Our organizations oppose the commoditization of GME slots and commend the efforts of CMS to halt the sale of Hahnemann's residency and fellowship slots. ✶

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Making the Experience of Practicing Medicine Matter

Alicia Mikolaycik Kurtz, MD, *is a Vituity Partner and assistant ED medical director at Mercy San Juan Medical Center in Sacramento, CA. She was named one of EMRA's 45 under 45, previously served as president of EMRA, and completed Vituity's Adminsitrative Fellowship.*

Humans have been telling stories since the very beginning. It's how we innately process our experience in the world — the joys, sorrows, surprises, and humor. We tell our friends and families our stories. And yet in medicine, we rarely pause to talk about our experiences.

Sure, we have plenty of opportunities to share our cases, do quality review, and reflect on our mistakes. But we rarely talk about how it all feels. We don't discuss what it's like when our patient dies, when a child is sick, when we witness a miracle, or what it's like to be a part of a team that literally saves lives.

I was given a lot of wellness advice when I was a resident. Much of it involved eating healthfully, doing more yoga, and taking advantage of the organization's wellness program.

Meanwhile, I was working 80 hours a week in a very intense environment. I didn't want more salads. Sometimes I just wanted to make it through the day without crying.

A Different Approach to *"Wellness"*

My fellow chief residents and I saw a need for more emotional and existential forms of support. So, we created Real Talk — a storytelling experience for healthcare providers that gives airtime to those unique experiences we have working in medicine.

> "I didn't want more salads. Sometimes I just wanted to make it through the day without crying."

As an Administrative Fellow with Vituity, I was able to further develop Real Talk as a program. In the past two years as a Vituity Partner, I've brought it to healthcare teams across the country. And a few months ago, I launched the Real Talk Podcast in the hope of bringing the healing power of storytelling to physicians everywhere.

Storytelling is especially powerful for healthcare providers because so few people outside our profession understand what our jobs are really like. By sharing our stories, we bring dignity, meaning, and significance to our experience, honoring our human side without seeing it as a sign of weakness — letting vulnerability be accepted and celebrated amongst our teams.

Impact of Real Talk

How does Real Talk change the way we practice medicine? Anecdotal evidence suggests that the experience is a powerful one. When the 40 residents in our program completed a survey that ranked the wellness and social activities they valued most, almost all of them put Real Talk at the top of the list. And while I can't claim sole credit for this, surveys of Vituity clinicians show burnout symptoms at rates 50 percent lower than national surveys.

In addition, Real Talk challenges the culture that doctors should be impenetrably tough and stoic and bucks the old *"go it alone"* cowboy doctor mentality. It shows us that our stories — our experiences — matter, and that the simple act of sharing them can heal us. It always amazes me how vulnerable people will be when we give them space and permission to do so.

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conversations that heal

Got a Story To Share?

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Show Me the Money!

How to Fund Your Program's EMRA Representative

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Conemaugh Memorial Medical Center
Speaker of the Council
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Early in my PGY-2 year, one of my chief residents said "Hey Brea, do you want to be our program representative to EMRA?" I agreed, despite having no idea what that would entail. A few months later, I wandered the halls of ACEP18 in San Diego, looking for EMRA's Representative Council meeting (RepCo). Resident representatives from every EM program in the country attend RepCo, during which national resolutions written by medical students, residents, and fellows are discussed, modified, and voted on. Sitting quietly in the Ohio section, I felt like an imposter holding my voting card. I was responsible for my program's 40 votes, but I did not know how my colleagues back home felt about these resolutions, especially given that they could affect our practice for years to come. At that moment I decided change was necessary. Our program needed to discuss these resolutions ahead of time, and we needed a democratically elected *and funded* representative to EMRA's RepCo.

Process

To start, I drafted a position statement that outlined not only the representative's duties and responsibilities, but also the process to select the resident who would speak and vote on our behalf. I discussed this plan with program leadership and secured their approval.

Next, I wrote a funding proposal so our representative could be reimbursed for travel and lodging at the EMRA RepCo meetings that occur twice a year. I sent this proposal to our institution's GME office, and it was approved with minor modifications.

These templates can help you do the same at your program:

- ✓ Sample EMRA Program Representative Position Statement: https://bit.ly/30jVaCJ
- ✓ Sample Funding Proposal for EMRA Program Representative: https://bit.ly/2t5NOq4

The Sales Pitch

Clearly outline why money should be spent. The first argument I made was that participation in organized medicine is increasingly important, but it is nearly impossible to transition from ED pit doc to state representative at ACEP Council without prior experience. **Attending EMRA's RepCo meetings is a great entry point to organized medicine.** Furthermore, the RepCo environment fosters group learning about parliamentary process and procedure. This is an unparalleled learning opportunity.

Additionally, an officially funded EMRA program rep provides an opportunity to introduce organized medicine to all of the EM residents. Resolutions must be discussed with the whole program so the representative knows how to vote on the RepCo floor. I helped our representative lead a 1-hour discussion during protected time at grand rounds, during which residents learned how to interpret resolutions, participated in the debate process, and voted on issues that directly affect them. This was a valuable learning experience for the whole program.

Impact

During the RepCo Town Hall last year, attendees discussed how (or if) EMRA's resident moonlighting policy should be revised. Resident representatives from across the country debated the policy's language, and it was obvious there was no "one-size-fits-all" solution. Every EM program is different (urban vs. rural, academic vs. community, small vs. big); given this diversity, moonlighting needs and expectations are varied. Without giving residents equal opportunities to speak on behalf of their programs, moonlighting may have become restricted to purely rural facilities, limiting supported opportunities elsewhere. **This is one example why having a seat at the table is so important.**

No Money? No Problem

Invariably, some programs will not fund a resident representative to attend RepCo meetings in person. That doesn't mean the program can't be fully engaged; **EMRA accommodates virtual attendance and remote voting**. Every program should elect a representative, discuss resolutions ahead of time as a group, and make sure their vote is recorded during the biannual RepCo meetings.

Need Help?

Please reach out! Dr. Sanchez is available at speaker@emra.org, and Dr. Jaqua can be reached at rrcemrep@emra.org. ✶

SPRING REPCO MEETING @ CORDAA20

Monday, March 9
8-11 am (check-in @ 7 am)
Virtual meeting: ATTENTION, PROGRAM REPS!
You will get an email with Virtual RepCo log-in and voting details. Follow those instructions.
Review proposed resolutions at emra.org/repco

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10 Ways You Can Help End Trafficking

Office on Trafficking in Persons
An Office of the Administration
for Children & Families

Note: Per policy adopted in 2016, the EMRA Representative Council continues to support the need for human trafficking training, research, policy development, and collaboration with organizations that work with victims of human trafficking.

Know the Signs

Learn the **red flags and indicators** of trafficking. **Challenge common myths** about trafficking with facts.

Report a Tip

Contact the **National Human Trafficking Hotline** if you have any concerns about a potential trafficking situation. Call 1-888-373-7888, text HELP to BEFREE (233733), or email **help@humantraffickinghotline.org**.

Spread the Word

Share and display **HHS Look Beneath the Surface** and **DHS Blue Campaign** awareness resources in your community. Let everyone know that the **National Human Trafficking Hotline** is here to help.

Think Before You Shop

Consider how you **shop** and **eat**. Who made your clothes? Who prepared your food? Calculate your **Slavery Footprint**, and know which **goods may be produced by child or forced labor**.

Tell Your Friends: Demand Fuels Exploitation

The U.S. Government has zero tolerance policies for employees, uniformed service members, and contractors paying for sex. Learn more about the **Federal Acquisition Regulations and human trafficking**.

Volunteer Locally

Ask anti-trafficking organizations in your **community** how you can support them. Perhaps they need volunteers or you could help with an awareness event.

Stay Informed

Sign up for **DOJ human trafficking news alerts**, follow relevant organizations on social media, read **reports** as they are released, or **check out OTIP's newsfeed**.

Register for Training

OTIP's **National Human Trafficking Training and Technical Assistance Center** trains public health professionals and the **Office for Victims of Crime Training and Technical Assistance Center** supports the criminal justice system.

Use Your Skills

Can you train or hire survivors? Reach out to **potential local partners**. Do you work in a school? Propose **anti-trafficking protocols**. Are you an attorney? Offer **pro-bono services**. Writing a story? Use **media best practices**. Work in hospitals or clinics? Encourage your colleagues to register for the **SOAR to Health and Wellness training**.

Raise Your Voice

Ask **representatives** how they are addressing human trafficking. Let them know what your community needs. ✶

How Do You Know If You're Ready To Moonlight?

David Beran, DO, MPH
UMC New Orleans

Every resident: *When should I start moonlighting?*
Every Attending: *Well, it depends.*

Moonlighting is a rite of passage for many residents. It's the experience that signals a degree of readiness to be on your own.

But the decision to moonlight means knowing the difference between being ready and *thinking you're ready*. You may ask your Attending physicians, but there's always insecurity when you're receiving direct feedback... *If I were unprepared, would they tell me to my face?*

When I made the decision to moonlight as a resident, I wanted clarity from my attendings. I wanted confirmation that I was safe to practice alone before I ventured out. I certainly didn't want to figure out that I was unprepared while alone at 2 in the morning, in a remote, single coverage facility.

As a new attending, I realize the answer isn't as absolute as I wanted it to be. Are all upper-levels ready to moonlight? If so, are they all ready to moonlight *anywhere*, or just at certain locations?

Competency is more fluid than I appreciated. It has little to do with your post-graduate year.

The facility a resident is considering for moonlighting is a key determinant of my answer. At one nearby facility, for example, a moonlighter is essentially the same as any other resident. The moonlighter sees and evaluates patients but doesn't make any major decisions or dispositions without signing the patient out to staff.

A resident may be ready to work in this setting by their second year.

At a different facility — a local critical

access hospital, a moonlighter is the sole physician available. This is the other end of the spectrum.

And in the middle of this wide spectrum is urgent care centers.

A resident may be competent to work in one setting but not the others. So, when residents ask if they're ready, my answer is: *Well, it depends*.

This answer would have been maddening to me as a resident.

In retrospect, there were a few clues that could have helped validate my decision to moonlight, I just didn't know to look for them at the time.

These are things to consider over the course of weeks to months — one shift will not give you enough information. Also, look for them with different attendings and across different facilities, especially in facilities similar to the place you're thinking of moonlighting.

Your work-ups don't vary from your attendings' work-ups.

There may always be some small, stylistic variations—you pick ibuprofen, they pick acetaminophen. However, are they ordering cardiac work-ups on patients you want to send home after a GI cocktail? Did they rule out a PE in a patient you said had bronchitis?

If major variations occur between your plan and your attendings' plan, it's a sign you may not be ready to go alone.

There are more conservative attendings who work everything up, every time. But, if this is happening to you with multiple attendings across multiple facilities, chances are that it's not the attending.

Explore your attendings' plans thoroughly. What would have been the difference between yours and their plans on patient outcome if they were both carried out?

Follow your patients throughout their inpatient course — it gives you insight into how you can best serve your patients and will slowly lessen the gap between your plans and your attendings'.

Your dispositions don't vary from your attendings' plans.

Do you and your attending want to admit and discharge the same patients?

If you're erring on the side of admitting too much: You're more conservative than average — that's fine, up to a point. You can't overuse resources or burn equity with consultants. If this is happening, ask yourself before admitting a patient: *What specifically do I want to occur as an inpatient that cannot happen as an outpatient?*

If you're erring on the side of discharging too much: You're more cavalier than average — that also may be fine, up to a point. Follow those patients you would have discharged to see what develops. Also, ask yourself — *if I were working in Moonlighting Hospital X, would I still discharge this patient?* There's a good chance that when you're on your own, you'll be less cavalier than when you work under someone else's license!

Also, discharging more may be institution-specific. Moonlighting settings often have less resources than your primary training institution. You may be accustomed to discharging people into an outpatient sector where they will be followed up by a system that can support them. That may not be true where you're moonlighting in a hospital that has less clinic support. You may find that you admit a little more as a moonlighter than you do as a resident.

Are you receiving more or less oversight than your peers?

Residencies have different cultures when it comes to resident oversight. However, by the time you're thinking about moonlighting, you probably have a clear sense of your residency culture and how they interact with residents.

If you're in your final year of residency and still are being checked up on, having all of your orders reviewed, being generally treated like an intern, there's an issue. If you're being "pimped" on topics that you find patronizing, it's not a good sign. If clinically liberal attendings are micromanaging you, it's also not a good sign.

You aren't ready.

On the other hand, if attendings are giving you independence, only seeking you out at the time of disposition, that's a good sign — it indicates your evaluations are being trusted. If attendings are letting you carry out plans that are stylistically different than their plans, it's a really good sign!

You're waiting on your attendings.

In residency, we had a fast track area that was staffed by an attending physician and a resident. In my third year (I went to a 4-year program), I reached a point where it took as much time to see and dispo patients as it did to have an attending sign the chart. After multiple fast track shifts without significant dispo or patient plan changes when staffed with my attendings, I knew I was ready to moonlight at urgent care centers. When the same pattern emerged in the main emergency department, I decided I was ready for single coverage moonlighting. It was still an intimidating transition, but I knew from my experience in the ED that my plans were solid and I was procedurally competent.

When you get to this point in residency, you start to get the itch for the next step. You have the confidence that you can manage an ED in residency and want to know whether you can do it alone. You're ready to move, to see the next patient, and you're just waiting for your attending to sign off on what you've done so you can keep things flowing.

Your motivations aren't financial.

Moonlighting can be great money — but if that's your motivation, you're in it for the wrong reasons. Remember that you do have peoples' lives in your hands who are trusting you for your expertise. Don't moonlight prematurely just to make money.

When you reach a point that your plans are consistent with standard of care, minimal disposition and patient-care discrepancies are noted between the attending physician and yourself, and you feel comfortable undertaking the responsibility for patients' lives without another physician overlooking your work, then you are ready. ✶

Gastric Perforation after Liquid Nitrogen Ingestion

A Scream after Ice Cream

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Liquid nitrogen is used as a food or drink additive to provide rapid cooling or produce an aesthetic effect in which smoke seems to emanate from a prepared drink or food. Although potentially dangerous and currently unregulated, it has gained popularity in recent years and is used to make cocktails, cool ice cream, and create snacks for children in order to enhance presentation and consumer appeal. Few cases have been reported over the years describing gastric perforation secondary to liquid nitrogen ingestion. We report the case of a child who developed pneumoperitoneum secondary to liquid nitrogen ingestion. This case is relevant to emergency medicine because providers should be aware of this popular additive that may have deadly sequelae.

Case

A 9-year-old female with no significant past medical history arrived to the emergency department via fire rescue shortly after ingesting 'dragon breath' ice cream purchased on a popular pedestrian street. Her mother stated she had ingested the liquid which had been left over at the bottom of the cup. Her parents who witnessed the event reported she immediately experienced pain, gripping her abdomen and seeming to have trouble breathing. A bystander believed the patient to be choking and performed the Heimlich maneuver with minimal relief in symptoms. Fire rescue was then called and transferred the patient to the emergency department in stable condition.

Upon arrival the patient continued to complain of abdominal pain. On examination she was hemodynamically stable but lethargic and responsive to verbal stimuli. Initial vital signs were temperature of 98.1 °F (36.7 °C), heart rate 85 bpm, blood pressure 120/83, and oxygen saturation 96% on room air. The patient weighed approximately 54 kilograms. The patient was placed on a cardiac monitor and end tidal carbon dioxide for continued monitoring. She exhibited a distended abdomen which was tympanic, rigid and tender to palpation in the epigastric region. There were no visible signs of trauma or burns along the face, abdomen or anterior chest wall. Lung sounds were clear to auscultation bilaterally. A portable chest x-ray demonstrated extensive pneumoperitoneum (Figure 1), highly suspicious for organ perforation. Laboratory results were significant for a white blood cell count of 16,400 / uL, a potassium level of 3.3 MMOL/L, and a lactic acidosis of 2.5 MMOL/L. Remaining complete blood count, chemistry and toxicology screen were unremarkable.

While in the emergency department the patient remained lethargic and exhibited multiple episodes of non-bloody, non-bilious emesis. Treatment was initiated with intravenous fluids, 20 mg famotidine, 1 g of ceftriaxone and 8 mg of zofran. The patient was promptly transferred to a separate pediatric facility where she was intubated for airway protection and taken to the operating room for exploratory laparoscopy. The procedure was converted to open laparotomy for better exposure, and a 3-4 cm full thickness perforation was identified along the lesser curvature of the stomach near the gastroesophageal junction. This area was repaired via Graham patch closure. The patient was extubated the following day and had a two week course in the pediatric intensive care unit complicated by fever attributed to aspiration pneumonia and treated with cefepime, vancomycin, fluconazole and metronidazole. She was discharged on oral antibiotics and followed up in the outpatient clinic with no further complications.

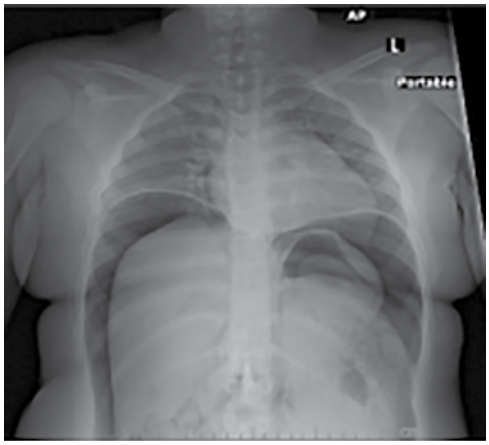

FIGURE 1. Portable upright chest x-ray demonstrating massive pneumoperitoneum.

Discussion

This case demonstrates liquid nitrogen to be a potentially fatal substance if directly ingested. Even if promptly treated, solid organ perforation may have a high morbidity and mortality. Prior case reports involving liquid nitrogen detail similar presentations in both adults and children with sudden onset abdominal

pain and shortness of breath after ingestion,[1-4] with the exception that our patient additionally presented with marked lethargy and altered mental status. Further, prior case reports also identified gastric perforation at the lesser curvature of the stomach as in this case.

Liquid nitrogen has an extremely low boiling point of -196° C and an expansion ratio of 1:694.[1] Proposed mechanisms of injury involve the accumulation of liquid nitrogen in the stomach, which causes damage by thermal burn to the epithelium or via barotrauma due to the rapid volume expansion within the stomach causing rupture at anatomical regions which are particularly susceptible to barotrauma.[3,5] The lesser curvature of the stomach is held in place by the hepatogastric ligament, possibly causing further traction on the gastric wall and facilitating gastric rupture at this site in the context of rapid volume expansion secondary to liquid nitrogen ingestion. As in this case, other cases reported no esophageal or oropharyngeal chemical burns with ingestion despite its potential to cause severe frostbite. This can be attributed to the Leidenfrost effect, wherein a liquid encounters a temperature significantly higher than its boiling point and creates a protective vapor layer that slows thermal transfer.[6]

Interestingly, this patient presented with altered mental status, initially suggesting another diagnosis such as accidental alcohol intoxication. The nitrogen may have caused displacement of oxygen and subsequent hypoxemia leading to altered mental status.[5] ✶

TAKE-HOME POINTS

In our case the child did well while ingesting the ice cream covered with liquid nitrogen. It was the act of drinking the remaining pooled liquid containing higher concentrations of liquid nitrogen that caused immediate pain and organ rupture. For emergency medicine specialists it should be noted that such pediatric behavior is normal, just as a child might drink the remaining milk from a cereal bowl. Thus, such natural behavior increases the risk of caustic injury to this population with such toxic ingestions.

Considering the potentially lethal effects of liquid nitrogen ingestion, we suggest the implementation of regulations for the use and purchase of foods with liquid nitrogen additives. Liquid nitrogen as a food additive is gaining more popularity within American culture and emergency physicians should be aware of this rare yet potentially fatal presentation.

References available online

Ultrasound Guided Supracondylar Nerve Blocks for Reduction of Distal Radius Fractures

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Distal radius fractures are one of the more common fractures taken care of in the ED. These occur in a wide variety of patients and often require manipulation or reduction in the ED prior to splinting. This reduction is one of the more painful procedures performed in the ED and, as such, has been associated with evolving analgesic procedures to assist in its successful performance. These procedures range from hematoma blocks to Bier blocks to procedural sedation. Reduction of distal radius fractures in the ED can be complicated if the patient has comorbid medical conditions such as polytrauma, hypotension, or traumatic brain injuries which can further complicate or limit the safety of procedural sedation (Smits et al., 2017). Recently, the utility of performing regional nerve blocks under ultrasound (US) guidance has gained popularity as it has the potential to combine adequate pain control with ease and efficiency in an ED setting.

While not widely studied, US guided Supracondylar Nerve blocks have been shown to be easily performed by an US trained physician in an ED setting with success rates as high as 95% (Ünlüer et al., 2016). When compared to hematoma blocks, US guided supracondylar nerve blocks have been shown to significantly decrease pain scores pre-reduction, during reduction, and post-reduction (Aydin, Bilge, Kaya, Aydin, & Cinar, 2016). Although their utility in decreasing overall ED LOS has not been studied, it can be inferred from many related studies that utilizing regional anesthesia over procedural sedation may lead to significant decreases in ED LOS and improvement in patient satisfaction (Blaivas, Adhikari, & Lander, 2011).

FIGURE 1

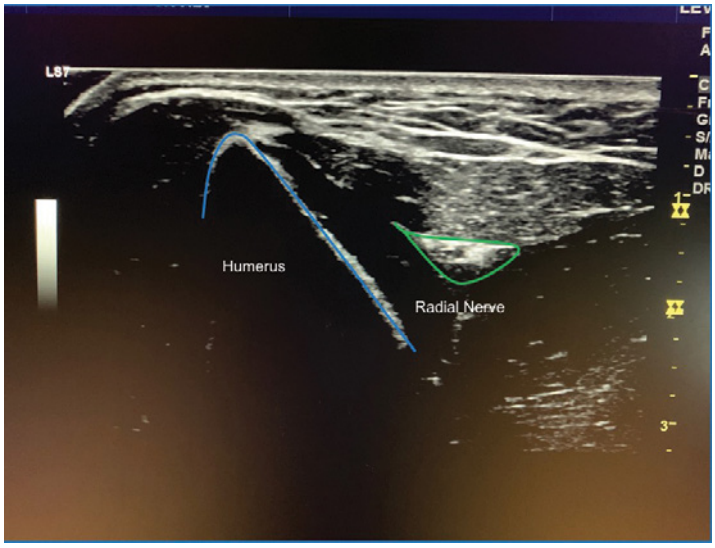


FIGURE 2

Cadaver studies have shown that the majority of the distal radius is innervated by the posterior interosseous nerve, a branch of the radial nerve. Therefore, the supracondylar nerve block can theoretically provide adequate pain control for distal radius fractures. If adequate anesthesia is not acheived, adding a median nerve block can address any nerves (anterior interosseous nerve and median nerve) not anesthetized by the supracondylar nerve block (Pol, Koudstaal, Schuurman, Bleys, 2006) (Ünlüer, Aslan, et. al. 2016).

Ultrasound guided supracondylar blocks provide a motor and sensory blockade of the radial distal forearm. This anesthetic affect has been described

as early as 15 minutes post-procedure with successful reductions taking place anywhere from 15-30 minutes post-procedure (Frenkel, Herring, Fischer, Carnell, & Nagdev, 2011). No serious or long term complications have been described to date. These procedures can be performed by a single EP and do not require additional staff, monitoring, or resources associated with procedural sedation.

The Procedure

Materials Needed

- US with linear probe
- 5-10 mL (milliliters) Anesthetic (Lidocaine, Bupivicane, or 1:1 mixture)
- 27 G Needle
- 20 or 22 G needle
- Sterile Gloves
- Sterile US probe cover
- Chlorhexidine or povidone Iodine

These should be performed under sterile technique with the use of povidone iodine or chlorhexidine, sterile gloves, and a sterile US probe cover.

Supracondylar Nerve Block

Step One: Positioning

Patients should be placed in a supine position to help prevent any complications associated with anesthetic introduction such as vasovagal syncope. The forearm should be flexed at 90 degrees at the elbow with the wrist held in pronation. The linear US probe can then be applied about 2-4 cm superior to the lateral epicondyle of the elbow to facilitate appropriate identification of the radial nerve, surrounding vasculature/musculature and bony landmarks (Figure 1).

Step Two: Landmark Identification:

This positioning allows for rapid identification of the radial nerve which can be visualized as a hyperechoic triangular structure lying between the hypoechoic structures of the brachioradialis and brachial muscles, and adjacent to the humerus. (Figure 2)

Step Three: Needle Advancement and Anesthetic Administration

The skin is prepped in a sterile fashion with chlorhexidine or betadine. A sterile US probe cover should be applied and sterile US gel should be used to help limit the risk of introducing infection. With the radial nerve kept in view under ultrasound guidance, an in-plane approach should be used to visualize the needle thought its entire course as it approaches the nerve. After anesthetizing the tract using lidocaine and a 27 gauge needle, a larger gauge needle (20-22G) is used for the procedure as it tends to be visualized better under ultrasound. The anesthetic is introduced in a circumferential pattern around the nerve; this is done by injecting above and below the nerve, which will dissect it from the surrounding tissue and allow anesthetic to surround the nerve. A total of 5-7 mL of anesthetic is infiltrated. Initially 1-2 mL of anesthetic can be introduced to ensure appropriate positioning with the remaining amount administered upon verification. (Figure 3)

Median Nerve Block

Step One: Positioning

The patient is placed in a position where the supinated forearm can be accessed by the provider. This can be in a sitting position or a supine position. The provider should create a clear line of sight from the patient's forearm to the ultrasound screen. (Figure 4)

Step Two: Landmark Identification

The median nerve traverses the mid-volar forearm. The ultrasound probe is placed so that a cross-sectional view of the forearm is obtained from the volar surface. The provider should locate the nerve around the mid forearm (if you look closer to the wrist the nerve is hard to differentiate from the surrounding wrist flexor tendons). The nerve appears as a cluster of hypoechoic structures that are wrapped by hyperechoic tissue: this has been described as a cluster of grapes, or a honeycomb. You should also identify the ulnar and radial arteries on the periphery of the screen as these will need to be avoided during the procedure. (Figure 5)

Step Three: Needle Advancement and Anesthetic Administration

Again, the skin is prepped in a sterile fashion, a sterile US probe cover is applied, and sterile US gel is used. With the ultrasound probe in cross-section and the median nerve centered in the screen, note the depth of nerve from the

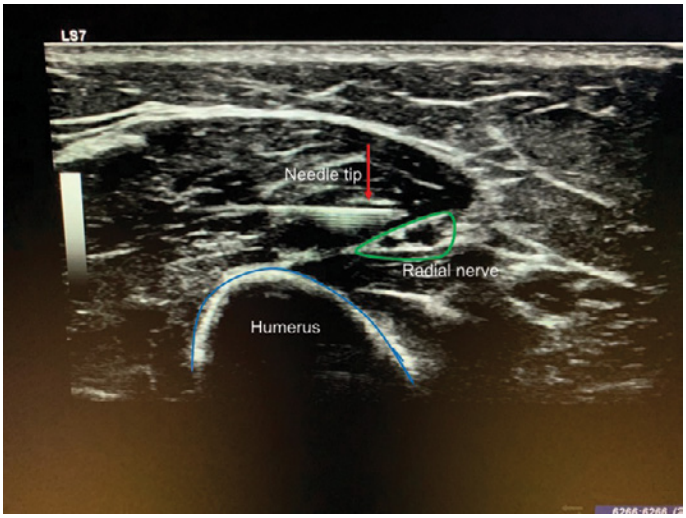


FIGURE 3

FIGURE 4

skin surface. Then at either the radial or ulnar side of the forearm insert the needle into the skin directly below the edge of the US probe at a depth that matches the nerve depth. This will also be an in-plane approach with a goal to visualize the needle thought its entire course and the needle will run parallel to the US probe.

As above, the tract is anesthetized using lidocaine and a 27 gauge needle and if better visualization of the needle is required a larger gauge needle (20-22G) is used for the procedure. The anesthetic is introduced in a circumferential pattern around the nerve; this is done by injecting above and below the nerve, which will dissect it from the surrounding tissue and allow anesthetic to surround the nerve. A total of 5-7 mL of anesthetic is infiltrated. Initially 1-2 mL of anesthetic can be introduced to ensure appropriate positioning with the remaining amount administered upon verification. (Figure 6)

The anesthetic of choice is provider dependent, but generally ranges from a short acting agent such as lidocaine, to a medium-acting agent such as bupivacaine or ropivicaine, to a mix of the two. Studies looking specifically at nerve blocks (orthopedic and anesthesia literature) show that lidocaine has a significantly faster onset of action compared to that of bupivacaine or ropivicaine, but a shorter duration of action (Cuvillion, 2013, Vinycomb, 2008); while studies looking at skin anesthesia (plastic surgery and emergency medicine literature) point toward equivalence between the action of the agents, with onset of both within 30 seconds and effects lasting over 6 hours (Collins, 2013, Alhelail, 2008). Mixing the two has been shown to combine the benefits of the individual anesthetics. The literature supports success with multiple different medication choices (Martin, Dumais, Cinq-Mars, & Tétrault, 1993). It is important to consider time to reduction, need for repeat neurovascular exams, and pain control upon discharge in these patients; anesthetic choice is based on balancing these considerations.

Complications

Given the limited adoption of US guided supracondylar nerve blocks, the associated risks or their rates of occurrence have not been widely studied, although they are important to consider prior to shifts in practice. In theory, these risks would be similar to other regional nerve blocks including neurovascular damage, bleeding, and infection. The use of US guidance and sterile technique can limit these risks, however more studies would be needed to show safety in practice.

It is important to realize that the supracondylar nerve block is a motor and sensory block. This will limit the ability to perform a neurovascular exam after the reduction. Because of this, the use of a short acting anesthetic (lidocaine) may be beneficial to facilitate the early recognition of any complications.

It is also important to consider anesthetic choice and the potential of rebound pain upon patient discharge which may lead to repeat visits or poor pain control upon discharge. There is limited evidence on rates of rebound pain in patients treated with regional anesthesia in an operative setting, but it is theorized that up to 40% of patients may experience this effect (Lavand'homme, 2018). It is reasonable to assume that this would translate to the ED setting. This is an important consideration, especially when providing return precautions and discharge pain control.

Anesthesia during splinting may also lead to tighter splint placement and limit diagnosis of compartment syndrome, however, the safety of forearm splint placement under IVRA has been shown in previous studies (Aarons et al., 2014).

Emergency Medicine is an ever-evolving field and it is important that we evolve with it. The addition of US guided procedures has increased the safety and efficacy of many different procedures from vascular access to arthrocentesis and should be considered in the utility of regional anesthesia. While more data is needed, there is promising evidence to suggest that distal radius fractures can be manipulated and splinted in a pain-free setting with fewer associated complications, shorter ED LOS, and with improved patient satisfaction with the use of ultrasound guided supracondylar radial nerve blocks. ✶

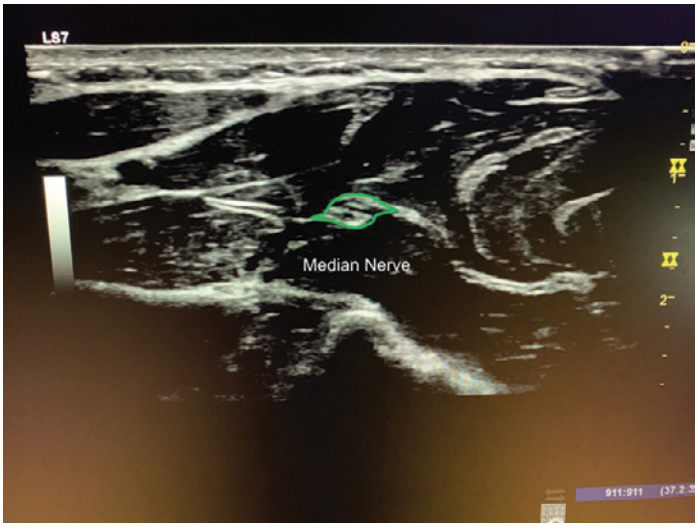


FIGURE 5

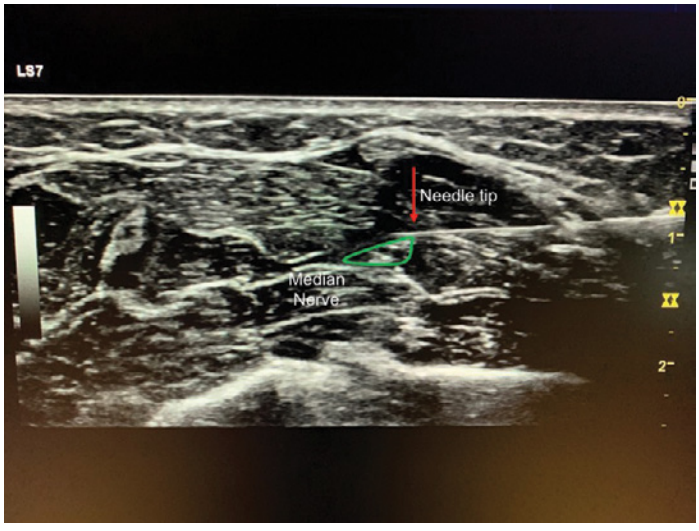
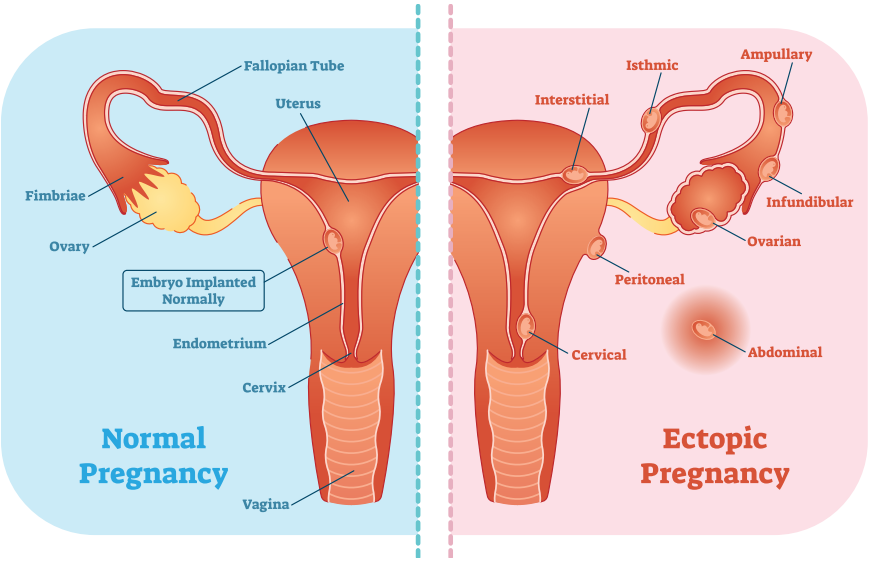


FIGURE 6

References available online

Defusing Ectopic Pregnancy



TICKING TIME BOMB

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A 32-year-old female presents to the ED with 7 days of worsening abdominal pain. She appears in pain and refuses to lay on her back or walk. She lays on her left side. Her vitals on arrival pulse 97, BP 103/57. Her pain is 10/10, constant, and nothing makes it better. She cannot pinpoint one location where it hurts the most. She denies fevers or chills. Upon chart review you find she is a G7P2032 with past medical history of treated PID. Her urine pregnancy test is positive, she did not know she was pregnant. What is your next step?

Introduction

An ectopic pregnancy is simply an extrauterine pregnancy, accounting for 2% of all pregnancies.[1] The vast majority (96%) occur in the fallopian tube, however other sites include the cervix, hysterotomy, ovary, or even abdomen. Very rarely, there can be both an intrauterine and ectopic pregnancy, which is coined a heterotopic pregnancy.[2] Rates of ectopic pregnancies have been steadily increasing, however at least 40% of cases are initially misdiagnosed as a non-pregnancy condition or suspected intrauterine pregnancy (IUP).[3] Failure to appropriately manage this common pathology leads to significant morbidity and mortality. In this article we will review the presentation, diagnosis, and approach to managing ectopic pregnancy.

Risk Factors

The biggest risk factor is previous ectopic pregnancy. Other major historical risk factors include uterine or tubal scarring from surgery (e.g. D&C, PID), increased maternal age, smoking, use of assisted reproductive techniques (ART) like in vitro fertilization.

Despite the popular misconception, IUD presence does *not* increase the overall risk of ectopic pregnancy, but a pregnancy with an IUD is more often an ectopic one.[4]

Presentation

Ectopic pregnancies can present in a variety of ways. Symptoms typically develop around 6-8 weeks after the last menstrual period. Women may misinterpret their vaginal bleeding as "normal menses". Typical symptoms of pregnancy (breast tenderness, polyuria, nausea/vomiting) can also occur but with lesser frequency than IUPs, as the levels of human chorionic gonadotropin (hCG) are often lower.[5,6]

A retrospective cohort study in 2009 analyzed 2,026 females presenting to a US emergency department with a positive pregnancy test, vaginal bleeding, and/or abdominal pain. 18% (376 patients) had an ectopic pregnancy. Of those with ectopic pregnancy, vaginal bleeding was reported in 76%, and generalized abdominal pain in 66%.[7] Importantly, there is no measured amount of bleeding that is associated more with ectopic pregnancy. Bleeding can range from scant to heavy. There is often non-focal tenderness on abdominal exam.

Even more fascinating, a population-based study in France looked at 849 tubal ectopic pregnancies and found the rate of tubal rupture to be 18% on presentation, so a high suspicion is warranted for potential decompensation.[8]

Multiple resources state that the diagnosis of ectopic pregnancy should be considered in any female with vaginal bleeding or abdominal pain- let's expand on that. One must have a low threshold of thinking about ectopic pregnancy in *any female of reproductive age*. Given the high mortality and high rate of misdiagnosis, here's some major complaints we *always* order a urine pregnancy test (UPT) for: syncope or near-syncopal symptoms, abdominal pain, chest pain, nausea/vomiting, dizziness, lightheadedness, or any GU complaint. This is by all means not a totally exhaustive list, but it does hit the highlights.

Important questions to ask a female

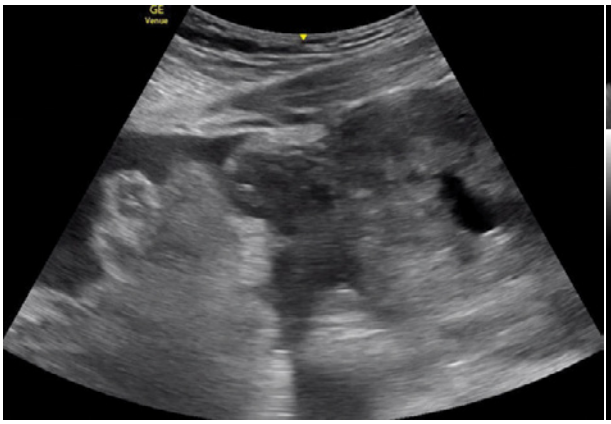


FIGURE 1 (left). TAUS Transverse view of the uterus and R ovary. Note free fluid surrounding R ovary in the left aspect of the image, as well as pseudogestational sac in uterus (right side of image)

FIGURE 2 (right). TVUS Sagittal view of the uterus demonstrating free fluid in the cul de sac

with a +UPT include gravidity and parity, history of prior ectopic pregnancies, birth control status, usage of in vitro fertilization, prior history of STIs especially PID, and surgical history.

Pelvic exam has come under fire recently for suffering from relatively poor specificity and sensitivity, but it is still a necessary part of any GU workup. Your primary goal during the exam is to assess for the presence of bleeding, its quantity, and confirm that the uterus is the source of bleeding.

Diagnosis

Workup of ectopic pregnancy can quickly get algorithmic and tedious. Here is an overview to keep you grounded:

Diagnostic evaluation	Comments
1. Confirm patient is pregnant (+UPT)	If UPT is negative this conversation is over.
2. Is the patient hemodynamically stable?	Quickly perform a bedside Gyn POCUS & FAST exam.
3. Order a serum hCG, blood type, CBC, CMP	The blood type is the most commonly forgotten test. Rh-D status is critical to know in these patients.
4. Perform bedside TVUS or order a formal study a. Determine intrauterine vs ectopic pregnancy b. Coordinate proper management strategy with OB/GYN	

Relevant physiology

hCG is secreted into maternal circulation after implantation, about 6 days after ovulation. Normally, hCG should double ~48 hours during the first 30 days; decline is concerning for failed pregnancy. Traditionally, slower rise is concerning for ectopic pregnancy or early intrauterine demise, but hCG alone it is *not* confirmatory and there is no common predictable pattern of hCG in certain pathologies.[9] In short, a single serum hCG level has very limited utility and it alone should not be used to make decisions (more on that below).[10]

Hemodynamically unstable

Here's a shiny pearl: *Females who are hemodynamically unstable with +UPT have an ectopic pregnancy until proven otherwise.*

The most critical step is to perform a **bedside basic gynecologic ultrasound (uterus, ovaries, cul de sac) with a FAST exam** to look for free fluid, ovarian pathology, or intrauterine pregnancy (Figures 1 & 2).

All the while, you should follow aggressive resuscitation algorithms (2 large bore IVs, blood products), and promptly alert OB/GYN.

Hemodynamically stable

In those hemodynamically stable, there needs to be a complete, formal ultrasound. Transvaginal (TVUS) is the best test to effectively exclude an ectopic pregnancy.

There are 3 possible conclusions that can be drawn from the TVUS[11]:

Option 1: Gestational sac with a yolk sac or embryo in the uterus = IUP

Option 2: Gestational sac with or without yolk sac outside the uterus or echogenic extraovarian mass = ectopic pregnancy

Option 3: No pregnancy is identified = nondiagnostic

In confirmed ectopic cases, the most common finding is an extraovarian adnexal mass, at 89% of the time.

It is critical to recognize that the presence of an intrauterine gestational sac alone does *not* confirm an IUP! In fact, the presence of an intrauterine "sac-like" structure could actually be a pseudogestational sac, which is a collection of blood and hypoechoic fluid in the uterus that can be seen in ectopic pregnancy (Figure 1).[12]

A small amount of clear fluid in the pelvis is physiologic, but echogenic free fluid in a woman with +UPT is virtually diagnostic of ectopic pregnancy. In a prospective study, finding echogenic fluid has a sensitivity of 56% and specificity of 96% for predicting ectopic pregnancy.[13]

From the TVUS, if **Option 1** occurs, ectopic pregnancy is effectively ruled out as the risk of heterotopic pregnancy is negligible in females not using assisted reproductive techniques. If **Option 2**, proceed with medical or surgical management of ectopic pregnancy by contacting OB/GYN.

Option 3 requires further workup. If no pregnancy is identified (either IUP or ectopic), it is likely because gestation is too early to be visualized on ultrasound. Transabdominal US (TAUS) can pick up an IUP at about **7-8 weeks**; TVUS around **5 weeks**. These patients will need close Ob/Gyn follow up with

repeat hCG measurements and likely a repeat TVUS.[14]

What about the magical "discriminatory zone"?

The discriminatory zone is traditionally defined as the hCG level above which one should see an IUP via US. On average, this is about 2000 mIU/mL for TVUS (about 6000 for TAUS). Traditional teaching was that if a patient's serum hCG was below the cut-off value and the US showed no IUP, there was a "decreased risk" for EP. This has been found to simply not be accurate and there are even some studies to suggest the opposite (i.e. increased risk for ectopic pregnancy).[15] Therefore, we recommend *not* using the discriminatory zone alone to rule out ectopic pregnancy. There is no standard hCG level ectopic pregnancies are expected to present at. Remember, a single serum hCG level has very limited utility.

For patients with an elevated hCG, but a nondiagnostic US, this is a *pregnancy of unknown location*, and a wide range (8-40%) turn out to be ectopic. Call Ob/Gyn and arrange for follow up. The patient will need repeat hCG measurement in about 48 hours along with potentially repeating the TVUS (Figure 3). Serial hCGs that do not rise by about 66% in 48 hours is coined an *abnormal pregnancy* (ectopic or nonviable IUP). Besides stressing close Ob/Gyn follow up with the patient, strict return precautions should be given.

What about heterotopic pregnancies?

By definition this is a simultaneous IUP and ectopic pregnancy. This is a feared pathology that very rarely occurs. In fact, it is estimated to occur in 1 in 30,000 pregnancies.[16] Therefore, in a female that has a confirmed IUP with no assisted reproductive techniques being used (ART), no further workup for heterotopic pregnancy need occur.

The risk of heterotopic pregnancy in those using ART is 1.5 per 1000 pregnancies.[17] We predict this number to increase in the future as more and more patients are utilizing ART. Expect similar symptoms of ectopic pregnancy. In these patients, aside from an IUP, evidence of heterotopic pregnancy typically includes complex adnexal mass or fluid. They are often falsely labeled as a corpus luteum cyst.[18] Ob/Gyn should be consulted early on to assist with this complicated pathology.

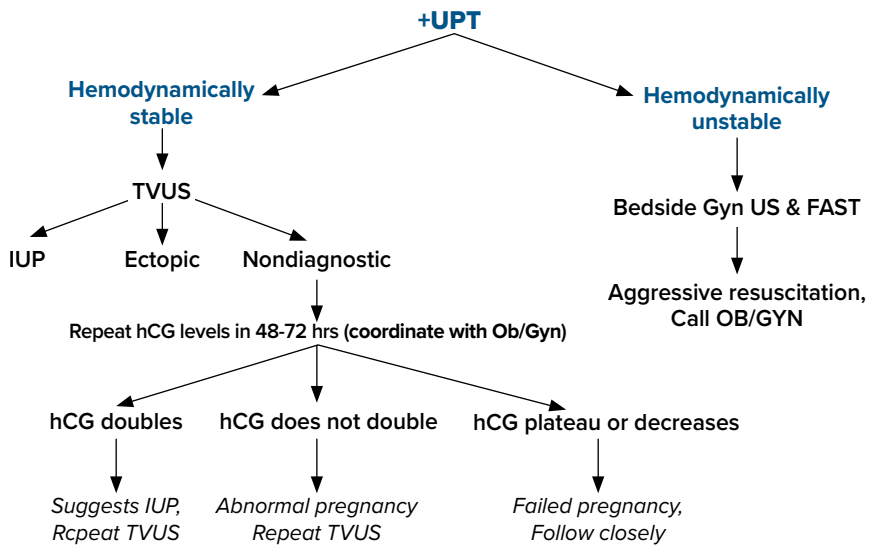
Treatment overview

If an ectopic pregnancy is confirmed, treatment discussion should obviously involve Ob/Gyn. All patients that are hemodynamically unstable, have significant free fluid on US, or have symptoms of rupture go to emergency surgery. That's easy enough. In stable patients, methotrexate therapy has been found to be quite beneficial at reducing surgical exposure and its associated complications. There are strict indications and contraindications that must be reviewed, and OB/Gyn will obviously drive this discussion.

Case Conclusion

You perform a pelvic exam which is negative for bleeding or discharge. You perform a bedside TAUS to look for IUP and discover free fluid in Morrison's pouch as well as a pseudogestational sac. As Ob/Gyn is urgently called, her repeat BP drops to 95/73 systolic and emergency blood products are hung. You place a 2nd large bore IV via US-guidance. Ob/Gyn urgently takes the patient to the OR where a ruptured ectopic pregnancy of the left ovary is found with a small hematoma. She recovers well and was discharged without incident. ✶

FIGURE 3. Simplified algorithm to ectopic pregnancy work-up



TAKE-HOME POINTS

- Have a low threshold for ordering a urine pregnancy test, even if the chief complaint isn't "GU related".
- A single serum hCG level has very limited utility and it alone should not be used to make decisions.
- Females who are hemodynamically unstable with +UPT have an ectopic pregnancy until proven otherwise.
- The most critical step in an unstable female with +UPT is to perform a bedside basic gynecologic ultrasound (uterus, ovaries) with a FAST exam.
- If the TVUS is nondiagnostic in a stable patient, it is likely because gestation is too early to be visualized on ultrasound. Transabdominal US can pick up an IUP at about 7-8 weeks; TVUS around 5 weeks. These patients will need close Ob/Gyn follow up with repeat hCG measurements and likely a repeat TVUS
- There is no standard hCG level ectopic pregnancies are expected to present at. Do not let the "discriminatory zone" guide management. Remember, a single serum hCG level has very limited utility.
- Assisted reproductive technologies raises the risk of heterotopic pregnancies.

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CRASH-3: TXA for TBI

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Tranexamic acid (TXA) has received much attention over the past decade secondary to its usefulness in treating hemorrhage. Released in October 2019, CRASH-3 is the latest trial exploring the benefits of TXA, this time in traumatic brain injury (TBI).[1] Each year there are nearly 70 million cases of traumatic brain injury worldwide[2], and in the United States more than 2.5 million patients seek care in the ED for TBI every year, accounting for approximately 2% of all ED visits.[3] CRASH-3 evaluated the effect of TXA on 28-day head injury-related death in patients with acute TBI.

Before diving into the study itself, it may be useful to briefly review why TXA has been so heavily investigated as a pharmacologic tool to help control hemorrhage. Having been accepted for the better part of two decades amongst the surgical community due to its reduction of peri-operative blood transfusion requirements, TXA is an anti-fibrinolytic agent that works by displacing plasminogen from fibrin to stabilize and inhibit clot breakdown. In the case of trauma, hyperfibrinolysis has long been an associated component of the coagulopathy of trauma. When present, mortality has been observed to be in excess of 70%.[4,5,6] Particularly in the case of severe, blunt trauma, tissue hypoperfusion stimulates the release of tissue-plasminogen activator (t-PA) from vascular endothelial cells, resulting in fibrinolysis and impeding hemostasis.[7] It is the role of TXA to directly inhibit this process. While it may be intuitive then to infer that the benefits of TXA may only be limited to those in shock, it is important to note that hyperfibrinolysis has been an identified component in severe trauma, including isolated head trauma, even when the clinical course was not complicated by hypotension.[8] Accordingly, if similar hemostatic benefits seen in surgical patients are extended to trauma patients, TXA may offer a low-cost, low-risk treatment option to impact outcomes in trauma surgery.

Over the past decade, multiple trials have investigated the usefulness of TXA in hemorrhage. Published in 2010, CRASH-2 was a massive RCT with more than 20,000 patients, which showed a 1.5% decrease in mortality when TXA was given to trauma patients with significant bleeding. This effect was time dependent and only seen when given within 3h and increasing to 2.1% when given within 1h. There was no observed increase in thromboembolic events. However, a subgroup analysis showed there was an increase in death due to bleeding when given >3h from injury.[9] The Military Application of Tranexamic Acid in Trauma Emergency Resuscitation (MATTERs) study published in 2012 included 896 combat injuries treated in Afghanistan in which the TXA group had a 6.5% mortality benefit over placebo despite being a more severely injured group.[10] The WOMAN trial published in 2017 studied the effects of TXA in postpartum hemorrhage in over 20,000 patients. This study showed a statistically significant 0.5% reduction in death due to postpartum hemorrhage when given within 3h of birth as a secondary outcome with no increase in thromboembolic events, but no significant decrease in the primary outcome of all-cause mortality with its use.[11] Finally, The Tranexamic acid for hyperacute primary IntraCerebral Hemorrhage (TICH-2) trial was released in 2018 which studied the effect of TXA on non-traumatic ICH when given within 8h. This study showed no benefit in the primary endpoint of functional status at 90 days or secondary outcomes of hematoma expansion, however it did show a significant reduction in early deaths at day 7.[12]

What did they do?

This brings us to the latest evolution of TXA research: CRASH-3. This was a very large, pragmatic, double-blinded RCT conducted at 175 hospitals in 29 countries across a range of geographic and economic settings (although no North American centers participated) from 2012-2019. Included patients were adults with TBI treated within 3 hours of injury who had a GCS ≤ 12 or any intracranial bleeding on CT (inclusion was originally within 8 hours however this was changed in 2016 after data showed patients were less likely to benefit from TXA when given beyond that time point). Patients were excluded if they had any obvious major extracranial bleeding. The intervention was 1g TXA given over 10 minutes followed by a 1g infusion over 8 hours versus a matching placebo regimen.

The primary outcome in this study was disease specific being head injury-related death within 28 days in those treated within 3 hours. Notable secondary outcomes included early head injury-related death (<24 hours), all-cause and cause-specific mortality, disability, vascular occlusive events (MI, CVA, DVT, and PE) and seizure. Of note, the authors had a pre-specified sensitivity analysis that excluded patients with a GCS of 3 or bilateral unreactive pupils as these patients were expected to have a very poor prognosis regardless of treatment and may bias treatment effect towards the null.

Results

Of the 12,737 patients randomized, 9,202 were treated within 3h of injury. Baseline characteristics including sex, age, time since injury, systolic blood pressure, GCS, and pupil reactivity were well matched at randomization. **As for the primary outcome, there was no statistical difference in head injury-related death within 28 days of injury with TXA compared to placebo (TXA 18.5% versus placebo 19.8%; RR .94; 95% CI 0.86 – 1.02).** Similarly, there was no statistically significant difference between TXA and placebo in the pre-specified sensitivity analysis which removed patients with GCS of 3 or bilateral unreactive pupils (TXA 12.5% versus placebo 14%; RR 0.89; 95% CI 0.80 – 1.00).

This brings us to the subset of patients receiving the most attention following the publication of the trial. **A subgroup analysis for risk of head injury related death in patients with mild-to-moderate head injury (GCS 9-15) was significantly reduced (5.8% vs 7.5%; RR.78; 95% CI 0.64 – 0.95; NNT 59).** In this subgroup, early treatment was also found to be more effective than later treatment (p=0.005). The benefit did not carry over to those with severe head injury (GCS 3-8; RR .99; 95% CI 0.91 – 1.07).

As for the secondary outcomes, TXA was found to be generally safe with the risk of vascular occlusive events similar in both groups (RR .98; 95% CI 0.74 – 1.28) and there was no observed increase in the risk of seizures (RR 1.09; 95% CI 0.90 – 1.33). Of note, TXA did increase the relative risk for non-head injury related death, however this too was not shown to be statistically significant (RR 1.31; 95% CI 0.93 – 1.85). Finally, among survivors there was no improvement in patient-centered disability for TXA vs placebo as determined by two separate disability measures.

Discussion

How should CRASH-3 be interpreted and what are the takeaways? The primary outcome of this study may be considered negative, with no significant difference seen between head injury-related death within 28 days when comparing TXA vs placebo given within 3 hours. However, when looking at the data more closely there appears to be a subset of patients for which TXA has a definitive benefit.

When excluding patients with a GCS of 3 or bilaterally unreactive pupils, those who are likely too sick to benefit from *any* intervention are removed, a dilutional skew towards a negative outcome is taken out. Patients with a GCS of 9-15 are less sick on presentation, but also have more room to decompensate following their TBI. This is the subset of patients where TXA was shown to have the highest mortality benefit. It may be that this benefit was simply not large enough to affect the mortality endpoints for the entire patient population studied, resulting in a negative primary endpoint. One can also conclude that earlier treatment is more effective than later treatment in patients with mild to moderate TBI, a similar finding to previously published literature regarding the need for timely administration of TXA in hemorrhage. Thus, increasing delays in TXA administration would reduce the potential for therapy to prevent expansion of intracranial hemorrhage in TBI.

Several limitations should also be mentioned. These include quite wide confidence intervals, making both a substantial and little to no benefit possible, a disease specific primary outcome which may be affected by misclassification of cause of death (although this was blinded to trial treatment), and possible underestimation of DVT/PE.

The authors summarized their findings by stating "*tranexamic acid is safe in patients with TBI and that treatment within 3 h of injury reduces head injury-related deaths.*" A caveat could be made this applies most clearly to patients with a GCS of 9-15. With a now demonstrated mortality benefit in TBI following CRASH-3 combined with the low cost and thus far proven safety of TXA, it is certainly reasonable to include timely administration of TXA to more established interventions (elevating the head of the bed to 30°, blood pressure control, avoidance of hypoxia, etc) as part of the treatment regimen for patients presenting to the emergency department with acute TBI. ✶

CRASH-3 Effects of tranexamic acid in patients with acute traumatic brain injury

The CRASH-3 Trail Collaborators. Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomised, placebo-controlled trial. *Lancet.* 2019;394(10210):1713-1723.

Methods

- 175 hospitals, 29 countries
- Randomized, double-blind, Placebo-controlled
- 9,202 patients treated within 3h
- Intention to treat, pre-specified subgroup analysis

Intervention

- 1g TXA over 10 min followed by 1g TXA over 8h OR placebo

RESULTS

No significant difference in head injury-related death within 28 days for TXA vs placebo.

Effect of TXA on head injury-related death	TXA	Placebo	RR (95% CI)
All	18.5%	19.8%	0.94 (0.86-1.02)
Excluding GCS 3 & bilateral unreactive pupils	12.5%	14%	0.89 (0.80-1.00)
Mild-to-moderate head injury (GCS 9-15)	5.8%	7.5%	0.78 (0.64-0.95)
Risk of vascular occlusive events	1.5%	1.3%	1.08 (0.71-1.64)

3-HOUR WINDOW


NNT = 59*
*GCS 9-15

THE BOTTOM LINE

When given within 3h of injury, TXA was shown to have a mortality benefit in head injury-related death in patients with acute traumatic TBI and a GCS of 9-15 with no significant increase in vascular occlusive events.

References available online

Primary Cardiac Synovial Sarcoma Complicated by a Malignant Pericardial Effusion

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A 26-year-old female presented to the ED complaining of 2 weeks of progressively worsening shortness of breath and left sided chest pain. The patient had been seen at a private clinic the week prior due to cough, congestion, chest pain, and intermittent shortness of breath. A chest x-ray was done at that time which showed an enlarged heart and she was subsequently instructed to follow-up with her primary care physician (PCP) for a cardiology referral. She was seen in her PCP's office one week later where an EKG was performed which revealed no acute abnormalities and an outpatient transthoracic echocardiogram (TTE) was ordered. The next day she presented to the ED due to worsening chest pain and subjective fevers. She stated that her chest pain was worse when lying flat and alleviated when she leaned forward however her physical exam was unremarkable and all vital signs were within normal limits. She then had a bedside TTE performed by the emergency physician which revealed a large pericardial effusion and an 8cm mass adjacent to the right atrium (Figures 1-2). On exam, she clinically had no signs of cardiac tamponade and was well-appearing.

A subsequent CT of the chest showed a large low-density pericardial effusion with a large heterogeneously enhancing mass likely arising from pericardium (Figure 3-4). The mass was located at the base of the heart abutting the inferior vena cava (IVC) and right atrium and was favored to represent a pericardial angiosarcoma. The patient was admitted to the cardiology service where a pericardiocentesis and biopsy were performed and 1100cc of bloody fluid was removed. The pericardial fluid was primarily composed of red blood cells and mixed inflammatory cells suggestive of a hemorrhagic effusion. Ultimately, the patient had an uneventful hospital course and was discharged from the hospital with a plan for her to follow up to discuss her biopsy results. A few days later the cytology on the pericardial fluid came back positive for synovial sarcoma. She was awaiting follow-up with both Cardiothoracic Surgery and Hematology/Oncology.

Background

Primary cardiac neoplasms are extremely rare with an incidence of 0.0001%. Primary cardiac synovial sarcomas (PCSS) account for < 5% of cardiac sarcomas and < 0.1% of all primary cardiac tumors.[3] Prognosis is extremely poor in cases of PCSS with a median survival rate of < 9 months.[4] PCSS is a rapidly progressive tumor which can present with non-specific symptoms such as chest pain, shortness of breath, weight loss, and fatigue. Patients usually remain asymptomatic until the tumor increases to a certain size or until spread and metastases occur. Additionally, pericardial effusions and subsequent cardiac tamponade are possible complications. Advanced tumors may spread to the opposite side of the heart by the time they are discovered. Symptoms usually present when mass effect of the tumor or obstruction of blood flow from the

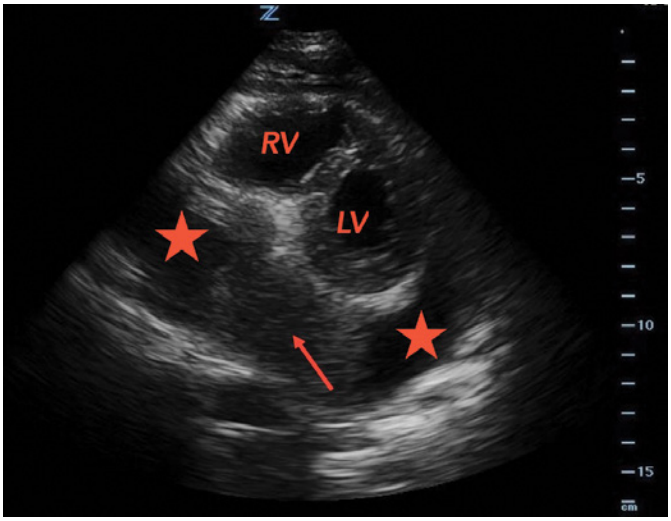

FIGURE 1. Parasternal transthoracic echocardiography in the short axis (PSAX). The arrow indicates a large mass adjacent to the right atrium. The two stars indicate the large pericardial effusion. LV = Left Ventricle. RV= Right Ventricle

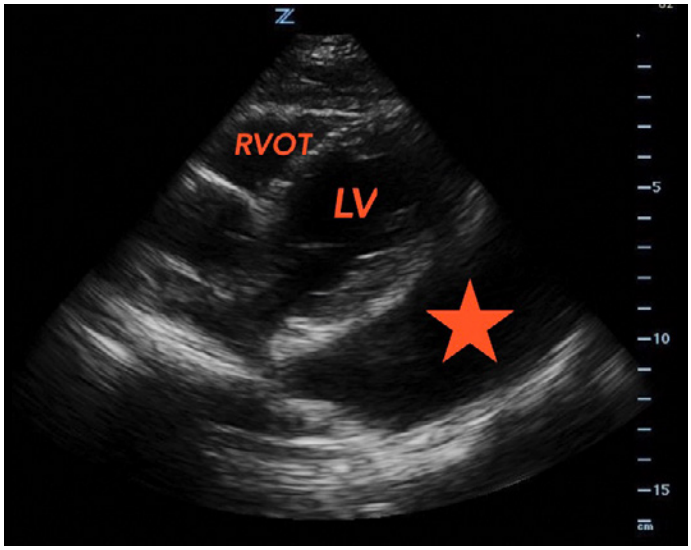

FIGURE 2. Parasternal transthoracic echocardiography in the long axis (PSAX). The star indicates a large pericardial effusion. LV = Left Ventricle. RVOT = Right Ventricle Outflow Tract

pulmonary veins occurs.[1] Diagnosis of PCSS is often achieved later in the disease course due to the generalized symptoms associated with it and the rarity of the disease. However, with increasing use of TTE in clinical and emergency department settings, a more rapid diagnosis can be made. Furthermore, transesophageal echocardiography (TEE), which has a sensitivity of 97% for detecting cardiac masses, is also becoming more common in specialty clinics and inpatient settings. TEE can be used to gain more information about the tumor's characteristics such as shape, size, and precise location.[5] In this article we describe a case in which the diagnosis and treatment of PCSS was expedited by the use of point-of-care TTE.

Discussion

Primary cardiac neoplasms are extremely rare, with an incidence of 0.0001%.[3] Because of the nonspecific clinical signs and symptoms associated with the disease, diagnosis can be challenging; often, preliminary detection first occurs through imaging techniques such as X-Ray or CT scan.

According to a review of the literature of PCSS, patients presenting with cardiac synovial sarcomas have a mean age of 32.5 years with a range of 13 to 66 years old. It is more common in males than in females, with a ratio of 3.5:1, and it has previously demonstrated a predisposition for young adults and adolescents. Also, the right side of the heart is more commonly affected, with a ratio of 2:1.

PCSS can also be associated with significant pericardial effusions and signs of congestive heart failure. Obstruction of blood flow within the heart and infiltration of the myocardium is often the cause of death in these patients. Because of the high fatality rate of these malignancies, rapid detection and early resection of PCSS, before invasion of the heart or metastasis can occur, offer the best chance of extending life expectancy. However, due to the rapid infiltration and aggression of the malignancy it is often detected when it has already advanced into the myocardium, complicating complete resection. When compared to left sided PCSS, right sided PCSS appear more infiltrative and are more likely to metastasize. This suggests that neoadjuvant chemotherapy may be of some benefit to help shrink the tumor before complete resection. Cases of right-sided PCSS that were treated with neoadjuvant chemotherapy along with surgical resection reported a median survival time of 27 months.[8] Unfortunately, complete resection is often not achievable because of tumor inaccessibility and the risk of affecting other cardiac structures. However, even in cases of partial tumor resection, surgical intervention has proven to increase prognostic survival time and has shown some benefit in regard to tumor control.[8,9] Patients who underwent surgical intervention showed a median survival time of 14 months compared to 9-12 months for medical therapy alone.[8,9]

Because of the rapidly progressive course of PCSS and the risk of metastases in primarily right-sided cardiac tumors, early detection is paramount in accelerating diagnosis and initiating the treatment process. Previous literature has shown that echocardiography is the primary method of evaluating the tumors, with a 97% sensitivity. Specifically, a TTE can assess location, shape, size, degree of adherence, and mobility of the tumor,[6] whereas TEE provides information about the specific insertion point of the tumor. In addition to echocardiography, CT should be used to gain a better understanding of the complexity of the mass and to check for metastasis.[6] In the case described here, TTE has been shown to be a relatively quick and effective way to evaluate for a cardiac mass with an associated pericardial effusion.

Conclusion

Diagnosing a primary cardiac synovial sarcoma can prove challenging because of the nonspecific nature of the symptoms and rarity of the disease. Furthermore, the risk of complications associated with the disease and the high mortality rate make early detection and intervention essential. By utilizing bedside echocardiography in the ED, we can expedite workup, help guide treatment options, and most importantly, identify life-threatening emergencies that would benefit from immediate intervention. ✶

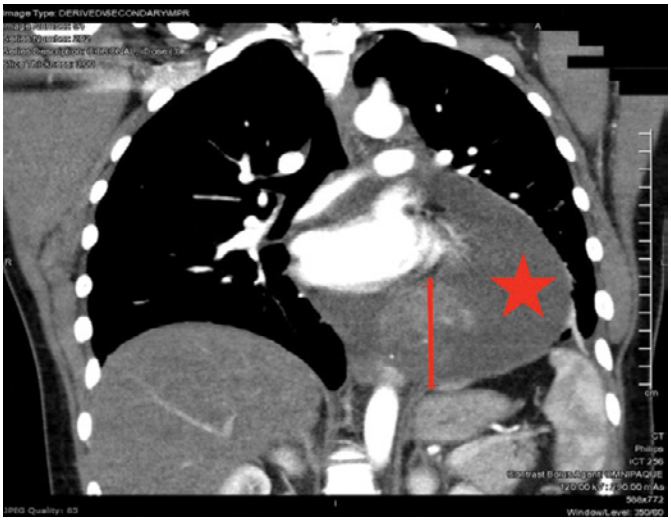

FIGURE 3. Coronal CT scan of chest. The straight red line is showing the size of the mass. The star indicates the large pericardial effusion.

FIGURE 4. Sagittal CT scan of chest. The straight red line is showing the size of the mass. The star indicates the large pericardial effusion. LV = Left ventricle

References available online

A Case of Pulmonary Hypertension in the ED

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A 63-year-old female with past medical history of COPD (on 2L home oxygen), hypertension, "some remote heart surgery," presents to the emergency department by EMS with acute, increasing shortness of breath over the past 12 hours. Patient denies fever, increased cough or recent travel.

Initial vital signs were HR 118, RR 35, SpO2 61% on 2L and BP 124/86.

On physical exam the patient is alert and in severe respiratory distress, with diminished but clear breath sounds bilaterally.

The patient's respiratory status fails to improve with non-rebreather mask or Bi-level Positive Airway Pressure and ultimately is intubated.

Laboratory work reveals no leukocytosis, no lactic acidosis, normal hemoglobin and VBG with pH 7.28 and CO2 >115. Chest-x-ray shows cardiomegaly with prominent pulmonary vasculature. Computed tomography pulmonary angiography reveals no pulmonary embolism, but marked dilation of the pulmonary trunk.

The patient required medical intensive care unit admission and was discharged 3 weeks later on her baseline oxygen requirement.

Discussion

Introduction: Pulmonary hypertension can be a complicating factor in many patient presentations, especially in the acute setting. It is defined as a resting mean pulmonary artery pressure (PAP) at or above 25mm Hg, and is typically diagnosed via right heart cardiac catheterization.[1] There are currently five categories of pulmonary hypertension (PH). These include: pulmonary arterial hypertension (PAH — group 1), PH due to left sided heart disease (group 2), PH secondary to chronic hypoxic lung disease (group 3), PH secondary to chronic thromboembolism (group 4) and PH secondary to unclear/multifactorial pathogenesis (group 5).[2] Pulmonary arterial hypertension (group 1) is often idiopathic or occurs as a result of a connective tissue disorders. Of the groups above, pulmonary hypertension secondary to left sided heart disease (group 2) is the most common. Our patient would fall into group 3 due to her history of COPD, and PH is important to keep in mind when evaluating patients presenting with presumed COPD exacerbations. It is vital to be able to identify and begin appropriate treatment for PH sooner rather than later, as it vastly improves patient outcomes and their quality of life.

Pathophysiology: The exact pathophysiology varies based on the underlying mechanism. In the case of PAH, it is characterized by vascular remodeling and accompanied by fibrosis, inflammation, and abnormal proliferation of endothelial and vascular smooth muscle cells.[3] The mechanism is thought to be secondary to endothelial dysfunction with an imbalance between endogenous vasodilators (eg, prostacyclin) and vasoconstrictors (endothelin-1) resulting in a net effect of vasoconstriction and thrombus formation. There are three major pathways (nitric oxide, endothelin and prostacyclin) playing a role in the development and progression of PAH.[4] Pulmonary vascular smooth muscle cells that normally have a low rate of multiplication undergo proliferation and hypertrophy leading to intimal narrowing and increased resistance to blood flow. Furthermore, circulating platelets in patients with PAH are in a continuous state of activation and contribute to the prothrombotic state by aggregating at the level of the injured endothelial cells.

In group 2 PH, left-sided heart disease leads to pulmonary venous congestion; eventually producing increased pulmonary arterial pressure. Group 3 results from chronic hypoxemia-induced pulmonary vasoconstriction and thus hypertension.[5] Group 4 involves chronic thromboembolism, which impedes normal blood flow within pulmonary vessels. This results in vascular congestion, pulmonary hypertension, and right ventricle strain. Group 5 is by definition unclear, and often has no clear pathophysiology.[4]

Signs and Symptoms: Approximately 86% of patients with PH will present with shortness of breath. As a nonspecific symptom, PH is often overlooked.[6] Additional associated symptoms can include fatigue, chest pain, exertional syncope, light-headedness, edema and palpitations. Initially, a loud S2 may be the only discernable sign on examination. However, as PH progresses, signs may include a pansystolic murmur of tricuspid regurgitation, diastolic murmur of pulmonary insufficiency, left parasternal lift, jugular venous distension, hepatomegaly, peripheral edema and ascites.[2] These signify right ventricular failure due to increased pressure in the pulmonary system.

Diagnosis: Definitive diagnosis is established via right heart catheterization.[3] However, in the emergency department we rely on more accessible modalities to indicate the presence of PH such as EKG, labs, and imaging. Evidence of right heart strain on EKG, such as a right bundle branch block or t wave inversions and ST depression in the anterior leads are associated with PH.[7] The most common electrocardiogram finding is right axis deviation (Figure 1). Right ventricular hypertrophy may also be noted, with V1 and V2 having large R waves and smaller

S waves. V5, V6, I and aVL may also display smaller R waves than normal. Prolongation of the QTc interval or QRS complex likely indicate more advanced disease.[7] (Figure 1)

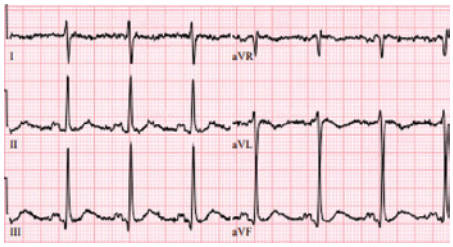

FIGURE 1.

Although not emergently indicated, a troponin level may be useful, especially if there is any concern for ischemia due to poor right coronary artery perfusion. An elevated troponin in the setting of pulmonary hypertension is associated with increased morbidity and mortality. A brain-natriuretic peptide level may also prove useful if it is elevated from the patient's baseline, as it reflects increased myocardial stretch.[2] Chest x-rays (CXR) can offer further evidence of pulmonary hypertension, as they may show cardiomegaly or prominent central pulmonary arteries (Figure 2). Specifically, right ventricle and atrium enlargement can be seen in advanced cases. Chest x-ray can also offer evidence of underlying disease processes leading to pulmonary hypertension; for example, hyperinflation as seen in COPD or interstitial lung fibrosis.[8] (Figure 2)

A computed tomography (CT) scan of the chest can also be useful in diagnosis if the main pulmonary artery diameter is >29mm and/or the ratio of the main pulmonary artery to the ascending aorta diameter is >1.[7] CT will reveal enlargement of the right ventricle,-mediastinal abnormalities, and other findings that will help clarify the diagnosis (Figure 3).

Bedside ultrasound and echocardiogram, can be performed quickly and provide key information to expedite the diagnosis. An RV: LV ratio >1 on the apical four-chamber view indicates right ventricular overload (Figure 4). The "D" sign may be visualized in the parasternal short-axis view (Figure 5). This is produced when the right ventricle is enlarged, leading to interventricular septum flattening during diastole, which in turn results in a D-shaped left ventricle.[9] Ventricular wall thickening will differentiate chronic vs. acute right heart. In acute strain, as seen with a pulmonary embolism, we would see a thin, free wall; however, the chronic strain characteristic of PH would produce a thickened wall. Like CT, ECHO can also be useful in determining whether there is another disease process playing a role in the patient's presentation. (Figure 4 and 5)

Management: Outpatient management may include a combination of calcium channel blockers, digoxin,

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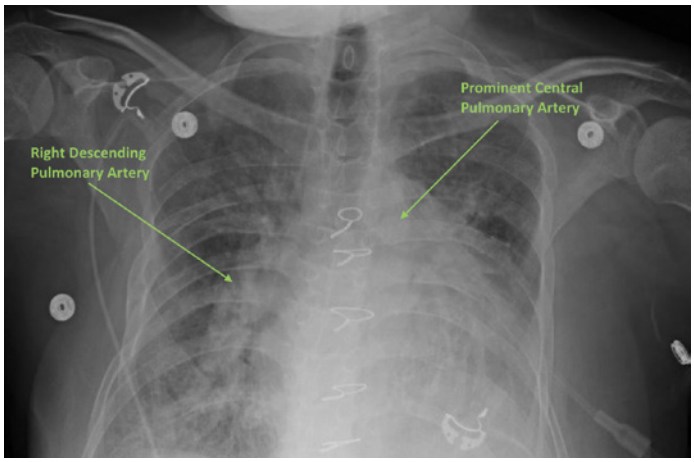

FIGURE 2.

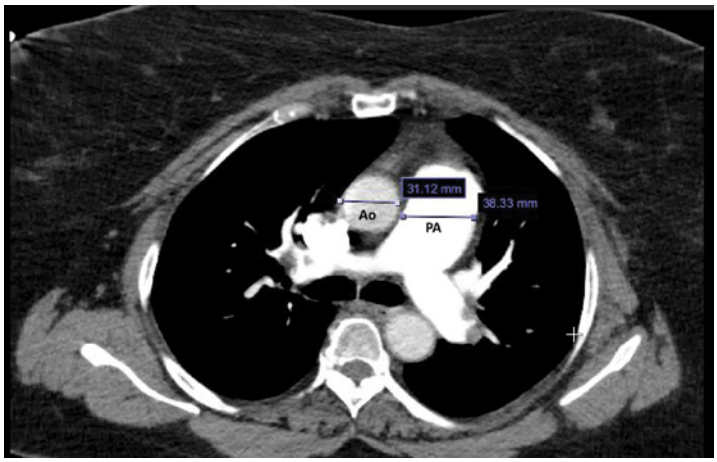

FIGURE 3.

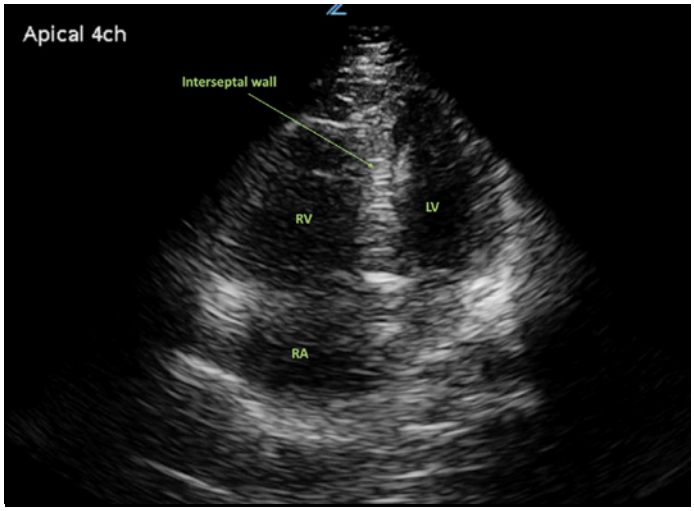

FIGURE 4.

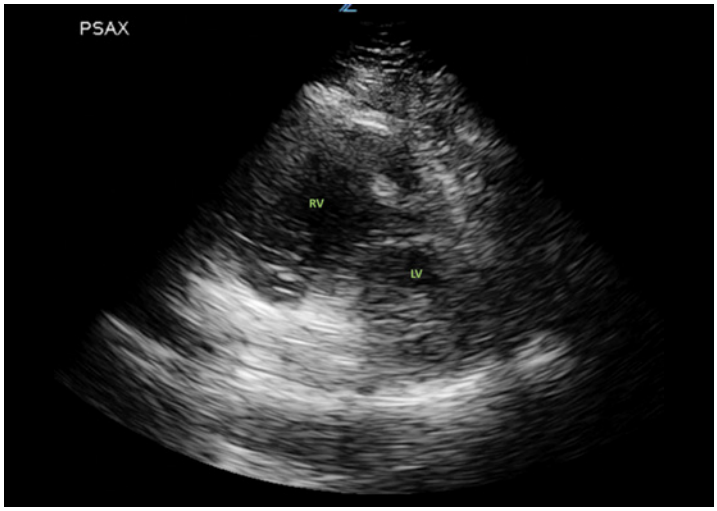

FIGURE 5.

The Echogenic Kidney

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Ultrasound in the emergency department can reveal the echogenicity of the renal pyramids in Medullary Sponge Kidney. Despite previous episodes and presentations, it is often undiagnosed or overlooked by physicians, and chronic presentations can cause diagnostic dilemmas for emergency physicians.

Case. A 31-year-old female with a history of nephrolithiasis and hematuria presented to the emergency department with a chief complaint of right flank pain and hematuria for the past three days, unrelieved by over the counter ibuprofen or acetaminophen. The patient reported pain, which was dull and constant in nature, which fluctuated to a sharper pain associated with movement. The pain was localized to the right flank, with radiation to the right lower pelvis.

Investigation of the abdomen, pelvis and kidneys with an ultrasound was unremarkable, except for bilateral renal echogenicity. Focused renal examination of the right kidney measured a size of 9.5x5.2x3.7 cm (Figure 1, 2) and 10x3.5x4.4 cm of the left, and was negative for hydronephrosis or focal masses, bilaterally. The right kidney was marked with a 5 mm stone in the lower pole, without focal masses. There were no stones in the left kidney. On careful inspection, diffuse increased echogenicity of the renal pyramids was visualized bilaterally.

The patient was given Toradol IV with improvement of pain. The patient also received IV fluid hydration to aid in calcium stone management. Labs were drawn and results remained with normal limits. The patient indicated she had approximately five previous episodes of similar pain over the years. However, these episodes did not require hospital admission. The diagnosis of medullary sponge kidney was made from assessment of the case and medical history, and discussion with the patient for management with oral hydration at home as well as pain management was recommended. The patient was discharged approximately five hours after presentation.

Discussion. Medullary Sponge Kidney (MSK), also known as Cacchi-Ricci disease, is an uncommon and benign congenital disorder affecting less than 1% of the population[1] and is thought to be attributed to the developmental abnormality between the ureteral-bud and the metanephric blastema in utero.[2] Nonetheless, investigations for the proteomic biomarkers responsible for the defects or genetic transmission is limited, and patients will often present with a negative family history and phenotype. As medical referrals and consults for MSK are increasing at a rate out of proportion to the prevalence of the disease,[3] understanding MSK in the emergency department (ED) can allow for appropriate patient care and management. Further, although the renal pathogenesis of MSK is associated with Beckwith-Widemann syndrome and renal hemihypertrophy, it is important to differentiate MSK from polycystic kidney disease and tubulointerstitial kidney disease as these can present with similar imaging results despite the unrelated pathophysiology.[4]

MSK is often asymptomatic. However, clinical presentation is often among adult wo[5]men between 30 to 50 years of age does demonstrate a history of recurrent painless hematuria, increased frequency of urinary tract infections, and recurrent calcium stones.[6,7,8] As there is no gold standard for the diagnosis of MSK, emergency physicians in the ED can use ultrasound for renal vascular flow analysis to visualize the renal architecture for the dilation of the

FIGURE 1. Ultrasound investigation of the right and left right kidney in 2D long views, reveal diffuse echogenicity seen here. The right kidney measured a size of 9.5x5.2x3.7 cm, whereas the left kidney measured a size of 10x3.5x4.4 cm. The right kidney was further marked with a 5 mm stone in the lower pole.

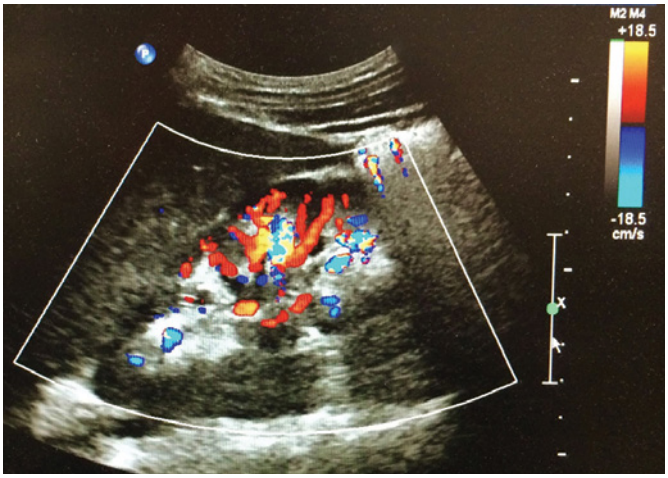

FIGURE 2. Ultrasound investigation of the right and left kidney in a 2D long view doppler flow. Diffuse echogenicity is seen.

terminal collecting ducts and/or diffuse medullary cysts, as was done in the management of this case. Other imaging studies include a preference of non-contrast computed tomography scan, as well as intravenous pyelography though rarely used, and magnetic resonance imaging with gadolinium.[3] Although ultrasound is less specific than other imaging modalities, it's benefits with time and cost effectiveness make it a favorable imaging candidate, which can reliably show a uniform echogenicity of the corticomedullary junction and hydronephrosis due to stone obstruction, seen in MSK.[9]

Initial treatment of MSK involves hydration for calcium stones, as well as the management of sequela (UTI, pain). Thorough case investigation with patient history further allows for cost-effective management and patient education. As seen in this case, effective management and awareness of this benign disease resulted in a favorable outcome. ✶

TAKE-HOME POINTS

- Patients with a recurrent history of nephrolithiasis and hematuria may have undiagnosed medullary sponge kidney. Although a benign disease, the management of sequela associated with MSK, such as antibiotics for urinary tract infections, and analgesics for pain management, is recommended.
- The awareness and understanding of the pathophysiology and presentation of MSK in the ED, where ultrasound imaging is frequently used for screening and diagnostic purposes, is valuable in establishing a management plan consisting of a diagnostic work up, potential medical consults and other invasive investigations.
- Patient education to understand the pathogenesis of MSK can alleviate anxiety and frustration and can allow for cost effective management.

A Case of Pulmonary Hypertension in the ED

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diuretics, home oxygen, anticoagulation, endothelin receptor antagonists, phosphodiesterase inhibitors and prostacyclin analogues. However, our chief concern is acute management.

1. Airway management can prove challenging because positive pressure ventilation (PPV) and intubation increase the risk of cardiovascular collapse. The increased intrathoracic pressure from positive pressure ventilation puts additional strain on the heart by decreasing preload, which worsens cardiac output.[3] If intubation cannot be avoided, Etomidate should be used for induction due to minimal effects on systemic vascular resistance, pulmonary vascular resistance and cardiac contractility. Lung protective settings should be embraced with a tidal volume of 6mL/kg ideal body weight and the lowest PEEP to maintain oxygen saturation >90%.[10] Monitor serial plateau pressures, as these should be kept low.[3]
2. Oxygenation: hypoxemia and hypercapnea cause vasoconstriction of the lungs and worsening pulmonary vascular resistance. A goal of SaO2>90% is preferable, as these patients cannot tolerate permissive hypercarbia and hypoxemia.[3]
3. Circulation: fluids must be used judiciously. The right ventricle is already under a great deal of strain and additional fluids can stretch the myocardial fibers and cause decreased cardiac output due to right ventricle failure (Figure 6). Additionally, in chronic PH, right ventricle remodeling leads to elevated transmural pressures, impairing RCA perfusion, which may lead to right ventricular ischemia. Intravenous fluids should only be used if the patient is obviously dehydrated, and even then should be used in small boluses with frequent re-evaluation.[3] Hemodynamic stability in these patients is precarious, and can easily be disrupted. (Figure 6)
4. Right ventricle support is critical. The main agents include dobutamine and milrinone. Dobutamine operates via beta-2 mediated systemic vasodilation, causing decreased pulmonary and systemic vascular resistance and increased contractility. Milrinone works as a PDE-3 inhibitor, and reduces peripheral vascular resistance to augment right ventricle function.[11] However, it is important to note that these agents may cause hypotension, and vasopressors may be necessary to offset this effect.
5. Vasopressors: norepinephrine is the vasopressor of choice, and reduces the 28-day mortality from cardiogenic shock.[12] Other agents that may be considered include epinephrine and vasopressin. Phenylephrine should be avoided since it causes direct pulmonary vasoconstriction, thereby increasing the work of the right ventricle. Dopamine is also not ideal due to increased risk of tachydysrhythmias and elevation in peripheral vascular resistance and pulmonary artery pressure.[3]
6. Next steps: consider prostanoids, endothelin receptor antagonists, and PDE-5 inhibitors. These agents have half-life of 30 minutes to one hour, and patients may develop severe rebound pulmonary hypertension if their infusion is stopped. Consider starting these agents with expert consultation. Nitric oxide (NO) should be utilized as an inhaled medication when available. Patients with PAH typically have low levels of NO, and the severity of disease inversely correlates with NO reaction products. Nitric oxide causes systemic vasodilation and helps to reduce the stress placed on the right ventricle by decreasing preload.[3]
7. If all else fails, consider right ventricular assist devices and extracorporeal membrane oxygenation.
8. Disposition: most patients will require inpatient admission, if for no other reason than to identify the underlying mechanism of their pulmonary hypertension. Additionally, intensive care unit admission should be considered for patients with right ventricular failure at the time of presentation.[3] ✶

End the Glow!

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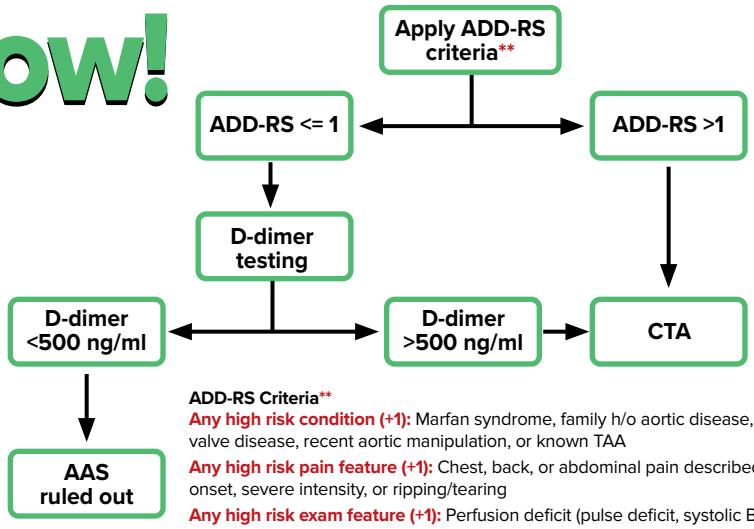

Aortic dissection (AD) is part of a group of acute aortic syndromes consisting of intramural aortic hematoma, penetrating aortic ulcer, and aortic rupture. On its own, the incidence is approximately 3-8 cases per 100,000 per year, and up to 25% of cases are missed. The in-hospital mortality when treated is 27%, with a 2% increase in mortality/hour. Imaging modalities like CT angiography, TEE, and MRA have made improved diagnosis of the disease, but are costly, potentially harmful, time-consuming, and require patient stability when in use.[1] The key concern in the ED is if there is a way to risk stratify patients for AD and if so, is there a test with high enough sensitivity and negative likelihood ratio (-)LR to rule out AD. Smooth muscle myosin heavy chain is a proposed modality, which is released from injured aortic media at the start of AD, but there is a lack of observational studies testing its efficacy as biomarker in diagnosing.[2] Hence, an algorithm to help reduce both misdiagnosis and overtesting is much needed.

Literature Review

Plasma D-dimer, a degradation product of cross linked fibrin by the endogenous fibrinolytic system, is found to be elevated in states like cancer, MI, pregnancy, sepsis, or disorders where there is indiscriminant activation of the coagulation cascade.[2] Meta-analysis reviews of D-dimer studies have shown that a cut-off level 0.50 ug/mL has proven to have high sensitivity, (-) LR, and negative predictive value.[2,3] According to the IRAD-Bio study, when utilized in the first 24 hours of symptoms, D-dimer can reliably rule out pulmonary embolism (PE) and acute AD with sensitivity of 96.6% and specificity of 46.6% studied on AD patients.[3,4] Although a rapid, economical, and accessible biomarker, it is also nonspecific with a low specificity and PPV and a poor (+) LR.[2] The possibility of excessive advanced imaging is increased when used alone on a low-risk patient population. Therefore, when coupled with a decision rule like the Aortic Dissection Detection Risk Score (ADD-RS), it can provide better utility with increased sensitivity.

Risk Stratification Tool

ADD-RS is a set of 12 clinical markers of aortic dissection released in 2010 by American Heart Association and the American College of Cardiology.[5] This scoring system was developed using the International Registry for Aortic Dissection, comparing common historical and clinical features. The strength of the ADD-RS scoring system is that its retrospective analysis of IRAD showed that low risk scores of 0 had a sensitivity for AD of 95.4%. Of the 4.6% that had AD with a score of 0, 48.6% of these patients had abnormal chest radiographs, including things such as widened mediastinum. If considering that these patients would be worked up anyway due to an abnormal chest radiograph, the miss rate of the ADD-RS would be 2.23%.

The ADvISED Trial[1] evaluated the ADD-RS combined with D-dimer testing by conducting a multicenter, prospective observational study which enrolled 1,850 consecutive chest pain patients, 241 (13%) of which were diagnosed with acute aortic syndrome (AAS). ADD-RS<=1 and negative D-dimer showed a sensitivity of 98.8%, NPV 99.7%, and LR-0.02. An ADD-RS=0 had a sensitivity of 99.6%. Furthermore, application of this rule could potentially spare ~3 in 5 conclusive imaging exams in all patients with AAS, and could avoid up to 1 in 2 CTA exams in patients with suspected AAS.[1]

For perspective, a 65-year-old male with known history of TAA presenting with abrupt onset of chest pain radiating to back who appears diaphoretic and hypertensive would immediately receive a CTA based on risk factors and presentation alone. However, a 56-year-old with history of HTN presenting with chest pain radiating to back, but well-appearing and stable vital signs can be appropriately risk stratified with this tool. Her ADD-RS of 0 indicates D-dimer can be obtained. If the level is negative, and she remains hemodynamically stable, we can safely rule out AAS while reducing cost and radiation exposure. This strategy could aid in standardizing decisions on advanced imaging for suspected AAS, while balancing the risks of misdiagnosis and over-testing. This could become an essential tool analogous to Wells Criteria, PERC, and D-dimer. The authors suggest further prospective studies for validation but are optimistic for its future.

Notice

This research was supported by HCA and/or an HCA affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA. ✶

References available online

Pediatric Nasopharyngeal Tumor

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A 14-year-old male presented to the ED with a chief complaint of vision changes. For three months he had been seen by his pediatrician and diagnosed with recurrent sinusitis and upper respiratory infections. Upon ED presentation, he reported left eye swelling with blurred vision. He denied eye redness or pruritus, fever, or photophobia. His mother insisted that his left eye was swollen and "different" than the right eye. Vital signs were T: 36.5 C, HR: 83, BP: 129/81, RR: 19, SpO2: 100% on room air. Physical exam was remarkable for left eye proptosis, left eye discharge, limited upward and lateral movement of the left eye, and bilateral maxillary sinus tenderness. A CT of the orbits with and without contrast revealed a heterogenous mass in the left nasal cavity which extended upward into the anterior cranial vault and left maxillary sinus. He was admitted to the pediatric inpatient service with consultations to pediatric neurosurgery and pediatric hematology-oncology.

Discussion

Nasopharyngeal tumors are rare and their ED presentation is variable, ranging from benign symptoms such as rhinorrhea to more insidious clinical findings, including facial asymmetry or neurologic sequelae.

Tumors of the nasopharynx may be benign or malignant. Benign tumors include angiofibroma and craniopharyngioma.[1] These primarily occur in children or young adults with the most common presenting symptoms being epistaxis and nasal obstruction.[1]

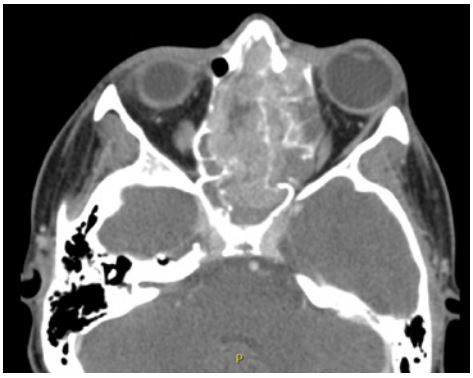
Malignant nasal tumors include nasopharyngeal carcinoma and may, even more rarely, be of neuroendocrine or neuroectodermal origin. Risk factors for carcinoma include EBV infection, which may spur malignant transformation of nasal epithelium.[2] While rare in the continental US, incidence is highest in Tunisia, China, Southeast Asia, Alaska, and the Mediterranean basin.[2] Nasopharyngeal carcinoma arises from epithelium of the fossa of Rosenmuller in the lateral nasopharynx and may metastasize to cervical lymph nodes, bone, lung, and mediastinum.[2]

Like the tumor in this case, neuroendocrine and neuroectodermal tumors of the nasopharynx are even less common. These are characterized as small, round blue cell tumors.[3,4] Primary neuroendocrine neoplasms typically involve the lungs but rarely originate in the head or neck.[3] These tumors have a penchant for highly aggressive behavior and prognosis is typically poor.[3]

Neuroectodermal tumors, such as esthenioneuroblastoma (ENB), arise from the olfactory nerve and can extend upward into the orbit and anterior cranial fossa.[4] Peak incidence is in the second decade of life with a pediatric incidence of 0.1/100000.[4] These historically follow an indolent course or are aggressive with fast growth and early metastatic spread.[4]

Nasopharyngeal tumors are exceedingly rare but their clinical presentation often includes symptoms commonly seen in the ED. These may include symptoms of more benign conditions, such as rhinitis or sinusitis. Many patients with tumors of the nasopharynx experience nasal obstruction, eye discharge, and rhinorrhea, which is often unrelieved by antihistamines. Benign tumors and carcinoma may present with recurrent epistaxis.[1,2] Mass effect may contribute to more advanced symptomatology. Patients may experience voice changes as the tumor grows and begins to affect air movement through the involved nare. In patients with ENB, facial asymmetry may occur as the tumor enlarges as well as proptosis and visual field changes if the orbit or optic nerve are affected.[4]

A tumor of the nasopharynx may be considered in patients presenting with multiple ED visits for rhinorrhea, epistaxis, facial asymmetry, ocular symptoms, and cranial nerve palsies. Diagnostic work up should be guided by clinical exam.



Imaging may include CT of the head, facial bones, sinuses, and orbits.[2] Depending on availability MRI is a useful modality for evaluation of soft tissues of the head and neck if tumor is found on CT.[2]

ED management of nasopharyngeal tumors consists of a two pronged approach: stabilization and early consultation. Airway must take first precedence. Theoretically, in the case of large and possibly hemorrhagic nasopharyngeal masses, ED physicians must include an airway management plan in addition to timely consultation.

Malignancies of the nasopharynx are often high-grade and aggressive.[2,3,4] Therefore, prompt consultation to hematology-oncology and ENT must be made. If there is invasion into the anterior cranial fossa, as seen in this case, discussion must be held with neurosurgery. Final diagnosis depends on formal biopsy. Treatment includes a combination of chemotherapy and radiation with surgical resection.[2,3]

Case Conclusion

Pediatric ENT and oncology were consulted. Biopsy revealed a small, round blue cell tumor of neuroendocrine or neuroectodermal origin. He received combination chemotherapy and was diagnosed with Li-Fraumeni syndrome, a rare familial cancer syndrome that occurs due to loss of function mutations in tumor suppressor genes. After chemotherapy tumor mapping revealed that the tumor is necrotic. ENT/neurosurgery team believe that surgical intervention is not necessary. He is followed by pediatric-oncology and continues to receive chemotherapy. ✶

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Tactical Medicine: An Evolving EM Subspecialty

Insights from a Tactical Medicine Pioneer

Cameron Justice, OMS IV
Pacific Northwest University College of Osteopathic Medicine

John Wipfler III, MD, FACEP, is an attending emergency physician at OSF Healthcare Saint Francis Medical Center, a Level I Trauma Center in Peoria, Illinois. He is board-certified and teaches as a clinical professor of emergency medicine at the University of Illinois College of Medicine (UICOMP). Dr. Wipfler served in the U.S. military for 14 years, attaining the rank of Major in the U.S. Army Medical Corps before transitioning to a support role for law enforcement tactical operations in 1994. Dr. Wipfler is involved in prehospital Urban Search & Rescue, Wilderness Medicine, and Technical Rescue; volunteers with IMERT (the primary Illinois disaster response team); and served as the medical director of Life Flight air medical program.

Dr. Wipfler was instrumental in forming the first tactical EMS unit in the state of Illinois (called STATT) certified by the Illinois Department of Public Health in 1998. His unit supports 3 tactical operations teams in central Illinois and has been directly involved in more than 220 SWAT callouts. In addition, he has supported callouts or training with the U.S. Secret Service, U.S. Marshals Office, Illinois State Police SWAT, FBI, and DEA in central Illinois.

In 1999, Dr. Wipfler developed one of the first formal 2-week electives in tactical medicine for EM residents at UICOMP/OSF St. Francis Emergency Medicine Residency. He continues to work closely with the Illinois Tactical Officers Association as Tactical Emergency Medical Services (TEMS) co-chair, and he serves nationally as chair-elect of ACEP's Tactical Medicine Section.

Dr. Wipfler is the lead author of "Tactical Medicine Essentials," a textbook endorsed by ACEP and developed with the help of more than 140 reviewers and editors.

Primer on Tactical Medicine

Tactical Emergency Medical Support (TEMS) is a rapidly evolving area of emergency medicine that focuses on prehospital emergency care specifically designed to support high-risk law enforcement operations and operators. Tactical medicine aims to enhance law enforcement operations by assisting in Medical Threat Assessments, training law enforcement officers (LEOs), providing on-scene casualty care, and overseeing preventive health care maintenance of the operators.

TEMS can be dated to19th century physician Dominique Jean Larrey, the surgeon-in-chief for Napoleon's Army, who was known for his innovative use of surgical teams dispatched on the battlefield to provide immediate lifesaving treatments.[needs a citation] In more recent years, TEMS has been utilized by the United States military in the form of specifically trained medical and tactical support personnel who provide critical treatment in active battlefields and allow for the successful extraction of patients to a higher level of definitive care. Civilian law enforcement agencies took note of the success of TEMS in the military and its potential application in the civilian world; in 1994, the National Tactical Officers Association (NTOA) issued formal positions supporting the wide implementation of a well-trained and equipped TEMS element into all tactical teams.

Today, tactical medicine is an increasingly essential element of law enforcement missions. Tactical medicine providers are involved in all aspects of tactical operations, including pre-mission planning, training, and implementation of clinical protocols tailored to the tactical environment. The goal of tactical medicine is to help ensure mission success and safety via preventative as well as acute care medicine. TEMS is a rapidly evolving and widespread practice with exciting opportunities for EM physicians — not to mention plenty of space to be involved as a resident.

CJ: How would you describe tactical medicine?

JW: Tactical medicine is a division of medicine where the prime objective is the support of the tactical officers of the SWAT team, also called Special Response Teams, Emergency Response Teams, or similar names. In my region, I primarily support three groups; ILEAS 6/7, Peoria City Police SRT, and CIERT (Central Illinois Emergency Response Team). A Special Weapons and Tactics (SWAT) Team is a special group of highly trained athletic individuals with specialized skills in assessing and resolving high risk situations in our communities that have significant threats to citizens. The goal is to resolve the crises with minimal morbidity/mortality as possible. As a tactical medicine provider (TMP), my primary objective is to provide comprehensive medical support to the tactical officers, with the secondary objective being providing necessary care to others on scene, ie, other first responders, hostages, innocent bystanders, and suspects.

CJ: What is the physician role in tactical medicine?

JW: Tactical physicians are there for many reasons — comprehensive team support, preventive medicine during training and 'callouts' (deployments), close up medical support with the goal of having TMPs and their advanced life support interventions

rapidly available when needed, along with leadership, EMS medical direction, training of team members, and many other functions. There are several ways of accomplishing this goal, and a variety of team structures are utilized in our country.

- Some physicians choose to remain at the Incident Command post with the brass and not attempt to provide warm or hot zone medical care. They can mostly provide oversight and backup support of the tactical medics that go inside the warm or hot zone perimeters.
- Some physicians choose to be a fully sworn law enforcement officer (LEO), obtain the training and qualification to carry a sidearm for protection, and deploy with the tactical team inside the warm or hot zone. Some tactical paramedics and physicians may go inside with entry teams if fully SWAT-trained and competent, but most will remain nearby — behind hard cover and within a 30-second response time — to be ready to respond to medical emergencies if needed. For most SWAT callouts, there is a single house or small building and the TEMS element can move close to but not inside the structure due to high threats. However, if there is a large building with multiple stories, then the TEMS element may deploy and accompany the rear portion of the SWAT entry team or rescue team, or Rescue Task Force element, which allows the benefit of being close to the team during all movement. Most SWAT callouts have a Tactical Operations Center (TOC), which is where all the operators are completing the mission planning and gearing up for the mission itself. Participating at this point involves much more tactical training with the team in order to be a safe and effective operator on scene with the rest of the team. Medical Threat Assessment (MTA) is formulated and communicated, and emergency medical response plans are determined and planned and prepared for.

There are also regional differences in the abilities to participate in these roles, and in general:

- The East Coast: Many East Coast tactical medicine physicians are dedicated to support LEOs, but many choose to not become sworn LEOs (reserve officers or deputized, etc.), are not armed, and choose to function in advisory roles from incident command. The patients get treated and extracted from the scene by the imbedded EMTs / paramedics / nurses and the tactical medicine physician will be able to provide advanced medical care when a casualty is brought to the CCP (casualty collection point), or they may go to the point of injury if the scene is rendered safe. They may also provide medical care during MedEvac / transport to the hospital.
- The West Coast: Many tactical medicine physicians in central and western USA choose to be more involved with warm and hot zone operations, and depending upon the politics and administrative support of LE / Fire / EMS, they may be sworn LEOs who are trained and authorized to be armed with a pistol or other firearm. Achieving law enforcement status can require part-time school, a standardized firearm course, and an agreement with a local/regional law enforcement agency in order to be deputized or sworn in as a peace officer with all the rights accompanied with the title. There is variability throughout the country and throughout the rest of the world. Many of these physicians simply feel that anyone who enters the inner perimeter of a tactical operations callout should be armed for self-defense and for defending the casualties they are caring for. As in other areas of life, things are sometimes controversial, and physicians certainly will want to sort through this and other topics in deciding when and how to become involved in tactical medicine.
- You really have a lot of options as far as being a tactical medicine provider depending on the level of involvement you are interested in as well as the level of participation your local agencies are willing to have you involved in. You can be the Medical Director of a Tactical Emergency Medical Service unit, where you primarily function as the primary physician for the team members, as well as write medical protocols and lead trainings for your team. You can choose to be more hands-on as well, imbedding within the team and participating in the same trainings as the tactical operators as well as being in charge of the medical aspects of your unit. EMS Medical Directors also help support their local Tactical Medics and Rescue Task Forces and can choose to be more or less involved. Just be aware that the medical legal coverage for tactical medicine can be a significant barrier, especially for resident physicians, so check with your hospital and local/regional teams.

CJ: What are the job prospects of the tactical medicine physician?

JW: There are a couple of paths currently, but this is a continually growing field as states and counties slowly begin to expand their goals and funding for TEMS units. You could be a paid EMS Medical Director who supports local TEMS units, and again, make sure you check into malpractice coverage for your area.

You could also become a faculty member at a residency program that has a tactical medicine elective and get paid to teach the elective. But a large majority of physicians who provide tactical medicine are unpaid volunteers who have decided to contribute towards our community's well-being using God-given talents in a helpful

and challenging way. It is a 'mission' or passion for most of the tactical physicians, and many can benefit from this.

CJ: What advice do you have for residents or new attending physicians who want to get involved in tactical medicine/local SWAT teams?

JW: The biggest thing is to get training and experience, meaning take courses on tactical medicine, prehospital medical skills, firearms safety, shooting courses, tactical medicine courses, and other instruction. A lot of different courses are out there that vary in length, depth, and cost. You could start with 1-3 day awareness courses (TEMS / TCCC / TECC), then look at some 5-day to 2-week courses. Some I would recommend looking into are ISTM-International School of Tactical Medicine, CONTOMS, and others. Use the internet and talk with experts to get further information.

Read some tactical medicine books, look at state/regional agencies to get an idea of their structure and curriculum. Out of all of the states, California has done the best job of setting up a standardized organization for tactical medicine, so the California EMSA website (search for Tactical Medicine) is a great resource!

Basically, I would say to build up your prehospital medical knowledge and skills with firearm safety, shooting, and tactical medicine courses and then approach your local law enforcement agency about getting involved. One of the big things is the firearms competency; you likely will have the medicine down, but you need to be competent and safe with a weapon to be respected by law enforcement, so go to a shooting school or two. And don't act like a Rambo wanna-be. If you show up at SWAT training with a black tactical vest on that has 3 knives and 5 magazines for your pistol and very little medical care, then that will not work in your favor. Be quiet and modest and start out slowly with a sincere desire to be there for emergency medical care and preventive medicine and team support. Ask about vaccinations, medical histories and allergies of team members; take blood pressures; and worry about the guns and shooting later, at an appropriate time.

CJ: In what ways could medical students get more involved in this field?

JW: Go ahead and check out the ACEP Tactical Medicine Section website, which lists the EM programs that have tactical medicine education. We are preparing to revamp the webpage to include some cool new resources, but there are currently some helpful resources such as the Tactical Medicine tool kit. There is also a list of training and education sites for various courses as well as a list of some of the EM residency programs that offer tactical medicine electives. I am working on creating a comprehensive list of all the residency tactical medicine training at the EM programs in the country, and currently most EM residencies do NOT offer some level of tactical medicine training. I would suggest starting by reading, completing courses if you can, and trying to choose a residency program that offers tactical medicine training.

CJ: In what ways could residents get more involved in tactical medicine?

JW: Kind of similar to the previous question, but basically try to choose an EM program that teaches tactical medicine, work on getting baseline training, and then approach the local team.

CJ: How would you suggest folks interested in this sector of EM get more experience if they lack a specific military or law enforcement background?

JW: Really work on building a solid foundation of the basic skills and knowledge. Get familiar with law enforcement, SWAT tactics, weapons, and how to treat injuries associated with those lethal and less-lethal weapons. Go take some 2-day and 5-day courses and at least 1 or 2 shooting courses. Become safe and reliable with weapons handling and safety. Don't be that 'doc' who accidently 'flashes' fellow shooters with the muzzle. Incompetence on the shooting range will be quickly noted, and you'll lose respect and they won't want you around. Start thinking through injury prediction based on the environment of mission and learn the medical knowledge and skills necessary to deal with them in the field when it's rainy and dark and you're providing medicine on your knees in the mud or on broken glass.

CJ: How do you see the role of the physician evolving in tactical medicine in the future?

JW: Right now many of the tactical medicine physicians are volunteers and unpaid. Many county and local law enforcement agencies have very limited budgets and don't have money to pay for tactical medics or nurses or physicians. Will this change as tactical medicine becomes recognized as the 'standard of care'? Yes, eventually it will be, and there will be a budget for it, because SWAT teams without formal TEMS support will be successfully sued in court due to deliberate indifference in providing close-up medical care. We have not quite reached that point in the USA but it will arrive someday. Meanwhile, fortunately there are medical professionals out there who are interested in the tactical medicine field and support the women and men in blue and camo who protect our communities. I feel there is a deep amount of satisfaction in volunteering and supporting the incredible professionals working to provide these critically important public services. For me, it is an honor, and a privilege, to support my community through tactical medical support. ✶

Helpful resources and links

ACEP Tactical Medicine Section: https://www.acep.org/how-we-serve/sections/tactical-emergency-medicine

CONTOMS Course: https://contoms.chepinc.org/EMT-TRegistration.html

Special Operations Medical Association: http://www.specialoperationsmedicine.org/Pages/default.aspx

THINK LIKE A GUIDE

Lessons Learned the Hard Way on International Expeditions

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Whether you are heading out on an international research project, volunteer medical mission, CME adventure travel trip, or just a vacation to a new corner of the globe, think like a professional guide. These lessons from international wilderness expedition leaders will make you more independent, capable, and confident on your next adventure.

Tate Higgins and Will Hockett were full-time expedition guides before medical school and have 2 decades of experience between them in leading remote and international excursions. Learn their hard-earned tips for making the most out of your international rotation, medical mission, or off-the-beaten-path vacation.

TH: Write down important contact information on paper — *actual* paper! Carry the paper with you in a gallon-sized water-tight bag, along with a paper copy of your passport. Once while working in India, I got off an all-day train ride and realized I had gotten off at the wrong station! My phone was dead, no WiFi, and no open shops. Luckily I had written down the contact info of the driver who was supposed to pick me up. I asked some locals for help and they called the number on my paper and explained to my ride.

Keep a paper backup of all the important things. Your phone is a good place to store tons of information. However, you need a hard copy of lodging addresses, tour operators, plane tickets because your phone is going to die when you need it most.

WH: Most international flights have 22 kg baggage limit. For expedition climbing or international medicine, your gear will add up quickly. Consider wearing your boots on the plane. Once you pass security, switch to flip flops and put those boots overhead. Luggage restrictions can be more flexible abroad. However, if you find yourself needing to take a bush plane or helicopter, weight limits can become very strict and you may be asked to leave gear behind if they are overweight.

TH: Travel is a great place to disconnect from electronics. However, when you're a guide, communication is essential for safety and logistics. I usually change my cell phone into airplane mode and use it to connect to WiFi for email, messaging, and Facetime only. Just be sure to stay in airplane mode to avoid accidentally connecting to local cell service and incurring international roaming fees. WiFi is becoming more and more widespread across the world — which came in handy when I needed to coordinate an emergency helicopter evacuation in Nepal.

Consider buying a local cell phone or SIM card with prepaid minutes for voice calls. When I first started guiding in East Africa and Nepal, I would buy a local cell phone for both in-country communication and to call home because the rates were so much cheaper than my U.S. carrier's international plan.

WH: Moving at altitude takes time and you'll need more than just your medical kit in the event of a medical emergency. Make sure you have the layers you need to survive, plus some extra layers for the patient. If you do have to package a patient for evac, make sure to use their gear and not your own. Take it from someone who lost a new ArcTeryx jacket, if you send something with the patient you won't get it back.

TH: Luggage gets lost! Pack essentials like hiking boots, medications, eye glasses, and electronics in a carry on. In a city like Kathmandu, Nepal, Arusha, Tanzania, you can find a huge market of slightly used outdoor and travel gear. Items like broken-in boots or medications may be more difficult to replace.

Book your return flight with a little

PEARLS: 6 ITEMS GUIDES ALWAYS HAVE IN THEIR BACKPACK

1. **Foul weather gear:** Guides don't even check the weather forecast, they just assume that it's gonna get worse, and pack for it.
2. **Snacks and water:** Pack the snacks you can't live without and have a method such as chemicals or UV to treat your drinking water while traveling.
3. **TP/personal hygiene kit:** If you need toilet paper then you should carry it with you.
4. **Buff or bandana:** Multipurpose dust shield, sun shield, and headband.
5. **First aid kit:** Have a kit and carry it with you. Doesn't do any good if you leave it at the hotel.
6. **"Sacred socks":** Reserve a pair of socks (or T-shirt or base layer) only for sleeping. At the end of a long day, being able to change into one semi-clean item of clothing can feel like a huge luxury and boost your entire outlook.

buffer whenever possible, especially if you are traveling in remote parts of a foreign country. Weather and travel delays are common. In the mountains of Nepal, I've been socked in by fog that meant an extra 2 nights in the mountains and a chartered helicopter to finally get back to civilization. This can be a fun bonus adventure if you've budgeted a buffer at the end of your trip, but devastating if you miss your international return flight.

WH: "In the event of an emergency, stop and roll a cigarette." I'm not advocating smoking, but this was the best advice an older guide gave me. On a trip, you might see an accident or hear a cry for help. Pause and take stock of the situation. Take a deep breath, exhale, and check your own pulse. When you're first on the scene you need to be a rescuer, not an additional victim.

TH: Get training in wilderness medicine and carry a personal first aid kit at all times, stocked with any medications that you need or expect to need. In addition, add othre basic supplies such as tape for blisters, bandages, etc. For an organized trip, find out what type of expedition first aid kit is supplied. If headed to extreme high altitude ask about a Gamow bag and oxygen tanks. No matter what is provided, have your own basic kit so you don't have to go to the guides for every blister or headache.

WH: Try out all of your gear before you leave home. A big trip is a great excuse to upgrade your gear and buy something new, but test it before traveling. Load backpacks with all of the gear you expect to carry and then take some laps around the neighborhood to get the fit adjusted. A little bit of effort before you leave can make a big difference in comfort during your trip.

The primary reason I have seen clients turn around are blisters. I had a Denali client spend a year training, a month acclimating in Ecuador, but no time in his new boots. He lasted 2 days on the trail before he needed to turn back.

Plan for the worst. In the comfort of your home, it's easy to imagine committing to sitting through a storm. At high camp, with -40 wind chill and a tent that needs to be dug out around the clock, it's a lot harder to wait for a weather window. Bring the best chocolate, book, or card games you can and keep your mind happy.

TH: Read the pre-trip information packet. Do not skim it; read it all! Things like strict weight limits for luggage are important; pack and weigh your gear before you leave, and count on the limits being enforced.

Be flexible. Be humble. Remember that it's about the journey, not the summit. It's easy to get super-focused on a specific goal, but it's often the in-between days that are the most magical and rewarding. ✶

Tate Higgins is a river guide, high altitude trekking leader, and wilderness medicine instructor. His recent research centered around wearable technology and sleep changes in the high altitude traveler.

Will Hockett taught leadership skills and mountaineering education on several continents. The best part was never the summit, but about the people he shared time with along the way. The adventure is reaching new heights with medical school.

Clinical Pathways in the ED

To Use or Not to Use?

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Rising health care costs and the move towards a value-based health care system has fueled the growth of clinical pathways (CPWs). While they may seem like a fad, CPWs have actually been used in health care since the 1980s and are now widespread in the U.S., Australia, Canada, Europe, and Asia.[1] As a result, there is now extensive literature about their design, implementation, and utilization. Despite this, there remains limited data regarding their true impact on patient care.

So, in the field of emergency medicine where increasing pressures threaten the ability of ED providers to deliver high quality care, the question remains: Can clinical pathways help acute care providers deliver safe, valuable, and standardized care to their patients? To help provide an answer, this article presents arguments for and against their use in an ED setting.

Best Thing Since Sliced Bread

There is extensive literature, and not just in emergency medicine, demonstrating the value of CPWs. First and foremost, they have been shown to improve cost-effectiveness and reduce length of stay by up to 22%.[2] With the direct relationship between hospital length of stay and ED boarding, this can have a significant downstream effect on ED care. Additionally, CPWs have been shown to reduce excessive variation in patient care.[3] In a practice environment where work-up is driven by variable risk thresholds, CPWs established using evidence-based medicine can decrease this variability. By doing so, they can theoretically reduce over-utilization of resources and redundancy in work-up. Pathways can also help identify systems issues that interfere with effective patient care and facilitate the resolution of system problems that can be irritating to both clinicians and patients. As such, **CPWs can simultaneously be used as vehicles for quality assurance and process improvement** — which is invaluable in an industry constantly looking to enhance safety, effectiveness, and efficiency.

As with any vehicle for change in health care, CPWs have their share of critics. One major concern is that they are robotic and depersonalized, going away from patient-centered care. While this might be the case in other practice settings, CPWs offer a tremendous benefit for both patients and providers in the ED. In an environment where there is a constant struggle to manage cognitive burden, CPWs allow providers to offload some of this burden by making certain aspects of patient care algorithmic. This, then, allows clinicians to spend intellectual capital on the undifferentiated sick, thereby increasing the overall quality of care delivered.

Close but No Cigar

Make no mistake that CPWs can serve to simplify decision-making. Nowhere is that more valuable than the ED. However, the distillation of the art of medicine to a series of binary choices can result in impersonal and inappropriate care. This "set it and forget it medicine" also creates a form of anchoring bias and reflexive compliance, which can blind providers to alternative or rare diagnoses.[4] In a setting where providers are trained to practice within the constricts of limited data, anything that has the potential to create bias and reflexive thinking consequently has the capability to introduce harm.

Furthermore, while nearing ubiquity in medicine today, the implementation of CPWs has yet to be standardized, and their effect hasn't been objectively proven as the variables remain ill-defined. While certain metrics may be realized, the core tenets of cost, length of stay, and patient and provider satisfaction have yet to be adequately investigated. In fact, some investigations report no direct relationship between using a CPW and the quality of care provided.[5]

Additionally, CPWs are usually not developed to serve the interests of an individual patient, but rather a patient cohort. Practices that are suboptimal from a patient perspective might be recommended as a way to control costs or protect special interests.[6] Guidelines that are inflexible can harm by failing to address the unique patient's case. In fact, CPWs are not designed for unusual or unpredictable cases, nor do they respond well to unexpected changes in a patient's condition. Therefore, when used by providers who may not have the expertise to adapt to variability, CPWs can increase risk.

Last, but not least, many patients view pathways as an unacceptable intrusion into the doctor-patient relationship.[7] This is especially troublesome when patient-centered care and shared decision-making are considered inalienable rights in the ED.

Summary

There is no denying the theoretical benefit of CPWs in an acute care setting. But reality is much harder to decipher, and evaluation of CPWs is particularly challenging given the wide variability in their implementation and use. So don't consider CPWs a panacea, but rather an additional tool to help deliver high-quality patient care, and be aware that they must be customized to each practice setting and allow for flexibility in the ED where the uncommon is, well, common. ✶

Demystifying the EM to PEM Journey

A Conversation with EM to PEM Attendings

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Upon completion of residency training we are expected to be well-equipped to handle whatever walks into the ED. However, many emergency medicine graduates will feel uncomfortable caring for the critically ill pediatric patient.[1] The most common reason for this is a lack of exposure to critically ill pediatric patients. A lot of us may choose to practice in an ED that sees very few pediatric cases, but it is hard to *completely* avoid pediatric patients, especially when they represent up to 22% of our patient population.[2] Also, up to 90% of these patients are seen in non-speciality facilities without pediatric emergency medicine (PEM) trained physicians, where both adults and children are treated.[3]

Pursuing a fellowship in PEM can provide expertise in caring for children in a shorter time frame than practicing in the community for several years. Furthermore, studies have shown that PEM physicians have some of the highest job satisfaction in medicine.[4] Despite these benefits of PEM fellowship training, most fellowship applicants come from pediatric residencies compared to emergency medicine. There are multiple reasons for this trend including perceived differences in salary compared to adult emergency medicine, duration of training, and the fact that emergency physicians can treat children without further training, among several other reasons.

To address some of these concerns, we interviewed EM to PEM attendings about their journey towards pediatric emergency medicine. Dr. Marianne Gausche-Hill (MGH) is the medical director of Los Angeles County EMS and a PEM faculty member at UCLA. Dr. Evelyn Porter (EP) is the assistant residency director and PEM faculty member at UCSF. Dr. Carolyn Holland (CH) is the Pediatric Emergency Medical Director and Division Chief at the University of Florida.

Q: Briefly tell us about your career trajectory.

MGH: While in medical school I was very interested in virtually every subject, but my heart had been set on a pediatric specialty. I had originally thought that I'd be a pediatrician but then became very interested in orthopedic surgery and applied to an orthopedic surgery residency with the thought that I'd do a pediatric fellowship. Once I had started my internship in general surgery at Harbor-UCLA Medical Center, I realized I had a real love for emergency medicine. I spent a great deal of time in the ED and decided to change my specialty in February of 1984; this was the last year that I could enter emergency medicine, having done an internship in another field. I then applied to and thankfully matched in emergency medicine at Harbor-UCLA Medical Center.

During my last year as a resident, I had worked with faculty to establish a Chief Resident year; however, there was no funding available at that time. James Seidel, MD, PhD, who was on faculty at Harbor, successfully competed for a grant with the Health Resources Services Administration on Emergency Medical Services for Children. Within that grant, he funded a fellowship position and I became his fellow in Emergency Medical Services/Pediatric Emergency Medicine, during my last year of residency. I worked on the grant as a fellow for 2 years in the Pediatric Emergency Department. At that time, there were no other fellowships that accepted emergency physicians in pediatric emergency medicine. So, after my 2-year fellowship in EMS for children/PEM, I became the first board certified, fellowship-trained emergency physician in the United States to be sub-boarded in Pediatric Emergency Medicine (1992).

EP: I started off like many medical students, with no specialty in mind. I found interest in all my rotations, but the ER seemed like home. I loved the staff, acuity, undifferentiated patients, procedures, team-centered approach, and ability to treat anyone no matter their background or status. I decided to pursue PEM out of a commitment to providing excellent care to patients of all ages and out of a nagging fear of sick children. During PEM fellowship I was immersed in a busy pediatric ED where I became comfortable with the sickest pediatric patients. Fellowship also nurtured an interest in teaching, simulation, adult learning theory and curriculum development. Academics seemed like a great fit, affording me the opportunity to combine all my interests and easily split shifts between adult and pediatric emergency departments. Currently I am heavily involved in the development of PEM education for both EM and pediatric residents.

CH: I did my residency in EM at the University of Cincinnati and then I pursued a fellowship in PEM at Cincinnati Children's Hospital. I then stayed on the faculty there for 2 years prior to coming to my current position at UF. I have spent the past 7 years at the University of Florida in Gainesville where I was recently named the medical director of the PED and Division Chief of Pediatric Emergency Medicine.

Q: Why did you choose to train in PEM after completing EM training?

MGH: I was very much interested in improving care for pediatric patients in the emergency department. I realized during my residency that there were many gaps, in terms of quality and methodology of care, and that emergency physicians were often ill-equipped to care for critical illness in pediatric patients. During my fellowship, I was able to participate in training the first national faculty in pediatric advanced life support (PALS). Furthermore, my research during

my fellowship made it clear that a lot of work was needed to improve pediatric readiness at the pre-hospital and ED settings.

EP: When I chose emergency medicine as a specialty I was fully committed to learning how to address any and all emergencies. Although I had quite a bit of exposure to PEM through my rotations in two separate pediatric emergency departments, both NICU and PICU rotations, international experiences and through critical care transports, I lacked confidence when it came to the care of the critically ill pediatric patient. I needed more volume and exposure. I chose fellowship as a means of getting the exposure and expertise in a concentrated way as opposed to having these experiences parsed out over the course of my career. I also wanted to explore academic emergency medicine and knew that fellowship would offer me that opportunity.

CH: I wanted to be as good at taking care of sick kids as I was taking care of sick adults. The number of critically ill pediatric patients I saw in residency was significantly less than critically ill adults — even though I rotated through one of the busiest pediatric emergency departments in the country as an EM resident.

Q: How do you navigate being an EM to PEM physician when the majority of PEM trainees primarily trained in pediatrics first?

MGH: Navigation in the specialty is easy if one embraces the concept that we are all emergency physicians. Peds-PEM trained physicians have similar goals and perspectives as emergency physicians. In other words, we are more alike than we are different. I find that my PEM colleagues are problem solvers just like me, and are very much interested in improving care for children in our nation's EDs and in the pre-hospital environment. I have been active both in AAP and ACEP and I believe that has helped create mutual trust and respect with both organizations. It also has resulted in a full career for me with exposure to PEM colleagues with a different training background and skill set, yet with a common vision.

EP: Fellowship training took into account my expertise as an emergency medicine trained physician and offered experiences to improve my blind spots. I was able to dig deeper into the pediatric subspecialties and procedures while practicing emergency medicine in a community ED to maintain my hard-earned EM skillset. I was also trained by and with pediatricians and have always found value in their perspectives and experiences. At the end of the day I'm capable of practicing in any pediatric ED alongside pediatric and EM trained physicians. My current practice houses the division of PEM within the department of emergency medicine. Additionally, I'm one of several EM trained, so I have colleagues who have traveled a similar path.

CH: The skills and knowledge that have to be acquired in fellowship are different. I had to do pediatric primary care, NICU, pediatric specialty clinics, but got to skip trauma, orthopedics and adult EM. The programs that I had interviewed with all had plans for the pathway differences for Pediatric primary trained fellows and EM primary trained fellows.

Q: How would you advise EM residents who are thinking of a PEM fellowship but are concerned about being compensated less financially throughout their career and the extra 2-3 years of fellowship when most EM fellowships are 1-2 years?

MGH: Going into pediatric emergency medicine provides the EM trained physician additional opportunities post fellowship training. There are PEM fellowship programs that allow for a 2-year PEM fellowship versus a 3-year. I will state that many academic programs are very interested in PEM trained physicians as they can immediately lead a division of PEM, can assist in establishing pediatric EDs within academic centers and provide a niche that other faculty cannot provide. Regarding the compensation, a PEM trained EM physician would be compensated equally to his/her EM colleagues and, in fact, because of fellowship training, often could start at a higher compensation level. This can be negotiated both in private practice and in academic settings. In addition, PEM physicians, as pediatric emergency medicine specialists, can also work and have leadership in not only academic centers but also community hospitals where they are models of PEM trained individuals who can assist community hospitals in improving their pediatric emergency care service line. Finally, EM physicians who are sub-boarded in pediatric emergency medicine have the opportunity to work in children's hospitals, unlike their EM trained colleagues. Overall, I feel PEM offers expanded opportunities for the emergency physician to contribute to the specialty.

EP: Being happy in your career is so important. At the end of the day if it's PEM you love then you should consider fellowship training. Compensation is variable depending on, but not limited to the type of group practice, location, and position/title you hold within your department. You should also moonlight regularly in a general ED to maintain your skillset (and supplement your income) if you plan to continue caring for adults. It is a very personal choice and is a sacrifice of time and money so make a thoughtful decision that's right for you and your family. Knowing what I do about personal finances, retirement and job satisfaction I would make the same decision if I had to do it all over again.

CH: The key in academics is to get a job under the Department of Emergency Medicine instead of the Department of Pediatrics. My fellow PEM providers and I get paid on par with the general EM providers. As for the extra time, in the big picture, another year or two is not really a big deal. I did moonlighting during my fellowship to keep up my adult EM skills and functionally doubled my salary.

Q: What strengths and contributions do you think EM trained physicians going into PEM bring into the field?

MGH: I believe that PEM trained individuals have a unique opportunity to improve care locally, regionally and nationally. At a local level serving on committees for state chapters for ACEP as well as EMS agencies, these individuals

can help improve the pediatric care services provided locally and regionally. There are data to suggest that improving pediatric readiness improves mortality within a region and a PEM trained individual is the perfect thought leader to enter these communities and begin the process of collaboration with other stakeholders to improve pediatric emergency care. Leadership can also occur at a state and national level as all states have EMS for children programs and state partnership grants. The PEM physician can get involved on that level on technical advisory committees and even as the Medical Director for these programs. Also at a national level, the PEM physician can be active in the AAP as a member of the Emergency Medicine section or on the Committee for Pediatric Emergency Medicine (COPEM). For ACEP, the PEM trained physician may wish to join the Pediatric section for ACEP as well as seek leadership opportunity on the Pediatric Emergency Medicine committee. In addition, there are lecturing opportunities both at the state and national level for ACEP. Furthermore, the emergency physician trained in PEM can develop a focus area for doing other continuing education lecture opportunities with the many providers wanting to expand their EM knowledge. There are also unique opportunities to train advanced practice providers (APPs) in the care of children.

EP:: As a minority participant you bring a different vantage point that is likely not represented. You know what it's like to take care of sick kids without the expertise and can speak reality into any questions or concerns that lack perspective. EM trained physicians are masterful at task switching, running a department and immediately prioritizing the care of sick patients. These skills are valued in PEM. EM is also an amazing field that allows for a huge variety of niche interests which can also be useful in PEM.

CH: EM primary trained physicians bring their well-honed sick/not-sick detector from the years of training in EM. Also, as more and more "adult-type" illnesses occur in pediatric patients due to childhood obesity (like type 2 diabetes, cardiovascular disease) the expertise of the general EM trained physician is critical.

Q: What do you like best about working in PEM? What do you like least?

MGH: Well, it's hard to say what I like least about it as I've enjoyed a full career of over 32 years in the field. What I like the most about working in PEM are the patients, the nurses and my colleagues. We are all joined by a singular vision to provide the best care possible to our patients and I enjoy very much working with nurses and my colleagues to achieve just that. I do love children and their very positive way of looking at the world. I love their joy, their desire to play, and admire their inherent trust of the world. For me, being around patients such as those is an honor. Lastly working with the team that I do is one of the greatest joys I have in my life.

EP: My favorite aspect of working in PEM is witnessing the resilience of sick kids. My least favorite thing about PEM is seeing how the shortcomings of our society affect kids.

CH: Best part of PEM is the kids and having the chance to help them feel better on a regular basis. My least favorite part is parents who come to the ED for evaluation of their not-ill child who may have had a fever for 60 minutes and the child has not received any antipyretics. Then, I have to spend lots of extra time convincing them that their child doesn't need any tests, blood work or x-rays. It always takes more time face to face time to disposition a well child who the parents think is sick.

Q: What's one thing you'd like people considering PEM fellowship to know?

MGH: The one thing that I would want them to know is entering a career in PEM will provide a full career and allow the physician to feel the strength of their training in ways that they never knew possible.

EP: Fellowship is a ready-made network of experts who are invested in your success. It's intended to develop your clinical expertise, but expose you to the variety of different interests that exist within PEM in a short period of time. This could technically be done without fellowship, but it would take a lot more time and individual footwork.

CH: While ABEM only requires 2 years of fellowship there are still some institutions that require 3 years, just like the primary Pediatric trained candidates. Keep that in mind when choosing programs to apply to.

Q: How can an EM resident stand out in a fellowship application?

MGH: The way they can stand out is through their personal statement and demonstration of their desire to have the training and leverage to better care for pediatric patients in emergency settings. I believe doing research, some type of scholarly work, and/or project centered around the care of children would demonstrate their sincere interest in addition to their attestation of their intent to utilize their training to better care for children. I do believe aligning themselves with current experts in the field so that these experts can get to know them and write them a strong letter for their fellowship application also would be extremely useful. However, most importantly the applicant should aim to excel in their residency.

EP: Demonstrate that you have seriously explored PEM life and be able to articulate why fellowship is of value in your career trajectory. This can be done through research, activities, curriculum development, or leadership activities. Know that your residency training is not a deficiency, but an asset. Your professional interests will likely be different from those coming from pediatrics just by virtue of the differences in training requirements. Letters of recommendation from a PEM trained physician, clinical excellence, intellectual curiosity and accomplishments are typically well received. Ultimately you want to find a program that fits your needs so be thoughtful in where you apply.

CH: Demonstrate enthusiasm for pediatric patients early in residency. Do research related to pediatric patients. Perform well in your pediatric rotations so you can get good letters of reference. Consider getting involved in pediatric emergency medicine on a regional or national level to help make connections and build your network. ✶

Grab a Shovel

Jeremiah White, MD
ChristianaCare

"Your aorta might rupture."

These aren't words you ever expect to hear, and surely not at the age of 26. But there it was. I stared at my dilated aorta on the echocardiogram, and it stared back at me — defiantly denying me the luxury of denial.

Symptoms had not brought me here. What was supposed to be a routine test had now become a life-altering diagnosis. And when the whistle of the train that had just blindsided me dissipated, I could finally hear its name: Loeys-Dietz syndrome, a genetic disorder that can cause aneurysms anywhere in your body. We don't come across that much in the emergency department, but even this emergency medicine resident knows the basic premise of connective tissue disorders, particularly ones that balloon the biggest blood vessel in the body: high risk for sudden death. As these words were repeated from primary care to cardiologist to surgeon, I understood one thing. This had to be repaired. Soon.

Sitting there, staring down the barrel of the unexpected, all the medical knowledge in the world couldn't resolve the gut-wrenching concerns this news had prompted. Countless hours of training and study proved useless to silence all the questions that persistently echoed in my mind that cannot yet be answered. What will come of this connective tissue disorder? Will there be complications from the surgery? How will this affect me and my wife down the road? My kids? My career?

Facing the unexpected is not new to me. It's the very nature of emergency medicine. Every day, each emergency medicine resident walks into the department knowing that they will assess, stabilize, and treat whatever comes through those double doors, but we have no idea what to expect. We are the frontline that sees both the mundane and the atypical, the worried-well and the sick and dying, often with the same chief complaint headlined on their chart. And yet that uncertainty doesn't faze us. On the contrary, for me and probably others, it's exactly that idea of "anything and everything" that drove us into this specialty. So how then, with this uncertainty, can we be so comfortable with the unplanned when the stakes are so high?

At the end of the day, it's all about who you have in the trenches beside you.

At our program, we have something called a "Golden Shovel Award." To paraphrase a former chief of mine, it's an award for a resident who has demonstrated the mindset of, "when you're deep in the mud and drowning, I'll bring the shovel." It's this mentality that enables us to function when faced with the overwhelming and the unknown. Some may say it's our proclivity for adrenaline or the culmination of our medical training that keeps us grounded when we face the unexpected. But those things only take you so far. Even the most experienced and hardened provider would flounder in a busy ED alone. To be able to function efficiently and competently with whatever comes through the door, you need the support of your colleagues.

I saw this in action recently as we drilled for a mass casualty incident. We practiced what it would be like if a tragedy resulted in countless patients flooding your doorstep from the back of pickup trucks, police cars, and frantic ambulances. In a situation like this, any one provider would be utterly debilitated. Answering medic calls, coordinating resources, triaging and treating patients — it's an impossible thing to ask someone to do alone. But, as a team, everyone plays a vital role. And the task, although daunting, becomes a bit more bearable.

We as residents face the daunting every day. We work long hours, holidays, and weekends. We deal with difficult patients, outcomes, and social circumstances. We see, smell, and hear things daily that would make the layperson squirm. And yet we are asked to do these time and time again, and the task can be seemingly insurmountable. We cannot do it alone. We must recognize those around us who need us to grab a shovel and help them through the muck that comprises our daily grind. And one day they will return the favor when you need the extra shovel.

Recently, an unforeseen diagnosis has encompassed me, and several questions remain unanswered. I don't know how this disease will progress over my lifetime. I don't know if there will be issues with the repair. I don't know if I will pass this burden to my children or how this will impact my career.

But I count myself fortunate because I realize that I am not alone. Much like the job I love, I do face certain uncertainty, but I have a team beside me ready to share the burden. A selfless wife, loving family, gracious colleagues and faculty leaders. And although I often feel that I'm neck deep and drowning, not knowing what the future may hold, I look beside me and take heart.

They've all brought their shovels. ✶

The Emergency Physician's "DERELICTION OF DUTY"

Why EM Should Lead the Charge for Foreign Policy Debate

William Bruno, MD
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The presidential race is in full swing, and health care is a major focus. From a single payer, Medicare-for-all system to mild Obamacare reforms, almost all the candidates have voiced an opinion. As an EM resident, I share the enthusiasm of many in the medical profession who find encouragement in a field of candidates engaged in a serious debate on how to improve our health care system. U.S. foreign policy, on the other hand, has been a second-tier issue at best, and as a physician, I find this incredibly disheartening. But perhaps even more disheartening is the disinterest and apathy I've noticed in my fellow physicians vis-à-vis American foreign policy — an issue that desperately needs our profession's voice.

U.S. Foreign Policy: A Neglected Global Health Issue

In today's world with unprecedented forced migration — according to United Nations High Commissioner for Refugees, we are witnessing the highest levels of displacement on record[1] — U.S. foreign policy is inseparable from unprecedented global health challenges, making it well within the physician's purview.

Take the example of Yemen. The U.S. is supporting Saudi Arabia's role as combatants on one side of the fight in Yemen's civil war. As a result of this conflict, every 5 minutes a child under age 5 dies of a preventable illness.[2] Or Venezuela, where, in the backdrop of political unrest that includes U.S. supporting an opposition leader's claim that the current president is illegitimate, outbreaks of measles and diphtheria are rampant.[3]

In a report aptly titled *Why Health Is Important to U.S. Foreign Policy*, the Council on Foreign Relations proclaimed "Supporting public health worldwide will enhance U.S. national security, increase prosperity at home and abroad, and promote democracy…"[4]

There is an interesting discussion to be had about what role U.S. foreign policy could have in alleviating or exacerbating these public health crises — but no one is having it. And that's not new. During the 2016 presidential primary, moderators asked, on average, only 2 foreign policy questions per Democratic Party debate. The 2020 debates are on track to see only a mild improvement.[5]

Unilaterality of Foreign Policy

When it comes to presidential politics, the neglect of substantial foreign policy debate in favor of domestic issues is exactly backwards. Making or changing domestic laws requires Congress to do the heavy lifting; the president just signs on the dotted line. Foreign policy, on the other hand, is an area in which the president takes the lead.

S/he could choose to pursue a bombing campaign or enforce an embargo, restricting access to desperately needed medicines, inflaming a public health crisis. S/he could, for example, use a phony polio vaccination campaign as a means of intelligence gathering, putting public health workers' lives in jeopardy, compromising legitimate vaccination campaigns, and exacerbating polio's spread through one of the last vestiges of this eradicable epidemic (this is not a hypothetical; it was a strategy employed by the CIA while in pursuit of Osama bin Laden).[6] The Commander-in-Chief could mobilize resources to stifle the next ebola crisis, lead vaccination campaigns, or pressure allies to end wars — all with the stroke of a pen or a phone call. No Congressional input necessary.

The Emergency Physician's Duty

There is a reason Democratic primary candidates are ignoring foreign policy. American voters prioritize other issues: the economy, health care costs, and education,[7] which is understandable on a personal scale. But ignoring U.S. foreign policy is a perilous mistake when it comes to presidential politics.

Emergency physicians should use their influential voices to advocate for a robust foreign policy debate. We should demand that our leaders articulate their plans for America's role in the world and challenge them to take ownership of the health consequences of those plans. Obviously, we are not all global health experts, but that doesn't absolve us of the responsibility to be informed and engaged.

Other health care professionals have heeded the call. The American Public Health Association, the World Federation of Public Health Associations, the International Federation of Medical Students' Associations, and the International Council of Nurses have all passed antiwar resolutions on public health grounds.[8] Where is EM?

Since starting residency I've been inspired by witnessing the real impact emergency physicians can have on society. We're in journals, magazines, news outlets, and social media. Our voices are heard on a range of issues, from health care reform and gun violence to human trafficking and domestic abuse. But when it comes to foreign policy and its profound impact on the public health, we've been shamefully silent. It is up to us to change the narrative and to ensure our specialty's relevance continues to grow in an increasingly globalized society.

It's time we pushed for a robust foreign policy debate. I don't expect everyone to agree with my politics. I'm not asking for us all to endorse the same presidential candidate. But I do expect each and every one of us to be informed and engaged. To quote the Jesuit peace activist and poet Daniel Berrigan, when it comes to U.S. foreign policy, all I'm asking is that you "know where you stand and stand there." ✶

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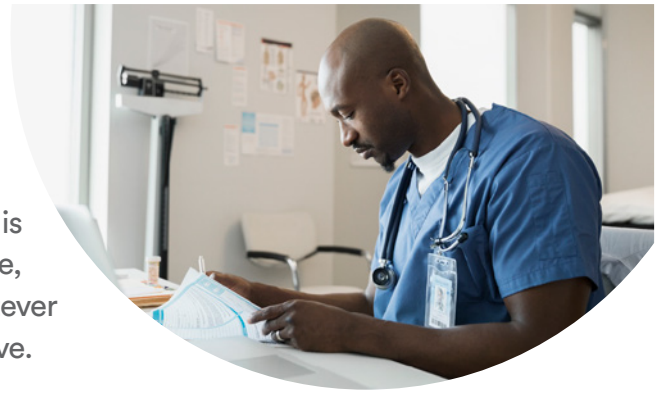
A Financial Guide to Surviving Residency



For many, becoming a doctor and choosing a career helping others is an innate calling. For others, it may be a family tradition. Or for some, the lure of being at the forefront of medicine is irresistible. But whatever your motivation, becoming a skilled medical professional is expensive.

According to the Association of American Medical Colleges (AAMC), 75% of the graduating class of 2018 reported leaving medical school with student loan debt. In fact, 51% of medical students that graduated with student loans in 2018 had loans of $200,000 or more.[1]

With graduation in May, a move in June, and residencies beginning in June/July, there will be less free time available for dealing with finances than you might think. So, what should you do once you've been matched to a program? In this article, we'll explore ways to improve your finances and make your residency a little more manageable.

Get Organized

Gather the records of all your debt—student loans, car payments, mortgage, personal loans, credit cards, etc.—and keep it in one safe place. Include the amount, terms, payments, interest rates, and any other key information.

Know What you Owe

See the full picture of your debt so you can make informed financial decisions. This should encompass how much you owe, monthly payment due dates, and your current payoff dates, even if they are 10, 15, or 20 years away.

Map Your Goals

House, kids, private practice, lifestyle—include it all. Even if plans and circumstances change, thinking about where you want to go now will help you be better prepared for the future.

Live Like a Resident

The average yearly salary for a resident is $59,300 according to a Medscape survey.[2] So while there is the potential to make more in the future, you should budget based on your current financial situation.

Consider Location

Remember, cost of living varies based on location. When budgeting for expenses like transportation, groceries, and housing be sure to research what these costs are near your residency program.

Save for Retirement

It's never too early to start saving for retirement. If your workplace provides retirement savings options, take advantage of these plans and any contribution matching offered.

Get Insurance

Disability, life, and umbrella liability preserve your investment in yourself, your assets, and your capacity to earn future income.

Have an Emergency Fund

Since insurance can't cover every eventuality, having a financial cushion can help get you through an unexpected challenge.

Maximize Your Deductions

You may be eligible to deduct up to $2,500 of student loan interest paid in a given year. There are some restrictions, so check the income requirements each tax year and be sure to consult a tax professional for help.

Set a Student Loan Repayment Strategy

To set the best repayment strategy for you, you'll need to know your options. Physicians with Federal student loans have a number of different repayment options at their disposal, including; direct consolidation, income-driven repayment and public service loan forgiveness.

Another attractive option available to physicians is student loan refinancing – which is what Laurel Road does. With student loan refinancing you can refinance all or some of your federal and private student loans. Refinancing gives you the opportunity to do one or more of the following:

- Lower interest rate(s)
- Pay off loans faster
- Lower monthly payments
- Move from a fixed rate to a variable rate (or vice versa)
- Reduce number of loans in repayment

To learn more about the different federal repayment options and student loan refinancing, check out our latest publication, *A Financial Guide to Surviving Residency*, at laurelroad.com/residency-guide.

1. Medical Student Education: Debt, Costs, and Loan Repayment Fact Card, AAMC, October 2018
2. https://www.medscape.com/slideshow/2018-residents-salary-debt-report-6010044
3. The 0.25% EMRA member rate discount is offered for student loan applications from EMRA members in good standing. The rate discount will end if EMRA notifies Laurel Road that borrower is no longer in good standing. Offer cannot be combined with other Laurel Road offers, except any discount for making automatic payments. The partner discount will not reduce the monthly payment; instead, the discount is applied to the principal to help pay the loan down faster

Welcome, EM Leaders of Tomorrow!

EMRA provides a leadership pipeline for every facet of the specialty. Please welcome the incoming EMRA committee chairs, chairs—elect, and vice chairs who are poised to make progress in 2020—2021.

Please see EM Resident online for full recognition of the committee leaders of 2019–2020.

Administration & Operations

Chair Ynhi Thomas, MD | Baylor College of Medicine

Chair–elect Nick Cozzi, MD, MBA | Spectrum Health/Michigan State University

Vice Chairs

Nicholas Stark, MD | UCSF — San Francisco General Hospital

Phillip Tseng, MD, MBA, MEd | The Ohio State University Wexner Medical Center

Critical Care

Chair Mark Ramzy, DO, EMT—P | Maimonides Medical Center

Chair–elect Mina Ghobrial, MD | Emory University

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Sean Hickey, MD | Mount Sinai School of Medicine — New York

Ally Hynes, MD | Hospital of the University of Pennsylvania

Timothy Montrief, MD | Jackson Memorial Hospital

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ABEM Announces Advanced Ultrasound Fellowship Program Requirements

ABEM continues to develop special recognition for emergency physicians with expertise in advanced emergency ultrasonography (AEMUS). Program requirements for AEMUS fellowship training are now available on the ABEM website. Approval of fellowship training programs under a focused practice designation falls outside of the purview of ACGME. The Emergency Ultrasound Fellowship Accreditation Council (EUFAC) accredits training programs based on AEMUS Program Requirements. Additional information is available on the EUFAC website. Questions can be addressed to inquiries@EUFACouncil.org, or FPD@abem.org. ✶

New Opportunity! Combined Subspecialty Training in Addiction Medicine and Medical Toxicology

ABEM is expanding career opportunities for emergency physicians. Combined subspecialty training in Addiction Medicine and Medical Toxicology has been approved by ABEM and the American Board of Preventive Medicine (ABPM). Normally, an Addiction Medicine fellowship is 1 year in length and a Medical Toxicology fellowship is 2 years; however, the combined fellowship training requires just 2.5 years of training. Program guidelines and application are available on the ABEM website. The application must be submitted to both ABEM and ABPM. ✶

EMRA/YPS Health Policy Primer: Get Ready to Rock

Advocacy newcomers, first-time LAC attendees, and all those interested in prepping for this year's issues should join the EMRA/YPS Health Policy Primer on Sunday, April 25.

Hosted by YPS Legislative Advisory Puneet Gupta, MD, FACEP, and EMRA Director of Health Policy Angela Cai, MD, MBA, this 4-hour event features Cleavon MD's "Schoolhouse Rock" rap explaining the legislative process. You'll also learn:

- Basics of health policy and advocacy
- Politics of policy
- How to advocate effectively

In addition, the 2020 Drop The Mic contestants will take the stage during the Health Policy Primer, and attendees will participate in a point/counterpoint discussion of how to solve the health care coverage dilemma.

Find details at https://www.emra.org/be-involved/events--activities/leadership-advocacy-conference/, and register for LAC at acep.org/lac. ✶

JACEP Open Accepting Submissions

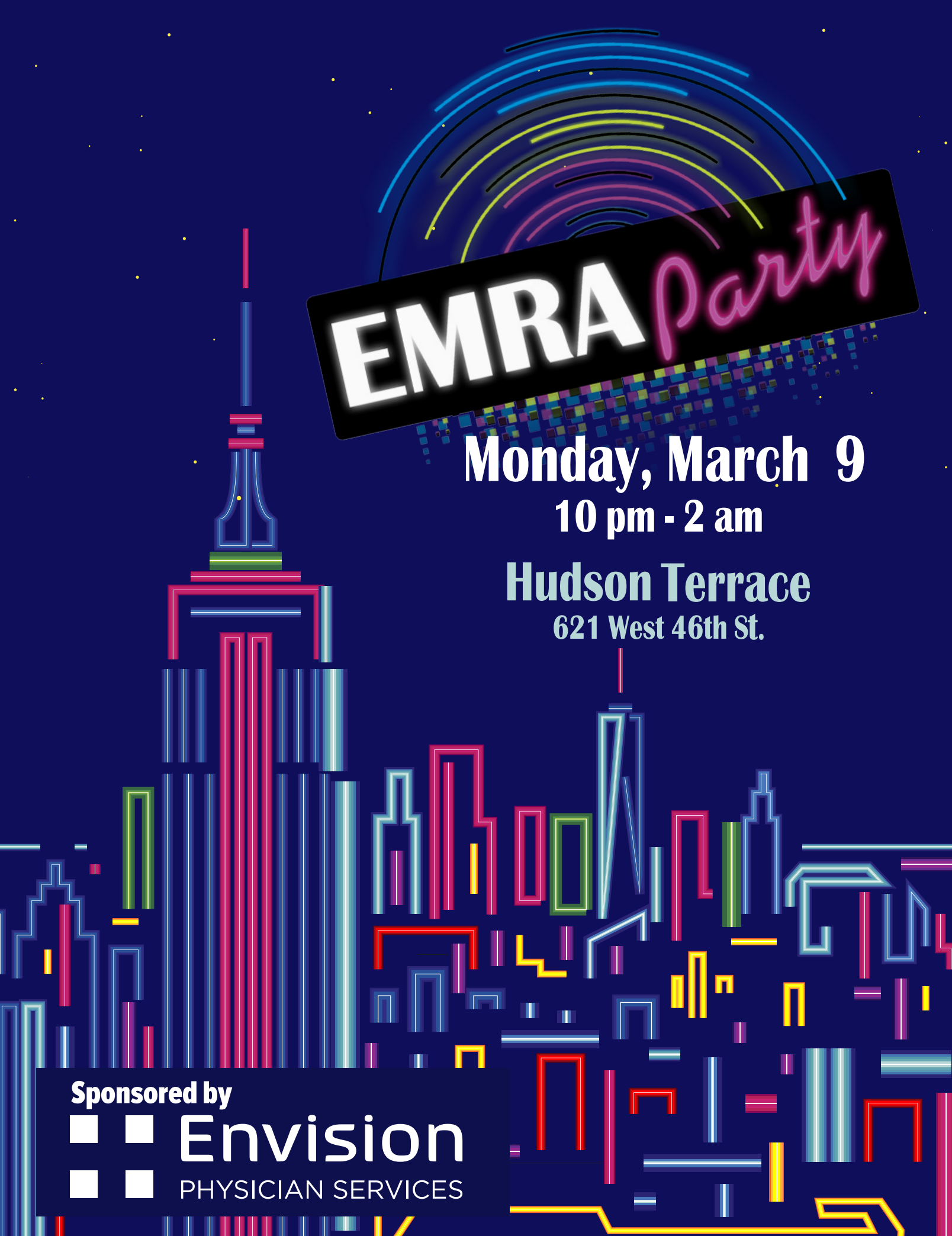
ACEP's new peer-reviewed, open-access journal is officially open for business! As a companion journal to *Annals of Emergency Medicine*, the focus of JACEP Open is to publish high-quality original peer-reviewed research, across the spectrum of basic and clinical research, in an open-access format to the worldwide community. Henry E. Wang, MD, MS, has been named editor, after serving as a deputy editor for Annals of Emergency Medicine. Article publication charges, deadlines, and submission requirements can be found at https://onlinelibrary.wiley.com/journal/26881152. ✶

Wellness & Assistance Program

The ACEP Wellness & Assistance Program offers ACEP members exclusive access to three free counseling or wellness sessions in partnership with Mines & Associates. Sessions are available 24/7 by phone, text or online messaging, or you can schedule a face-to-face appointment near your office, home, or school. Learn more at https://www.acep.org/life-as-a-physician/ACEP-Wellness-and-Assistance-Program. ✶

UPCOMING EVENTS

Feb. 26: NRMP Rank Order List certification deadline
March 7: EMRA Spring Medical Student Forum
March 7: EMRA Committee Events at CORD Academic Assembly
March 8: EMRA Quiz Show
March 8: Public Hearing & Resolution Review
March 9: Spring Representative Council Meeting & Town Hall
March 9: EMRA Party
April 25: Health Policy Primer at ACEP Leadership & Advocacy Conference
April 26-28: ACEP Leadership & Advocacy Conference
May 21-23: Essentials of EM 2020


EMRA Party
Monday, March 9
10 pm - 2 am
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ECG Challenge

Paul Smyser, MD
ChristianaCare
@p_smys

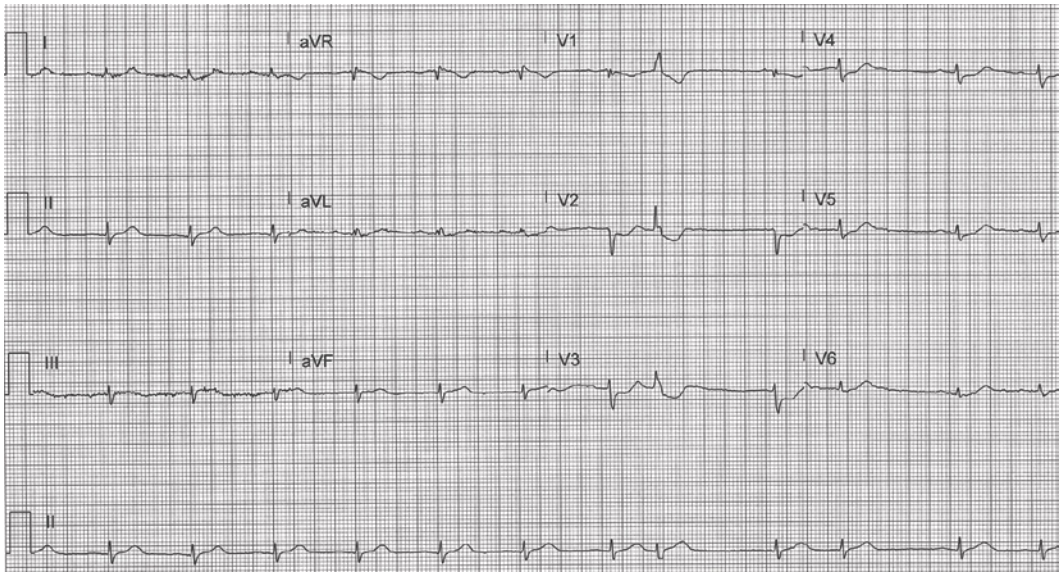
Jeremy Berberian, MD
Associate Director of Resident Education
ChristianaCare
@jgberberian

CASE.
A 62-year-old male presents with 1 hour of crushing chest pain radiating to the right shoulder.

What is your interpretation of the ECG and what would you do next?

Case continued on page 49

See the ANSWER on page 50



EMRA QUIZ SHOW 2020

CHECK OUT THE 2020 COMPETITORS! TEAMS ARE ANNOUNCED AT EMRA.ORG/QUIZ-SHOW

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Sponsored by Rosh Review, the Quiz Show is the perfect mashup of board prep and bar trivia. Compete or heckle from the audience, it's all fun and games!

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CORD *Academic Assembly*
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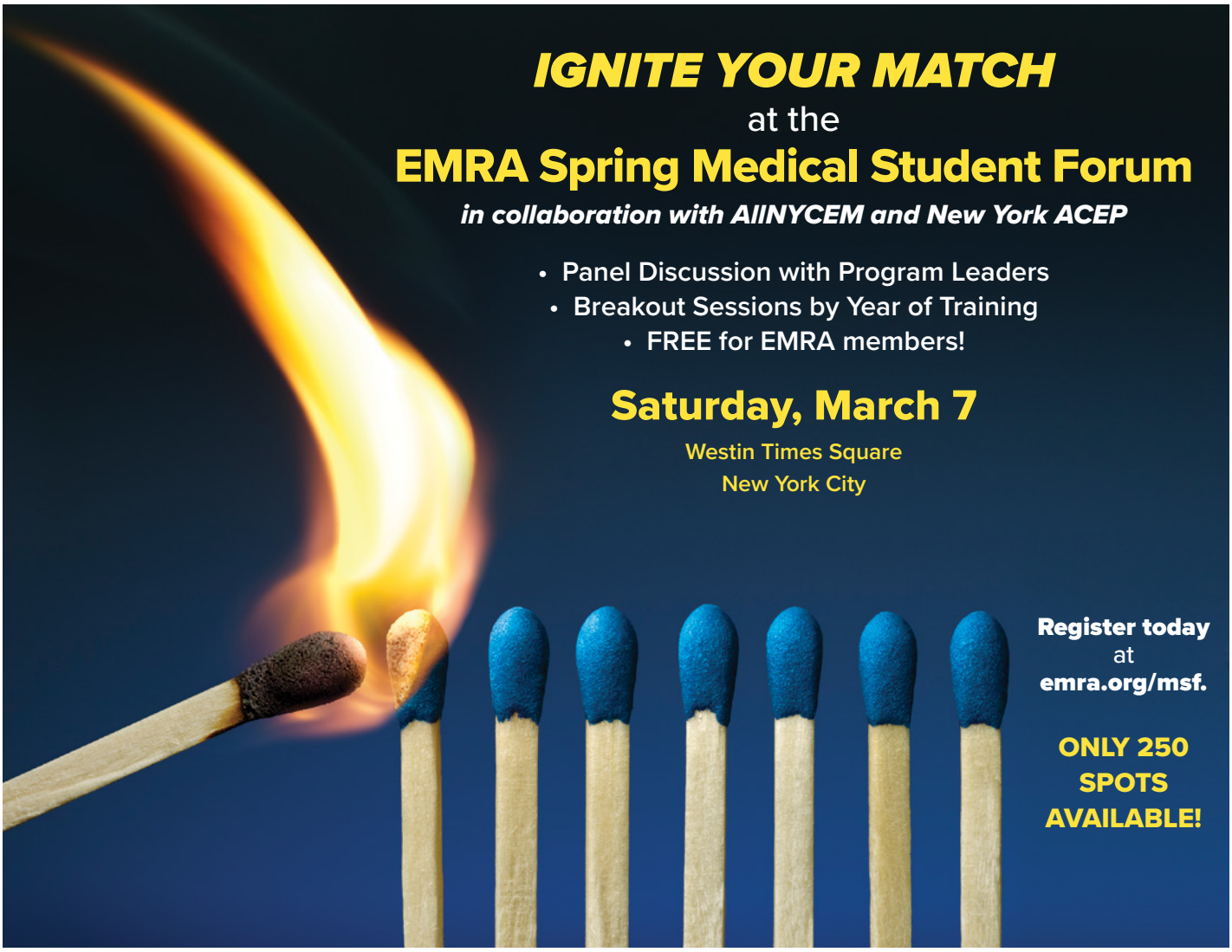

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ECG Challenge

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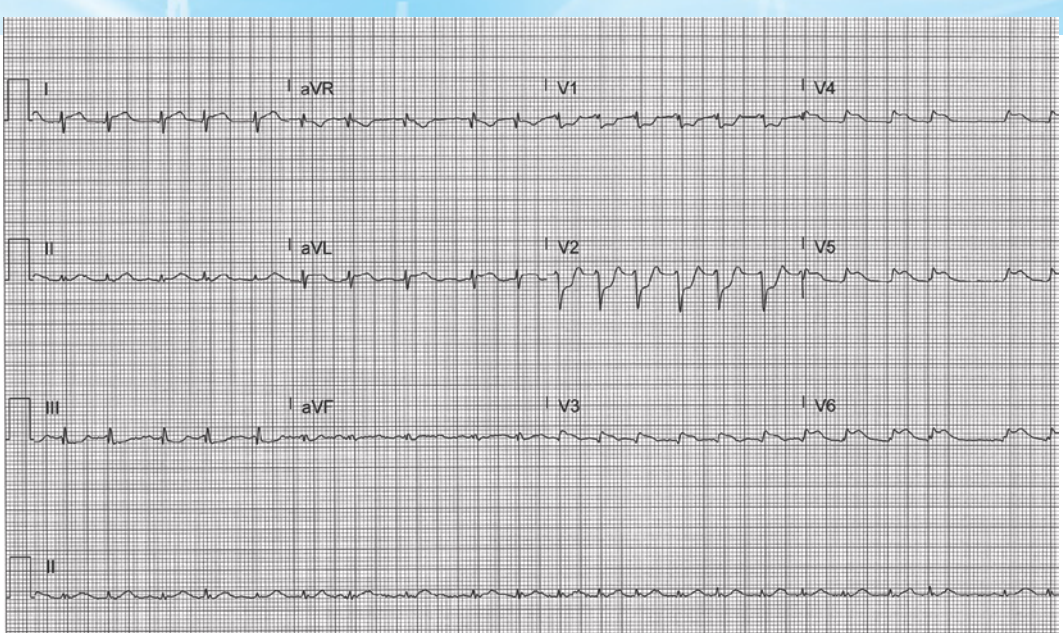
CASE CONTINUED.
This EKG shows sinus rhythm at 72 bpm with a PVC (8th QRS complex followed by compensatory pause) and STD in I, aVL, and V2-V6. The STD in V2-V3 are concerning for a posterior MI, so a posterior EKG was obtained. What is your interpretation of the following EKG and what would you do next?

What is your interpretation of the ECG and what would you do next?

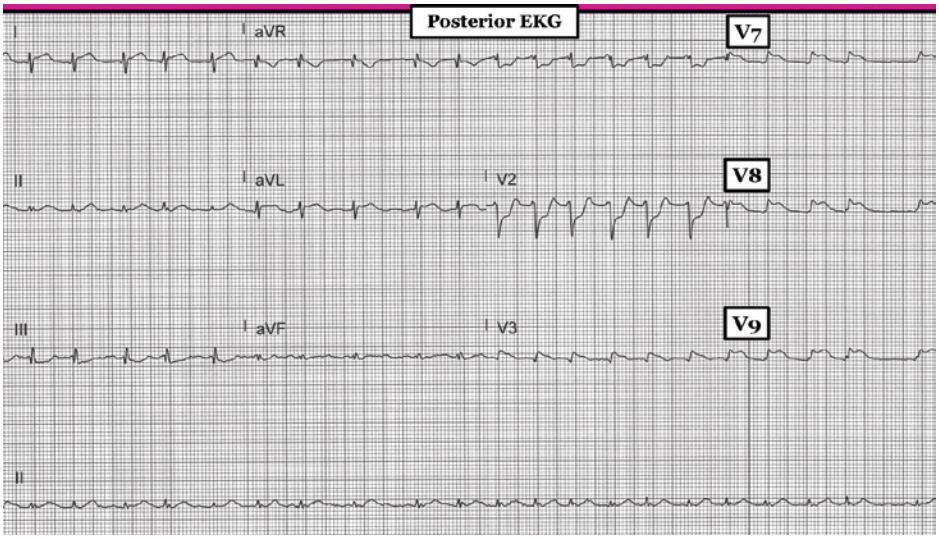
See the ANSWER on page 50



ECG Challenge

Anteroseptal STD

This EKG shows atrial fibrillation with a ventricular rate ~130 bpm, STE in aVL, V3, and V7-V9 with STD in III and V1-V2. The STE in V7-V9 meets AHA criteria for an acute posterior MI so the cath lab was activated.



Discussion

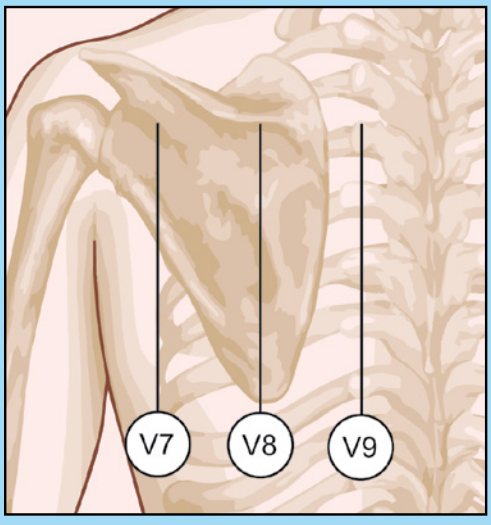
Isolated posterior, also called inferobasilar, MI is an important and easily-missed diagnosis. Infarctions in this territory are typically seen with either an inferior or lateral MI, and in such cases portend a worse prognosis due to the larger area of ischemia. However, an estimated 3.3% of STEMIs are isolated posterior MIs and therefore do not show evidence of ST-elevation with standard lead placement.[1]

Diagnosing an isolated posterior MI requires using posterior leads (see Learning Points below). The criteria differ from traditional STEMI criteria in two important ways: there only needs to be 1 posterior lead with STE and the STE only needs to be ≥0.5 mm. The classic findings in leads V1-V3 on a standard ECG (i.e., no posterior leads) that are concerning for a posterior MI include deep horizontal STD, upright T-waves, and tall R-waves (which are equivalent to q-waves in an anterior MI, and are not present in our case above).

LEARNING POINTS

Posterior MI

- Obtain a posterior EKG on any patient with a concerning story and isolated STD in V1-V3
- ≥0.5 mm STE in ≥ 1 posterior lead (V7, V8, or V9) diagnoses a posterior STEMI[2]
- Posterior lead placement (see image) is at the fifth intercostal space, parallel to the placement of V6, and moving lateral to medial:
  - V7: left posterior axillary line
  - V8: left mid-scapular line
  - V9: left paraspinal border[3]



Case Conclusion

The patient had a 100% occlusion of the distal RCA which was stented, and after a prolonged course in the cardiac ICU, the patient made a full recovery. ✶

References available online

Board Review Questions

1. For a patient with vaginal bleeding, which risk factor could indicate endometrial cancer?
   A. Anorexia
   B. Anovulatory cycles
   C. More than three lifetime pregnancies
   D. Multiple sexual partners

2. Which treatment option is recommended to prevent recurrences of pericarditis?
   A. Anti-inflammatories
   B. Colchicine
   C. Narcotics
   D. Steroids

3. A 14-year-old boy presents with acute shortness of breath and altered mental status 2 days after he fractured his lower leg. Petechiae are noted on his chest. His vital signs are BP 95/45, P 130, R 33, and T 38.6°C (101.4°F); SpO_2 is 85% on room air. Which intervention should be performed first?
   A. 1 L normal saline fluid bolus
   B. Heparin bolus at 80 units/kg
   C. Intralipid infusion
   D. RSI and endotracheal intubation

4. A 30-year-old man presents complaining of chest pain. He says he has used "a lot" of cocaine over the past 2 days. His vital signs include BP 170/120, P 120, and T 39.9°C (103.8°F). He appears very agitated. Laboratory test results include creatinine 2.6 and CPK 8500. Which treatment should be avoided?
   A. Active and passive cooling
   B. Intravenous haloperidol
   C. Intravenous lorazepam
   D. Intravenous normal saline

5. A 22-year-old man presents by ambulance after a high-speed crash. His car hit a concrete barrier, and he was ejected. On arrival, his GCS score is 5. He has bilateral periorbital ecchymosis. Which concomitant factor significantly increases the likelihood that he will die or have a poorer outcome?
   A. Heart rate
   B. Hypertension
   C. Hypothermia
   D. Hypoxia ✶

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

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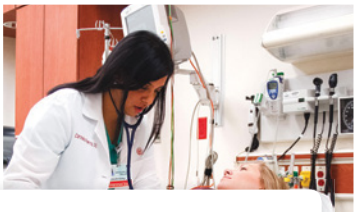

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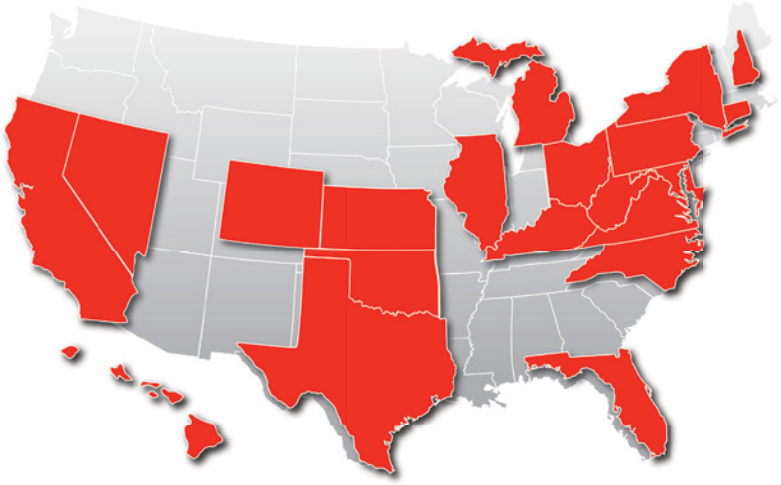

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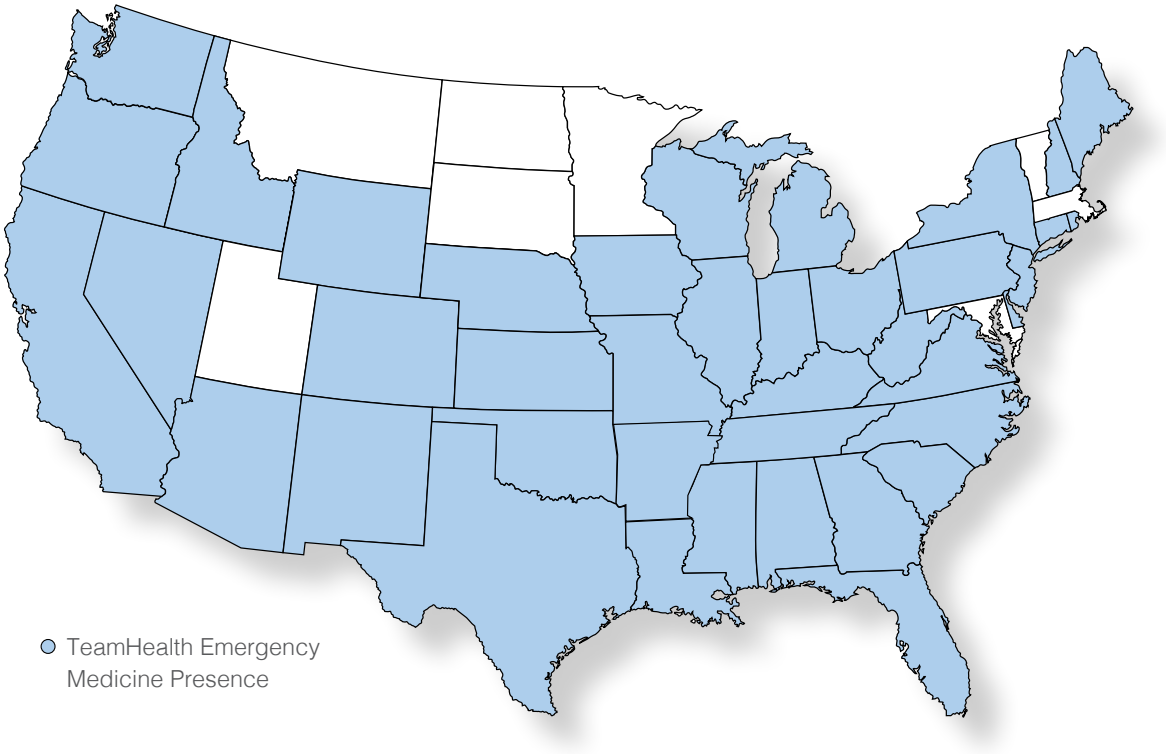

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