

EM Resident

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Dank Vapes



Terminal Extubation

**C-Spine Injuries
in Children**

COVID or Coral?



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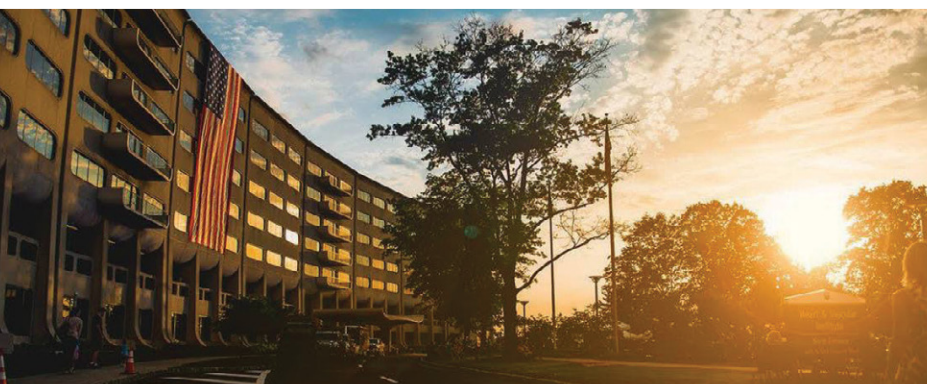
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On the Importance of Anti-Racism

Black lives matter.



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The past few months we have seen a resurgence of Black advocacy and empowerment like we haven't seen in years. There were Black Lives Matter protests in all 50 states and numerous countries around the world. The world wept together. The world marched together.

However, we still have so much more work to do. In so many avenues Black and minority communities are disadvantaged. Black women are up to 4 times more likely to experience a pregnancy-related death when compared to White women, even with things like income and education were factored in.¹ And a study that examined trends 2013 to 2017 noted that White patients in the United States received higher quality health care when compared to 40% of Black patients.²

Recent statistics noted that only 6% of physicians and surgeons are Black, even though Black people make up 14% of the United States population.³ This becomes even more problematic when we consider that minority populations tend to have higher rates of obesity, chronic illness. Black men have the lowest life expectancy of any racial group.⁴

Research from the National Bureau of Economic Research demonstrated

that Black patients, especially Black men, trusted medical advice more when it came from Black doctors than White doctors. The paper argued that centuries of oppression and brutality has made Black patients trust White authority figures less than the doctors who looked more like themselves.⁵ Thus, increasing representation becomes even more important.

Even though by now we have all heard about Black Lives Matter movement, it was important to me to highlight part of the group's mission statement for all of #EMRAFamily to read:

"Four years ago, what is now known as the Black Lives Matter Global Network began to organize. It started out as a chapter-based, member-led organization whose mission was to build local power and to intervene when violence was inflicted on Black communities by the state and vigilantes.

"In the years since, we've committed to struggling together and to imagining and creating a world free of anti-Blackness, where every Black person has the social, economic, and political power to thrive.

"Black Lives Matter began as a call to action in response to state-sanctioned violence and anti-Black racism. Our intention from the very beginning was to connect Black people from all over the world who have a shared desire for

justice to act together in their communities. The impetus for that commitment was, and still is, the rampant and deliberate violence inflicted on us by the state."

The statement is much longer, and I would empower all EMRA readers to take a few minutes to visit their website (blacklivesmatter.com) to learn more. I would also encourage you to join EMRA's Diversity and Inclusion committee. This committee has hosted international and national leaders at their events, which has always left me so fulfilled and refreshed.

The resurgence of anti-racism mentality in this country is the growth the country has been long overdue. We have been forced, repeatedly, to come to terms with the racism in this country. Racism is not dead. It is very much alive and thriving. And it's important for us to understand it will never be dead. We all need to continuously work to be the change we want to see. I have already witnessed positive changes in the community, with my hospital creating a task force that works to intentionally increase diversity in residency programs and in program leadership. Multiple studies have demonstrated that diversity in an organization's leadership is important and has shown that diverse companies produce 19% more revenue.⁶

I implore everyone reading this to not only be educated and informed, but to be anti-racist. ★

Life of an ED Resident in the Era of COVID-19

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@hrh_approved

It's night 6 of 6, with 51 clinical hours already logged in the books. Walking into shift, I'm thinking about all the "extra" things I have to do outside my clinical responsibilities — that Grand Rounds lecture I'm giving in 3 weeks; finishing up the next month's resident shift schedule; the dozens of medical student emails with questions about the upcoming residency application cycle needing responses.

The back doors of the ED open with a sign that says, "DO NOT ENTER" in big capital letters. Underneath, "*Only clinicians treating ED patients permitted past this point.*" It serves as a reminder that most people, patients and hospital staff alike, are doing everything they can to stay away from the place where I've spent the most time during the past week.

It was eerily quiet, with no one in the lobby and no one in the Shock Resuscitation Unit, what we lovingly call the SRU ("shrew"). But I put on my armor anyway — N95, surgical mask, face shield — ready for the battle that will inevitably come. As I prepare to take sign out from my colleague, the telemetry phone rings. I answer, "University Hospital, this is MD 2104. Go ahead with report." I can sense the angst in the paramedic's voice as he tells me about incoming patients. I call out over the hospital system, "Trauma STAT, multiple GSW victims, ETA 5 minutes." The SRU went from no one to 6 patients instantaneously.

What is it like to be an emergency medicine resident in the era of COVID, particularly in a city that is not a hot spot?

- Crime is up, with more penetrating trauma than usual
- Accidental opioid overdoses are up, leading to more buprenorphine administration than I've ever given before
- Suicide attempts are up, as patients

At the end of 8 hours, I've seen 32 patients and called time of death on 8 people. None of them had COVID, but COVID affected every one of us.

battle their mental health diseases while coping with new realities of unemployment, food scarcity, and even homelessness

Of the 6 patients who roll in, 2 go up immediately to the operating rooms, another 2 go to the CT scanners in the ED for imaging, and 1 moves swiftly to the pod, as he is not in critical condition. For the final patient, I call time of death after we've given multiple blood products, intubated, and performed a thoracotomy.

It's less than an hour into my shift.

The social worker finds me, handing over a purple Post-It note with information for the patient's mother. He was 16. I braced myself as I dialed her number to deliver the worst news she will ever hear — all via telephone — because COVID-related restrictions prohibit visitors from entering the hospital. Her sobs are unforgettable.

No sooner than hanging up the phone, I'm called by EMS again for not one but two different patients who sustained cardiac arrests in the field and had no return of spontaneous circulation. The death toll for the shift is already up to 3 and I can't help but wonder — were they having chest pain and afraid to come to the ED? Were their deaths preventable? I throw away the thought, not because it isn't important to understand the unintended implications of stay at home orders, but because there are now 9 new stable patients waiting to see me in the pod with complaints ranging from abdominal pain, to frequent falls, to dizziness.

As I'm catching up on documentation, I look up from my computer and see the charge nurse trying to wake a patient

on the EMS' gurney, but the patient doesn't respond. Back to the SRU I go. The patient had ingested over 200 pills of his anti-hypertensive medications and benzodiazepines within 30 minutes. We move swiftly to intubate him and drop a gastric lavage tube, something I've never done before in training but figure it out on the fly. As I literally pump his stomach, I think how rarely indicated it is to perform the procedure, how archaic it seems to do so. By the time we're done, he's on 3 pressors, high-dose insulin and glucose, and methylene blue. Off to the medical ICU he goes.

At the end of 8 hours, I've seen 32 patients and called time of death on 8 people, 4 in the ED and 4 in the field. I walk out, defeated by so much loss, and go home to my husband (a resident himself) to decompress and get ready to do it all over again in 2 days.

None of the patients I saw that day had COVID, but COVID affected every one of us — from the sweaty mask I took off at the end of my shift to the mental health implications, socioeconomic factors, and health-seeking behaviors it wrought in my patients.

I never imagined training during the middle of a pandemic. But I did sign up to be available 24-7-365 for any patient who walks through the door — regardless of age, gender, orientation, race, religion, citizenship status, or ability to pay.

I did not sign up to be on the front lines of COVID. But I am humbled to put on my armor and return each day, because there is no greater honor in life than to step up during a time of need.

I am an emergency medicine resident. ★

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Emergency Medicine Residents' Association



Terminal Extubation in the ED

Palliative Care in EM

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Toward the end of your shift, EMS presents with a 94-year-old female found obtunded in her home by neighbors after an unknown period of time. She required intubation in the field by the paramedic for depressed level of consciousness; neither family nor a POLST form were available on scene. Her vitals are stable on arrival and she has a history of hypertension, prior ischemic stroke, and atrial fibrillation on coumadin. Her CT shows a large intraparenchymal hemorrhage with intraventricular extension and midline shift. Her bleed is deemed to have poor chance of recovery by the EM, Neurology, and Neurosurgery Teams. A discussion with her children who have arrived at bedside reveals that she did not want to receive aggressive treatment or be on a ventilator for any period of time. The decision is made to transition to comfort measures. Your ICU is at full capacity and you are boarding critical care patients in your ED; therefore, you make the decision to terminally extubate the patient in the ED and transition her to the palliative care service.

Palliative Care in the ED

Palliative care is a growing topic of interest in EM. Greater than 50% of geriatric and 80% of metastatic cancer patients visit the ED within the final months of life.¹ Beyond discussions of advance directives, goals of care, POLST forms, and hospice services, providing palliation and end-of-life care has become an important aspect of emergency medicine. Providers likely will be faced

with the need to terminally extubate a patient in the ED during their careers; this has become especially relevant in this time of the COVID-19 pandemic. Comfort measures and terminal extubation may be one of the most important procedures you perform during your shift.

Teamwork and Communication

Goals of care discussions and breaking bad news are fundamental skills for an EM clinician. Once the decision

to transition to comfort care has been decided, effective communication with family members is key to understanding their wishes and setting expectations. Several studies have shown that open and clear dialogue with families regarding their relative's wishes and symptom management contributed to higher family satisfaction during end of life care in ICUs.^{2,3} Ensure you have thoroughly explained the steps that will take place and signs of the dying process that family may notice. Reinforce that your team will be attentive to keeping the patient comfortable. If possible, consider moving the patient to a private room in a quieter section of the department with more room for family members and loved ones. A sign on the door indicating the need for privacy can be considered. Ensure the nursing team and respiratory therapists are aware of the plan and prioritize patient and family comfort. Consider speaking with organ donation services, social workers, and spiritual care if requested by family as well your hospital's palliative care team.

Preparing Your Patient

Prior to terminal extubation, consider several steps to prepare the patient. This will be the last time family members will be able to see their loved one alive. Therefore, compassion and respect for the patient, family and loved ones are paramount. Attempt to organize the room and provide the patient with enough blankets and pillows. Adjust clothing or hospital garb for the patient.

Anecdotal evidence indicates aspiration and emesis can sometimes occur during the process of terminal extubation: consider decompression of the patient's stomach contents with a nasogastric tube if already in place. The care team should remove blood pressure cuffs, telemetry leads and any other monitoring devices in the room; this ensures a peaceful environment for the patient and limits additional stress to family. If remote-only monitoring is possible, providers may consider leaving only finger pulse-oximetry to monitor waveform/pulse on telemetry to note time of death. If a prolonged course is expected and it does not provide discomfort to the patient, urinary catheters may remain

in place at the provider and family's discretion; condom-catheters may be considered in male patients as a less intrusive option. Wound care in patients with traumatic injuries should be limited to limit odor and drainage and preserve patient dignity.

If the patient is on vasopressors, IV fluids or receiving any other non-palliative interventions these should be stopped prior to terminal extubation. Patients with automated implantable cardioverter-defibrillators (AICD) should have the defibrillator function deactivated with a ring magnet and left-ventricular assist devices (LVAD) can be disconnected from their battery source or driveline controller unit. Depending on your state guidelines and patient's presentation, endotracheal tubes (ETT) and IV access must remain in place prior to evaluation by the local coroner's office. Withdrawal of life-sustaining treatment may be delayed in order to achieve appropriate and anticipatory symptom management. Delaying withdrawal of care for family arrival or spiritual rites should be considered by the provider but not unduly prolong suffering of the patient.

Medications

Prior to terminal extubation, providers should actively treat any symptoms the patient is experiencing as well as anticipate symptoms that may occur after extubation. Opioids, benzodiazepines, and anticholinergic medications are the cornerstones of pharmacotherapy of the dying patient. Appropriate, early and frequent re-dosing are key to ensuring the patient remains comfortable during the dying process.

Opioids play a large role in palliative care for the management of both pain and dyspnea. Morphine is a mainstay of palliative care, but providers may also choose to use hydromorphone or fentanyl (Table 1). Bolus dosing of morphine in opioid-naïve patients typically starts at 0.1 mg/kg IV for analgesia or 0.05 mg/kg IV for air hunger.⁴ This should be repeated every 15-30 minutes to achieve desired effect and may require significantly higher doses for patient chronically taking opioids.⁵ Maintaining adequate serum levels can then be

achieved with infusions, long-acting formulations, or repeated dosing. Infusions are particularly useful for the ease of titration. For example, a morphine infusion of 2 mg/hr and 2 mg IV q15min for breakthrough pain or RR > 18 with increase in rate by 1 mg/hr if 3 or more PRNs are used within one hour is one commonly used approach.⁴ Doses may need to be titrated up to 10 mg/hr or more, particularly in patients with chronic opioid use or severe respiratory failure.⁵

Providers may be concerned about using opioids in comfort-care patients due to the theoretical effect of depressing respiratory drive and thus hastening death. This is known in palliative care as the "double-effect". Providers have a legal and ethical mandate to provide appropriate comfort as a primary goal, even if this may hasten patient death as a secondary effect.⁴ However, there is evidence that when opioids are titrated for subjective respiratory comfort, they do not significantly alter PaCO₂, PaO₂, or overall survival.⁶ In fact, appropriately elevated morphine dosing has been associated with no change or a longer time to death.^{5,7} However, opioids are certainly not benign medications and providers should be ready to manage side effects including histamine response and nausea.

Patients nearing end of life may also be experiencing anxiety, and/or delirium. Mainstays of treatment will include benzodiazepines and antipsychotics (Table 1).⁴ These medications will need to be titrated to effect with significant ranges in effective doses due to many factors including age, gender, renal/hepatic function, and prior exposure to these medications. A patient's comorbidities and prognosis may influence your medication choice, i.e., use of lorazepam for patients with hepatic impairment or midazolam when faster onset is a priority.

Some patients may experience nausea or vomiting and are particularly at risk following extubation and with the use of opioids. Ondansetron is a commonly prescribed antiemetic and may be particularly effective in patients receiving chemotherapy. Dexamethasone may also alleviate nausea related to

chemotherapy use.⁸ Metoclopramide should be considered if gastroparesis or stomach compression are thought to be contributory.⁸ Finally, dopamine antagonists can be effective for refractory nausea.⁸

Secretions commonly contribute to the anxiety of family members and loved ones due to the characteristic death rattle.⁹ Anticholinergics can be provided to decrease secretion production with glycopyrrolate and scopolamine showing equivalent efficacy.¹⁰ These medications only limit new secretion production so they may take time to effectively show a change in symptoms. Frequent, gentle suctioning is key. Atropine ophthalmic drops work quickly and may be administered PO if IV access is not possible or the patient's skin is not amenable to patches.¹⁰ (Table 1)

When choosing medications to address symptomatic care and preparation for terminal extubation, EM providers should consider onset of action, half-life, and dosing. Unlike patients that have been admitted for hours or days, patients arriving in the ED have not yet received prior treatment or reached therapeutic levels. An initial bolus followed by infusion or long acting medications is generally necessary. Building flexibility into your orders via titration and/or PRNs will allow your team to meet patient needs in a setting where patients will need to be frequently re-evaluated. Having additional PRN doses available at bedside during the extubation process can help in avoiding delays in treatment. Intravenous medications are preferred due to the faster rate of onset and the ease of titration. If IV access is unavailable providers may consider buccal, nasal, subcutaneous, oral, or intramuscular routes for certain medications. (Table 1) The care team should monitor the patient closely for signs of distress including fist-clenching, tears, grimacing, tachycardia, diaphoresis, tachypnea, accessory muscle use, and nasal flaring. Standardized assessments scales such as Sedation-Agitation Score (SAS) or the Ramsay Agitation Sedation Scale (RASS) may provide additional input. Ketamine is not routinely recommended

by several guidelines due to concerns for emergence reactions.¹¹⁻¹⁴ Paralytic agents during terminal extubation are not recommended as they may blunt the care team's ability to assess the patient for signs of distress and may unnecessarily hasten the dying process.¹¹⁻¹⁴ Propofol may be considered as a sedative/anxiolytic and has anti-emetic properties.¹³

Terminal Extubation

Once the patient has been adequately medicated and other life-sustaining measures stopped, the patient can be considered for terminal extubation. There are two general techniques for removing a patient from ventilator support — terminal extubation and terminal wean — each with various indications and outcomes.^{4,11,13,17-20} Terminal extubation (without a slow taper in respiratory support) may be considered in patients without significant respiratory compromise (ie, those intubated for depressed GCS) and still have a gag reflex. Terminal wean is preferred when there is concern for respiratory compromise (ie, ARDS, pulmonary edema, COPD).

To perform a terminal wean, patients should be placed on IMV or PS mode and then should have a step-wise decrease in the FiO₂ to 40% and PEEP to 5 cm H₂O. At each step-down, the patient should be reassessed for signs of air hunger or agitation and receive appropriate bolus dosing and up-titration of infusions to match symptoms. The RSBI (Rapid-Shallowing Breathing Index: respiratory rate divided by tidal volume) can be used to determine level of distress.⁴ The terminal wean is usually performed over 10-60 min depending on the patient.^{4,12} Once the ventilator settings have been weaned and the patient's symptoms addressed, the provider can consider extubating the patient. If imminent loss of airway or significant respiratory distress is anticipated during weaning or removal of the ETT, several guidelines suggest a proactive rather reactive approach using aggressive palliative sedation.^{4,12}

When performing the extubation, have suction ready, turn off the ventilator alarms, and have a respiratory therapist at bedside if possible. Consider draping the patient's chest with absorbing pads during the extubation to prevent

secretions and blood landing on their gown. Providers should consider wearing PPE depending on the circumstance as this can be an aerosol-generating procedure. Once off ventilator support, guidelines vary on removal of the ETT.^{11,13,18} Many providers will remove the ETT for patient comfort and family request. However, in some cases such as massive hemoptysis, major facial trauma, significant secretions or swollen tongue the patient may be more comfortable with the ETT kept in place with a T-piece and humidified air. If stridor is anticipated or noted post-extubation, providers may give nebulized epinephrine or steroids such as methylprednisolone to help with symptom management (Table 1).^{11,21} In general, guidelines do not recommend transitioning to non-invasive ventilation after extubation.¹⁴

Setting Expectations

Family members may inquire how long the dying process will take and what symptoms may occur. Answering these questions can be difficult but important for anticipating symptom management, family expectations, and disposition. On average, ICU patients survive between 35 minutes to 7.5 hours after terminal extubation.¹¹ Providers must be able to recognize key symptoms that require interventions in the dying patient. The most common symptoms requiring intervention include fatigue (28.7%), pain (22.1%), and respiratory distress (22.1%).²² Several studies have shown that it is difficult for providers to accurately predict time of survival in individual patients after extubation.^{11,22,23} The death rattle (sound of secretions pooling in the hypopharynx and bronchial tree), respiration with mandibular movement, Cheyne-Stokes respirations, and cyanosis of extremities are common symptoms in the dying patient, however none is specifically predictive of imminent death (can be noted hours to days before death) or used to accurately predict duration of survival.²⁴ Other factors such as GCS score, SpO₂, and the amount and duration of sedation/analgesia required have also not been found to be predictive of time of death.¹¹ It is important for providers to communicate these uncertainties to families when setting expectations.

TABLE 1. Review of Medications to be Used in Symptomatic Care for Palliative Patients

	Medication	Initial Bolus	Infusion with Titration/PRN	Time to Onset
Pain	Morphine	0.1 mg/kg IV	2 mg/hr IV and 2 mg q15m for breakthrough pain	5-10 min
	Hydromorphone	1 mg IV	0.5-3 mg/hr	5 min
	Fentanyl	1-2 mcg/kg IV	Repeat 0.35-0.5 mcg/kg q30-60min PRN	Immediate
Dyspnea	Morphine	0.05 mg/kg IV	0.05 mg/kg/hr IV with 1-2 mg IV PRN	5-10 min
Anxiety/Agitation	Haloperidol	2-10 mg IV	Repeat 0.5 to 6 hrs PRN	3-20 min
	Midazolam	0.5-5 mg IV	Repeat 0.5-2 mg/hr	3-5 min
	Lorazepam	0.25-2 mg IV	Repeat q3-6hr PRN	2-3 min
Nausea/Vomiting	Ondansetron	0.15 mg/kg or 4-8 mg IV	Repeat q8hr PRN	30 min
	Dexamethasone	4-20 mg/day IV	Dosed daily or split BID	2-6 hours
	Haloperidol	0.5-2 mg IV	Repeat q6-8hr PRN	3-20 min
	Metoclopramide	5-10 mg IV	Repeat q4-6hr PRN	1-3 min
Secretions	Glycopyrrolate	4 mcg/kg IM/SC/SL/IV	Repeat q6-8hr PRN	IV < 1 min IM 15-30 min
	Scopolamine	1 patch	Repeat daily	4-8 hours
	Atropine	0.4-1 mg IV/SL/SC 1% Opth Solution: 1-2 drops PO	Repeat q4-6hr PRN	IV, opth solution – 30 min
Respiratory Stridor	Methylprednisolone	100 mg IV or IM	Repeat q8-12h PRN	1 hour
	Nebulized Epinephrine	0.5mL via nebulizer		Immediate

Assume immediate-release formulations of medications and availability of IV access. Doses provided are for medication-naïve patients and higher doses may be needed for chronic users of opioids/benzodiazepines.

IV – intravenous, IM – intramuscular, SC – subcutaneous, SL – sublingual, PO – by mouth.^{4,12,15,16}

Improving the Process

Providing end-of-life care in the ED is an essential skill for EM providers. The ABEM Model of Clinical Practice includes palliative care as an essential part of residency training.²⁵ Programs should consider including didactics and simulations on end-of-life discussions and terminal extubation. Residents can continue to improve these skills and the processes in their departments by providing dedicated training to fellow residents, nursing, and ancillary ED staff, discussing guidelines with department leadership and debriefing sessions after individual cases. Several guidelines exist that providers may reference.^{12,13,26,27} Palliative care, and particularly the process of terminal extubation, does not make for an easy shift. Transitioning from managing a critically ill patient to the application of comfort care is taxing for patients, families, and health care teams. Clear communication, establishing an appropriate environment,

aggressive management of symptoms, and understanding the concepts of terminal extubation will help ensure a compassionate and dignified process for your patients and their families.

Case Resolution

After discussing the plan with both the patient's family and nurse, you move the patient to a private room designated for end-of-life care. The nurse administers a bolus dose and infusion of morphine. Once your patient appears comfortable, the respiratory therapist terminally extubates the patient. You and the nurse frequently re-assess the patient for additional PRN doses of medications and gentle suctioning as needed. After monitoring for 40 minutes and checking with family, your patient continues to have a faint pulse and SpO₂ around 84%. You discuss with the palliative care team, who admits her to their service. Your patient passes away peacefully 6 hours later with her family at bedside. ★

TAKE-HOME POINTS

- When transitioning a patient to comfort care and performing terminal extubation in the ED, maintain open and clear communication with your patient, their families, nursing and ancillary staff.
- It is important to set the scene. Establish a private space, turn off monitors, and avoid unnecessary procedures to reflect the respect and compassion this situation deserves.
- Be aware of and closely monitor symptoms associated with the dying process. Appropriate medications such as opiates, benzodiazepines, and anticholinergics should be given early and as frequently as needed.
- Be familiar with the process of terminal extubation. Understanding the preparatory steps and post-extubation care are essential to ensuring a comfort-oriented, compassionate and dignified process for your patient. Training and establishing departmental guidelines can help ease what can be a difficult process.

COVID or CORAL? A Case Report

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St. Joseph's Regional Medical Center

May 2020: You're working in a busy inner-city ED amid the coronavirus pandemic. You get an ALS call: 44-year-old male, no known PMX, en route with shortness of breath, saturating 80% on room air. Your next steps have become rote. The escalation algorithm flashes in your head: nasal cannula, non-rebreather mask, non-invasive positive pressure ventilation, and, if all else fails, endotracheal intubation.

The patient arrives in moderate respiratory distress, tachypneic, RR > 40. There is obvious increased work of breathing, though he is still able to speak in full sentences. He has had some tactile fevers and GI symptoms, both of which you know by now are typical of COVID-19. His wife and daughter have similar symptoms and are in the ED, further solidifying a viral picture in your head. Treatment with oxygen via nonrebreather improves his symptoms. You establish IV access, get labs, and continue to monitor. Chest radiography looks familiar: bilateral ground glass opacities (Figure 1). ABG reveals a P/F (PaO₂/FiO₂) ratio of 116. Labs show moderately high leukocytosis – not something routinely associated with COVID-19, but this evolving virus requires diagnostic flexibility.

Then you notice something else odd: his inflammatory markers (namely D-dimer and ferritin) are not as elevated as you expect. Then the COVID-19 test comes back negative. What are you missing?

Upon re-evaluation, the patient mentions he recently cleaned his home aquarium for the first time in 7 years. He didn't use any chemicals, but his aquarium contains some living coral, over which he ran hot water. Could this be related to the clinical presentation?

Discussion

Palytoxin is a nonprotein environmental toxin found in the Zoanthid coral species, which includes Palythoa and Zoanthus subspecies. This compound was first isolated in the 1970s and is thought to be one of the most toxic marine substances ever classified.¹ The ornate corals that contain this toxin are soft; they are occasionally used in home aquariums and are sometimes available for commercial purchase. In vivo, palytoxin acts on blood vessels to cause vasoconstriction. On the cellular level palytoxin inhibits the sodium-potassium ATPase.²

Though exceedingly rare, inhalation can cause respiratory distress and even respiratory failure. The irritant properties of palytoxin are thought to contribute to the inflammatory reactions seen with inhalational contact.³ Often released upon cleaning this specific type of coral, steam containing palytoxin is pungent and foul-smelling. Symptom onset is usually minutes to hours following exposure.^{4,7} Lab studies often show leukocytosis, and patients can present febrile.⁸ Without sufficient history, this presentation could easily be mistaken for pneumonia, especially in conjunction with an abnormal chest x-ray.⁹⁻¹⁰

Aside from respiratory distress and

failure, in some reports, clinical toxidrome can present with GI symptoms and distorted sense of taste,¹ very like the 2019 novel coronavirus. Palytoxin may even cause generalized fatigue and muscle weakness due to rhabdomyolysis or cardiac dysrhythmias,¹⁰ and overall can lead to death.^{1,11}

In addition to inhalation exposure, there are reports of GI and dermatological toxicity through ingesting the toxin in contaminated seafood or handling coral, respectively.⁴⁻⁵

There is no specific antitoxin.

Treatment is often supportive, sometimes including inhaled steroids. Patients usually recover within several days of exposure.

Case Conclusion

The whole family was admitted to the hospital. The patient and wife were afebrile; however, their daughter had a temperature of 101°F. Labs showed elevated ESR, CRP, lactic acid, and procalcitonin, as well as acute kidney injury. Chest CT showed confluent ground-glass opacities with areas of consolidation involving the lung apices, plus interlobular septal thickening (Figure 2). Leukocytosis (WBC as high as 27 x 10³/uL for the patient, 35 for the wife, and 37 for his daughter) trended down over time. Each family member was hospitalized several days, with symptoms and CXR infiltrates peaking on day 2–3. High flow nasal cannula was used for symptomatic treatment, and the patient's acute kidney injury resolved with hydration. The family was discharged with strict instructions not to handle or attempt to clean the coral again. ★

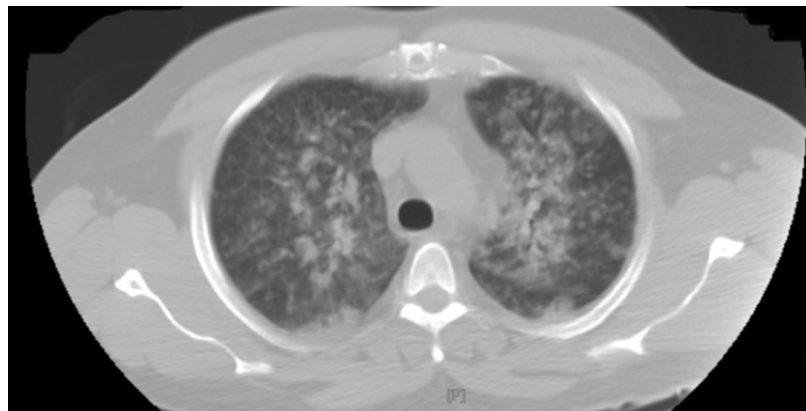
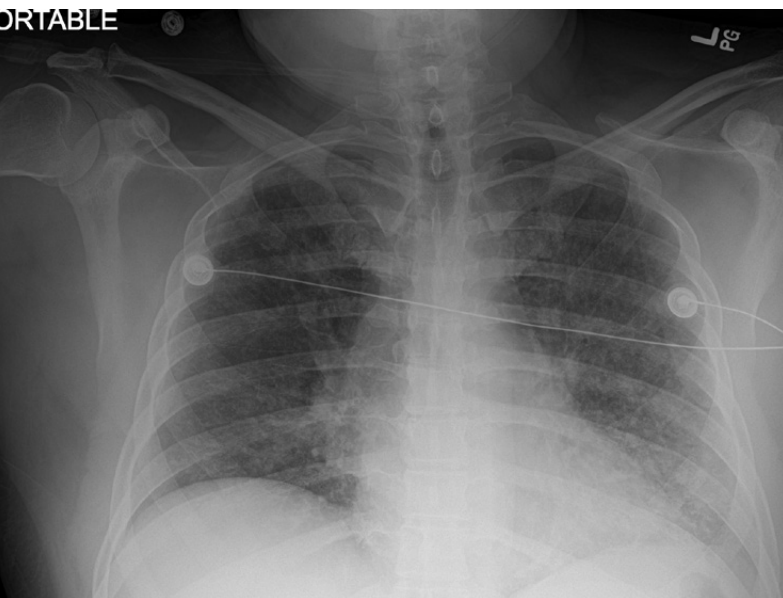


FIGURE 1 (left). Bilateral Ground Glass Opacities
FIGURE 2 (above). Interlobular Septal Thickening



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Management of a pregnant trauma patient can be challenging as the physician must be aware of the anatomical and physiological changes of pregnancy in addition to the clinical implications these changes have in a trauma setting. It is important to keep in mind that the mother's wellness is a priority during resuscitation of pregnant trauma patients as fetal outcome is largely dependent on aggressive and early resuscitation of the mother. This concise review article highlights key concepts in the management of a pregnant trauma patient. Table 1 provides an overview of the anatomic and physiologic changes of pregnancy.

Pre-hospital Care

The pre-hospital care of pregnant trauma patients focuses on rapid assessment, adequate stabilization, and transport to the nearest appropriate medical facility. It is recommended to place pregnant women in the left lateral decubitus position in order to alleviate compression on the inferior vena cava (IVC) and improve hemodynamics.¹ The 2015 American Heart Association guidelines on cardiac arrest in pregnancy recommend placing pregnant women in supine position with manual displacement of the uterus superiorly and laterally towards the left due to

Plus One

Care of the Pregnant Trauma Patient

improved quality of chest compressions and ease of performing resuscitation procedures (eg, intubation). These same recommendations should be followed when possible when cardiac arrest is secondary to trauma. Additional resuscitative measures include obtaining intravenous (IV) access, leg elevation, and supplemental O₂ administration.²

ED Assessment and Management
Primary Survey

The ED management of the pregnant trauma patient should ideally consist of a multidisciplinary approach. If possible, the trauma and obstetrical teams should be activated early. Additionally, the neonatal intensive care unit should be consulted as early as possible in preparation for a potential infant resuscitation.

1. Airway

Pregnant patients have altered respiratory physiology resulting in a decreased functional reserve capacity (FRC), increased oxygen demand, and thus lower tolerance to prolonged apnea times. Therefore, a pregnant trauma patient should be preoxygenated adequately when the airway needs to be secured. Airway management is further complicated due to increased edema, hyperemia, and friability of the mucosa of the upper airway in pregnant women and may result in an increase in the Mallampati score.³ In the pregnant population, the rate of failed tracheal intubation is 0.4%, ten times higher than for the non-pregnant population (0.04%).⁴ The application of cricoid pressure has been recommended despite the lack of evidence supporting its benefit.^{5,6} Because of the decreased esophageal sphincter tone during pregnancy, there is an elevated risk of aspiration.⁷ To reduce this risk of

aspiration, an orogastric tube placement should follow intubation.⁸

2. Breathing

Evaluation of respirations in the pregnant patient mirrors what is done in the non-pregnant patient. As noted in Table 1, PaCO₂ is reduced in pregnancy. A normal or elevated PaCO₂ may represent pending respiratory failure. Due to the elevation of the diaphragm that occurs during pregnancy, management of a pneumothorax proceeds with placement of a tube thoracostomy 1 to 2 intercostal spaces superior to the usual 4th or 5th intercostal space anterior to the mid-axillary line.⁸

3. Circulation

All trauma patients should have 2 large-bore IV cannulas placed to aid with volume resuscitation. Shock may be due to hemorrhage, direct cardiac injury, or obstructive mechanisms such as tamponade or tension pneumothorax. The uterus should be displaced manually or by placing the patient in left lateral decubitus position. When transfusion is necessary, the risk of alloimmunization in the Rh (-) mother is reduced by administering uncrossmatched type O, Rh (-) blood until type specific blood is available.⁹

4. Disability

Disability assessment is a rapid neurologic assessment that includes a Glasgow Coma Scoring, pupillary examination, as well as an evaluation for lateralizing neurological deficits.

5. Exposure and environmental control

As in the general population, the patient should be fully exposed and thoroughly assessed. Hypothermia should be prevented in order to avoid the "trauma triad of death" — a vicious cycle involving hypothermia, coagulopathy, and acidosis.¹⁰

Secondary Survey

History

In addition to obtaining a thorough obstetrical history, providers can use the mnemonic AMPLE (allergies, medications, past illnesses/pregnancies, last meal, events/environment related to trauma) to aid in history taking.¹¹

Fetal Assessment

Ultrasound can be utilized to assess fetal heart rate, fetal movement, amniotic fluid quantity, position of the placenta, as well as fetal femur length for calculating gestational age. A femur length > 4 cm is suggestive of viability.¹² A pregnant patient with a viable fetus (more than 22 to 24 weeks) should undergo continuous fetal cardiotocographic monitoring for a minimum of 4 hours. The presence of prolonged, painful, and/or regular contractions necessitates further monitoring or obstetric intervention.

Physical Exam

Uterine tenderness, vaginal bleeding, and pooling of fluid in the vagina are indicators of possible complications with the uterus. Bimanual exam should be avoided when rupture of membranes is suspected. If the gestational age is > 23 weeks, speculum exam should be deferred until placenta previa is ruled out. While examining the vagina, the physician should also assess for the presence of lacerations or bony fragments.

Imaging Studies

Focused assessment with sonography for trauma (FAST) is less accurate in pregnant patients, although serial FAST exams may improve the accuracy.¹³ Due to low sensitivity, ultrasound should not be used to rule out retroperitoneal

hemorrhage or placental abruption. Addition of lung windows to the FAST exam is known as the extended FAST (eFAST) exam. Lung ultrasound is more sensitive and has similar specificity as supine anteroposterior chest radiographs.¹⁴

Laboratory Testing

Lab testing largely follows what would be done in most patients with traumatic injuries. The Rh status should be determined as Rh (-) patients are at risk of alloimmunization. Fibrinogen levels are often elevated in pregnancy^{15,16} and low fibrinogen levels are associated with severe hemorrhage or the development of disseminated intravascular coagulation (DIC). The Kleihauer-Betke (KB) test is used to detect the approximate volume of fetal-maternal hemorrhage (FMH) but its lower limit of sensitivity does not allow this test to rule out the presence of FMH.

TABLE 1. Anatomical and Physiological Changes of Pregnancy and Their Clinical Implications

Anatomical changes during pregnancy ²¹	
Relative protection of uterus by pelvic bones during first 12 weeks of pregnancy	
Uterine enlargement causes compression of IVC and/or aorta	
→ Supine Hypotension Syndrome (aortocaval hypotensive syndrome)	
Cephalad displacement of intra-abdominal organs and diaphragm:	
→ Relative protection of intra-abdominal organs by thoracic wall in cases of blunt abdominal trauma	
→ Tube thoracostomy at a more superior rib interspace than in a non-pregnant patient	
Physiological changes during pregnancy ⁴⁰⁻⁵⁰	
System	Effects/clinical implications
Cardiovascular	
↑ Heart rate (HR) 15-20 bpm	Elevated heart rate and decreased blood pressure at baseline
↑ Stroke Volume (SV)	Physiologic anemia of pregnancy
↑ Cardiac output (CO) by up to 40%	Delayed clinical symptoms of hemorrhagic shock
↑ Plasma volume 40-50%	
↑ RBC mass 20-30%	
↓ Mean Arterial Pressure (MAP)	
Pulmonary	
↑ Diaphragm excursion during inspiration	Primary respiratory alkalosis
↑ IC	Lower tolerance to apnea times
↑ TV 30-50 %	
↓ FRC 20-30%	
Renal	
↑ Intravascular volume	Decreased serum levels of creatinine, blood urea nitrogen, and uric acid
↑ GFR 40-50%	Hydronephrosis and hydroureter are common findings
Hematologic	
↑ Factors I, VII, VIII, X	Increased risk of venous thromboembolism
↑ Von Willebrand Factor	
↓ Protein S	
↓ Resistance to activated protein C	
Gastrointestinal	
↑ Gastrin	Increased gastric acid production
↓ Gastric emptying	Increased risk of aspiration
↓ Lower esophageal sphincter tone	

The formula used is:

$$\% \text{ of fetal cells determined by KB test} / 100 \times 5,000 \text{ ml} = \text{volume of FMH (in mls).}^{17}$$

Flow cytometry is a superior alternative test for estimating the volume of FMH but it is rarely available in most hospitals.^{18,19} Evaluation for prelabor rupture of membranes (PROM) is done by testing vaginal fluid for the presence of ferning, higher pH (vaginal pH is 5 vs amniotic fluid pH is 7), or for the presence of specific amniotic proteins such as IGFBP-1 and AFP.²⁰

Medications

Rho(D) immune globulin (anti-D IgG, Rhogam)

It is recommended that anti-D IgG is administered within 72 hours to all Rh (-) pregnant trauma patients at risk of FMH.²¹ The standard dose of 300 mcg administered intramuscularly is effective at preventing alloimmunization to 30 mL of fetal blood. The need for additional doses of anti-D IgG is determined by the results of KB testing or less frequently flow cytometry.²²

Corticosteroids

For imminent delivery of a viable fetus between 24- and 34-weeks gestational age, corticosteroids (e.g. betamethasone or dexamethasone) given over a period of 24 hours before birth or even in single doses has been shown to reduce overall neonatal morbidity and mortality.²³

Tocolytics

The role of tocolytics in pregnant trauma patients is widely controversial. Their use might be valuable when delaying delivery is vital for administering important medications such as magnesium sulfate or corticosteroids.²⁴ Tocolytics that have beta adrenergic activity (e.g. terbutaline) should be avoided in the trauma setting as they may cause tachycardia and/or hypotension.²⁵

Tranexamic Acid

In the setting of pregnancy, tranexamic acid (TXA) has been used to prevent complications from postpartum hemorrhage. Results of the World Maternal Antifibrinolytic (WOMAN) trial demonstrated that the use of TXA in postpartum hemorrhage resulted in lower reported outcomes of death (TXA 1.5%

vs Placebo 1.9%), with most benefit seen in patients who received TXA between 1 and 3 hours of delivery.²⁶ Multiple studies have studied the utility of TXA in the trauma setting; however, none have looked specifically at the use of TXA in pregnant trauma patients. The CRASH-2 trial showed that TXA administration significantly decreased all-cause mortality due to trauma by 1.5% (14.5% in TXA group vs 16.0% in placebo group).^{27,28} Similarly, results from the retrospective MATTERS study showed that TXA administration in a trauma setting was associated with reduction in unadjusted mortality (TXA 17.4% vs No TXA 23.9%).²⁹ The dose of TXA frequently used is 1 g infused over 10 minutes, followed by an infusion of 1 g over eight hours.

Complications Specific to Trauma in Pregnancy

Placental abruption is the second highest cause of perinatal mortality from trauma.⁶ The diagnosis is often made clinically with cardiotocographic fetal monitoring.^{30,31} Because 40% of abruption hemorrhages are retroperitoneal, computed tomography (CT) imaging is more sensitive for diagnosis than ultrasonography.³² Uterine rupture is another dangerous complication of trauma, with a fetal mortality rate of almost 100%.²⁵ If present, examination may reveal an irregularly shaped uterus, palpable fetal parts, or abdominal tenderness. Prompt laparotomy with fetal delivery and either hysterectomy or uterine repair is the treatment of choice. Amniotic fluid embolism (AFE) presents with sudden hypoxemia and cardiovascular collapse and can progress to DIC and multi-organ failure. The mechanism of AFE is hypothesized to be amniotic fluid entering the maternal circulation and leading to either vascular obstruction or anaphylaxis. Treatment is supportive with resuscitation and potential delivery of the fetus.³³ The risk of preterm labor, preterm premature rupture of membranes (PPROM), or PROM is significantly higher after traumatic injury and may not present immediately after the injury.³⁴

Perimortem Cesarean Section

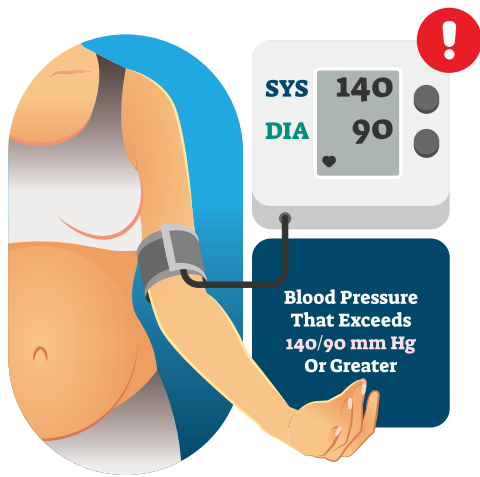
Perimortem cesarean delivery is considered a life-saving procedure for both the mother and the fetus as it alleviates the

compression of the IVC by the uterus and thus improves maternal hemodynamics and fetal perfusion. Ideally, but rarely in practice, the procedure should commence within 4 minutes of the arrest with delivery of the fetus one minute later.^{35,36} There are reports in the literature showing fetal survival even if delivered 30 minutes after arrest.³⁷ Procedural success can be optimized by contacting an obstetrician and a neonatologist, as well as ensuring that an incubator, pediatric crash cart, and surgical tools are available.³⁸

The first step in the procedure is to perform a vertical incision through the skin of the abdominal wall, starting from the pubic symphysis and extending to the xiphoid process. The subcutaneous tissue is bluntly dissected to expose the peritoneum, which is then cut. The uterus should be delivered anteriorly in order to improve visualization. Generally, the uterine incision should be performed on the inferior aspect of the uterus owing to the usual superior location of the placenta. However, if the location of the placenta is already known, then the incision should be performed opposite to that location. If the placenta is located anteriorly, then it should be cut through in order to prevent delay in delivery. After delivering the fetus, the cord is clamped and cut immediately, and the fetus is transferred to an assistant for resuscitation. The placenta should be delivered manually, followed by packing of the uterus. If there is return of spontaneous circulation, uterine massage and oxytocin administration may be necessary to prevent atony. Oxytocin should be infused slowly in order to prevent hypotension.³⁹

Conclusion

Management of traumatic injuries in pregnant patients requires careful evaluation with an understanding of the alterations in anatomy and physiology that occur during pregnancy. Standard evaluation of pregnant patients proceeds in the usual fashion as for non-pregnant patient with primary attention to the A-B-Cs of trauma care. Interpretation of vital signs and lab tests may be different for the pregnant patient. To optimize the potential for good outcomes for the mother and the fetus, resuscitation of the mother takes priority. ★



Preeclampsia Complicated by a Cerebrovascular Accident

Posterior Reversible Encephalopathy Syndrome, or Reversible Cerebral Vasoconstrictive Syndrome?

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A 38-year-old G1P0 right-hand dominant female at 34 weeks and 3 days gestation with a history of hyperlipidemia presents to the ED at 7:15 pm as a “Stroke Alert” for expressive aphasia since 2 pm while eating dinner with family. Family describes it as “word salad.” In addition, the patient complained of a left-sided headache shortly after the aphasia and dysarthria started. No history of hypertension, cardiac disease, diabetes, or pregnancy complications. The patient is being managed by Maternal-Fetal Medicine (MFM) given her advanced maternal age. The patient only takes prenatal vitamins. No alcohol, tobacco, drug use during pregnancy.

On the patient’s arrival to the emergency department, Neurology and Obstetrics are at bedside evaluating the patient given she presents as a “Stroke Alert” in the third trimester. The patient is found to be hypertensive to 220/115 with a heart rate of 80 on arrival to the ED. On physical exam, the patient is well appearing. She has profound expressive aphasia and dysarthria with an inability to follow commands. No other neurological deficits noted (5/5 strength, no limb ataxia). NIH stroke scale (NIHSS) of 4 for level of consciousness (2pt) and best language

(2pt) is given. The abdomen is gravid to the subxiphoid process. One plus pitting edema in bilateral lower extremities is noted without calf tenderness.

The patient is given hydralazine 10mg intravenously (IV) times three and magnesium sulfate IV for the presumptive diagnosis of preeclampsia with severe features and blood pressure improves to 164/94 with no change in neurological status.

The patient was taken to the OR for an emergent cesarian section secondary to a non-reassuring fetal heart rate. Post-operatively, the patient was taken to the CT suite for the CT of the head without IV contrast in addition to a CT Angiogram (CTA) of the head and neck with intravenous contrast.

FIGURE 1. CT Head



CT Head Impression

1. Focus of hypoattenuation in the left temporo-occipital lobe which is better visualized on the CTA head/neck.

FIGURE 2. CTA Head



CTA Head Impression

1. Moderate to severe diffuse narrowing of the M2 segment of the left middle cerebral artery with diminished contrast opacification of the distal cortical branches relative to the contralateral side. Overall, the significant vascular abnormalities on this study are most suspicious for an underlying process such as reversible cerebral vasoconstriction syndrome.
2. Moderate irregular narrowing of the vertebrobasilar circulation which is most pronounced in the left posterior cerebral artery.

Discussion

Preeclampsia is a life-threatening obstetric condition on a spectrum of hypertensive disorders in pregnancy. Preeclampsia with severe features presents with signs of end-organ damage — which includes cerebral insult. Posterior Reversible Encephalopathy Syndrome (PRES) and Reversible Cerebral Vasoconstrictive Syndrome (RCVS) are considered to be two rare

complications of preeclampsia. This discussion highlights preeclampsia and these two rare complications as well as the clinical and radiological difficulty in diagnosing these two conditions. After reviewing these conditions, you — the reader — will have the opportunity to decide if the patient suffered from a cerebrovascular accident, PRES, or RCVS.

Preeclampsia

Preeclampsia is a hypertensive disorder of pregnancy diagnosed after 20 weeks of gestation and up to 4 weeks postpartum. It is theorized to be caused by maternal and fetal vascular dysfunction. Diagnosis is by an elevated blood pressure greater than 140 systolic and/or greater than 90 diastolic OR proteinuria greater than 0.3g in 24 hours.

Risk factors include advanced maternal age, chronic kidney disease, twin gestation, antiphospholipid antibodies, first pregnancy, past medical history or family history of preeclampsia, BMI >26.1, or a nulliparous state.

Clinical features of preeclampsia include headache, visual changes, epigastric/RUQ pain, elevated blood pressure, peripheral edema, pulmonary edema, altered mental status, and lab abnormalities (acute kidney injury (AKI), AST/ALT elevation, Uric acid elevation, and proteinuria).

Preeclampsia is managed with blood pressure maintenance with antihypertensives such as labetalol, hydralazine, nifedipine, or methyldopa. To prevent the progression of preeclampsia to eclampsia (above findings + seizures), seizure prophylaxis is achieved through magnesium sulfate with an initial 4 gram loading dose IV followed by a 2 gram per hour IV infusion to maintain magnesium

level between 4.8 to 8.4 for 24hrs postpartum — and delivery if emergent.

Reversible Posterior Leukoencephalopathy Syndrome

A clinical radiographic syndrome of heterogenous etiologies that are grouped together because of similar findings on neuroimaging studies — Posterior Reversible Encephalopathy Syndrome (PRES), Reversible Posterior Cerebral Edema Syndrome, Posterior Leukoencephalopathy Syndrome, Hyperperfusion Encephalopathy, or Brain Capillary Leak Syndrome. Despite the name, the syndrome is not always reversible and it is not confined to either the white matter or posterior regions of the brain — though it is unclear why there is primary involvement of posterior brain regions.

The syndrome is most commonly seen in hypertensive encephalopathy, eclampsia, and with the use of cytotoxic and immunosuppressant drugs (cisplatin, cyclosporine). It is also noted to be most common in women and all age groups are susceptible. Other conditions noted to be associated with RPLS include AKI, CKD, Sepsis, MultiOrgan Dysfunction, autoimmune diseases, and organ transplantation.

RPLS is characterized by an insidious onset of constant, nonlocalized headache unrelieved by analgesia, confusion or decreased level of consciousness, visual changes, and seizures associated with the posterior cerebral white matter edema seen on neuroimaging.

The pathogenesis is unclear, but it is thought that sudden blood pressure elevation causes cerebral autoregulation to exceed the upper limit and the arterioles dilate resulting in cerebral

hyperperfusion, breakdown of the blood brain barrier and the extravasation of fluid and blood products into parenchyma. Cerebral ischemia can in turn occur due to focal vasoconstriction/vasospasm and hypoperfusion and resultant cytotoxic edema OR hydrostatic vasogenic edema and microcirculatory compression. This edema can increase cerebral perfusion pressure.

Preeclampsia and cytotoxic therapies may lead to capillary leakage and blood brain barrier disruption, axonal swelling, and trigger vasogenic edema. In preeclampsia, secretion of trophoblastic cytotoxic factors from poorly perfused fetal unit may provide an initial stimulus and result in elevated markers of endothelial damage. Some even suggest that RPLS could be considered an indicator of eclampsia — even when the other features of eclampsia (hypertension, proteinuria) are not present.

Diagnosis is by neuroimaging with symmetrical (subcortical) white matter edema in the posterior cerebral hemispheres — particularly the parieto-occipital regions — and it is usually not confined to a single vascular territory. RPLS can be picked up on CT, but it is best depicted by MRI. CTA and MRA studies have documented irregular vascular narrowing in medium to large-sized vessels in some groups. Resolution of neuroimaging findings is expected within days to weeks — suggesting edema rather than infarction.

Blood pressure should be lowered within two to six hours with easily titratable parenteral agents like nicardipine or labetalol — with the maximum initial fall not exceeding twenty-five percent of presenting value. Most seizures should be treated with phenytoin — except in the setting of eclampsia where treatment with magnesium and delivery of the baby and placenta are sufficient.

Prognosis in most case series and reports suggest that RPLS is fully reversible within a period of days to weeks and radiologic improvement lags behind clinical recovery. Rarely do patients survive with permanent neurologic disability.

Reversible Cerebral Vasoconstriction Syndrome

Also known as Call-Fleming Syndrome, Postpartum cerebral

TABLE 1. Pertinent Laboratory Findings

Lab	Result	Comment
WBC	14.3	
Hemoglobin/Hematocrit	16.1/46.1	HIGH
Platelets	171	
Creatinine	1.0	HIGH (<0.8 in pregnancy)
Magnesium	2.1	
Bilirubin Direct/Total	<0.2/0.2	
AST/ALT	60/49	
Alkaline Phosphatase	147	
Uric Acid	7.8	HIGH
LDH	388	HIGH
Random Protein:Creatinine Ratio	5.87	HIGH

angiopathy, and CNS pseudovasculitis; Reversible Cerebral Vasoconstrictive Syndrome (RCVS) is a rare condition that occurs as the result of a sudden, transient, diffuse dysregulatory constriction of intracranial vessels producing the main feature of recurrent sudden, severe, and disabling headaches that are characterized as “thunderclap”. Other symptoms associated with RCVS include vomiting, photophobia, phonophobia, visual changes, hemiplegia, ataxia, dysarthria, aphasia, and seizures.

Some risk factors proposed to cause these multifocal arterial vasoconstriction and dilations include preeclampsia and eclampsia, childbirth, hypercalcemia, vasogenic tumors, prescription and over the counter medications, and illicit drugs that cause vasoconstriction.

RCVS is most commonly found among women between the ages of 20 and 50 and is underdiagnosed because it mimics common conditions like migraines. PRES has a very similar presentation and is found in 10-38% of RCVS patients.

Routine blood tests, inflammatory markers, and cerebrospinal fluid analysis are typically normal in RCVS. CTA and MRA can identify seventy percent of cases by revealing diffuse reversible cerebral vasoconstriction that appear as “string of beads” on angiography with complete resolution within 1-3 months. Initial MRI is normal during the first week in 30-70% of cases; 10% of patients have MRI abnormalities consistent with PRES.

Currently, there is no approved treatment. Verapamil, nimodipine, and other calcium channel blockers may help reduce the intensity and frequency of the headaches. Triptans and ergot derivatives are contraindication as they have vasoconstrictive actions.

Prognosis is usually full recovery in most patients to permanent brain damage in others. All symptoms normally resolve within 3 months and may only last a few days.

Case Conclusion

A viable, 1660 g female infant was delivered with reassuring APGAR scores and transferred to the neonatal intensive care unit, where she did very well. The

patient's creatinine and hemoglobin and hematocrit improved over the days while maintaining excellent urinary output.

Patient improved rapidly to where she felt she was back at baseline and was discharged home without home services on aspirin 81 mg, labetalol 100 mg twice daily, and Procardia XL 90 mg daily. Patient was scheduled for neurology follow-up.

Conclusion

Given the history and hospitalization course that this young primigravida female endured, it is quite possible these 3 processes are not independent and exclusive, but in fact a continuum of related processes. Our patient possibly experienced preeclampsia while at home that progressed to reversible cerebral vasoconstriction syndrome and PRES. The imaging performed as part of the broader work-up seem to reveal findings of both RCVS and PRES. We know these 2 conditions are likely associated with one another and are also associated with preeclampsia. Re-imaging and follow-up are necessary in order to establish the final diagnosis. ★

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CERVICAL SPINE INJURIES in the Pediatric Population

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Case Presentation

Case 1. A 6-year-old girl is brought in via EMS to your level 1 Trauma as a bicycle vs. car. It is approximated the car was traveling approximately 25 mph. During your initial examination: the patient is crying, equal and bilateral breath sounds, tachypneic and tachycardic with a GCS of 15. She is in a cervical collar and after exposing her you appreciate left shoulder, back, and left leg abrasions. Upon log-roll, it is difficult to appreciate if the patient is having any cervical/thoracic or lumbar spine tenderness as she is intermittently crying, but no step offs are appreciated. What would be your next step? Would you image her C-spine? If so, what type of imaging would you get? Can you apply the same clinical tools for cervical spine injury imaging in adults to pediatric patients?

Case 2. A 2-year-old boy is brought in by mom after her car was rear-ended by another car going 30 mph while she was parked and breastfeeding him in the back seat. Mom states the patient has not wanted to move his neck and has been breathing "funny." Prior to the exam, the child was placed in a C-collar due to high suspicion of C-spine injury (CSI). During the exam, the patient does not speak to you, has irregular breathing, tachycardic, avoiding moving his neck, and has minimal movement of his extremities. The patient was immediately intubated. What is your next step? Do you go straight to CT or MRI as you are worried about a CSI?



Background

Cervical spine injuries (CSIs) are fortunately very rare in the pediatric population. Of all pediatric patients admitted for blunt injuries, only 1.3% are diagnosed with a CSI.¹ However, when examining pediatric spinal injuries overall, CSIs account for the majority, occurring in 60-80%.²

Mechanisms of Injury

The most common mechanisms of injury include motor vehicle collisions (MVC), falls, diving accidents,

acceleration-deceleration forces, or a clotheslining force.³ Depending on the patient's age group, certain mechanisms of injuries are noted to be more common than in others. MVC and falls are most common in children less than 2 years old; MVC, falls, and pedestrians struck by motor vehicle in children 2 to 7 years old; and sports injuries and MVC in children 8 to 15 years old.⁴ In a cohort of 540 children with CSIs, 1% had injuries due to assault, of which half were attributed to child abuse.⁴ Although non-accidental trauma appears to be a rare cause of

CSIs, clinicians must be vigilant in their assessment of a patient, looking for other locations of questionable injuries and reporting any suspicions that a CSI was non-accidental.

Common Sites of Injury

The probable location of a CSI can vary among age groups. Injuries to the axial region (C1-C3) were seen in 74% of CSIs in children less than 2 years old and 78% of CSIs in children 2 to 7 years old.⁴ In children 8 to 15 years old, however, subaxial injuries were more prevalent, accounting for 53% of CSIs.⁴ In the same cohort of 540 children mentioned previously, only 1% had dislocations at more than one cervical level and 3% had fractures of more than one cervical vertebra.⁴

Anatomy and Physiology of Pediatric Patients with Suspected CSI

Children's anatomic development increases their susceptibility to CSI. Compared to adults, children have larger heads relative to their bodies, their spinal column is more elastic, and their cervical spine muscles are weaker.⁵ Further, there is greater ligamentous laxity in their spine.⁵ In addition, the atlas (C1) and axis (C2) have ossification centers that do not complete fusion until up to 7 years of age.⁵ This may explain why children are 2.5x more likely to sustain atlantoaxial injuries than adults.⁵ This not only places children at increased risk for CSI, but also can make interpreting imaging more difficult for clinicians. Ossification centers can appear widely different between patients, leaving room for the possibility of misdiagnosing fusion lines as vertebral fractures.⁵ Despite all these inherent risk factors, the incidence of CSIs is still low in children. However, there should be increased suspicion of CSI in multisystem trauma and patients with a head injury.

Work-Up

One should first immobilize the neck based on suspicion of CSI and then follow the guidelines established by the Advanced Trauma Life Support beginning with the primary assessment and management (ie, ABCDEs). Once the patient has been stabilized during the primary evaluation, then the secondary

exam involving palpation of the neck and cervical spine, focused neurologic examination, and history-taking can occur. This process may be challenging with younger patients or those who are unable to fully provide a history and cooperate with the examination. For these patients, it's prudent to understand the mechanism of injury to determine whether a CSI may be present and utilize this information for further management.

Examination

In patients with suspected CSIs, the examination should focus on vital signs, neck examination, and neurologic evaluation. Upper CSIs may result in patients with arrested respiration, hypotension, or altered mental status, and injuries to C3-C5 may result in apnea or hypoventilation due to loss of diaphragmatic control.⁶ Upon neck examination, CSIs present more commonly as midline cervical tenderness, though a triad of neck symptoms including cervical pain, muscle spasm, and decreased range of motion should prompt suspicion for a CSI.⁷ If there is midline tenderness to palpation, ROM testing should be deferred, and the patient should be re-immobilized in a C-collar. In combination with the initial assignment of the Glasgow Coma Scale score, the neurologic examination must evaluate the patient's tone, strength, sensation, and reflexes, since approximately 53% of children with cervical cord injuries have neurologic deficits.⁸ However, pediatric patients who are asymptomatic or are able to walk should not have a CSI ruled out if the mechanism of injury suggests the possibility of one. Among children with diagnosed CSIs, a study found that 18%

were asymptomatic at presentation although their mechanism of injury was high-risk.⁷ Patients with a concerning history or any of these presentations on the exam require continued cervical spine immobilization and further evaluation.

Clinical Tools

Unfortunately, clinical decision tools such as the Canadian C-Spine Rule and the Nexus criteria have not been well validated in the pediatric population. The Canadian C-Spine study has not been validated for pediatric patients since it did not include patients under the age of 16.⁹ In contrast, the NEXUS (Table 1) study contained 3,065 patients under the age of 18 years. However, only 30 of these patients were found to have CSIs. Almost all of the injured patients were older patients, with just four patients being under the age of 9 and no patients under the age of 2.¹⁰ One study demonstrated that the NEXUS criteria has a 100% sensitivity and a 19.9% specificity for diagnosing cranial spine injuries in pediatric patients aged 9-17 years old.¹¹ Despite this study, the NEXUS criteria should only be used as an aid to the overall clinical gestalt as it has yet to be validated as a tool in pediatric trauma.

Another study conducted in the Pediatric Emergency Care Applied Research Network (PECARN) compared pediatric patients from the ages of 0 to 15 years with CSIs to control patients. The study determined that there were 8 findings, as illustrated in Table 2, that could be used to recommend imaging and detect CSIs. The findings listed in the study had a 98% sensitivity and 26% specificity.⁶ Unfortunately, these risk factors have yet to be fully validated. Therefore, we are currently limited to only using the NEXUS criteria and PECARN findings as clinical assessment guides along with our clinical gestalt in deciding C-spine imaging.

Imaging

Once the patient warrants further evaluation to rule out a CSI, an imaging modality must be chosen. With increasing awareness of the impact of radiation, medical costs, and practicality, the decision for one form of imaging over the other depends on the patient's circumstances. For most pediatric

TABLE 1. NEXUS Criteria for Imaging of Patients with CSI

NEXUS Criteria	Imaging Recommended
Midline cervical spine tenderness	Yes
Focal neurologic deficit	Yes
Not alert or intoxicated	Yes
Distracting injury	Yes

TABLE 2. PECARN Findings for Imaging of Patients with CSI

NEXUS Criteria	Imaging Recommended
Neck pain	Yes
Decreased neck ROM	Yes
Torticollis	Yes
Altered mental status (intoxication or trauma)	Yes
Focal neurologic deficit	Yes
Substantial co-existing injury	Yes
Conditions predisposing to cervical injury (Down Syndrome, Ehlers-Danlos, cervical arthritis)	Yes
High-risk mechanism (diving, MVC, clotheslining injury)	Yes

patients with a normal mental status and benign mechanism of injury, plain cervical spine radiographs are reasonable to exclude significant CSIs with 2-3 views (anteroposterior, lateral ± open-mouth odontoid views) being standard. The use of a cross-table lateral view radiograph provides a 79% sensitivity; the addition of the AP and odontoid views increases sensitivity to 94%.⁷ However, the biggest pitfall in using plain radiographs is obtaining a series that adequately evaluates the cervical spine. Complete evaluation of the cervical spine requires that all seven vertebrae, including the C7/T1 junction, be visualized. Furthermore, interpreting cervical spine radiographs can be quite challenging, especially since normal anatomic variants of children, such as ligamentous laxity and incomplete ossification of the posterior elements, must be distinguished from pathological findings.¹²

Therefore, CT should be utilized if inadequate plain radiographs were obtained, there were suspicious findings on plain radiograph, the patient has a GCS less than 9, and with patients with a mechanism of injury and/or physical exam findings that are suspicious for CSI.^{13,14} The sensitivity and specificity of CT for detecting cervical spine osseous injury is about 98%.^{15,16} In making the decision to utilize CT imaging, the recommended study of choice is multidetector CT with sagittal and coronal reconstructions. You can also consider a limited CT up to C3 in patients less than 8 years old. However, when deciding to utilize CT one must be aware of the risks, specifically to the

pediatric population, in terms of radiation exposure. CT delivers a 50% higher mean radiation dose relative to conventional radiography.¹⁷

Magnetic resonance imaging (MRI) has slowly become the imaging modality of choice, sometimes even before plain radiography and CT. However, the current practice guidelines still recommend plain radiographs and CT imaging prior to the use of MRI. MRI can be exceptionally useful for patients that have neurologic dysfunction but normal plain radiograph and CT imaging, also known as SCIWORA (Spinal Cord Injury without Radiographic Abnormality).¹⁸ This is mainly due to the fact that MRI is significantly more sensitive in visualizing soft tissues, intervertebral disk herniation, ligamentous injuries, and spinal cord damage. Unfortunately, limited access, cost, time to obtain the study, and the possible need for sedation in younger children prevent the use of MRI from being readily utilized. Despite these challenges, the benefits outweigh the risks when it comes to diagnosing CSIs.

Disposition

With regard to the treatment options for these patients, it depends on the fracture stability and concomitant injuries of the patients. For all children with neurologic abnormalities or possible CSIs, it is best to consult neurosurgery/spine service. If unavailable, immediate transfer to a center with these services should be arranged. The treatment for children with unstable cervical fractures utilizes closed reduction under fluoroscopic guidance and halo-vest immobilization, which can be applied for cervical and even upper

thoracic fractures and dislocations.¹⁹ For those with no neurologic deficits and minor spinal fracture patterns on imaging, outpatient management may be possible with analgesics and follow-up care being the main components of the plan.²⁰

Case Resolutions

Case 1

Utilizing clinical gestalt, NEXUS, and the unvalidated PECARN criteria you decide she is at high risk for sustaining CSI (MVC vs Bicycle) and get a cervical spine x-ray series, which were inadequate, so you get a CT which was normal. You perform a thorough neurologic exam which is negative for signs of neurologic deficits with no pain or impinged range of motion, so you clear the spine and take off the C-collar and discharge the patient home with instructions to follow up with her PCP and return precautions if she begins to have any neurologic symptoms.

Case 2

Due to clinical findings and history you promptly order a CT, call neurosurgery, and admit to the trauma service ensuring that everyone on your team knows there must be strict C-spine precautions and continued C-collar use. ★

TAKE-HOME POINTS

- C-spine injuries are rare in children
- Children less than 8 years old: C2-C3 injuries; children greater than 8 years old: C5-C6 injuries
- Use physical exam to initially clear a patient but do not hesitate to obtain imaging
- If imaging is needed start with plain films
- CT in cases of high suspicion of CSI in the context of negative or inadequate plain films or high-risk mechanism
- Can consider limited CT to C3 in younger children (3-8 years old)
- MRI if pain or neurological deficits persist despite normal CT to assess for SCIWORA.

DANK VAPES

A Tale of a Pediatric E-cigarette Vaping Associated Lung Injury

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A 17-year-old male with a history of chronic abdominal pain presented to the emergency department with 2 weeks of worsening abdominal pain and diarrhea. His CT scan showed possible early appendicitis and incidental findings of bibasilar ground glass opacities in the lungs. Stool studies were positive for *Clostridium difficile* (*C.diff*) and enteropathogenic *Escherichia coli* (EPEC), and laboratory work-up revealed elevated inflammatory markers and leukocytosis. He had no respiratory complaints and had normal saturations on room air. He was diagnosed with colitis and discharged home on oral metronidazole. Two days later, the patient returned to the ED with worsening abdominal pain and fever. He had oxygen saturations of 91% on room air and a respiratory rate of 28. A chest x-ray showed diffuse interstitial lung markings



FIGURE 1. Diffuse Interstitial Lung Markings in Both Lungs on Chest x-ray

(Figure 1), and a chest CT showed extensive ground glass alveolar opacities (Figure 2). The patient was started on supplemental oxygen and admitted.



FIGURE 2. Extensive Interstitial and More Notably Alveolar Ground Glass Opacities in a Patchy Distribution in Both Lungs on Chest CT

Vaping: An Epidemic in Teens

In the time before COVID-19, electronic cigarette use, or “vaping,” occupied the airwaves as an emerging public health concern, particularly within pediatric and adolescent populations. Considered to be an alternative to traditional cigarettes and marijuana smoking, vaping is a smoking method that involves heating a liquid so that it aerosolizes and can be subsequently inhaled. The liquid itself contains various different toxins, including highly concentrated amounts of nicotine, cannabis-derived extract, propylene glycol, vegetable glycerin, acrolein, formaldehyde, ethanol, and menthol which provides flavoring.²⁻⁴ Vaping can be performed through a variety of devices, all of which are made differently depending on the users needs. For example, there are newer generation types of products such as the “Mod” (Figure 3), or JUUL (Figure 4), both of which are longer lasting, are reusable, and have the potential to deliver higher amounts of nicotine than earlier generation devices.



FIGURE 3.



FIGURE 4.

In the more recent years, there has been an up-trend of vaping product purchases within the adolescent population, as vaping use rose up to nearly 8% (approximately 1.3 million teenagers) between 2017-2019. Not only do weaker FDA regulations on e-cigarette and vaping devices contribute to these findings,⁵ social media, too, is another influential factor.⁶⁻¹⁰ One study found that > 78% of middle and high-school aged students were exposed to at least one vaping advertisement.¹¹ Other studies revealed that flavor is one of the most appealing qualities of vapine, and therefore producers have created an assortment of eye-catching vaping devices that offer fruit and candy flavors.¹²⁻¹³

Addiction with vaping occurs much faster than combustible cigarettes; while addiction occurs with the daily consumption of four to five traditional cigarettes, this is equivalent to only a

quarter of the amount within a JUUL pod.¹⁴ Contributing to the dependency on these products is the higher concentration of nicotine found in vaping devices compared to traditional nicotine products. A recent study by University of California, San Francisco found that blood nicotine concentrations in the JUUL group was 5.2 times higher than traditional cigarettes.¹⁵

Therefore, it is critical to recognize the risk factors, histories, and presentations of patients to treat E-cigarette or Vaping Associated Lung Injury (EVALI) to avoid long term health complications.

E-Cigarette or Vaping Use-Associated Lung Injury (EVALI): A Diagnosis of Exclusion

Despite EVALI becoming more prevalent in our society, our understanding behind its underlying pathophysiology remains unclear. There are no specific symptoms, imaging modalities, or markers that directly lead to its diagnosis.¹⁶

Although it is more common for EVALI to present with respiratory symptoms, there have been case series showing that it can, too, manifest as gastrointestinal and constitutional complaints. In one case study, patients identified with EVALI were often white males with a median age of 21 who presented with shortness of breath (85%) and cough (85%). Subjective fever (84%) and chills (60%) were also common in these patients, as well as nausea (66%), vomiting (61%), diarrhea (44%), and abdominal pain (34%). Patients were also generally found to be tachycardic and, on lab studies, had increased inflammatory markers and a leukocytosis. It should be noted that 100% of patients in this study were found to have bilateral infiltrates on chest CT, which, along with the patients' histories, aided the ED staff in deriving the diagnosis.¹⁷

Given EVALI's non-specific presentations, it is critical to maintain a high index of suspicion to ensure these cases are diagnosed early. This involves the emergency healthcare provider screening adolescents with non-specific symptoms for EVALI. By assessing vaping history and risk factors including social and environmental factors, smoking history, drug use history, and family stressors, such as having divorced parents,¹¹ during initial

patient encounters, EM physicians with heightened suspicion can expand their differential and start treatment before respiratory decompensation occurs.

Identifying presentations and creating guidelines for the evaluation and care of pediatric and adolescent patients is necessary to reduce the morbidity and mortality that has been associated with vaping. As of December 2019, there have been over 2,000 hospitalized EVALI cases and 48 deaths reported, highlighting the significance of its rise to prominence as EVALI was only first described in 2019.¹⁵ With the recent rise in the number of cases, much has been done to develop these guidelines; however, these do not fully encompass the wide variety of ED presentations with EVALI.¹⁸ In order to screen these patients, it may be advisable to complete chest imaging (either x-ray or CT) in patients with non-specific presentations and significant vaping use. The exact pathogenesis and progression of this new disease are still being researched and may allow for more specific screening protocols as more information is uncovered.

Current treatment guidelines center on attempting to treat the overlying pneumonia with antibiotics based on community-acquired pneumonia guidelines, bacterial isolates, and clinical suspicion. Additionally, starting systemic steroids has shown promise in inpatient treatment, but has yet to be adequately studied in the outpatient setting.¹⁹ In general, it is advisable to discharge patients with EVALI to complete outpatient workup and management if:

1. O₂ saturation >95%
2. There is no respiratory distress
3. There are no comorbidities that compromise pulmonary reserve
4. The patient has reliable access to care with a 24-48 hr follow-up
5. The patient has strict return precautions

In addition, organizing plans to quit and giving resources to help patients overcome their dependence is extremely important to prevent additional progression of the disease. As this is a new and developing disease, reporting cases to local health departments for further study is also encouraged by the CDC.

Back to Our Patient

While recent reports show that 77% of patients with EVALI have gastrointestinal symptoms, as was experienced by our patient, it is rare for these to be present without concomitant respiratory symptoms.¹⁷

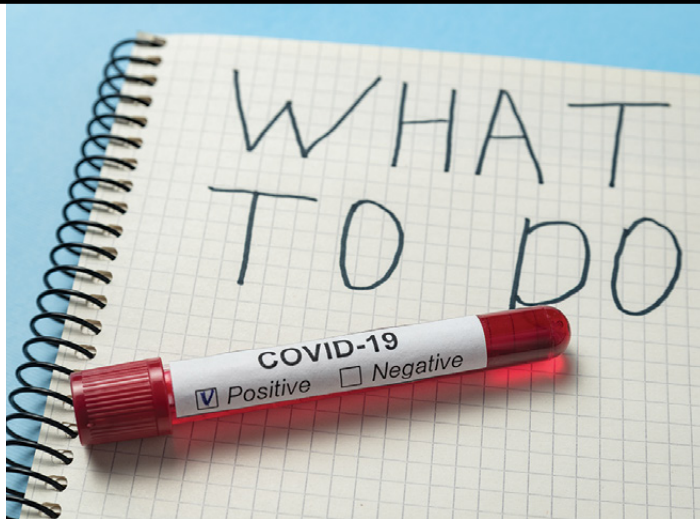
Our patient's GI symptoms and respiratory distress worsened early on in his course, leading to a temporary stay in the pediatric intensive care unit (PICU) where he needed additional respiratory support in the form of bilevel positive airway pressure (BIPAP). His antibiotics were broadened for empiric treatment of other potential intra-abdominal pathology.

After obtaining a more extensive history, the patient admitted to a 2-year history of vaping. His product of choice was JUUL e-cigarettes, and he smoked approximately one nicotine pod daily. He admitted to smoking marijuana as well, but denied smoking synthetic marijuana or using marijuana containing pods in e-cigarettes. After these revelations, the patient was subsequently started on high dose intravenous methylprednisolone. Over the next 48 hours, the patient improved clinically, and he was weaned off BIPAP to room air within 72 hours. He was discharged home on prednisolone and fluticasone propionate therapy and was counselled extensively on the effects of vaping and lung related injuries, as well as the need for continued pulmonology follow up.

Conclusion

While vaping has disappeared from the forefront of our collective minds in light of recent global pandemics, its place in and effect on pediatric populations is not going anywhere anytime soon. Vaping-induced lung injury is a new diagnosis that has increased drastically in prevalence as the popularity of electronic cigarettes, or "vaping," has grown at an incredible rate. Many users are not aware of the harms this practice can do to the body, and furthering knowledge about the consequences may be able to prevent disease.

EM physicians should have a high index of suspicion for electronic cigarette use in adolescents presenting with gastrointestinal symptoms with no pertinent history, and it is imperative that we continue to examine the syndrome as its prevalence rises. ★



Classical Treatments for a New Disease

COVID-19 Management

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You are working a shift when a 34-year-old Caucasian woman presents to your ED with altered mental status (AMS), hypotension and tachycardia. An emergent EKG shows a sinus tachyarrhythmia at 119 beats/min with a prolonged QTc interval 600 ms. Labs are significant for hypokalemia 2.1 mEq/L, and CT scan of the brain shows no acute findings. You find out the patient self-medicated prophylactically with approximately 15 pills of hydroxychloroquine (HCQ) (7.5 g) in an attempt to prevent symptoms of COVID-19. Suddenly, the nurse calls you to the bedside, where the patient's cardiac monitor indicates a rate of 220 with polymorphic ventricular tachycardia; you're contemplating torsades de pointes (Image 1).

Case reports illustrate this hypothetical. A female patient presented to the ED with AMS and VTach after ingesting approximately 30 g of HCQ purchased online in an attempt to prevent COVID-19.¹ A couple in their sixth decade of life from Arizona presented to the ED in critical condition after ingesting fish tank cleaner that contained chloroquine (CQ) phosphate in an attempt to prevent COVID-19 symptoms.² It is important for emergency physicians to recognize the

narrow therapeutic index and increased incidence of toxidromes globally from COVID-19 treatments.

Current Proposed Treatments

Given the global pandemic of the novel SARS-CoV-2, clinical trials are underway to elucidate an effective treatment. Several treatment options for COVID-19 are being used in the ED and across hospitals, such as the low-cost antimalarial drug CQ, its derivative HCQ, macrolides, antivirals, monoclonal antibodies (MABs), and convalescent plasma (used first in the 1890s for diphtheria). Countries across the globe have begun clinical trials involving these agents, including both CQ and HCQ.³

CQ and HCQ are used as treatment and prophylaxis of malaria, but there are chloroquine resistant strains of malaria and HCQ is a less toxic derivative.⁴ HCQ is also therapeutic for several autoimmune diseases, including systemic lupus erythematosus, rheumatoid arthritis, Sjogren's syndrome, and dermatomyositis. The molecular mechanism of action suggested by in vitro studies of CQ and HCQ against COVID-19 occur at multiple steps in the viral pathway. These drugs alter cellular entry and exit, alter intracellular pH, and induce endoplasmic reticulum stress, which retards the formation of essential viral proteins⁴. Both medications have narrow therapeutic windows. There are many factors that can alter drug bioavailability such as the patient's genome, metabolism, drug-drug interactions, kidney function, and dose.

In addition to their antibacterial properties, macrolides (erythromycin, clarithromycin, and azithromycin) also have immunomodulatory effects. They have been shown to have viral reduction efficacy in treatment of rhinovirus, influenza, zika and ebola; azithromycin reduced influenza virus replication in vitro.⁵ A recent study illustrated that treating COVID-19 patients with HCQ, along with azithromycin, for six days showed significant viral reduction via polymerase chain reaction (PCR) nasopharyngeal swab; in comparison with HCQ alone.⁶ The mechanism is currently not well understood however studies suggest it to be promising in treatment of COVID-19. Research is being released daily with new data to be analyzed.

Antiviral agents are being considered. These include RNA-dependent RNA polymerase inhibitor Remdesivir (RDV), neuraminidase inhibitor Oseltamivir (OTV), and protease inhibitor Lopinavir (LPV). RDV has recently been approved by the FDA for treatment of COVID-19 as Emergency Use Authorization.⁷ RDV resembles adenosine triphosphate (ATP) and is used as a substrate for viral RNA polymerase resulting in termination of viral RNA production.⁸⁻⁹ OTV is also currently being investigated as a treatment option as it is known to reduce viral shedding in respiratory secretions.¹⁰ LPV has shown to be a strong inhibitor of the protease enzyme present in SARS-CoV-1 which is a key enzyme for the viral life cycle.¹⁰

Clinical Manifestations

CQ is rapidly absorbed from the GI tract and symptoms can present within 1-3 hours of ingestion. Common side effects at therapeutic CQ doses (500mg-2500mg per day) for malaria prophylaxis and treatment are nausea, vomiting, headache, and vision changes. Of particular concern is the development of hemolysis in G6PD-deficient patients in particular¹¹. Rarely at therapeutic concentrations, hypoglycemia, sensorineural deafness, and retinal damage may be seen (bull's eye retina; image 2). Symptoms at supratherapeutic levels can be lethal and can include apnea, hypotension, and cardiovascular collapse. EKG abnormalities include QRS prolongation, atrioventricular block, ST-T depression, presence of U waves, and QT prolongation.¹¹ Significant hypokalemia can be secondary to CQ-induced intracellular shifts and exacerbate any direct chloroquine-induced QT prolongation.¹²

HCQ overdose is relatively rare and most of the current understanding of toxicity and management of HCQ overdose comes from its related compound, CQ.⁴ Observed side effects with routine HCQ dosing (400 mg) for malaria prophylaxis are similar to CQ.¹¹ The current literature demonstrates a wide range of outcomes with varying doses of HCQ ingested, with death occurring with as little as 5 g and survival after 20 g.¹² Studies suggest that HCQ mortality is primarily due to rapid cardiovascular collapse with refractory hypotension and ventricular arrhythmias.¹³ Several case reports also provide echocardiogram (using pulse doppler of the mitral inflow analyzing the E-wave to A-wave ratio) and magnetic resonance evidence of this restrictive cardiomyopathy (image 3).¹⁴

Acute oral overdoses of macrolides are usually not life-threatening and comprise mainly of gastrointestinal symptoms. Rarely, macrolides cause QT prolongation and torsades de pointes. The risk of macrolide-induced arrhythmias is increased when combined with other drugs, cardiac disease, cardiac channelopathies that prolong the QT interval.¹⁵ A score for Drug Induced

QTc Prolongation is published by the American College of Cardiology.¹⁴

RDV has mild adverse effects including nausea and vomiting. Patients treated with RDV should have liver enzymes monitored as there have been cases that suggest RDV-induced liver injury. The most common adverse reactions (incidence at least 5%) for the IL-6 inhibitor tocilizumab are upper respiratory tract infections, nasopharyngitis, headache, hypertension, increased ALT, and injection site reactions.¹⁶ Convalescent plasma transfusions have adverse risk factors such as transfusion related acute lung injury, transfusion associated circulatory overload, and allergic/anaphylaxis.¹⁷

Work Up

A thorough history and physical exam is especially essential in patients presenting with altered mental status to verify history through bystanders, such as family, friends, EMS personnel, law enforcement, pharmacies, and available pill bottles. Diagnostics should begin with a basic metabolic panel evaluating for emergent electrolyte abnormalities and an EKG. Specific drug concentrations may help with diagnosis and directing treatment depending on the drug of concern. All intentional overdoses should include an acetaminophen concentration.¹⁸ Use the available history, physical, and laboratory findings to narrow the differential as much as possible.

Clinical Management Pearls

Initial treatment for any potential overdose should be focused on the

primary survey (airway, breathing, and circulation). Supportive care is critical to enhance survival. Current recommendations for CQ/HCQ overdose, based on assessment of patient, include the following main points. Diazepam 2 mg/kg IV (or 0.5 mg/kg midazolam) should be given over 30 minutes for seizure and sedation. Diazepam has been shown in porcine animal models to improve vitals and shorten QT duration indicating cardioprotective effects.¹⁹ Higher doses of diazepam has been shown to reduce mortality in other animal models and one prospective, multi-center, double-blind, placebo-controlled study showed that low dose diazepam (0.5 mg/kg loading dose then 1 mg/kg infusion over 24 hrs) did not affect serial ECGs in overdose CQ patients.²⁰⁻²¹ Early intubation and mechanical ventilation should be planned. Other medical intervention include the following: epinephrine 0.25 µg/kg/min IV targets vasodilation and myocardial depression; potassium repletion (if below 2 mEq/L) along with magnesium and calcium repletion; and activated charcoal 1 g/kg PO, for gastrointestinal decontamination if ingestion occurred within one to two hours of presentation.²²⁻²⁷ Consider sodium bicarbonate in the setting of QRS prolongation.²³ Always consult with your local poison control center for specific recommendations. The efficacy of currently recommended treatment modalities may differ in patients affected by COVID-19. Further research is needed to elucidate optimal treatment in this patient population. ★

TAKE-HOME POINTS

- Multiple medications, MABs, and transfusion products are being used to treat COVID-19.
- Recognize the toxidromes above.
- Assess and treat the patient.
- Be aware of your available treatments at your institution, ranging from benzodiazepines to ECMO.
- Main treatment is supportive care.
- As of this publication, prepublished studies on HCQ are showing questionable mortality benefits, peer review is pending.²⁸
- Clinical trials are underway, including with the World Health Organization, called the Solidarity Trials.²⁹
- Research is ongoing. Critique the literature using basic research skills, using resources such as the ACEP EMBRS Webinars or the SAEM Research Learning Series.³⁰⁻³¹

A RARE CASE

Adolescent Joint Pain in the ED

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An 18-year-old male presented to the Emergency Department (ED) with a chief complaint of left knee pain. The patient states the pain woke him from sleep and has been ongoing for several hours. He reports a past medical history of chronic left knee pain and psoriasis. His chronic knee pain has been waxing and waning for 6 months with moderate relief with ibuprofen, acetaminophen, and topical lidocaine. He has no prior surgeries, allergies, tobacco/alcohol/drug use, or recent sexual activity. He reports that he participated in high school football but did not sustain specific injuries to the knee. On review of systems, he reports no trauma, recent injury, fevers, chills, penile discharge, rash, or history of gout.

Initial vital signs were BP 140/72, HR 72, RR 16, T 36.7, and SpO₂ 99% and remained stable. Throughout the interview, he held his knee in a flexed position at approximately 30°. On exam, he was noted to have a moderate to large left knee effusion. The left knee was warm compared to the right. He had generalized tenderness to palpation to the knee. The active range of motion was limited due to pain. The knee was



FIGURE 1.

able to be ranged passively from 0-110°. No joint laxity was noted with anterior drawer, posterior drawer, varus, or valgus stress. His gait exam was antalgic and he avoided putting his full weight on his left knee.

Given the patient's age, history, and exam, the differential was broad. It included psoriatic arthritis, juvenile idiopathic arthritis, gout, pseudogout, septic arthritis, osteomyelitis, fracture, meniscal injury, ligamentous injury, patellofemoral pain syndrome, osteochondral defect, and Osgood-Schlatter disease, among others. A CBC, BMP, ESR, CRP, urinalysis, and x-ray were ordered. An arthrocentesis was performed. The blood and urine studies were unremarkable. Synovial fluid analysis (Table 1) was not consistent with an infectious, or inflammatory etiology.

The x-rays (Figures 1 and 2) demonstrated a 9 mm free-floating osseous density without evidence of fracture and an irregularity of the lateral articular aspect of the medial femoral condyle, which was concerning for osteochondral defect. The patient reported significant pain relief after the aspiration of joint fluid. An ACE wrap was applied to the knee, he was provided with crutches, and made non-weight bearing until able to follow up in the orthopedic clinic.



FIGURE 2.

Discussion

Osteochondral defect (OCD), historically referred to as Osteochondritis Dissecans, was described by Dr. Franz König more than 125 years ago. It is an acquired subchondral lesion characterized by osseous resorption, collapse, and sequestrum formation.⁴ OCD is a rare cause of joint pain with an incidence of 20 per 100,000 people.⁵ Patients aged 10-20 account for the majority of cases, although it may also be seen in adults. Incidence is 2-4 times higher in males than in females. The most common joint involved is the knee, with the lateral aspect of the medial femoral

TABLE 1. Synovial Fluid Analysis

Fluid Analysis	Value	Reference Range
RBC count	15,000	≤ 0/μL
WBC count	1052	0-10/μL
Fluid color	Yellow	N/A
Crystals	None seen	N/A
Fluid neutrophils	26	0-5%
Fluid lymphocytes	71	28-96%
Fluid macrophages	3	N/A
Fluid eosinophils	0	N/A

continued on page 24

Dysuria and Progressive Abdominal Pain in a Male Pediatric Patient

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Urachal abnormalities are a rare etiology of pediatric abdominal pain, most commonly occurring secondary to infected urachal cysts or abscesses.¹ We present the case of a 10-year-old male who presented with significant suprapubic abdominal pain who was found to have an infected urachal cyst.

Case

A 10-year-old previously healthy male presented to the pediatric emergency department (ED) with severe abdominal pain. The pain started four days prior and progressively worsened, with pain greatest in the suprapubic region. He developed significant dysuria, urinary frequency, and urgency over the last two days. Recent history was significant for a diagnosis of streptococcal pharyngitis two weeks prior, for which symptoms resolved and antibiotics were not initiated. The patient did not have a report of fever, nausea, vomiting, diarrhea, urethral discharge, or weight loss. The family denied a history of trauma.

On arrival in the ED, he had a temperature of 37.2° Celsius, blood pressure 107/71, heart rate 104, respiratory rate 20, and oxygen saturation 99%. His exam was significant for moderate suprapubic tenderness. Obturator sign was negative, however the patient experienced significant abdominal pain with a short vertical jump. Bowel sounds were normal, and there was no distension, palpable hepatosplenomegaly, costovertebral angle tenderness, or rebound tenderness. Genitourinary exam was within normal limits, with no evidence of



discharge, testicular erythema, swelling, or tenderness.

The differential diagnosis considered included urinary tract infection, intrabdominal mass, renal stone, post-streptococcal glomerulonephritis, and appendicitis. Lab results revealed an elevated C-reactive protein 40.9 mg/L (normal <5), mildly elevated white blood cell count 11.4 k/mm³ (range 4.1-10.1) with 78% neutrophils, and mildly elevated platelets 469 k/mm³ (range 130-450). Rapid strep testing was positive. Comprehensive metabolic panel, hemoglobin, lipase, and urinalysis were unremarkable. Fecal occult blood testing was negative, as were swabs for respiratory syncytial virus and influenza. Abdominal ultrasound was significant for a 3 cm non-compressible complex structure anterior to the bladder with echogenic and vascular structural components, and a small volume of free fluid in the lower abdomen. Chest x-ray and renal ultrasound were done, with no visualized masses or acute structural abnormalities.

Given the concern for a new abdominal mass, an abdominal and pelvic computed tomography (CT) with contrast was obtained. CT demonstrated a multi-lobular collection with peripheral enhancement anterior to the bladder that measured 2.8 × 2.3 × 2.6 centimeters, concerning for an infected urachal cyst. The patient was admitted to inpatient pediatrics with urology consulting, and received intravenous ceftriaxone to treat the infection, and ketorolac for pain control. After 3 days, the patient was tolerating an oral diet with significantly improved abdominal discomfort and was discharged with fourteen days of cefixime to continue antibiotic coverage. Urology obtained a follow-up voiding cystourethrogram 6 days after discharge that was unremarkable, and planned for outpatient surgery following resolution of the acute infection.

Discussion

Urachal remnants are residual embryonic structures situated between and sometimes connecting the bladder and the umbilicus. They occur due to

failed obliteration of the allantois, the structure that drains fetal urine from the bladder. This can result in a persistent patent urachus, urachal cyst, urachal sinus, or vesicourachal diverticulum.²⁻⁴ In infants, urachi typically spontaneously involute by 6 months, however this is less common in older patients.¹⁻³ Incidence is relatively rare after infancy, with asymptomatic and symptomatic urachi detected by ultrasound in 1.6% of pediatric patients and 0.063% of adult patients.² In patients presenting to the ED with abdominal pain, the incidence of symptomatic urachi is even lower, occurring in approximately 0.03% of presentations secondary to infected urachal cysts and abscesses.¹

Urachal cysts are typically asymptomatic until infected, at which time they can present with fevers, abdominal pain, and dysuria.^{1,4-6} Cases can present with umbilical erythema, swelling, or drainage, though not all cases result in visible abnormalities at the umbilicus.^{1,4-6} On exam, tenderness is often greatest at the umbilical or suprapubic area,⁵⁻⁷ and a mass may be palpable at the site of maximal pain. Due to infection progression when treatment

is not received, patients can also present with significant peritoneal signs and a clinical acute abdomen.⁷

Diagnosis of infected urachal cysts is by clinical presentation in conjunction with abdominal imaging. Imaging is most commonly initially by ultrasound, and confirmatory scans can include CT or magnetic resonance imaging when there is a high suspicion of urachal cyst and for surgical management.^{2,4,6}

While surgical removal was previously recommended for all cases due to concern for future malignancy and recurrent infection, in first time presentations there is now greater consideration of conservative treatment with antibiotics and pain management. This is due to the high rate of spontaneous resolution, with up to 80 percent of urachal remnants resolving in infants less than 6 months old, and up to 50 percent resolving in childhood overall.³ Urachal malignancies cause less than 0.4 percent of bladder cancers, and their occurrence has not been linked to resolved pediatric urachal remnants.³ Additionally, postoperative complication rates can reach 14.7%, with surgical complications including bladder leak or rupture, bladder diverticulum,

persistent urachus, and infection.⁸ Therefore, conservative management is recommended as the first line approach, with surgical intervention considered for recurrent symptoms.³

Conclusion

Urachal cysts are embryonic remnants that can become symptomatic secondary to infection, causing suprapubic or umbilical abdominal pain. Conservative management should be highly considered in younger patients and first-time presentations of urachal remnants due to high rates of spontaneous resolution. ★

TAKE-HOME POINTS

- ✓ Infected urachal cysts typically present with umbilical or suprapubic abdominal pain and can have associated fevers and dysuria. Not all cases have visible umbilical abnormalities.
- ✓ Diagnosis is by clinical exam and diagnostic imaging, with ultrasound being the most common first line imaging modality.
- ✓ Given high rates of urachal remnant resolution, conservative management should be considered for first time presentations of infected urachal cysts, and the patients should follow with urology in the outpatient clinic.

Adolescent Joint Pain in the ED

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condyle being the most common location. Lesions can also be found in the ankle and elbow.⁴

There are many hypotheses regarding the etiology of OCD. They include inflammation, vascular deficiency, spontaneous osteonecrosis, genetics, and repetitive microtrauma. Currently, the most accepted of these is the microtrauma hypothesis. Many studies and case reports have suggested that repetitive trauma, frequently in the setting of athletic activity, may be the cause.²

Patients may present in one of three ways with pain during sports, pain with mechanical movement, or incidental findings in an asymptomatic individual. The most common symptom is pain with weight-bearing which is present in up to 80% of cases. A sudden increase in pain, or a joint effusion suggests an unstable

lesion. The physical exam should be thorough as it can help rule out other potential etiologies.¹

ED workup should begin with X-rays. **Imaging of both knees should be obtained as 25% of cases have bilateral involvement.**³ Serum and synovial fluid evaluation should be considered depending on the differential diagnosis. If imaging reveals concern for OCD, the knee should be immobilized, weight bearing and activity should be restricted, and the patient should be instructed to follow-up with orthopedics.

In the outpatient setting, MRI is used to help stage the lesion and determine operative vs non-operative management. Non-operative management strategies include immobilization, restricted weight-bearing, and activity restriction. Serial x-rays are obtained to assess

for healing and the patient follows a gradual return to activity. Operative strategies include arthroscopy, chondral resurfacing, and osteochondral grafting.^{3,4} Most athletes return to sports with varied degrees of success.

Conclusion

Although OCD is a rare entity, emergency physicians should consider it in their differential for both traumatic and atraumatic joint pain. The diagnosis is made radiographically and is often missed by emergency medicine physicians and radiologists. These patients should be made non-weight bearing, restricted from all activity, and urgently referred to orthopedic surgery. A missed diagnosis can progress to chronic pain, mechanical symptoms, and early onset osteoarthritis.⁴ ★

Learning to Take the Heat

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The Problem with Stress

The job of an emergency physician is stressful.¹ Multiple factors, such as unpredictable patient volume and acuity, fatigue, and lack of previous relationship with the patient, all play a part in the magnitude of this stress. In fact, managing critically ill or injured patients manifests characteristics of “crisis situations”: circumstances rife with uncertainty, clear and present danger to life, the need to take immediate action, and at least partial inability to control certain features of the situation.² These situations, where patients’ lives are on the line, necessitate optimal performance.

However, stress compromises our ability to perform at our very best by degrading important faculties. For example, one very well-documented effect is attentional narrowing. In the world of engineering psychology, this is referred to as “increased selectivity.”³ People have a tendency to lose global situational awareness and focus on particular tasks. Evidence demonstrates this can be a result of numerous stressors including noise, visual distractions, or time pressure.^{4,5} Under these circumstances, study participants have shown decreases in detection of objects in the peripheral vision.⁶ Furthermore, the problem is more than just a decrease in visual field or breadth of what an individual’s mind can attend to, it is also a failure to focus on the most appropriate information. As it turns out, we seem to focus on what we *perceive* to be the most important information⁷ (an adaptive cognitive triage mechanism of sorts), but this could be dangerous if the stimulus that grabs our attention is not the most critical to actually solving the clinical puzzle presented.⁸ Not surprisingly, the fewer pieces of information we have to process, the lower the cognitive load, and the lesser the tunnelling effect.⁹

This attentional narrowing is further complicated by increased perseveration: continuing or repeating a given action or plan that they have recently used or regularly apply. As stress increases and cognitive faculties deteriorate, people are more likely to continue trying the same unsuccessful solution despite clear evidence of its failure.^{10,11} Cognitive psychologists have suggested this aligns with current understanding of human behaviour: people tend to default to what is known or familiar in times of stress. Thus, in a problem-solving situation, the range of options is not only narrow, but we fail to explore other solutions even if the narrow range of options are failing.^{12,13} The result is a potentially dangerous enhanced effect of confirmation bias.¹⁴

Stress also decreases information processing and working memory.^{15,16,17} It affects both internal dialogue¹⁸ (keeping information at hand) and also causes increased distraction of attention.¹⁹ The compromise to working memory is more pronounced the more complex the task. Researchers have demonstrated marked effects on complex

problem solving²⁰ and decision problems that involve special visualization for successful resolution.²¹ So, our ability to perform clinically important cognitive tasks (such as thinking about the underlying pathological process) is inhibited, to an extent, and takes more time.

These effects have specific implications for emergency physicians. The dynamic nature of practice in the emergency department and levels of stress make it uniquely prone to these aforementioned cognitive sequelae, resulting in mistakes and medical error.²² While many authors discuss the complexities of general diagnostic errors or medication errors,^{23,24,25} a few have identified errors involved in common emergency procedures.^{26,27} For example, providers can lose situational awareness during endotracheal intubation. Cemalovic et al found that emergency physicians' perception of time to intubation was significantly skewed. Providers believed they were actually much faster than they were in reality. Possibly more concerning was the fact that providers consistently underestimated how often their patients desaturated during intubation attempts.²⁸

The Training Paradigm of Stress Inoculation

Stress Inoculation Training (SIT) is a multifaceted type of cognitive-behavioral therapy that was originally designed to help individuals cope with stress. It was initially developed by psychologist Donald Meichenbaum in the 1980s and has been employed to mitigate the sequelae of stress in a variety of situations. The essence of SIT is that by exposing people to increasing levels of perceived stress, they practice employing different coping skills and eventually develop increased tolerance or immunity to a particular stimulus.²⁹

This cognitive behavior therapy paradigm was adapted over time and applied to preparing individuals to perform in high-stress, high-risk occupations. Organizations like NASA and the military, although not formally referring to it as SIT, have applied these concepts to improve performance and reduce stress in their respective domains.³⁰⁻³⁵ In particular, various organizations within the Special

Operations have adopted these concepts and incorporate them into training and selection.³⁶

The general goals of incorporating this paradigm into technical skills training and simulation are^{37,38}:

1. To gain knowledge and familiarity with the stressful environment and each individual's unique emotional response as well as its effects on cognition
2. To develop and practice task-specific skills (including various psychological skills), as well as decision making faculties, to be performed under stress
3. To build confidence in one's capabilities

Structure and Content of Stress Inoculation Training for Emergency Medicine

Driskell and Johnson suggested some slight modifications to the initial SIT training structure proposed by Meichenbaum. These adjustments made training adaptable to both a broader domain of technical skills and preparation for performance in a stressful environment (as opposed to a therapeutic modality *after* a stressful incident). The general structure of this training was divided into three phases³⁵:

1. **Information provision** — This phase provides information on the human stress response, conditions participants should expect to encounter, and other preparatory information
2. **Skills acquisition** — This is phase is designed to develop and refine behavioral, technical, and cognitive skills
3. **Application and practice** — This phase includes practicing skills under conditions that approximate the operational environment and that gradually attain the level of stress expected

Information Provision

In the first phase, preparatory information is provided to trainees. They are taught about the physiological response to stress normally and how these natural physiological mechanisms can interfere with the specific cognitive

processes and technical skills during resuscitation. In this phase of training it should be made clear that deterioration in their faculties is normal; it is nearly universal, it is a natural result of the trainees' psychological response, and it is no way a sign of weakness or inadequacy. This explanation sets realistic cognitive and behavioral expectations of how trainees will respond to a medical emergency. Having realistic expectations, as it turns out, is crucial. Just by having more reasonable expectations, people perform better under stress.³⁸

Another important part of this phase is making it clear that providers aren't helpless in the face of these hard-wired stress responses. The belief that people have the capacity to exert control over their behavior is also critical. This understanding of self-efficacy and maintenance of an internal locus of control has been linked to improved performance in different domains.^{39,40} It also allows you to predict potential areas of weakness and motivate individuals to obtain the necessary skills to improve their response under stress.^{41,42}

Skills Acquisition

The second phase of this training paradigm is, perhaps, the most important phase. Many would argue that it is more important than the application of stressful stimuli. Furthermore, it should be emphasized that inadequate development of this phase, skipping it entirely, or moving too quickly to apply stressful stimuli can be counterproductive.^{45,46}

Skills acquisition develops the host of technical and non-technical skills needed to perform in the resuscitation environment under low or "no-stress" conditions. The goal is to learn and develop constructive coping mechanisms and to develop effective performance habits. The fundamental technical skills of emergency medical care must be established in conjunction with various cognitive and behavioral techniques. Trainees and experienced clinicians can both be taught to develop various psychological tools to help manage stress.

While teaching the knowledge and technical skills needed to perform well during medical emergencies has been

well-developed by clinician educations over the years, psychological skills instruction is somewhat novel. These skills have been developed in other domains by performance psychologists and have yielded significant benefits.⁴³ Some of these skills include breathing techniques, positive self-talk, mental practice, and attention control techniques.⁴⁴ These psychological skills can be taught and incorporated in a domain specific fashion. For example, trainees can be taught to perform structured visualization and mental practice of emergency endotracheal intubation as they are preparing their equipment for the procedure.

Other authors have established several other important aspects of skills acquisition.³⁵ Some of these include training decision-making skills (e.g. institution specific airway algorithms or checklists), over-learning technical skills (e.g. central venous access, laryngoscopy, or chest tube insertion), communication, and team training. Although beyond the scope of this article, each of these topics is important in its own right and worth mentioning.

Application and Practice

This phase is designed to take the psychological and technical skills learned and rehearse them under increasingly stressful conditions. This allows trainees to experience, in real-time simulation, the various performance challenges they will face in a specific (OR, ED, or prehospital) setting. It also reduces uncertainty and anxiety as well as increases confidence when individuals realize that they can overcome stressors. Finally, stimuli experienced during stress training are less distracting when experienced in real life. Requisite to these desired effects is a graduated approach to stress exposure. It is by incrementally increasing the stress that the desirable outcomes, familiarity, resilience, and confidence, are developed.^{35,37,41}

The application of stressful stimuli can be generally divided into three categories: intrinsic, extrinsic, and socio-evaluative stressors.^{47,48} Intrinsic stressors represent elements specific to the clinical scenario (eg, simulated disease severity or difficulty

of interventions required). Extrinsic stressors represent other elements not directly linked to the simulated patient's clinical condition (e.g. noise in the room, poor lighting, malfunctioning equipment). Socio-evaluative stressors are both a natural extension of the simulation (i.e. peers and instructors watching and evaluating trainee performance in real time) or artificially generated as part of the simulation (eg, an intimidating consultant telling the trainee to "hurry up").

What remains unclear, and difficult to generalize, is when, how, and to what degree to increase these individual stressful stimuli. In the absence of clear evidence, it stands to reason that these must be carefully titrated by skilled clinician educators to the skill level and education needs of individual trainees. Small increases in stimuli may push novices to be overwhelmed while more senior trainees can be pushed with a high degree of many stressful stimuli.

Incorporating SIT into Existing Training Models

One of the most promising training techniques where SIT may be ideal for incorporation is in-situ simulation. This type of simulation occurs in the actual clinical environment where people work with the actual staff on duty at the time.⁴⁹ Moving the simulation out of the lab and into the real clinical space has showed promise by better retention of clinical concepts⁵⁰ and enhanced team performance.^{51,52} It has even demonstrated evidence that

it helps teams identify critical patient deterioration earlier than traditional training^{53,54} and even improved cardiac arrest outcomes in one center.⁵⁵ Finally, it has the added benefit of identifying latent safety threats and opportunities for process improvement.^{56,57}

The first two phases of SIT might be conducted in a more traditional learning environment such as the classroom or simulation lab. However, once trainees move to the third phase of application and practice, conducting training in situ may be advantageous. This is because many distractions and stressful stimuli are specific to environment in which resuscitation occurs.^{35,37} Therefore, there may be significant benefit to allowing trainees to work through stressors and challenges that might be encountered in a real clinical environment.^{58,59,60}

Conclusion

Clinician educators have worked diligently and made significant advances over the years in developing effective methods for providing residents with the knowledge and technical skills needed to manage medical emergencies. While knowledge and technical skills are certainly required to treat critically ill patients, they may not be sufficient. The unique stressors experienced in the emergency department may cause untoward effects on cognition and skills performance. SIT offers a promising solution that can incorporate existing medical education modalities into an accepted cognitive and behavioral training framework. ★

As stress increases and cognitive faculties deteriorate, people are more likely to continue trying the same unsuccessful solution despite clear evidence of its failure.



Emergency Medicine Dispatch

The True First Responder

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Each year, an estimated 240 million calls are made to 911 by patients or bystanders for the full range of emergencies.¹ For the majority of callers, it is their first interaction with the emergency medical services (EMS) system. At the other end of the call is often a specially trained call-taker who is referred to as an Emergency Medical Dispatcher (EMD).² Without ever seeing the patient or the scene, these individuals are tasked with identifying the complaint, triaging the patient's severity, and providing pre-arrival instructions to callers.^{2,3} Historically, these providers were overlooked as key links in the EMS and emergency health care system, leading to low standards, poor funding, and inadequate training.² However, the expertise of EMDs, together with their calm demeanor and guiding nature, has led to improvements in patient outcomes.

History

Emergency medical dispatching, similar to other aspects of EMS, is a relatively new concept. In the 1970s it was recognized that calls for emergency medical help were on the rise and systems needed to be developed to deploy resources appropriately. In 1978 Salt Lake Fire/EMS identified the dispatcher as the "weak link" in the chain of survival.⁴ It wasn't until the 1980s that the first structured EMD protocols and training started to be adopted. Service providers wanted to send the right resource, to the right person, for the right complaint, and provide direction prior to that resource's arrival. Even today, the availability of EMD is not standardized and different

answering points may deploy different avenues for emergency response.

The Call

Generally, in the United States, once a prehospital emergency becomes apparent, most patients gain access to the emergency medical system by dialing or having a bystander call 911. These calls are routed to a designated Public Safety Answering Point (PSAP). The first priority of the call-taker is to determine the nature of the emergency; in other words, are police, fire, or EMS assistance needed? The first immediate challenge can be determining the location of the emergency. This can be difficult as callers may not know their location, cell phones may ping a tower that is outside the jurisdiction of the local PSAP, or automatic location technology (E911) may be inaccurate.⁵ However, call-takers are trained in dealing with this challenge and can promptly help callers identify their location and then direct the appropriate first responders to the closest location.²

Once the nature and location of the emergency has been confirmed, the call-taker's responsibility turns to identifying the chief complaint, age, level of consciousness and breathing status of the patient.² Challenges quickly arise as callers may not fully understand or may not be able to describe effectively a patient's condition. For example, a patient with altered mental status may be having a stroke, toxic exposure, metabolic emergency, or hypoxia. Therefore, many agencies choose to employ a standardized interrogation of the caller designed to elicit key information that allows the chief complaint to be categorized as one of 33 standard chief complaints.² An example of this approach is known as the Medical Priority Dispatch System (MPDS).

MPDS is a set of protocolized decision tools designed to allow the identification of the complaint, determine the appropriate resource response, and provide pre-arrival instructions.³ The system involves use

of a computer-based script that helps the call-taker guide the caller through a series of yes/no questions. Depending on the answers, the call-taker is prompted to ask different follow-up questions.

The process begins by asking the patient's age and chief complaint followed by "Are they conscious?" and then "Are they breathing?"² If the answer is "no" to both of these questions, the call-taker determines that the patient is likely in cardiac arrest and will require the highest level response ("ECHO") as well as pre-arrival instructions for the caller to perform bystander cardiopulmonary resuscitation (CPR). This results in the simple concept of "no-no-go," resulting in earlier CPR, which has been proven to be one of the main mitigating factors that can positively influence the outcome of an out-of-hospital cardiac arrest.⁶ Otherwise, if the answers are "yes," the call-taker continues to ask questions per the algorithm, ultimately sending the appropriate response, giving pre-arrival instructions to the caller on basic medical care, making the scene easy for responders to find, and mitigating on-scene safety concerns.

There are several other obstacles that call-takers must overcome when gathering information about an emergency. In addition to the caller not knowing the exact location of the patient, panic or refusal by the caller to provide pre-arrival care are common challenges.^{2,3} EMDs are trained to overcome these obstacles using techniques such as repeatedly asking the same question and reassuring callers that help is on the way even as they speak.³ This particular type of dispatch is known as horizontal dispatch, which refers to the call-taker continuing to gather information from the caller while a second EMD simultaneously dispatches response units.²

Pre-arrival Instructions

From the time the call is dispatched to the time the first unit arrives on scene, the EMD plays an important role in providing pre-arrival instructions (PAI). These are a

set of medically approved, standardized, and protocolized instructions given to a layperson by EMDs.² A study by Billittier et al found that callers expect instructions to be given while waiting for responders to help mitigate the situation.⁷ PAI incorporate components of Dispatch Life Support (DLS) and have been shown to effectively prevent further mortality and morbidity during the response phase of EMS.² Examples include opening the airway, cooling burns, removing dangerous objects from around the victim, and administering certain medications. One of the first instances of PAI took place in Phoenix, Arizona, in 1975. In that case, a paramedic in the dispatch center gave instructions to the mother of an apneic child while EMS was en route.⁴ That child survived.

DLS focuses on the most time-sensitive medical emergencies such as acute myocardial infarctions, stroke, trauma, and cardiac arrest. Cardiac arrest victims are the most time-sensitive of all prehospital patients. Without bystander CPR, their chance of survival quickly diminishes.^{8,9,10} Laypersons are often ineffective in locating a pulse, and they may not be able to identify agonal breathing. The risks associated with performing CPR on a patient not in arrest are significantly less than the risks associated with withholding CPR, and therefore the assumption is that the patient is in cardiac arrest.² Dispatch Assisted-CPR or Telephone-CPR (DA-CPR or T-CPR) instructs the caller on how to perform CPR and has been associated with increased rates of bystander CPR.¹⁰ Some systems employ specific instructions on how to perform CPR along with counters or metronomes to identify inadequate breathing and ensure CPR is done at an appropriate rate.¹¹ EMDs may also be able to identify the location of automatic external defibrillators (AEDs) and help callers properly place and use AEDs: another proven life-saving intervention.^{12,13}

Calls to 911 for chest pain are common. One study suggests those that call 911 with chest pain may self-select and be sicker than those that transport themselves to the hospital.¹⁶ Aspirin has been shown to be the drug of choice for reducing mortality in acute myocardial infarction.¹⁷

Some call centers will identify the patient experiencing chest pain and have the patient self-administer aspirin if the caller has access to the drug.¹⁸

Stroke is difficult to identify over the phone as callers often use vague terms to describe symptoms.¹⁴ For example, a caller may dial 911 for “fall” but not recognize focal weakness. Despite these challenges, EMDs are able to correctly identify strokes with surprising accuracy.^{14,15} The EMD will interrogate callers for time of symptom onset, rule out common stroke mimics (eg, hypoglycemia), gather important previous medical history (eg, prior strokes), and discover pertinent medications (eg, antiplatelet agents or anticoagulants), thereby helping responders make improved triage and transport decisions.

Trauma patients are clearly also in need of prompt emergency medical care. Bleeding control and expedited transport to surgical services are mainstays in prehospital treatment of trauma. The EMD will attempt to identify the mechanism of injury (eg, gunshot wound versus fall), the severity of the injury (eg, fall from standing versus fall from height), and the timing of the injury (eg, occurring today or occurring > 9 hours ago).² Additionally, the EMD plays an important role in recognizing life-threatening bleeding. Language that differentiates the type of bleeding (venous versus arterial) is employed by asking if the blood is “spurting or shooting” from the wound. The EMD may instruct the caller to simply apply direct pressure or even guide tourniquet placement.² In the San Antonio Fire Department, in Texas, the first metropolitan EMS service to carry whole blood, dispatchers are responsible for determining what calls may warrant the dispatch of whole blood, which is carried by a select number of units in the city.¹⁹

Medical Oversight

Physician oversight of EMD protocols are an integral part of ensuring the quality of out-of-hospital emergency medical care. EMS Medical Directors should be directly involved in the development, review, and implementation of EMD protocols. Some protocols require input depending on local medical resources. For example, a community with limited percutaneous coronary intervention might adjust their dispatch protocols to include

the placement of helicopter EMS resources on standby when chest pain is the chief complaint. Protocols will occasionally need updating as new evidence-based practices change the prehospital care plan. Quality review of protocol compliance has been shown to improve the accuracy of resource allocation and DLS implementation, which is an important part of medical direction.²

Future Developments

Improvements in cell phone technology continue to be game-changing in the initial care and triage of patients. Ideas being developed include the use of crowdsourcing responses from non-traditional responders. Programs such as PulsePoint push cardiac arrest locations to registered laypersons notifying them of a nearby cardiac arrest, thereby allowing for bystander CPR to be initiated faster.²⁰

A large percentage of 911 calls are made from smartphones with built-in cameras. Further developments in technology could allow EMDs and first responders to see the patient prior to EMS arrival, resulting in better triage and pre-arrival instructions to the caller. In one feasibility study, dispatchers were able to view a livestream from the caller's phone in order to decide on whether to dispatch a helicopter to the scene.²¹

Other ideas include incorporating augmented reality to demonstrate proper CPR, identify patient medications, and provide instructions to stop life-threatening bleeding.

Dispatcher Health and Wellness

It is important to remember that EMDs are critical members of the emergency response system. They often have to listen to extremely dynamic, heart-wrenching, and violent incidents, all while maintaining their composure and professionalism. They provide emergency medical care without being able to directly see or interact with patients. Often they are not able to find out the outcome of the patients they interact with as they have to immediately move on to the next caller.²² These factors can lead to burnout, depression, and posttraumatic stress disorder. Timely resources should be provided to EMDs, as would be provided to other first responders, including counseling, incident debriefing, and praise for jobs well done. ★

A Model for EM Resident and Ski Patrol Cross-Educational Training Day

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The ED acts as a linchpin between hospital-based care and pre-hospital providers. Environmental emergencies and pre-hospital care are part of core teaching for emergency medicine residents and while many residency programs provide experience with EMS, formal training with pre-hospital groups like ski patrol are limited. The residents of Geisinger Medical Center have developed a cross-educational training day to bridge that gap.

Resident Perspective

Emergency medicine is a key interface between the health care system and the community, making outreach and education to various groups an important part of training and a career in emergency medicine. Cross-educational trainings such as these provide residents a great avenue to hone their teaching skills, gain a better appreciation for what groups like ski patrol do and gives us the opportunity to form a better working relationship.

TABLE 1. Example Schedule

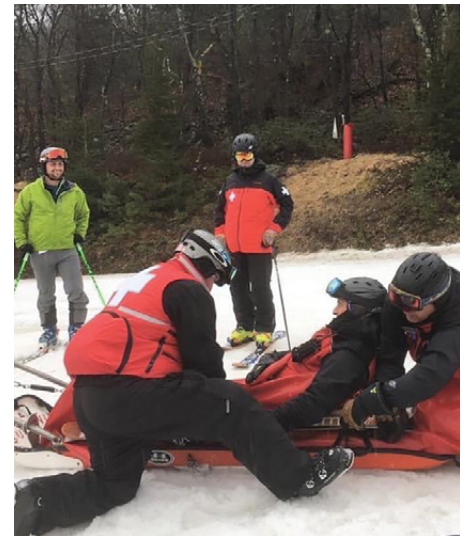
AM: Resident Didactics
8:30–9:40 am: Introductions and Breakfast
9:40–10 am: Non-traumatic Causes of Altered Mental Status
10–10:20 am: Updates in C-Spine Immobilization
10:20–10:40 am: Dental Fracture Simulation
10:40–11 am: Hospital Treatment for the Hypothermic Patient
11–11:20 am: Pediatric Concussion
11:20–11:40 am: Proper OPA, NPA, and BVM Use
11:40–12 pm: Lunch
PM: Ski Patrol Didactics
12:00–12:30: Ski Patrol Demonstration: Splints, Slings, and Sleds
12:30a–1:30p: Mock Rescue Scenarios
1:30p–5:00p: Shadow Ski Patrol or Free Ski

We asked residents to create 15-minute, high-yield, talks on topics that were planned ahead without the use of AV equipment. This was a great way for residents to practice skills in creating engaging, interactive presentations targeted to their specific audience. Beyond EM residents, this training also builds collaboration with other specialties that don't usually interact with pre-hospital providers. In our 3 years of running this field training, we have looped in trainees from Critical Care, ENT, Pediatric Dentistry, Orthopedic Surgery, Trauma Surgery, General Surgery, Respiratory Therapy, Internal Medicine, Family Medicine, and Pediatrics.

Cross-educational trainings also provides residents a chance to better understand the unique set of obstacles faced by ski patrol, including trying to care for patients in bulky clothing, in the cold and often on dangerous terrain. During the second part of the day the ski patrol trainers designed several simulation scenarios on the mountain,

TABLE 2. Example Topics to Consider Teaching

Orthopedic Management of Extremity Fractures (various)
Pelvic Fractures
Shoulder Dislocations
Orthopedic Neurovascular Exam
Facial Fractures and Nosebleeds
Dental Injuries
Eye Injuries, including UV Keratitis
Altitude Illnesses
Hypothermia
Frostbite
Pediatric Concussions
Non-traumatic Causes of Altered Mental Status
Updates in C-Spine and Backboard Immobilization
Stop the Bleed / Until Help Arrives Courses
Pathophysiology and Treatment of Traumatic Shock
Airway Adjunct Review: Proper OPA, NPA, and BVM use



including patient assessment and extraction. Residents quickly learned how different it can be to perform a patient assessment, stabilization and transport on the icy slopes with limited supplies and personnel compared to usual conditions in the ED or trauma bay. The ski patrol trainers encouraged residents to troubleshoot and sometimes fail in attempts to rescue the patient – important lessons for both in the field and in the hospital.

In addition to valuable experiences in teaching and gaining perspective, our ski patrol cross-educational days are regarded as a great wellness activity and way of promoting collaboration across house staff. Often ski patrol were able to provide introduction to skiing/snowboarding lessons, a great way of encouraging beginner residents to participate as well.

Ski Patrol Perspective

Ski patrollers have a unique first responder perspective; they are tasked with assessing and transporting injured skiers and snowboarders in precarious situations. After completing their duty and safely transporting the patient to a

higher level of care, they often are not informed of the outcomes and treatment of their patients or the exact nature of the patient's injuries or medical conditions. Most patrollers (both volunteer and employed) are members of the National Ski Patrol (NSP) — their national, nonprofit member association. NSP provides patrollers with their medical training known as Outdoor Emergency Care (OEC) which is similar to a Wilderness First Responder (WFR). Many patrollers are also trained as EMTs, paramedics or have other medical background. We found that patrol staff are eager to learn more and build on whatever medical training they have, including the subtleties for certain injuries or medical conditions as well as follow-up treatment and management of their patients.

Ski patrollers love adrenaline and exciting medical pathology as much as EM residents. However, similar to EM, they often lack continuity of care, and their most frequent question to us is, “What happens to our patients when they arrive at the hospital?” While developing a curriculum for a cross-educational day, be sure to incorporate this perspective — and discuss with ski patrol leadership any specific topics they would like to review. While patrollers are already experts at managing and stabilizing extremity injuries and fractures in the field, other topics such as non-traumatic causes of altered mental status, facial injuries, and airway adjuncts are also areas of interest for review.

When planning a similar cross-educational day, consider ways patrollers

can get “hands-on” training. Examples include dental fracture simulators, CPR mannequins, airway adjuncts, and even practice writing SOAP notes. Demonstrating chest tubes, intubation, portable ultrasound findings, and other advanced modalities are procedures that a patroller will likely never encounter in the field but will lend them perspective on the follow-up care of their patients. Consider bringing hand-outs with XRay/CT findings, images of classic injury findings (eg. battle sign, hemotympanum), and before-and-after treatment photos to demonstrate how certain pathologies are diagnosed and treated. (Be sure to stay HIPAA compliant.) It is very important during these sessions that residents encourage patrollers to always act within their protocols, training, and scope of practice. The overall goal should be to educate and inform, not re-educate or reform. While patrollers may be interested in shoulder reduction techniques and how to clear a C-spine, those tasks might not fall within their guidelines; be sure their leadership confirms ski patrol protocol.

Ski patrols are only one group of pre-hospital wilderness providers. Residency programs that are not located close to ski resorts can consider similar events with search and rescue groups, swift water rescue teams, lifeguards, outdoor



guides, and state, national, and municipal park rangers. Many of these groups have informal or formal medical training that residents can build-on as well.

GET MORE INVOLVED!

Join the EMRA Wilderness Committee to find more ways to learn about and get involved in activities like this. Visit emra.org/be-involved/committees/wilderness-committee. ★

TAKE-HOME POINTS

- Pre-hospital groups like ski patrol provide a great opportunity for EM residents to lead cross-educational training days.
- Discuss with these groups early to find a day they will not be busy. Get an understanding of their prior medical training, the scope of practice, and topics they want to learn more about.
- Come with an open mind and ready to answer lots of questions. Dress for the weather and be ready to get your hands dirty!





Preparing for a Global Health Experience

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In the past several years, medical student and resident participation in international rotations has dramatically increased.¹ Many benefits to participating in international rotations have been described.²³ Students who have traveled to other countries reported increased cultural and interpersonal competence and improvement in medical knowledge.⁴ Global health allows the trainee to experience health

care through a completely different resource and cultural paradigm and can lead to introspection and critical assessment of clinical practice back home. International medical experiences can also help the student learn about pathologies not commonly seen in the U.S. such as some tropical diseases and advanced stages of diseases not treated because of lack of resources.

Beyond the cultural and clinical learning, many medical trainees seek global health experiences as an opportunity to help very needy populations. After all, there are tremendous needs in low and middle income countries that, depending on the specific setting, range from medical expertise in a given area (eg, emergency, medicine) to common medications, electricity, or even running water.

This marked difference in resources creates the perception that it takes very little to have a positive impact in places that lack so much. And while global health interventions can have a tremendous impact compared to relatively low investment when done the right way,⁵ unfortunately, often global health interventions can have negative unintended consequences for both the trainee and the host community.⁶

Common reasons for negative experiences for the trainee include lack of preparation and contingency planning (ie, preparing for when things do not go as planned). And common reasons for projects that are ineffective or have a negative impact include lack of knowledge of and buy-in from the local population and a lack of emphasis on sustainability.

How Do We Avoid These Negative Consequences?

We asked three global health experts: **Dr. Abigail Hankin-Wei**, director of the first emergency medicine residency in Mozambique; **Dr. Hiren Patel**, Global Health Fellowship director at the Massachusetts General Hospital in Boston; and **Dr. Anna Yaffee**, International Section Chair in the Department of Emergency Medicine at Emory University. They offer tips on how to choose and prepare for a global health experience to increase the chances of having a positive impact and lower the risk of unintended consequences for the trainee and the host community.

Types of Global Health Experiences

Before delving into preparing for a global health experience, it is important to consider a few types of experiences one can pursue:

- **Remote Participation:** Dr. Hankin-Wei recommended that trainees look for opportunities to work on international health projects remotely before traveling abroad. The expansion of the internet in the developing world has made it possible for trainees to support international projects from home. Trainees can help with activities such as literature reviews, data analysis, administrative tasks, and proposal and report writing for research or capacity building projects. U.S.-based trainees can also help with teaching activities and journal clubs via video conferencing. One advantage of this global health experience is that it may fit more easily with training schedules, as trainees can stay involved over time without interrupting their studies. Remote activities could be stand-alone experiences, or a way to prepare for a planned trip. For example, Dr. Hankin-Wei has had U.S. residents collaborate with residents in Mozambique on journal articles and newsletters before visiting Mozambique, which likely contributed to their overall experience while in country.
- **Medical Missions:** During medical missions, the medical trainee travels for a short period of time to help

an organization providing medical care on a temporary basis. Trip duration is usually in the order of days or weeks. Dr. Yaffee developed her passion for international work after volunteering in Tanzania. She cautioned that mission trips are not the “epitome of global health,” but the experience did teach her about the importance of cultural exchange in medicine and affirmed her interest in this field. For students who have never had international experience before, mission trips may be a formative starting point.

- **Clinical Rotations:** During international medical rotations, trainees participate in medical care under the supervision of local or international physicians. Rotation duration is an important consideration. Dr. Patel recommends dedicating at least four weeks given the steep learning curve for the trainee in a new environment before she can be effective in her role.
- **Research or Development Projects:** Research and capacity building or development projects allow the trainee to look at the health care system in the host country from a broader perspective. Participation in these activities usually requires longer term commitment, at least in the order of months given the need to become familiar with the host community to achieve the project’s results.

Choosing a Global Health Experience

Finding one’s first global health experience can feel like a daunting task. The best place to start is usually global health faculty in the student or resident’s program. If there are no global health faculty in one’s program, one can look online for faculty and organizations working in a country and project of one’s interest. “Cold-emailing” may be an uncomfortable but sometimes necessary part of this process. Dr. Patel recommends global health committees and conferences through different potential organizations (eg, EMRA, ACEP, SAEM) to make global health connections.

Often, trainees will run into multiple global health experiences they could pursue. How should they choose? Personal interest in a specific country or culture, connection to an existing project via a faculty member, and previous language skills or experiences are all common reasons to choose one specific experience. These are other factors that trainees should consider:

- **Timing:** Will the experience be available during the trainee’s elective time?
- **Safety:** Will the experience take place in a country and province safe enough for travel? Will the student be staying in a safe place? Are there severe health risks to the trainee (eg, ebola)?
- **Sponsoring organization and local contact:** Is the organization reputable and dependable? Will there be a local contact that can be easily reachable in case of emergency and to help guide the trainee with any logistical issues.
- **Impact and sustainability:** Does the program seem to listen to and uphold the host community’s values? Is the program sustainable? What are the risks of negative unintended consequences to the host community from the program?
- **Cost and Funding:** What will be the cost of travel and room and board? Are there scholarships available?

Dr. Yaffee encouraged students to work within the framework of an already well-defined system. She recommended trainees pursue a larger, more established program for their international experiences, particularly for trainees who are only traveling for a short period of time. She added, “no student or resident should be going to a site that has not been vetted by either an institutional faculty member or another institution that is trusted.”

Preparation Before Traveling

Preparation is crucial for the safety of the participant and the success of the experience, as well as minimize any negative impacts on the host community. Figure 1 lists some of the recommended steps when preparing for an international experience. First and foremost, the trainee needs at least two

good mentors: one in the U.S. and one in the host site. A global health experience, after all, is a learning experience, and one needs guidance. There is a lot to learn about the host country, healthcare in low resource settings, culture, and language. The pace of work can vary significantly in other countries, which can be a source of frustration for trainees. Frequently students and residents come back from their experiences frustrated because they were not able to finish their projects. Having clear expectations from one's mentors that are based on the host community's reality—while remaining flexible—can help the trainee make the most out of the experience. Dr. Yaffee recommends contacting the local staff via apps such as WhatsApp or Skype to start building relationships that will be helpful once the rotation begins.

Not only will the participant find the experience more fruitful with good mentor support and clear guidelines and objectives, but mentorship is paramount for the participant's safety, as trainees may be completely out of their element in a different country. Before traveling it is important to talk extensively with the local and U.S.-based mentors about the conditions in the host site and how to stay safe. It is important to have the phone numbers of people in country who can be of help 24/7 in case of emergency. Furthermore, Dr. Patel brought up it is important that the trainee recognizes he or she will likely be one of the most affluent people in the community and easily identified as foreign because of her look, language, accent, clothing, or even mannerisms. Extra care should be taken to not flaunt expensive clothing or technology. Not only will this create a barrier when establishing relationships with the local community, but it can make the trainee a target of unwanted attention, harassment, or crime. Thus, it is important that the trainee discuss with local contacts proper attire and how to move around the local community most safely (to and from work, grocery store, pharmacy, etc.). Health insurance and evacuation insurance should also be discussed with your mentors and training program. Other safety

considerations include a visit to the travel clinic for vaccinations and prophylactic medications (e.g. malaria) and reading the country profile in the Department of State website for any upcoming political or civil event with potential for turmoil (e.g. upcoming elections).

Learning as much as possible about the local community will not only help with safety but can help the trainee connect with local collaborators, understand local patients, and uphold the values of the community. Dr. Hankin-Wei believes that, in addition to knowing the state of Emergency Medicine in the country, one should be familiar with its history to better understand patients and the systems that are currently in place. One should ask about the social determinants of health of the host population and ask what the main causes of illness and the main barriers in the healthcare system are. Before embarking in a global health experience, ask if community members were involved in the planning and execution of the project/program and what the end goal is. In other words, does the community feel ownership of the program and will they be able to continue it once foreign aid stops? Ask about local manners. Drs. Hankin

Wei and Yaffee recommend learning how to say basic words and phrases in the local language, such as “hello” and “thank you,” to demonstrate respect and interest in the local community.

In addition to the advice above, we asked our interviewees what resources trainees should read before departure. [Figure 2](#) contains their recommendations and other helpful links. Furthermore, our experts encouraged trainees to read about some of the ethical dilemmas frequently experienced during global health experiences, as discussed below.

Ethical Considerations

A common ethical issue trainees run into while working abroad is being asked to work outside their scope of practice.⁷ Not uncommonly trainees may be asked to perform tasks and procedures beyond their level of training or without the level of supervision they would usually require. This can happen for many reasons, including lax local regulation, a less hostile malpractice environment, shortages of healthcare personnel, or lack

of understanding of the trainees' level of training by the host medical facility. However, all our interviewees stressed that trainees should practice with the same level of supervision and in a scope of practice as close as possible to what would be expected of them in the U.S. Obviously, working outside of one's scope and level of training can cause harm. Take Dr. Yaffee's advice: “Don't be a cowboy.”

Other ethical challenges stem from resource scarcity. All three global health experts indicated that observing patients suffer from potentially preventable causes is a significant stressor for rotating trainees. Consider a hypothetical: a U.S.-based emergency medicine resident is caring for a patient X with new kidney failure in country Y. The resident has cared for similar patients in the U.S. where they have been started on dialysis, feel much better, and go home. However, in country Y, there is only one dialysis clinic, hours away by car and the costs of each treatment is hundreds of times the patient's family's daily income. Thus, patient X is not able to receive dialysis, struggles to breath from volume overload, and dies on day five of hospitalization. It can be very upsetting to witness patients suffer or die from conditions one perceives as very treatable back home, even if it is completely beyond one's resources in a given setting. Another common situation is having to choose who gets treatment when resources are available but limited. Schwartz et al. describe a situation in rural northeast Africa where a hospital had only one oxygen machine that could not be split between patients. The clinician had to make the decision about who received life-saving oxygen and who did not.⁸ Resource scarcity can result in myriad situations like these where the trainee can experience moral injury (or injury to their conscience), feeling guilt and like they could have done more, even though they could not. This is another important reason it is critical to have good supervision, mentorship, and a support system during a global health experience. Each of our experts acknowledged the importance of debriefing, whether that is with a supervisor at the site, or in a group upon returning home. Dr. Patel mentioned that journaling is also frequently a helpful

adjunct. Being able to process these experiences is essential to caring for one's mental health.

Trainees witnessing scarcity sometimes want to pay for treatments or some element of a patient's care. However, Dr. Yaffee and Dr. Patel feel this is not sustainable. Who will pay when the trainee leaves? Other people may hear about the trainee giving financial assistance and come asking for help. Where does the trainee draw the line? If trainees are motivated to make a financial donation, Dr. Patel recommends those donations go to an organization doing work in the area as opposed to individuals.

While on the topic of local organizations, it is important to consider any unintended consequences a global health activity can have on those local organizations. For example, a hypothetical medical mission M starts going to town T twice a year for 2 years to provide free medical care and medications. Unfortunately, its funding runs out at the end of year 2, and program M stops. During those 2 years the only medical clinic and the only pharmacy in town T closed because people stopped using their paid services in favor of mission M's free mission services. In the long-term, mission M left town T worse than it found it — without its only permanent clinic and pharmacy. People from town T must now travel 2 hours by car to seek medical care. Thus, any global health project must have the input of patients, community members, local government, local businesses, and any other stakeholders. Perhaps if Mission M had delivered its services through the local clinic and pharmacy, these local businesses would have become stronger and better able to serve the community when the mission left. While trainees most often will not design global health interventions themselves, they should choose to participate in sustainable programs. Trainees should ask how a specific program is strengthening local capacity, its impact on local organizations, and how it will transition its activities to the local community when it leaves. Programs should leave communities more self-sufficient than they found them.

In contrast to the example above, sometimes local community members distrust foreign programs and do not take advantage of the services provided. For example, during the Ebola epidemic, many people in the affected communities actively avoided healthcare services provided by NGOs because of distrust.⁹

Dr. Patel highlighted the necessity of understanding what is important to the community one wishes to serve. All three interviewees indicated that it is crucial to obtain “buy-in” from the local community. Dr. Patel emphasized that local professionals are the experts in their system — not the visiting trainee. As Dr. Yaffee stated, “Being deferential is important; realize that many times we are going to learn a lot more from places we visit than we are giving back.” Listening and being deferential to the host system will earn you respect and buy-in from the community. An intervention developed without the input and active participation of a local community will often fail because it is either ineffective in the local context or because it fails to gain the community's interest and trust. A trainee that feels superior to her local coworkers and patients will struggle to gain trust and be effective in her role.

Table 3 lists articles that discuss some of the challenging ethical dilemmas that healthcare workers encounter when doing international work. All of our experts recommended reading papers such as these before embarking on a global health rotation.

Reflection

Our experts think working abroad has made them more resourceful in their practices in the U.S. Dr. Yaffee shared that she has been able to solve problems more creatively, without relying as heavily on as many resources. Dr. Patel mentioned the challenge of switching from treating serious, debilitating illnesses in a low resource area to practicing in an emergency department in the U.S. that welcomes many non-emergent complaints. It can be easy to feel judgmental of patients with low acuity complaints.

However, he states we must not forget each patient deserves the same level

of respect. “You can't be judgmental of people's vulnerabilities.”

A global health experience can be intense and transformative. To get the most out of it make sure you take pauses and reflect all the way through and especially at the end. Debrief with your mentors and other people who have had similar experiences. How do care and resources compare across countries?

What do you wish you would have known before going? What would you do differently on your next trip? Did you feel your experience had a positive, negative, or neutral impact on the host community? What are some parallels between the social determinants of health affecting your patients in the community you visited vs. your home setting? How will practicing medicine abroad influenced your work in the U.S.? Are there ways you can stay connected with the host community and help from home?

Conclusion

International rotations can have a profound impact on medical trainees. According to our interviewees, the experience will be enhanced by significant preparation, good mentorship, allotting enough time in the host community, debriefing, and staying connected with the individuals at the host site. Some pitfalls to avoid are practicing outside of one's scope, disregarding the knowledge of the local community, overconfidence, and lack of respect for the local community. Above all, it is important that, as visitors, we make every effort to familiarize ourselves with the host country's history and medical system and not simply try to impose our own ideals. As Dr. Patel stated, “We have this notion when doing global health work we want to go and make all these changes. We have all these ‘wants’: ‘I want to teach them this, I want to do that,’ without understanding the needs of the community. Instead we must be humble, listen and be thankful to the community for letting us be there, think about unintended consequences of well-meaning actions, and expect to learn much more than we can teach.”

For more details, a checklist of global rotation preparations, and additional resources please see the expanded article on emresident.org. ★

Are You Satisfied with Your Patient Satisfaction Scores?

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As the U.S. health care system continues to transition to value-based reimbursement, patient satisfaction is becoming an increasingly important metric for hospitals, clinicians, and patients. From a hospital systems standpoint, it can be used to compare different health initiatives, evaluate the quality of care, and identify areas of improvement.¹ From a financial perspective, it can be an essential marker of performance and compensation for hospitals, administrators, and physicians.

A study by Fullam et al. found that patients' perceptions of quality explained nearly 30% of the variation in hospital financial performance.² This has led to senior health care executives' compensation being tied to patient satisfaction scores, which in turn prompts administrators to incentivize (or penalize) scores.³ Moreover, patient satisfaction is important from a malpractice standpoint, where studies have shown that positive patient experience is associated with lower medical malpractice risk. In one study, they found that the likelihood of a provider being named in a malpractice suit increased by 21.7% for each drop in patient-reported scores along a 5-step scale of "very good" to "very poor".²

Patient satisfaction is also linked to greater employee satisfaction, resulting in reduced staff turnover. For instance, a focused initiative to improve the patient experience at one hospital led to a 4.7% reduction in employee turnover.⁴ Not only is patient satisfaction an important reflection of the quality of work we're doing as physicians, but it can also be impactful to the health outcomes of our patients. Higher patient satisfaction has been shown to improve patients' compliance with recommended treatments and will result in closer patient follow-up with appointments.¹

And most important, measuring patient satisfaction gives patients a voice in their own healthcare, and is fundamental when striving towards patient-centered care.

Measuring Patient Satisfaction

In 2002, the federal government became involved in patient satisfaction scores with the creation of the 27-question Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. Then in 2010, the Affordable Care Act tied hospitalized Medicare pay-for-performance with HCAHPS. As part of the Hospital Value-Based Purchasing Program, hospital performance on the HCAHPS survey can affect the hospital's base operating Medicare payments by 2.0%, positively or negatively. To aid in capturing the HCAHPS payment, roughly 50% of hospitals use Press Ganey as the vendor of the HCAHPS survey. In addition to the financial benefit of the survey, it also provides feedback that guides hospitals in policies and allows patients to have a voice in their own healthcare. Informed by survey data, hospitals can develop initiatives to make the patient experience better in terms of effectiveness and efficiency.⁵

The HCAHPS survey asks about:

- communication with doctors
- communication with nurses
- responsiveness of hospital staff
- communication about medicines
- care transition
- cleanliness of the hospital environment
- quietness of the hospital environment
- discharge information
- overall hospital rating
- likelihood to recommend

In terms of doctor communication, the survey asks:

1. During this hospital stay, how often did doctors **treat you with courtesy and respect**?
2. During this hospital stay, how

often did **doctors listen carefully to you**?

3. During this hospital stay, how often did **doctors explain things in a way you could understand**?

However, the HCAHPS survey also has several limitations that may impact the scores. For example, taking care of critically ill patients may lower some scores due to low acuity patients potentially grading you poorly as a result of increased wait times as you were actively resuscitating and stabilizing more sick patients. Another limitation is the lapse of time between a patient's ED visit and the receipt of a survey in the mail, which may affect a patient's memory of their visit. And patients who were unhappy due to a long wait or because they did not receive requested medications or testing may be more inclined to show their unhappiness by down-grading all aspects of their care, even when other aspects of the care they received were exceptional. As well, certain patient dispositions may influence the attention received from providers. For instance, patients who leave without being seen or who are admitted to the observation unit do not receive surveys, leaving open the possibility that providers can change how they manage these patients to minimize poor scores.⁶ Herein within this context, an opportunity presents itself for emergency physicians to gain awareness of the drivers of patients satisfaction.

Determinants of Patient Satisfaction

Hospital Environment

The hospital environment has a large impact on patient satisfaction, and facility improvement can lead to improved patient scores. A systematic review by Batbaatar et al. found that the aspects of the hospital environment that were associated with patient satisfaction included: pleasantness of the atmosphere,

room comfort, bedding, cleanliness, noise level, temperature convenience, lighting convenience, food service, bathroom comfort, clarity of sign and directions, arrangement of equipment and facilities, and parking. Furthermore, patients who were in appealing rooms evaluated physicians' actions and perceived competence more favorably.¹

Patient Characteristics

The characteristics of a patient can influence whether a patient is more or less likely to be satisfied with your care. Older patients are generally more satisfied than younger patients. Patients in rural areas tend to be more satisfied than those in urban areas. Health status can impact satisfaction, as patients reporting their health as poor are generally less satisfied than those who describe themselves as

healthy. Conversely, religion, gender, and race have not shown to impact patient satisfaction.¹

Provider Characteristics

A provider's physical appearance is considered important for the patient experience. Physicians wearing glasses positively affects perceived warmth and competence, whereas beardedness has a negative effect on perceived warmth.⁷ For emergency physicians, studies have shown that patient satisfaction **does not** change whether a doctor wears a white coat or scrubs in the ED.⁸

The provider's gender can also impact patient satisfaction. A study by Mast et al. demonstrated that patients have different expectations about female and male physicians in-line with gender stereotypes. For female physicians, they

found that patients were more satisfied if the provider demonstrated more interpersonal orientation, caringness and empathy, while negatively viewing assertion or dominant behavior. For male physicians, satisfaction was greater when they showed more interpersonal distance, more expansiveness, less orientation toward the patient, more looking at the patient chart, and louder voice. It was also found that female doctors attained highest satisfaction ratings using a consultative communication style with younger and middle-aged patients, whereas male physicians reached the highest satisfaction ratings using an authoritative communication style with middle-aged and older patients.⁹

Nonverbal Actions

Nonverbal actions by the physician, such as smiling, eye contact and social contact can all influence a patient's perception of their provider. Patients were more satisfied when physicians smiled more during interactions.⁹ As well, eye contact has been determined to be important, but the extent of its effect changes with the length of the interaction. The degree to which eye contact influences satisfaction increases when the visit length is short, but as the visit becomes longer, the effect of eye contact decreases.¹⁰ In terms of social contact, patient ratings of likability and connectedness increased with social touch, to a point, but decreased when done in excess. The study by Mast et al hypothesized that two social touches in a consultation may be ideal.⁹ Other nonverbal techniques that were found to have a positive association with patient satisfaction includes nodding, forward-leaning, gesturing, gazing and eyebrow lowering. On the other hand, keeping a far distance to the patient and frowning had a negative association. And no association was found for talking while doing something else or the attractiveness of provider.⁹

For more information on patient satisfaction scores and other areas of EM operations, consider applying for the EMRA/ ACEP Emergency Department Director's Academy (EDDA) Scholarship! ★



CHEAT SHEET

— The Perfect Patient Satisfaction Score +

The Introduction: What Matters To You?

- Address the patient formally: acknowledge they have been waiting
- Introduce yourself
- Shake hands
- Stand or sit openly
- Maintain eye contact

Initial Interview: Making Patient Part of Team

- Listen without acting rushed, setting expectations while planning to exceed them
- Make sure to address each concern without being dismissive or interrupting. Identify **medical/ clinical diagnosis** and **customer service** diagnosis
- Provide timeline: next sequence of events so the patient knows what to expect
- Provide an honest timeline for results

Continuation of Care

- Reassess patient's symptoms
- Update patient on test results and the plan: **try to have touch point every 20 minutes**
- Update the patient on delays of their care

Conclusion or Transition of Care

- Use easy to understand language to explain diagnoses, cause of illness, medications, and discharge instructions
- Allow for shared decision making when appropriate
- Listen to Understand: "Sometimes I'm not as clear as I want to be; what is your understanding of what I just said?"
- Introduce the patient to the next provider during transitions of care
- Explain specific and realistic return precautions when discharging the patient
- Final opportunity to leave a legacy. Consider asking patients: How did we do today? Intervene on outstanding issues.

TRAINING THE FRONT LINE

Substance Use Disorder Education for EM Residents

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Emergency Medicine Residency

Case Vignette

Daniel had overdosed, again. Someone must have noticed him passed out on the street and called 911 because, before he knew it, an ambulance crew had picked him up and dropped him off at the emergency department. He reminded me of dozens of other patients that I have taken care of over the past 7 years in Boston — first as a medical student, then as a resident training in emergency medicine during the height of the nation's opioid epidemic. He was a mid-30's, white male who had grown up in an economically depressed part of the north shore of Massachusetts. From his first exposure to opioids at age 14 to his eventual progression to IV heroin and cocaine use, Daniel's* medical history outlined the story of a life upended by addiction: untreated hepatitis C, multiple ED presentations for opioid overdoses, hospital admissions for complicated skin abscesses from which he often left against medical advice, and one ICU admission after getting intubated in the ED for excessive agitation while intoxicated with a bad combination of opioids and cocaine.

On this particular evening, Daniel had overdosed on heroin. By the time he had arrived to the ED, he had become increasingly somnolent with pinpoint pupils and a respiratory rate that was dipping into the danger zone. The nurse placed an IV and I gave him a tiny dose of IV naloxone (0.04 mg, one-tenth of the standard dose)—just enough to restore his respiratory drive, but not enough to send him into florid withdrawal.

Substance Use Disorders in the ED

The prevalence of substance use disorders (SUDs) among the ED patient population is on the rise.¹⁻³ The emergency department has become a critical point of access to the health care system for patients with SUD, representing nearly half of all ED visits in the US.⁴ And yet, the rates of treatment remain low. The National Survey on Drug Use and Health data from 2016 revealed that of the 19.9 million American adults who needed treatment for a substance use disorder, only 10.8% received addiction treatment within the past 12 months.⁵ Why are so many people left untreated? Lack of knowledge about evidence-based treatment modalities, the pervasive stigma surrounding addiction, and lack of a feeling of self-efficacy on the part of clinicians to intervene may all contribute to the missed opportunities to save lives.⁶

Some would argue that the emergency department is actually the optimal setting to perform screening and intervention for SUD. For example, EDs often serve the primary health care needs for patients with opioid use disorder (OUD), provide overdose reversal, attention to injuries related to substance use, and entry points into OUD treatment.⁷ When patients present with an acute problem to the ED, physicians may be able to leverage their motivation to change and initiate buprenorphine, distribute naloxone, counsel patients, and refer them to outpatient treatment and follow-up.⁸ Because of the unique role that emergency physicians are able to play in reducing overdose deaths and increasing linkage to addiction treatment, it is essential that SUD education be taught in every EM residency in the nation.

Development of the EM Curriculum

The Substance Abuse and Mental Health Services Administration (SAMHSA) has awarded the American College of Emergency Physicians (ACEP) a \$220,000 grant to develop and disseminate SUD curriculum to EM residency programs around the country. With this grant funding, ACEP has partnered with the American Board of Emergency Medicine (ABEM), Council of Residency Directors in Emergency Medicine (CORD), and EMRA to carry out a two-year project, called "Training the Front Line." The goals of this project are to teach residents about SUD disease processes and evidence-based treatment options, reduce stigma, and empower emergency physicians to actively engage patients in treatment. In the first phase of the grant in the fall of 2019, ACEP convened a committee of experts in the field of SUD research to determine the design the curriculum. The subject matter experts included Drs. Kathryn Hawk, Alexis LaPietra, Ryan McCormack, and Reuben Strayer. I had the privilege of serving as the EMRA representative to the committee and helped to shape a curriculum that would be practical and focused on the needs of EM residents.

Together, we created a series of short, 20-minute teaching modules organized by topic: Introduction to Opioids, Treatment and Management of Opioid Use Disorder, Alcohol and Benzodiazepines, Cannabis and Vaping, Stimulants, and Special Populations such as adolescents and pregnant patients. In the second phase of the project, twelve residency programs served as the pilot sites for the rollout of this curriculum from January to June 2020. Faculty at those residency programs delivered the modules to their residents, and residents provided feedback to ACEP about the quality of the curriculum. In the

third phase, resident feedback will be used to revise the curriculum. By the end of 2020, the revised curriculum will be made available to all EM residencies in the U.S. As the final output of this grant, the 2021 In-Training Exam (ITE) will be updated to include examination questions based on this SUD curriculum.

By creating a standardized SUD curriculum that is specific to EM residents, we hope to equip emergency physicians with the tools they need to provide their patients with high-quality and evidence-based SUD screening, assessment, and treatment.

Evidence-based Interventions

What kind of evidence-based interventions are we talking about? In a randomized control trial by Yale University in 2015, patients who presented to the ED with opioid withdrawal were randomized to one of three treatment arms: 1) referral to outpatient treatment, 2) referral and brief counseling intervention, and 3) referral, counseling, and initiation of buprenorphine from the ED. The results were impressive: being given a buprenorphine “starter pack” from the ED increased a patient’s 30-day retention in treatment to 78%, nearly double the rate of the group who received brief counseling and referral alone (45%), as well as compared to the group who received referral alone (37%).⁹

In a study published in the *Annals of Emergency Medicine* in January 2020, Weiner, et al, determined that patients treated in the ED for overdose had a one-year mortality rate of over 5%.⁸ They found that a large number of patients discharged from the ED after an opioid overdose died in the first

month. Approximately 20% of patients who died did so in the first month, and approximately 20% of those died in the first two days following discharge from the ED. With the median age at time of death of 39 years, the loss of life from those preventable overdose deaths was astounding. On the other hand, if patients are provided with medication for opioid use disorder (MOUD) — specifically buprenorphine or methadone maintenance treatment — one death can be prevented for every 40 patients treated, which would reduce the annual mortality from 5% to 2%.^{8,10}

By training emergency medicine residents in evidence-based practices such as reduced opioid prescribing to prevent

development of OUD, use of alternatives to opioids for acute pain management, harm reduction techniques such as distribution of naloxone kits, and ED initiation of MOUD, we can significantly increase the likelihood that patients will engage with health services and achieve long-term improvements in health outcomes.¹¹

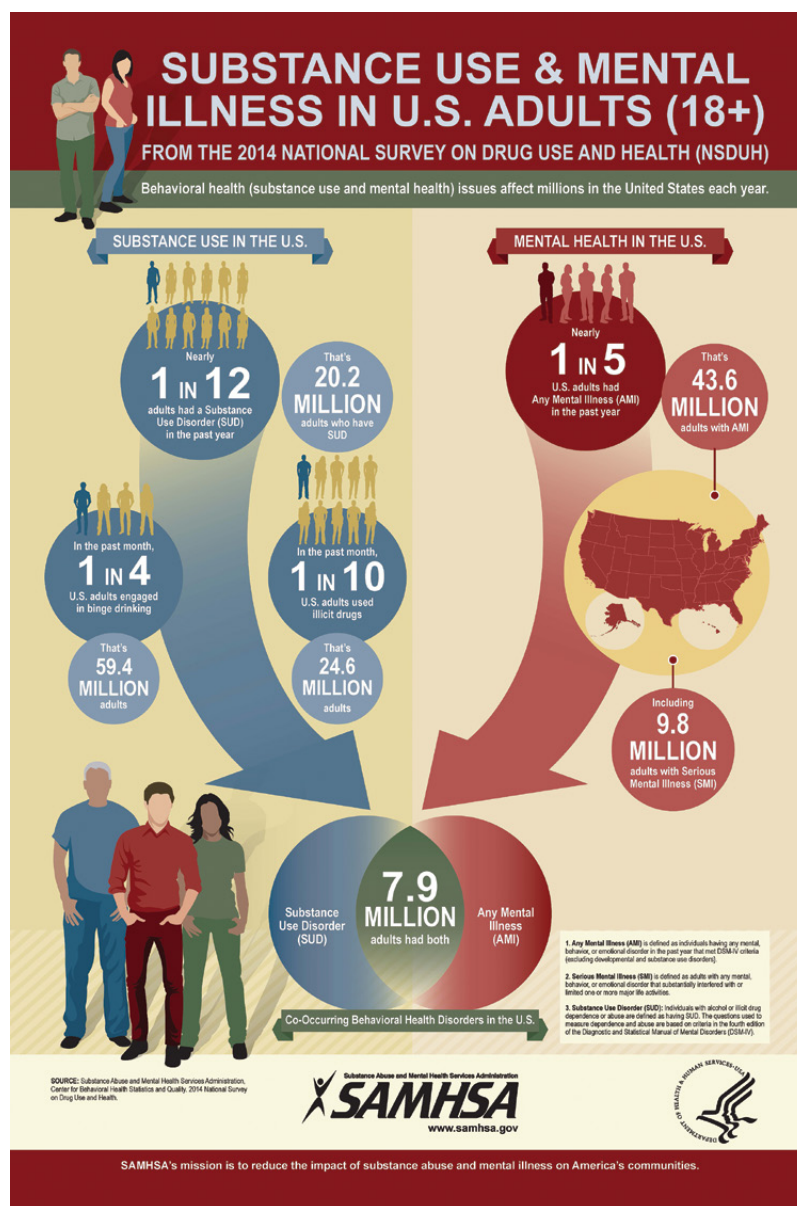
Case Resolution

So, what happened to Daniel that night in the ED? After giving him the small dose of naloxone, his breathing normalized and he did not go into withdrawal. I kept an eye on him while he slept through the rest of the night connected to end-tidal CO₂ monitoring and made sure that he didn’t need further doses of opioid reversal. By the morning,

when he had sobered, one of our ED social workers talked to him about treatment options. Ultimately, he wasn’t ready to start buprenorphine or other MOUD treatment that day, but I left my shift knowing that I had treated him with respect and understanding.

One day he may be ready to come back for help. I hope that when that day comes, the next emergency physician to care for him will be empowered by resources such as this SUD curriculum to counsel and guide him towards effective treatment options. That indeed should be our standard. ★

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COCKTAILS WITH CHAIRS

Pearls for EM Physicians-In Training

Nicholas Cozzi, MD, MBA

Spectrum Health/Michigan State University
EMRA Administration & Operations Committee
Chair-Elect

@NickCozziMDMBA

Adrian Cotarelo, MD, MHS

St. John's Riverside Hospital

Wendy Sun, MD

Yale New Haven Medical Center

While the COVID-19 pandemic continued to affect each corner of the world, emergency medicine physicians were leading on the front line while also meeting together to imagine the future of our specialty. EMRA and SAEM RAMS collaborated alongside EM department chairs across the nation as part of the May Virtual SAEM Meeting. Our “Cocktails with Chairs” event sought to reduce the power distance between residents and EM department chairs and afforded an intimate session with residents, attending physicians, and medical students — over cocktails!

Our Chairs

- **Dr. Andra Blomkalns** is the founding Chair of the Department of Emergency Medicine at Stanford School of Medicine.
- **Dr. Michael Brown** is the founding Chair of the Department of Emergency Medicine at the Michigan State University College of Human Medicine and Immediate Past President of the Association of Academic Chairs of Emergency Medicine.
- **Dr. Bo Burns** is the George Kaiser Family Foundation Chair of the Department of Emergency Medicine at the University of Oklahoma School of Community Medicine and current CORD Board Member.
- **Dr. Gabe Kelen** is the founding Chair of the Department of Emergency Medicine at Johns Hopkins University and current ACEP Board Member.
- **Dr. Ian Martin** is the Chair of the Department of Emergency Medicine at the Medical College of Wisconsin and Immediate Past President of SAEM.
- **Dr. Angela Mills** is the founding Chair of the Department of Emergency Medicine at Columbia University Vagelos College of Physicians and Surgeons, the Chief of Emergency Services of New York — Presbyterian — Columbia, current SAEM Board Member, and 2019 EMRA Inaugural EM Chair of the Year.

Our chairs gave insight into their experience, day-to-day roles, and career trajectory from resident physician to leader of their respective departments and our field.

10 Pearls Gleaned from the Event that You Can Use in Your Journey of Becoming an Emergency Physician

Secret Sauce: Failure is necessary

Remember that not every idea, project, or initiative will be successful. Something may seem better in theory than it turns out in practice. Part of leadership is learning from these experiences, taking setbacks in stride, and moving forward.

Imposter Syndrome

Many students and residents face imposter syndrome — EM department chairs are no exception. Many of the chairs noted feeling inadequate compared to their colleagues during their residency training. They reported imposter syndrome as a driving factor in working hard to develop their clinical knowledge base.

“Planting Trees Under Whose Shade You May Never Sit”

Being a chair is like being a maestro. One of the key tenets of being a chair includes advocating for your department, junior learners, and the field of emergency medicine. Some of our panelists were founding department chairs. The success of your colleagues is a reflection of your success. Part of the goal of a chair is building up the next generation of leaders in our field.

High Reliability Culture

Our chairs described the importance of establishing a highly reliable culture of continuous improvement, trust, and consistency. This triad helps accelerate the process of building trust and can help you starting day one of residency.

The Power of Radical Candor

Honest, professional, and direct conversations build relationships that hold people accountable. Be candid, but with compassion, as you lead your department and in your residency.

Portfolio of Skills

Cultivate skills that will make you an effective leader including listening, understanding and being approachable. Be intellectually flexible. Be a learner and take advantage of various developmental and national opportunities within EMRA and SAEM.

Go First

Raise your hand to help in the time of need. Often leadership roles occur serendipitously when a person steps up to do what they feel is right. One of our chairs described obtaining 165 brand new N-95 masks for each member in his department. Follow your ambition, pursue the changes that you feel are necessary, and your career will follow.

Introverts

Leaders come in all shapes, sizes, and personality types. Introverts can and do succeed in leadership at every level in emergency medicine.

Practice makes Permanent

Consistent, intentional and deliberate effort leads to progress. No one develops competency overnight. Improvement comes with having a growth mindset.

Send the Elevator Back Down

An EM department chair is inherently a mentor to many, and each panelist described the impact mentors had on their careers. As a resident physician, you have the ability to mentor countless medical students, undergraduates, and students in high school. Take the first step today. Repeat often. Doctor's orders. ★

Thank you to both EMRA and SAEM RAMS for hosting this collaborative event. Special recognition goes to our participating EM department chairs; Cathey Wise, CAE (Executive Director of EMRA); Holly Duncan, (SAEM Director of Membership and Meetings); Hannah Hughes, MD, MBA (EMRA President); and Nehal Naik, MD (Immediate Past President of SAEM RAMS). For the full Cocktails with Chairs event, please see the video available on SAEM's Youtube Page.

Medical Education Fellowship Director Interview Series

Frances Rusnack, DO, MS

Mount Sinai Morningside – West, PGY-3
EMRA Education Committee
Vice Chair of Resident Education

Moira Smith, MD, MPH

University of Virginia Health System, PGY-2
EMRA Education Committee
Vice Chair of Resident Education

Erin Karl, MD

University of Nebraska Medical Center, PGY-3
EMRA Education Committee Chair

Sarah Ring, MD

Mount Sinai Hospital, PGY-2
EMRA Education Committee Chair-Elect

The EMRA Education Committee is excited to bring you our newest project, the *Medical Education Fellowship Director Interview Series*, which will allow Medical Education Fellowship Directors a platform to describe their fellowship program, highlight different medical education career paths, and provide resources for potential fellows. We are excited to showcase the first interview for you here within *EM Resident's* August/September issue, and **we encourage you to visit EMResident.org for a collection of these Q&A format articles from other programs.** The interviews will also be linked to each fellowship's profile on EMRA Fellowship Match, serving as a valuable resource to applicants. This is particularly timely given the loss of many conferences and other networking opportunities for prospective fellows. *If you are a MedEd Fellowship Director interested in submitting a profile on your program, please email emra.education@gmail.com.*

Medical Education Scholarship Fellowship at the Department of Emergency Medicine at the Alpert Medical School of Brown University

Director: Chris Merritt, MD, MPH, MHPE

Title: Associate Professor of Emergency Medicine & Pediatrics

Institution: Department of Emergency Medicine at the Alpert Medical School of Brown University

Social Media Tags: www.brownmeded.org, @chris__merritt

Tell us about you and your program

Our program's philosophy is to create a network of colleagues, collaborators, mentors and teachers around each fellow with the goal of positioning our fellows to achieve their educational and professional development goals. Rather than fit a fellow into a program, we work to build a program around the individual's identified needs and goals.

Medical education at Brown focuses on understanding, opportunity, mentorship, and scholarship. Fellows are fully privileged faculty in the Department of Emergency Medicine at Brown.

Our 2-year program is built around 4 pillars:

- I. *Building a background in educational understanding:* To achieve this, we offer a fully-funded master's degree in medical or health professions education. Fellows can choose from among dozens of programs, finding a graduate program that meets their needs. We find that the combination of didactic learning gained through the master's degree process provides a broad base upon which a career in education can be built. Our most recent graduate completed the MEHP program from Johns Hopkins. Brown's program mentors work together with graduate program leaders to align the goals of fellowship with the goals of graduate work.
- II. *Opportunities to teach:* There is no shortage of opportunity here at Brown. Because our faculty and colleagues have connections across the entire spectrum of medical education, our fellows are afforded the chance to dip their toes in the water at any level, from undergraduate university students to ongoing professional education with experienced faculty, and everywhere in between. Fellows have participated in the preclinical doctoring course at Brown's medical school, taught in the EM clerkship and

pre-residency boot camp, developed residency curricula, and been on the planning committee for the Program in Educational Faculty Development — the medical school's professional development arm for educators. In addition, fellows have taught at regional and national conferences.

- III. *Scholarship:* Scholarship may take many forms, from dissemination of newly developed curricula to scholarly application of educational evidence to primary education research in the health professions. Within the Department of Emergency Medicine, the Education Section is an active network of educators and education scholars cooperating in regular collaborative efforts. Fellows have access to this body of shared expertise and mentorship with BrownEM, and to the broader community of educators throughout the institution. Whether fellows seek support in traditional research, or opportunities to engage in more non-traditional scholarly pursuits such as podcasts or digital health, we will build a program that meets their professional development goals.
- IV. *Mentorship:* One of the greatest joys as an educator is to engage in the sort of mentorship relationship that our fellowship offers. Our faculty are dedicated to engaging with fellows, identifying individual and shared goals, and helping to build the personal learning networks that we hope can enrich not just a fellowship program but an academic career.

How did you get involved in medical education, and what is your career path that led you to your Fellowship Director position?

I've been drawn to education since medical school, but it wasn't until I joined the faculty at Brown that I realized that it could become such a significant part of my career. I started by directing a month-long rotation for EM residents. I got to know every EM resident in our program on a 1:1 basis, each over the course of a month, which remains one of my most memorable and fulfilling roles as an educator. It was then that I recognized that if I were going to really pursue med ed as an academic niche, I would need to strengthen my foundation. Through a faculty development grant, I was able to pursue a master's degree in health professions education, during which time I recognized the importance of

mentorship and sponsorship. The mentoring relationships I developed then have stood to this day, and the network of educators and colleagues I began to build have strengthened over time. I've had roles in education across the spectrum — directing a short course for preclinical medical students, running a residency rotation, spending time as a residency director, and planning and teaching in Brown's faculty development program. I currently am a longitudinal mentor to more than 30 medical students at Brown, which has been a whole new adventure! Through my role as fellowship director, I hope to help new faculty find this same joy through education and education scholarship.

What are the benefits to completing a fellowship in medical education?

More and more, education is becoming professionalized — and by this I mean that learners and program leaders have begun to expect that their education leaders have a deeper understanding of the many facets of education, including education theory, education scholarship, and leadership. The “see one, do one, teach one” mantra no longer applies. By identifying education as a niche, fellows signal that they have sought this deeper understanding. Fellowship provides the protected time to really sink your teeth into all the aspects of what it means to be an educator within emergency medicine. Graduates go to the head of the line when it comes to seeking faculty jobs, leadership positions, and other opportunities. Simply put, a med ed fellowship is a short investment in a long career.

Does your program have a particular niche within medical education or unique aspects potential fellows should be aware of?

We've prided ourselves on building individualized programs for each of our fellows and helping each of them build the career they desire. We don't try to shoehorn anyone into a one-size-fits-all approach.

What are the different career paths that fellowship graduates from your program have taken after graduation?

Our fellowship grads have been really well-positioned to take on leadership roles in medical education, from sitting on residency committees, medical school curriculum committees, all the way to positions in the medical school Office of Medical Education and even deans!

A sample of positions/titles held by our graduates:

- Director of clinical skills training (4-year longitudinal “doctoring” course)
- Chair of AAMC's Northeast Group on Educational Affairs
- Chair of AAMC's Group on Educational Affairs national Grant Award Program
- Assistant Dean for advising, Program in Liberal Medical Education
- Course leader
- Chair, SAEM Education Research Interest Group

What advice do you have for residents who are just starting to get involved in medical education, especially residents who may not have a lot of resources at their own program?

Be on the lookout for opportunities to be involved! Medical schools in particular often love to have residents on board as clinical skills teachers or mentors. Volunteer or campaign to represent residents and trainees on hospital or university committees — graduate medical education committees or senates,

for example. Seek opportunities within your own program — maybe there's a rotation curriculum that needs to be revamped? These local curricula can even be shared and presented at regional or national meetings. Is there a residency committee that needs your voice? Elective time might be an opportunity to learn simulation or another med ed skill. And look to your national organizations — EMRA, of course, but CORD, SAEM, ACEP all have resident sections and committees, and many have state or regional arms that might just be looking for a voice like yours.

What qualities does your program look for in potential fellows?

We really look for a passion for teaching — of course! — but also for individuals with a vision for how their passion for education can contribute to both their own careers and to the community of academic emergency physicians. I love to see people's eyes light up when they talk about their hopes and aspirations, and how they see a Med Ed fellowship as a step toward the future they hope for.

What is the application and interview process like at your program (ie, application requirements, timeline, match process, participation in CORD universal offer day)?

The application is pretty straightforward — we ask for a letter of intent, a CV, and three letters of reference. These can be sent to me and our fellowship coordinator, Wendy Wesley (wendy.wesley@brownphysicians.org).

We've historically invited applicants to come visit us and interview in the fall — typically in October. We love the chance to show off our city — trust us, if you've never been to New England in the fall, it's amazing. Providence is a great little city, with so much more to offer than its size might suggest.

We're hopeful that we'll still be able to bring folks to us to interview, but travel may be tricky depending on how the COVID pandemic progresses — we'll be offering virtual interviews as well.

The CORD universal offer date was met with mixed reviews last year — we're definitely involved in the conversation about how it will evolve for the coming year. Med ed fellowship directors met at CORD this winter, and we continue to stay up to date with that dialogue!

What are your thoughts on the value of a master's degree in medical education? Does your program require it or accommodate fellows who want to pursue one?

A fully funded master's degree is built into our fellowship program. We believe that this has high value in establishing the foundation of understanding medical education theory and practice, as well as in helping fellows develop a wide-reaching personal learning network and a robust professional identity as an educator. A master's degree program helps augment the mentorship relationships we form with fellows. The combination of formal education in health professions education plus the components of the fellowship program itself is really a win-win. Together, this helps us develop education leaders.

If a resident is interested in getting to know more about your program, what is the best way for them to get in touch with you?

Please reach out to me directly! I'm always happy to share everything great we've got going on at Brown. I can also put prospective fellows in touch with alumni of our program, faculty, or others who might be helpful. cmerritt@brown.edu / [@chris_merritt](https://twitter.com/chris_merritt) on Twitter / brownmeded.org ★

When Medicine Robs You

Tiffany Proffitt, DO
EMRA® Cast Host
Spectrum Health Lakeland
@ProMammaDoc



Induction Day

When you are 38 weeks pregnant with twins, this day comes with mixed emotions. But even more so when you are a second-year medical student about to sit for the first, and most important, of your medical licensing boards. Step 1 determines which specialty you will match into and, often, your potential future earnings and career longevity. At 38 weeks people would often ask, “Aren’t you ready to deliver?!” *You must be tired of being pregnant!* My answer: “Yes. No.” Yes, I was tired of carrying around 2 babies and not being able to sit behind a computer, steering wheel, stand up without a forklift, plus I couldn’t remember the last time I saw my feet or was able to tie shoelaces. No, because I had so much to do. I was glad I had made it through my rigorous finals week, which consisted of 5 exams, 3 of which addressed 2 years of cumulative information in 1 week. But I digress.

I had made it. To 38 weeks. To my last final. It was a 7 am psychiatry exam; I woke up at 5 am, and my mother drove me the hour each way to campus because I didn’t fit behind the steering wheel. Then there was a clerkship orientation, which I attended because I didn’t want to give anyone a reason to dismiss me. THEN I was ready for my induction. I exchanged my exam study materials for my maternity “go bag,” which included my Step 1 prep book.

This is how medicine robs you of the most important moments of your life.

From before the moment my twins were born, I was distracted by medicine. Who brings a Step 1 prep book to labor/delivery when they’re the patient? I didn’t have a birth playlist. I didn’t have baby

books. But I *did* have my Step 1 book. I didn’t open it, but it nagged me all through the night, as I waited to bring my children into the world.

The next morning, my OB/GYN discussed my failed induction, how my son was having late decelerations and it would be safest if I underwent a c-section. I was secretly relieved because after finals week I was exhausted. After a night of no sleep — made impossible by the uncomfortable position required to make sure the toco monitors worked — I was exhausted.

Then they were there, my son and daughter, the most important people in my life next to my husband. And when they were 2 weeks old, when I was still trying to figure out how to breastfeed, how to pump, how to hold my 4 lb son, I had to leave them. Step 1 and clinical rotations loomed; I had to study.

My mother and husband, who are ceaselessly supportive and loving, took over my role.



I am fortunate to have them. But medicine assumes that because I want to be a doctor, I don’t want to be a mother. Medicine thinks I wanted to abandon my children when they were tiny; 2 weeks old was the last time I was able to focus entirely on them.

Medicine is more than dehumanizing. Some days I cry to myself, some days I cry to my husband because I missed it all and I wish I could go back. I wish I could have been present. I don’t think real maternity leave is too much to ask.

It makes me so angry — actually, that’s not a strong enough word. Infuriated, enraged. They robbed me of the first month of my children’s lives. The powerlessness of being a medical student (whom medical schools and residencies exploit) prevents us from asking for what we need.

What we need is an accommodating system. I’m tired of being forced to be grateful for scraps of humanity and equity.

Now that I’ve finished residency, I look forward to focusing on my family again. But I am infuriated and enraged by what I have lost. It eats away at me every day. The pain is palpable, physical, it tugs at the very fibers of my soul. It comes unexpectedly and without conscious thought. And then I have to go work a shift or attend didactics or journal club or a mandatory residency event when all I want to do is hold my family. Breathe in my children. Feel the fine, soft hairs of their heads run through my fingers and read them a bedtime story.

This is not just my story. This is the story of being a parent in medical training and an example of how medicine tries to rob us of what we cherish. Things are changing, but there is more work to be done. ★

Lord NRMP Match

“We are sorry, you did not match to any position.”

Matthew Caviness, MD

Saint Louis University School of Medicine
Class of 2020

“Good morning, Matt. We admitted 2 new patients overnight. Why don’t you see this patient who presented last night with pancreatitis?” My ICU senior resident suggested early on the Monday of March 16.

“Sure!” I responded, realizing this would be an excellent learning case. The ICU had been enlightening for furthering my understanding of emergency medicine. I had found myself immersed in my cases. GI bleeding from esophageal varices, acute respiratory failure secondary to opiate overdose complicated by aspiration pneumonia, stroke in a young female with Graves’ disease. Caring for these high acuity, and medically complicated patients was captivating.

I went to see my new patient, a gentleman in his 50s with a past medical history of alcohol abuse. He came to the ED overnight with abdominal pain and shortness of breath, and was diagnosed with pancreatitis secondary to alcohol abuse; appropriate treatments were administered. Immediately, as I walked into the room, I became concerned. My patient was tachypneic, unable to speak in full sentences, but was still maintaining adequate O₂ saturations. Additionally, he had profound abdominal distention.

“This is the largest and most firm belly I have ever mashed on,” I thought

to myself. I turned his oxygen up to 6L and told him we would do everything we could to make him more comfortable. I went to find my senior resident to discuss my concerns about abdominal compartment syndrome, then prepared for rounds.

It was an hour before match results were set to be released.

As we were rounding, results of testing ordered by my resident after our discussion were back: our patient with alcoholic pancreatitis had a bladder pressure of 25. A subtle, congratulatory fist bump and a “Good job man, you called that one” made me feel like a contributing member of the team.

Then the clock reached 10 am sharp. My sense of success was short-lived.

“We are sorry, but you did not match to any position.”

I heard the sound of the ice cracking beneath my feet as I plunged into the cold depths of the unknown. “Is this a mistake? Surely, this wasn’t meant for me. Not even one program? I had hit the recommended number of interviews. My advisors had assured me of my chances. We were never concerned.” The thoughts raced through my mind as I became increasingly pale and tachycardic.

But there was no time to process; the clock had already started ticking on the 3-hour window to apply to a maximum of 45 programs listed in the SOAP process.

I realized I had put *everything* into matching EM and hadn’t even

considered an alternative. While applying I had focused on programs near my home in the Midwest. I had hit my number of interviews recommended. I thought I had done all of the “right things” during the application and interview season.

“How could I have not prepared for this? I don’t know where to apply. I don’t even know what positions to apply to. Should I switch fields and apply to a categorical internal medicine position? Surgical or medicine prelim? What the hell even is a transitional year?” I asked myself as I furiously began familiarizing myself with the SOAP.

My phone rang and I was relieved to see my advisor’s name flash onto the screen. “Hey Matt, it’s Dr. T. I heard the news. I wanted you to know that everyone here in the department is shocked. This was unexpected, but you should know we are all here to help. Do you know Dr. C? You may not have been aware of this, but he didn’t match during his first attempt and went through the same process. I think he would be a great help.”

“Dr. C didn’t match? Dr. C, the fellowship trained, POC ultrasound educator and clerkship director?” I thought to myself.

Within minutes I was on the phone with Dr. C. “Hey. Sorry to hear the news, Matt. I want you to know that a career in EM is still an option. I initially didn’t match and was able to successfully reapply. Don’t lose hope on this. A career

in EM is still a definite possibility for you. We think the best option for you is to apply to surgery preliminary position or transitional year position and reapply next cycle.”

I took a deep breath, mentally preparing for my next steps. **I was not going to drown... and I was not alone.**

The next few days were a blur. I reviewed the 45 programs, submitted my applications, and kept researching the 45 possibilities while I waited. Phone interviews could happen at any time after application submission. This was not the type of “being on-call” I had pictured for myself.

“Why do you think you didn’t match?”

I began ruminating my answer to this standard question for people in my position. *“The match had failed me. Or maybe, I had failed the match.”* I thought as I recounted every decision I had ever made.

I was standing before the all-powerful judge, Lord NRMP Match. My Judgment Day had arrived, and I had been deemed unworthy. Exiled uncaringly to the Underworld of the Unmatched. If Lord Match could be so callous, how could I hope for mercy from his crony, Mr. SOAP?

But then I got a phone interview for a preliminary position! It lasted 6 minutes and 32 seconds. Brief, straightforward, and formal. The questions were standardized. My ambitions were framed around this snapshot interview.

I checked my phone every few seconds for some sort of contact. I hoped for an offer, an executive pardon, from Mr. SOAP. The offer rounds passed as I commiserated with other lost, unmatched souls in internet forums.

My phone was silent.

My pleas to the Lords of the Match went unanswered. When the final round of offers concluded and I was not offered a position, I turned to my spreadsheet of remaining unfilled positions.

The spreadsheet was fully equipped with program contact information, color coding, and sectioning for programs based on personal interest. My “spam” template email with my application

materials and prefilled program contact emails was ready. I was prepared for my final trial: the post-SOAP scramble.

I contacted my advisors about the results of the final SOAP round. Everyone was standing by to advocate for me.

Then SOAP officially ended, the laws of the Match were lifted, and the floodgates opened. Myself and my team of superiors sprang into action.

During the scramble, I received a waitlist offer, meaning I was next in line if another applicant declined during an agreed-upon 1-hour timeframe. As I left voicemails, (and brightened the day of ERAS and American Express stockholders by even paying more application fees) I received a call from the waitlisted offer.

“We’re sorry, the other applicant accepted the position and we are now filled.”

“*We’re sorry, but you did not match to any position*” echoed in my overly caffeinated and sleep-deprived state of consciousness.

I realized it was time to go home as the afternoon came to an end. I had called programs, left voicemails, and emailed every program with unfilled positions. Time to regroup and ponder my promising future as a well-educated Uber driver.

That’s when I received a text from Dr. C. “I just spoke to a program director for a transitional year position. The PD is an EM doc and he’ll be calling you soon. Also, he mentioned the hospital is working on opening a new EM program. Hopefully, this is an opportunity for you.”

“*Is Dr. C really still advocating and making calls to programs for me? It’s so late in the day.*” I had tried everything without success. I had also started warming up to the idea of my life as Dr. Uber. But Dr. C still had hope. I allowed myself a brief, half-hearted flash of a smile.

During the phone interview, I conversed with the program director for some time. I explained my thoughts on why I had failed to match and spoke of my ideas for the future. We talked about the excitement of EM as a career. I was able to ask questions in a more

conversational manner than I had previously experienced over the past week. By the end of the interview I was left with a good impression.

“What do you think about the idea that when we get off the phone, I’ll have my coordinator send you an offer and we can both call it a day?”

“I am ready to sign.”

It was Thursday, March 19, 4:35 pm. I made it. I was in. **I was going to be included in tomorrow’s Match Day.**

My transitional year at HCA Healthcare West will be a welcome experience in my journey to EM.

I was drawn into emergency medicine for the same reason that I needed to share my story. This story is about the **PEOPLE** in emergency medicine, where going above and beyond is the norm. Throughout all of the chaos, turmoil, fear, and uncertainty, I was never alone. Emergency physicians embody the greatest heroes of fiction, venturing into chaos headstrong with bravery. They are leaders fighting on the front lines amongst a team of residents, scribes, nurses, students, social workers, law enforcement officers, pharmacists, EMS workers, and, thankfully, unmatched EM applicants.

Whether working against a worldwide pandemic or rushing to the aid of a code blue, emergency medicine providers serve to keep the fibers of life, humanity, and order from tearing apart. While my journey is still uncertain, my story and gratitude must be shared. To me (and others in my position) the future is simple. Continue the fight through failure, chaos, and uncertainty. Continue to learn and grow. Continue to exemplify these values inherent in emergency medicine. And when the time comes... look straight back into the cold eyes of Lord NRMP Match.

Special Acknowledgment

I can hardly express my sincerest gratitude, respect, and admiration to the emergency medicine faculty at Saint Louis University, but hopefully this was a start. A special thank-you to my advisors, Dr. Tina Chen and former EMRA Board member Dr. Kene Chukwuana, for their unwavering guidance and support. ★

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Leaving behind the limitations of travel, we're going big!

Join EMRA at ACEP20 for our regularly scheduled programming, with a twist!

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Fall Medical Student Forum

Saturday, August 15 @ 9:30 am

Register at emra.org/student-forum

Sponsored by Laurel Road

EMRA Residency Program Fair for medical students seeking to match at an EM residency

September 26 – 27

Registration opens soon at emra.org/acep

Sponsored by *Laurel Road*

Virtual Mock Interview Practice

Dates coming soon

Visit emra.org/student-forum
for information

Medical Student Case-Con Competition

October 25 @ 9 am

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Nobody predicted this current climate, and it's an ever-changing landscape. We're here to help you navigate it, whether that means finding your first job out of residency or your new job after a career change.

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Registration opens soon at emra.org/acep

Sponsored by *emCareers.org*, *TeamHealth*, *Vituity*,
and *Laurel Road*

COMMITTEE PROGRAMMING

Stay tuned for event specific details posted to
emra.org/acep

EMRA ELECTIONS & REPRESENTATIVE COUNCIL

October 26

Participate in our Representative Council and elect members of the EMRA Board of Directors.

See emra.org/repc

Sponsored by *ACEP/PEER*

**Programming Updates
@emresidents**



ALL-EMRA PROGRAMMING (CON'T)

COMPETITIONS & MEDUTAINMENT

EMRA 20 in 6 Resident Lecture Competition

October 28 @ 9 am

See emra.org/20in6 for watch party information

Sponsored by *Hippo Education*

Resident Case-Con

October 27 @ 9 am

Check emra.org/case-con for event details

EMRA Resident SIMWars

October 29 @ 9 am

Check emra.org/SIMWars for competition updates

Airway Stories

October 27 @ 6 pm

Check emra.org/airwaystories for event details

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For a full conference experience, we encourage registration to ACEP20.

Note that ACEP20 registration is not required to sign up for EMRA events and programming.

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#ACEP20

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Times and dates are subject to change.

All times listed are Central Time.

For more information, visit
<https://www.emra.org/acep>





ABEM News

Exam Updates

Exam dates have been set for the 2020 online ConCert Exam administrations: **July 27–Aug. 16** and **Nov. 2–22**

The exam is online, open book, and taken without collaboration. It can be taken anywhere, anytime within the three-week testing period. View ABEM Exam Dates and Fees and *Frequently Asked Questions* on the ABEM website at abem.org for additional information.

Due to the ongoing COVID-19 pandemic, ABEM has made the difficult decision to postpone the fall Oral Certification Examination. It will not be offered at all in 2020. ABEM is discussing options for administering the examination in 2021 and will share that information as soon as possible.

ABEM has developed a letter that physicians may provide to employers to verify they have successfully completed the Qualifying Examination and states that they are awaiting assignment to take the Oral Certification Examination. The letter explains that ABEM has canceled the 2020 exams due to COVID-19 and deferred the Oral Exam to 2021. Letters will be available in mid-July. Physicians can contact oralcertification@abem.org to request a letter. ★

ABEM Selects Inaugural Members of Resident Ambassador Panel

- Haig K. Aintablian, MD
- Alaa M. Aldalati, MD
- William Spinosi, DO

Panel members will provide a resident perspective to certain ABEM activities, such as applying for certification, the Residency Visitation Program, and the ABEM website. They serve 2-year terms beginning July 1, 2020.

Additional information about the Resident Ambassador Panel is available on the ABEM website. ★

EMRA to Elect 5 New Board Members

The EMRA Representative Council elects new members to the Board of Directors each year, and applications are now open for the 2020 elections.

Anyone who is a resident member in good standing on the day of elections is eligible to seek a board position. **The deadline to declare candidacy is Sept. 12. Apply online at www.emra.org/be-involved/be-a-leader/become-a-board-member/guide-for-emra-elections/#applytobod.**

In 2020, the following board roles will be up for election:

- **President-elect:** This is a 3-year term, with one year spent in each successive role (president-elect, president, immediate past president/treasurer). Prior leadership experience is strongly encouraged.
- **Vice Speaker of the Council:** This is a 2-year term, with one year spent as vice speaker and the following year as Speaker of the Council. In this role you work closely with the Representative Council and the policy-making procedures of the association.
- **Resident Representative to the ACEP Board of Directors:** This 2-year term requires presence and participation not only at EMRA Board events, but also as an ex-officio member of the ACEP Board of Directors. Prior leadership experience is strongly encouraged.
- **Director of Leadership Development:** This is a 2-year term, during which the board member works closely with EMRA's 20 committees and EMRA representatives to ACEP Sections, helping develop leadership opportunities for residents within the association and the specialty.
- **Director of Health Policy:** This is a 2-year term focused on representing EMRA in policy circles, keeping EMRA members apprised of and engaged in policy initiatives, and serving as an organizer of the annual EMRA/YPS Health Policy Primer that kicks off the ACEP Leadership & Advocacy Conference each year.

Serving on the EMRA Board requires support from your program. Clear expectations and descriptions of the time and travel commitments connected with board service can be found at www.emra.org/be-involved/be-a-leader/become-a-board-member.

Elections will be held during the Fall RepCo Meeting, Oct. 26. **Make sure your program is represented; sign up your voting rep at emra.org/repro-program-update-form and get meeting details at emra.org/repro.** ★

ACEP Section of Medical Humanities Writing and Visual Arts Awards

The Section of Medical Humanities is soliciting submissions for its 13th annual Writing Awards. Eligible pieces are creative, not scientific, works related to emergency medicine published in print or online between September 2019 and August 2020. Word count limit is 2500. Blog entries will only be eligible if reconfigured and submitted as an independently publishable piece of creative writing. Self-nominations or nominations of another ACEP member's writing are both welcome. Poetry and prose will be considered in separate categories. Limit 2 pieces per person.

The Section of Medical Humanities is also soliciting submissions for its 7th annual Visual Arts Award. This is an opportunity for artists to show off their paintings, photography, etc. Submit a digital image or file of the visual art (photograph, sculpture, textile, pottery, painting, etc). Limit 2 pieces per person.

Submissions for both awards are accepted from any member of ACEP or affiliated organization (EMRA, SEMPAA). Submissions will be voted on by the members of the Section of Medical Humanities. Nominations should be emailed to Tracy Napper (tnapper@acep.org) before **Sept. 14**. Submissions will be blinded before being sent to the judging panel. ★



As emergency physicians, residents, nurses, physician assistants, and medical students, we are servant leaders in our communities.

We care and advocate for our patients while working clinically. We also respond to the call to give back to the communities we serve.

The EM Day of Service was created with this essential concept in mind.

The EM Day of Service is a specialty-driven event where emergency care providers identify community needs and volunteer to address those needs.

Events take place throughout September. Please share your efforts and tag us with [#EMDayofService](https://twitter.com/EMDayofService). For ideas and details visit <https://www.emra.org/be-involved/events-activities/em-day-of-service>. ★



ECG Challenge

Brett Jennings, DO
ChristianaCare

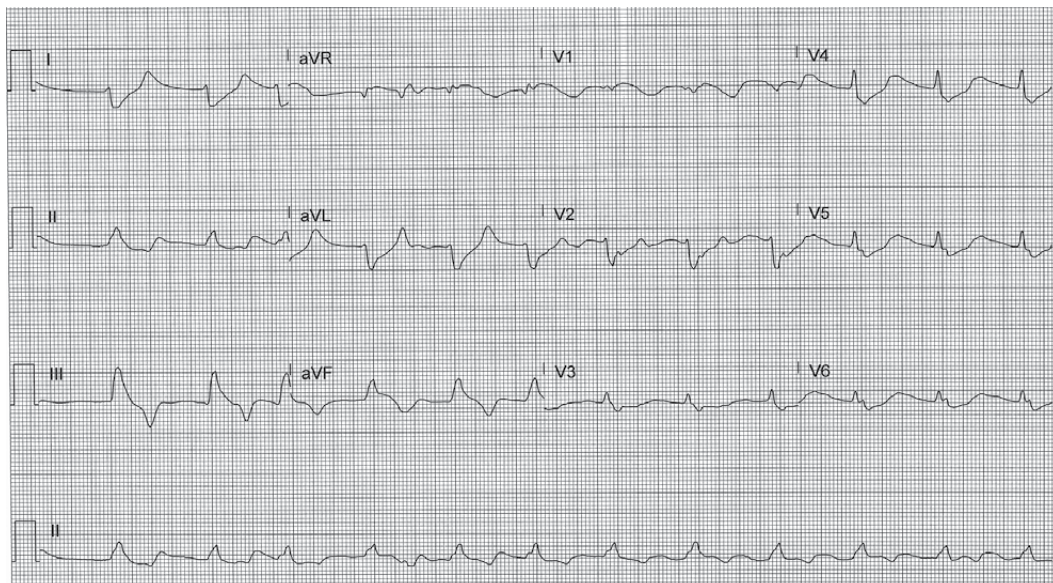
Jeremy Berberian, MD
Associate Director of Resident Education
Dept. of Emergency Medicine,
ChristianaCare
@jgberberian

CASE.

A 57-year-old male presents with AMS. He is minimally responsive and there is no additional history available. His initial heart rate was 25 with a blood pressure of 80/30. What is your interpretation of his ECG.

What is your interpretation of his ECG?

See the ANSWER on page 50



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ECG Challenge

This ECG shows an irregular wide complex rhythm with an average ventricular rate of 72 bpm, right axis deviation, no discernable P-waves, and a prolonged QRS duration at 200 ms with an intraventricular conduction delay. These findings, in particular the very wide QRS complexes with bizarre morphologies, are consistent with hyperkalemia

Hyperkalemia Presentation and Etiologies

Hyperkalemia is a common and a potentially life-threatening electrolyte disorder in patients presenting to the Emergency Department. Although severe cases may be associated with paralysis and cardiac arrest, symptoms in the majority of cases are nonspecific, including muscle pain/weakness, nausea, vomiting, and abdominal pain.¹

The major causes of hyperkalemia can be categorized into two groups: conditions which impair the elimination of potassium, such as renal insufficiency or medications interfering with urinary excretion (spironolactone, NSAIDs, ACEI) and those conditions that cause the extracellular shift of potassium, such as digoxin or beta-blockers, acidosis, diabetes induced insulin decrease, and the tissue breakdown seen in rhabdomyolysis.

Hyperkalemia ECG Findings

The earliest electrocardiographic finding in hyperkalemia is typically peaked T waves. As serum potassium levels rise, the PR interval lengthens, P waves flatten and can eventually disappear entirely, and the QRS widens with the development of bizarre QRS morphologies. Severe hyperkalemia can lead to bradycardia, loss of SA nodal conduction, the development of the classic “sine wave” morphology, and, ultimately, asystole. In short, the ECG changes seen with hyperkalemia progress as if the entire P-QRS-T complex were being pulled at both ends like a string.

It is important to note that although the most severe cardiac manifestations of hyperkalemia have been shown to regularly occur at serum potassium concentrations greater than 9 mEq/L, ECG abnormalities do not always correlate reliably with serum levels and clinical decompensation can occur without profound changes in potassium concentration.¹

Hyperkalemia Treatment

The initial goals in the treatment of hyperkalemia are stabilizing the cardiac membrane, promoting

potassium influx into cells, and enhancing potassium excretion.

Calcium

- Temporarily stabilizes the cardiac membrane by counteracting potassium’s depolarizing effects
- Calcium gluconate via peripheral IV or calcium chloride if central venous access is obtained
- Dose: 1 amp of calcium gluconate (10 mL of 10% solution) every 3-5 min until ECG normalizes
- Onset of action: < 3 min
- Duration: ~20-50 min

Insulin and Dextrose

- Shifts potassium from serum into cells
- Effect is dose-dependent, and the dosage of dextrose should be adjusted per the patient’s serum glucose level and risk factors for hypoglycemia (renal insufficiency, use of medications for diabetes, etc.)

- Dose: 10 units regular insulin IV with 25-50 g (1-2 amps) 50% dextrose solution
- Onset of action: 10-30 min
- Duration: 2-6 hours

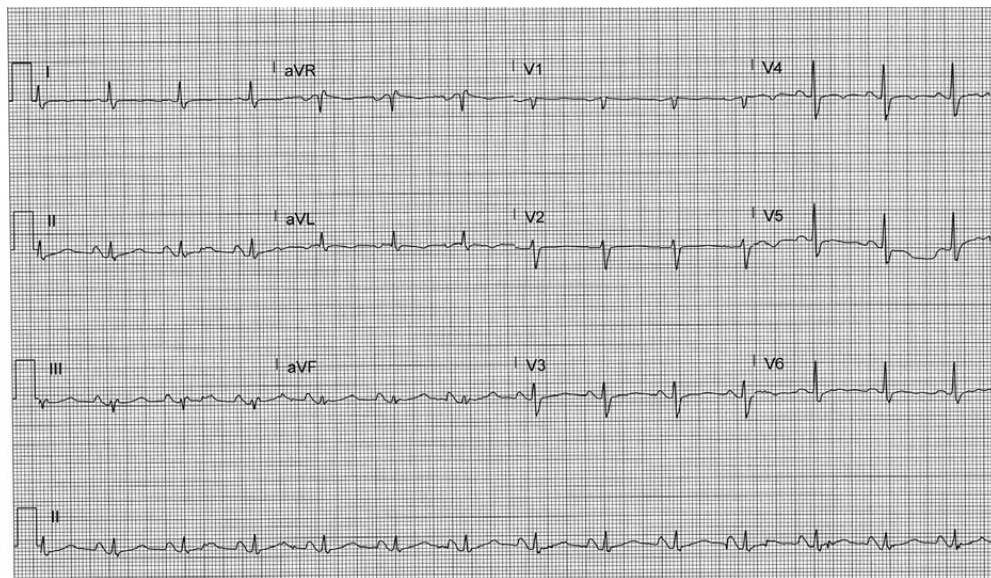
Albuterol

- Shifts potassium from serum into cells
- Usually given via a nebulizer and can be administered prior to obtaining IV access
- Dose: 10-20 mg nebulized over 10-30 min
- Onset of action: 15-30 min
- Duration: 2-4 hours

Diuretics and Dialysis

- Both eliminate potassium from the body
- Dialysis is the most effective and reliable method for the definitive treatment of hyperkalemia, especially for patients on dialysis

Repeat ECG after Treatment



- Loop diuretics, such as furosemide, promote potassium excretion via the kidneys and can be considered in the appropriate clinical scenario

Cation Exchange Resins

- Includes sodium polystyrene sulfonate and patiomer
- Bind potassium in the GI tract to prevent absorption
- Onset of action is hours to days, so not indicated for acute hyperkalemia treatment

Of note, though bicarbonate was traditionally considered an element of the hyperkalemia treatment regimen, there is no literature to suggest a benefit when used in patients with hyperkalemia with normal pH. Bicarbonate infusions may have a role in the treatment of academia in patients who are concurrently hyperkalemic.

HYPERKALEMIA LEARNING POINTS

- EKG is specific but not sensitive for hyperkalemia
- EKG changes are not always sequential/progressive and include:
 - Tall, narrow, peaked T-waves (best seen in precordial leads)
 - P-wave flattening and PR interval prolongation
 - Widened QRS with bizarre morphology
- Conduction abnormalities (AV blocks, fascicular and bundle branch blocks)
- Sinoventricular rhythm (loss of P-waves, extremely widened QRS) with normal or slow rate
- Ventricular dysrhythmias
- Treatment goals include:
 - Stabilization of the cardiac membrane
 - Promote potassium influx into cells
 - Enhance potassium excretion

Case Conclusion

The patient's initial labs were notable for a potassium of 7.9 mEq/L. This was treated with 3 g of calcium gluconate, 10 units of insulin, 1 amp of dextrose, and a 15 mg albuterol neb, after which his mental status and vital signs improved. A repeat ECG was obtained (see image) and showed resolution of the multiple abnormalities seen on his initial ECG. The patient was admitted to the hospital for further treatment of his hyperkalemia. ★

What is your diagnosis?

Frances Rusnack, DO, MS
 Emergency Medicine Resident
 Mount Sinai St. Luke's Roosevelt
 @FrancieRusnack

A 42-year-old female with a history of bipolar disorder and genital herpes presents with a diffuse rash for 1 month. She reports the rash is red, nonpruritic, and nontender. It started on her chest and spread to now involve her face, trunk, extremities, palms, and soles.

She endorses associated diffuse joint pain as well as fevers, sore throat, nausea, vomiting, mild headache, and intermittent blurred vision. Current medications include clonazepam, haloperidol, and clozapine without recent changes. She is sexually active with multiple partners.

Physical exam is notable for a diffuse non-blanching papular rash, lateral tongue ulceration, and minimally reactive pupils to light and accommodation. There are no genital lesions and her neurological exam is otherwise unremarkable.

See the **DIAGNOSIS** on page 52



Assessment

Syphilis

Her ED presentation was concerning for secondary, and possible tertiary, syphilis with neurologic manifestations. She had biopsy results from a week prior that confirmed a syphilitic rash. HIV testing was negative. Rapid plasma reagin test (RPR) was reactive, as well as serum fluorescent treponemal antibody absorption test (FTA-ABS). Cerebrospinal fluid Venereal Disease Research Laboratory (VDRL) test was negative. Ophthalmologic examination was negative for ocular complications of syphilis. The patient was treated for secondary syphilis and discharged to follow up as an outpatient.

Discussion

Syphilis is a sexually transmitted infection caused by the spirochete *Treponema pallidum* and is known clinically to be “the great pretender” or “imitator.”¹ Syphilis is categorized into 4 stages: primary, secondary, tertiary, and latent.¹ Primary syphilis is characterized by a painless chancre.¹ Secondary syphilis develops weeks later and includes a papulosquamous rash that can involve the palms and soles.¹⁻³ This stage can also have systemic symptoms of sore throat, malaise, fever, and headaches.² Tertiary syphilis occurs years later and can involve multiple organ systems, notably the nervous and cardiovascular systems.² Latent syphilis indicates positive testing without clinical manifestations. This is further subdivided into early latent phase if infection occurred within the past 12 months and late latent phases if infection occurred more than 12 months prior.²

Treatment

Primary, secondary, and early latent stages of syphilis are treated with a one-time intramuscular dose of penicillin G benzathine, 2.4 million units.³ Doxycycline 100 mg BID for 14 days can be used as an alternate therapy if patients have penicillin allergies.³ Pregnant women that have penicillin allergies require desensitization.³ Late latent syphilis, latent syphilis of unknown duration, or tertiary syphilis with normal CSF studies should be treated with intramuscular penicillin G benzathine, 2.4 million units weekly for 3 weeks.³ Neurosyphilis and ocular syphilis are treated with parenteral/aqueous crystalline penicillin G 3-4 million units every 4 hours (18-24 million units per day) for 10-14 days.³ Repeat serologic testing should be done to ensure improvement.³ ★

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Board Review Questions



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

Order PEER at acep.org/peer

1. A 54-year-old man with a history of diabetes, hypertension, and smoking presents complaining of dizziness since he woke up this morning. He says he feels like the room is spinning. He is also nauseated and cannot stand or walk without falling to the right. He denies numbness or weakness and is unable to complete finger-to-nose testing. Which vessel is most likely occluded?
 - A. Anterior cerebral artery
 - B. Cerebral venous sinus
 - C. Middle cerebral artery
 - D. Posterior inferior cerebellar artery
2. What is definitively seen in cardiac tamponade?
 - A. Electrical alternans
 - B. Inferior vena cava collapsibility
 - C. Pulsus paradoxus
 - D. Right ventricular diastolic collapse
3. Which condition is the most likely cause of widened mediastinum in a patient who has been experiencing weight loss and fatigue for several weeks?
 - A. *Burkholderia cepacia*
 - B. *Pseudomonas aeruginosa*
 - C. *Staphylococcus aureus*
 - D. *Streptococcus pneumoniae*
4. Systemic toxicity is most likely to occur after topical dermal exposure to which acid?
 - A. Acetic acid
 - B. Hydrochloric acid
 - C. Hydrofluoric acid
 - D. Sulfuric acid
5. Which physical examination finding indicates a cribriform plate fracture as a serious complication of trauma to the face and nose?
 - A. Clear nasal discharge
 - B. Epistaxis
 - C. Hemotympanum
 - D. Septal hematoma *

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



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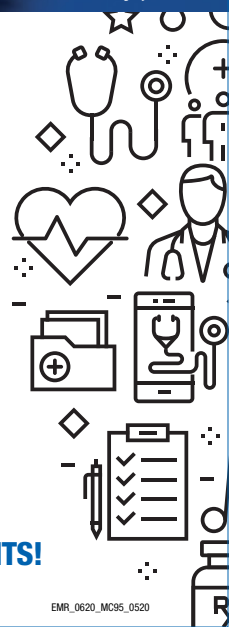
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The COVID Corner:

Managing Money, in the Midst of Mayhem

It's not all doom and gloom,
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TAXES

Tax Deadline pushed back to 9/15/2020

OPPORTUNITY: Extended time to fund 2019 SEP IRA and reduce 2019 tax liability, fund Roth or Back Door Roth for 2019 and 2020, accumulate funds to pay for 2019 tax bill if necessary.

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Federal payments and interest suspended for six months

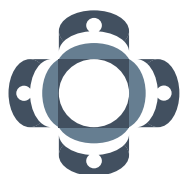
OPPORTUNITY: Redirect former payments to higher interest debt, building cash savings or funding that 2019 Roth IRA that you didn't think was possible!

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Fellows receive an academic appointment at The George Washington University School of Medicine & Health Sciences and work clinically at a site staffed by the Department. The Department offers Fellows an integrated, interdisciplinary curriculum, focusing on research methodologies and grant writing. Tuition support for an MPH or equivalent degree may be provided, as per the fellowship's curriculum.

Complete descriptions of all programs, application instructions, and Fellowship Director contacts can be found at:

<https://smhs.gwu.edu/emed/education-training/fellowships>



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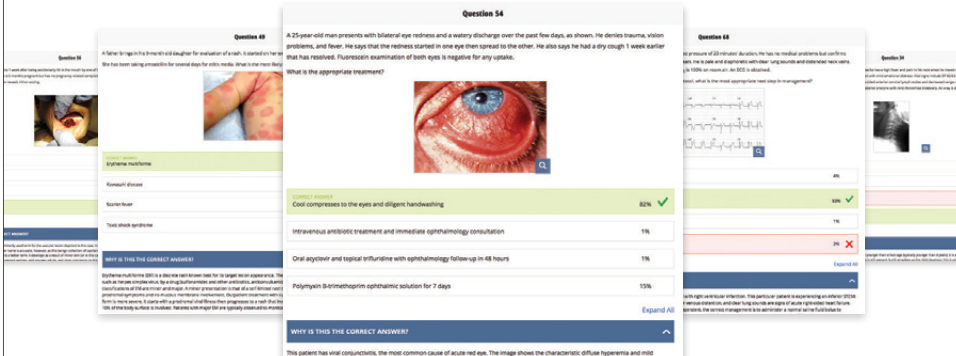
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