

# EM Resident



Official Publication of the Emergency Medicine Residents' Association

April | May | June 2024

VOL 51 | ISSUE 2

## Eclipses and the ED Connection



Can Celestial Forces Affect  
Patient Visits and Acuity?

Flood Syndrome

Paralytic Shellfish Toxin Poisoning

Splenic Rupture and its Life-Threatening  
Consequences

Contact Lenses, a Hot Tub, and Corneal Keratitis

Artificial Intelligence in EM: Byte-Sized  
Benefits and Glitches

Unique Psychiatric Care: The Role of  
EmPATH Units

Difficult Diagnosis of Cerebellar Abscess  
Without MRI Ability



# Penn State Health Emergency Medicine

## About Us:

Penn State Health is a multi-hospital health system serving patients and communities across central Pennsylvania. We are the only medical facility in Pennsylvania to be accredited as a Level I pediatric trauma center and Level I adult trauma center. The system includes Penn State Health Milton S. Hershey Medical Center, Penn State Health Children's Hospital and Penn State Cancer Institute based in Hershey, Pa.; Penn State Health Hampden Medical Center in Enola, Pa.; Penn State Health Holy Spirit Medical Center in Camp Hill, Pa.; Penn State Health Lancaster Medical Center in Lancaster, Pa.; Penn State Health St. Joseph Medical Center in Reading, Pa.; Pennsylvania Psychiatric Institute, a specialty provider of inpatient and outpatient behavioral health services, in Harrisburg, Pa.; and 2,450+ physicians and direct care providers at 225 outpatient practices. Additionally, the system jointly operates various healthcare providers, including Penn State Health Rehabilitation Hospital, Hershey Outpatient Surgery Center and Hershey Endoscopy Center.

We foster a collaborative environment rich with diversity, share a passion for patient care, and have a space for those who share our spark of innovative research interests. Our health system is expanding and we have opportunities in both academic hospital as well community hospital settings.

## Benefit highlights include:

- Competitive salary with sign-on bonus
- Comprehensive benefits and retirement package
- Relocation assistance & CME allowance
- Attractive neighborhoods in scenic central Pa.



**PennState Health**

**FOR MORE INFORMATION PLEASE CONTACT:**  
Heather Peffley, PHR CPRP - Penn State Health Lead Physician Recruiter  
[hpeffley@pennstatehealth.psu.edu](mailto:hpeffley@pennstatehealth.psu.edu)

Penn State Health is fundamentally committed to the diversity of our faculty and staff. We believe diversity is unapologetically expressing itself through every person's perspectives and lived experiences. We are an equal opportunity and affirmative action employer. All qualified applicants will receive consideration for employment without regard to age, color, disability, gender identity or expression, marital status, national or ethnic origin, political affiliation, race, religion, sex (including pregnancy), sexual orientation, veteran status, and family medical or genetic information.



# The Power of Emergency Medicine:

## Sculpting the Leaders Within Us



**T**ake a moment and picture the greatest leader who comes to mind. Consider their essence, their traits, and the actions they take that make them a great leader to you.

Who came to mind? Was it a great world leader? A teacher? A family member? A resident, fellow, or attending? Was it yourself?

Amid a particularly critical case during my resuscitation block, one of my favorite attendings told me: “Your place as the leader of this resuscitation is at the foot of this bed. Everything else can be done from here.”

I’ve thought of this statement numerous times since. A simple phrase, but it changed how I thought about my role.

Nothing tests a leader more than a crisis situation. They can take a step back and look at the bigger picture. The best leaders can guide, influence, and direct effectively under conditions of rapid change. This — *rapid change* — is the definition of our specialty. Do we think of ourselves as leaders of the emergency department? Leaders in health care? Leaders of resuscitation?

*There is opportunity for leadership within every single patient encounter.*

This is something we have to be mindful of as an intangible but crucial part of emergency medicine training. It is not just attending physicians who lead. Residents lead every day. We influence others — consultants, nurses, techs, our patients — especially on their perspectives of emergency physicians. Now is the time to develop these leadership skills.

There is no one way to lead. I bet every leader who came to mind at the beginning of this article had unique characteristics and different leadership styles. Each

emergency physician has a different technique to successfully lead the department.

Leadership — in addition to being 1 of the 3 main pillars at the heart of EMRA’s mission (the other 2 being education and advocacy)

— is part of the hidden curriculum of emergency medicine. How do we unhide it? This is a core part of our training.

At EM Resident, we are further investing in EMRA’s core pillar of leadership — to help you become the best leader you can be — by relaunching EMPower, a hugely popular and in-demand magazine series last published in 2018. EMPower gives us a closer look and backstage access to some of the greatest leaders in emergency medicine. Keep an eye out for EMPower profiles in future EM Resident editions as well as on [emresident.org](http://emresident.org). And if you know EM leaders or role models who are worthy of EMPower spotlights, email me at [emresidenteditor@emra.org](mailto:emresidenteditor@emra.org) and send them my way!

The future power of emergency medicine, though? That is us. If there is one thing I can say that has and always will be true of emergency medicine residents, it is that *we are up for a challenge*. I look forward to seeing some of you featured in our EMPower section one day, as we all continue to advocate for our patients and work toward making this specialty the best it can be. ★



**Morgan Sweere  
MD, MPH**

Editor-in-Chief,  
EM Resident  
University of Florida –  
Jacksonville

Morgan Sweere, MD, MPH

Email [emresidenteditor@emra.org](mailto:emresidenteditor@emra.org) | Instagram [@sweerecheer](https://www.instagram.com/sweerecheer) | X (formerly Twitter) [@morgansweere](https://twitter.com/morgansweere)

# TABLE OF CONTENTS

- 1** The Power of Emergency Medicine  
EDITOR'S FORUM
- 3** Celebrating 50 Years as the Voice of the Future of EM  
PRESIDENT'S MESSAGE
- 4** Flood Syndrome: Ruptured Umbilical Hernia  
GASTROENTEROLOGY, HEPATOLOGY
- 8** Sustainability in Health Care  
OP-ED, SOCIAL EM
- 10** Pediatric GI Bleed With Meckel's Diverticulum Diagnosis  
PEDIATRIC EM, GASTROENTEROLOGY
- 13** Paralytic Shellfish Toxin Poisoning in the Aleutian Islands  
TOXICOLOGY
- 18** The Art of Negotiation: Workshop Reflections for the EM Physician  
CAREER PLANNING, ADMIN & OPS
- 20** Splenic Rupture and its Life-Threatening Consequences  
HEMATOLOGY
- 24** Dangerous Pill to Swallow: A Case Report  
TOXICOLOGY, CARDIOLOGY, ADDICTION MEDICINE
- 27** Corneal Keratitis in the ED  
OPHTHALMOLOGY
- 32** AI in EM: Byte-Sized Benefits and Glitches  
OP-ED, ADVANCEMENT OF EM, ETHICS
- 35** Role of POCUS in Ruptured Ectopic OB/GYN, ULTRASOUND
- 38** Unique Psychiatric Care: The Role of EmPATH Units  
PSYCHIATRY, PATIENT INTERACTIONS, HEALTH CARE ADMINISTRATION
- 40** Addressing the Boarding Crisis in the Emergency Department  
ADMIN & OPS, HEALTH CARE ADMINISTRATION
- 46** Valacyclovir-Associated Neurotoxicity in End-Stage Renal Disease  
NEUROLOGY, NEPHROLOGY, TOXICOLOGY
- 50** Eclipse Study: Can Celestial Forces Affect ED Visits and Acuity?  
ADMIN & OPS
- 54** Difficult Diagnosis of Cerebellar Abscess Without MRI Ability  
NEUROLOGY
- 65** ECG Challenge  
CARDIOLOGY
- 67** News & Notes in Emergency Medicine
- 68** Board Review Questions  
PEERPREP

## EDITORIAL STAFF

### EDITOR-IN-CHIEF

Morgan Sweere, MD, MPH  
*University of Florida — Jacksonville*

### EDITORS

Matthew E. Apicella, DO <i>Mount Sinai Medical Center</i>	Lucas Goss, MD <i>Emory University</i>
Richie Cunningham, MD <i>Stanford Medical Center</i>	David A. Leon, MD <i>Johns Hopkins Medicine</i>
Annemarie Daecher, MD <i>Einstein Healthcare Network</i>	Evan McMurray, MD <i>Mount Sinai Morningside West</i>
Zackary Funk, MD <i>University of Florida — Jacksonville</i>	Luke Wohlford, MD, MPH <i>University of Vermont</i>

### MEDICAL STUDENT COUNCIL EDITOR

Mara Havard  
*A.T. Still School of Osteopathic Medicine*

### ECG FACULTY EDITOR

Jeremy Berberian, MD  
*ChristianaCare*

### TOXICOLOGY FACULTY EDITOR

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

### ORTHOPEDICS/SPORTS MEDICINE FACULTY EDITOR

MAJ John Kiel, DO, MPH, FACEP, CAQ-SM  
*University of Florida COM — Jacksonville*

### DESIGNER

Laurel Rummel | *Good Clean Design*

## EMRA BOARD OF DIRECTORS

Blake Denley, MD <i>President   Ochsner Health</i>	Joe-Ann Moser, MD, MS <i>Director of Education University of Wisconsin — Madison</i>
David Wilson, MD <i>President-Elect University of Cincinnati</i>	Kenneth Kim, MD <i>Director of Health Policy UCLA Ronald Reagan Olive View Emergency</i>
Jessica Adkins Murphy, MD <i>Immediate Past President University of Kentucky</i>	Derek Martinez, DO <i>Director of Leadership Development University of Oklahoma Tulsa School of Community Medicine</i>
Michaela Banks, MD, MBA <i>Speaker of the Council Louisiana State University New Orleans Health Science Center</i>	Angela Wu, MD, MPH <i>EMRA Rep to the AMA George Washington</i>
Jacob Altholz, MD <i>Vice Speaker of the Council   Kirk Kerkorian School of Medicine at University of Las Vegas/ Nellis Air Force Base, Mike O'Callaghan Military Medical Center</i>	Morgan Sweere, MD, MPH <i>Secretary/Editor University of Florida — Jacksonville</i>
Aaron R. Kuzel, DO, MBA <i>EMRA Rep to ACEP University of Louisville School of Medicine</i>	Jinger Sanders <i>Medical Student Council Chair   American University of Integrative Sciences</i>

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

© Copyright 2024

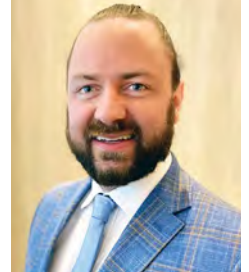
Emergency Medicine Residents' Association



# Celebrating 50 Years as the Voice of the Future of EM

*“So there we were in a hotel bar in Dallas in the spring of 1974, just sitting around and talking. There was a guy named Bill Walker from Cincinnati, a guy named Jeff Sullivan from the Medical College of Pennsylvania, and a couple of others. I told them about my idea to form an organization for residents. They all liked the idea, and that afternoon EMRA was born.”*

— Joseph F. Waeckerle, MD, EMRA Founder



**Blake Denley, MD**

EMRA President  
@BlakeDenleyMD

**H**alf a century ago, our association was founded with a vision of service to, and representation of, emergency medicine residents. EMRA has kept that charge at the core of its mission. From our inception we have prioritized hearing from our members through the EMRA Representative Council, which has produced an extensive policy compendium guiding the beliefs of our organization.

As we stand at this significant milestone, I'm excited to spend 2024 reflecting on our journey, honoring our achievements, and looking forward to a future filled with even greater accomplishments. What we now label as our 3 pillars — education, leadership, and advocacy — have been part of our DNA since day one.

**Education** is the core of residency and the cornerstone of excellent patient care. Over the past five decades, EMRA has been at the forefront of providing industry-leading, evidence-based educational resources used by thousands of physicians daily. And every step of the way, residents have been involved in the planning and creation of these resources. Our commitment to education has not only helped shape the careers of individual physicians but has also impacted the practice of emergency medicine as a whole.

**Leadership** is foundational to providing the gold-standard, physician-led care that EMRA believes every patient deserves. EMRA has consistently fostered leadership skills among its members, preparing them to be not just exceptional clinicians but also influential leaders in their communities and the broader medical field. Our leadership programs have nurtured the growth of young physicians, many of whom have gone on to hold key positions within health care institutions, shaping policies

and driving innovations that have a lasting impact on patient care and emergency medicine practice.

**Advocacy** is where our passion for emergency medicine meets our commitment to society and one another. EMRA has been a powerful voice advocating for policies and reforms that



References available online.



## Emergency Medicine Residents' Association

ensure the best possible care for patients and optimal working conditions for emergency medicine professionals. With an invitation to send an EMRA representative to the Liaison Residency Endorsement Committee for Emergency Medicine (precursor to the ACGME Residency Review Committee for Emergency Medicine, now the Review Committee for Emergency Medicine), EMRA helped shape emergency medicine residency standards from the beginning. It was also an EMRA representative who in 1978 introduced a resolution to the AMA Resident Physician Section (now the Resident & Fellow Section) that supported recognizing emergency medicine as a specialty. We have championed the causes that matter most to our members, shaping not just emergency medicine training, but also the specialty itself.

As we celebrate our 50th anniversary, we honor these pillars by recommitting ourselves to the values they represent. We will continue to advance our knowledge, lead with integrity, and advocate fiercely for the betterment of our members and the future of our specialty. The journey ahead is filled with opportunities and challenges alike, but together, we are poised to meet them with the same spirit of excellence that has defined EMRA for the past 50 years. ★

# Flood Syndrome: A Ruptured Umbilical Hernia in a Patient with Severe Ascites

**Michael Farney, DO**

Resident, PGY-3  
Emergency Medicine  
Medical University of South Carolina

**Earl Quinn Cummings, MD**

Assistant Professor  
Department of EM/Ultrasound  
Pediatric Emergency Medicine  
Medical University of South Carolina

**Flood syndrome is defined as a spontaneous rupture of an umbilical hernia leading to sudden loss of ascitic fluid. It is a rare condition that carries a high mortality rate.**

## INTRODUCTION

Flood syndrome is defined as a spontaneous rupture of an umbilical hernia leading to sudden loss of ascitic fluid. It is a rare condition that carries a high mortality rate.

We present a case outlining the history of present illness, physical exam, laboratory data, emergency department management, and definitive treatment of one patient. There is a scarcity of literature recommending a standardized emergency department workup for Flood syndrome. We will outline a proposed approach, as well as the importance of correct and timely disposition.

## CASE

A 64-year-old male with a history of alcohol abuse and resultant severe cirrhosis presented to the emergency department with a chief complaint of “stomach leaking” 2 hours after noticing a yellow fluid beginning to drain from his umbilicus. His cirrhosis had been complicated by recurrent ascites requiring regularly scheduled paracentesis. His previous scheduled paracentesis was 2 months prior; during this time, he had noticed a progressive protrusion of his navel along with worsening bilateral lower extremity swelling and exertional dyspnea. The patient and his family estimated that he had lost at least 1-2 liters of this fluid

prior to his arrival to the emergency department.

Initial vital signs revealed a blood pressure of 139/89 mm Hg, heart rate of 97 bpm, a respiratory rate of 16 breaths per minute, an oral temperature of 97.9 °F, and an oxygen saturation of 100% on room air. His physical exam was notable for severe abdominal distention with a fluid wave. The umbilicus was protuberant, and there was a small central ulceration with a large amount of clear yellow fluid slowly draining out. No tenderness, guarding, or rebound was appreciated. Bedside ultrasound showed free fluid in the abdomen with a sinus tract leading from the peritoneum to the umbilicus through a defect in the anterior abdominal wall (**Ultrasound Figures 1, 2, 3**). An ostomy bag was placed over the lesion and an additional liter of ascitic fluid was observed to drain spontaneously during the patient’s 5-hour stay in the ED.

Laboratory results were remarkable for a hemoglobin of 11.1 gm/dL, platelets 53 K/mm<sup>3</sup>, total bilirubin 1.2 mg/dL, albumin 3.0 g/dL, aspartate aminotransferase 32 (5-34 U/L reference range), alanine aminotransferase 12 U/L, creatinine 1.0 mg/dL, prothrombin time 16.5 seconds, and international normalized ratio 1.33.

A diagnosis of early Flood syndrome was made; albumin and IV antibiotics were administered to the patient,

and general surgery was consulted for admission and definitive repair. The following day, the patient was taken for herniorrhaphy, where a 5 cm defect was identified and closed; there was no bowel incarceration or strangulation; 2.9 liters of ascites were drained intraoperatively. There were no immediate surgical complications. On postoperative day 1, the patient underwent repeat paracentesis with an unremarkable fluid analysis. He was continued on his home furosemide, spironolactone, lactulose, rifaximin, and labetalol during his hospital stay and was discharged home on postoperative day 2 with scheduled hepatology follow-up.

## DISCUSSION

Flood syndrome (named for Frank B. Flood, who published the first case series) involves the sudden drainage of ascitic fluid from a spontaneously ruptured umbilical hernia in patients with severe liver disease. Twenty percent of patients with cirrhosis will have an umbilical hernia, and nearly half of these patients will require emergency surgery for complications related to the hernia.<sup>3</sup> The etiology of Flood syndrome is multifactorial; contributing factors include umbilical vein dilation and varices secondary to portal hypertension, deconditioning and atrophy of abdominal musculature,



IMAGE 1



IMAGE 2



IMAGE 3



IMAGE 4



IMAGE 5: Post-op

poor nutritional status, and chronically elevated intra-abdominal pressure.<sup>8</sup> The clinical course can be complicated by spontaneous bacterial peritonitis (SBP), skin and soft tissue infections, sepsis, and bowel herniation, incarceration, and strangulation. Cutaneous ulceration over the umbilicus is a warning sign that indicates impending rupture.<sup>5</sup>

No standardized treatment guidelines have been formalized for Flood syndrome. Most surgeons are apprehensive to take patients with cirrhosis to the operating room, as they carry high mortality rates and are at high risk for postoperative

complications. Many of these patients present on varying spectrums of their disease course, requiring counseling on operative risks. One study gave a 13% mortality risk in the operating room for patients undergoing urgent operative repair of Flood syndrome.<sup>10</sup> Palliative care discussion may be beneficial in defining the patient's goals of care.

The mortality of Flood syndrome patients has been shown to be reduced by 6-20% with operative repair.<sup>4</sup> Furthermore, the literature shows a 60-87% mortality rate in patients who are managed only conservatively (e.g., ostomy bag dressing, bedside closure,

**The mortality of Flood syndrome patients has been shown to be reduced by 6-20% with operative repair.**

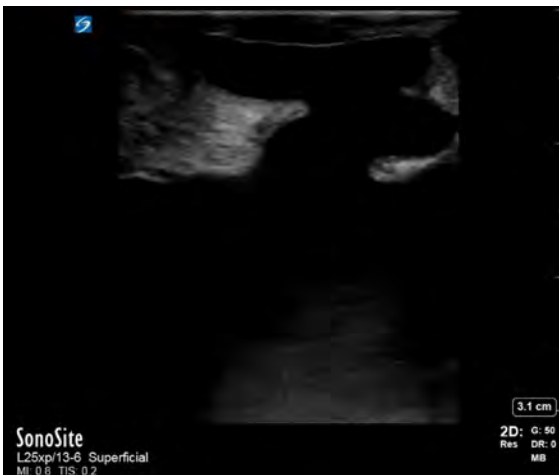
fibrin skin glue).<sup>4,10</sup> Closure in the OR should be pursued if possible.<sup>5,7,13</sup> Postoperative control of ascites is essential to limit complications and recurrence.<sup>3,6,9,10</sup> The literature has described liver transplant, TIPS procedure, pigtail catheter drains, and therapeutic paracentesis in the perioperative setting. The decision is guided by risk stratification using measures such as the Model for End-Stage Liver Disease (MELD) and Child-Turcotte-Pugh scores.

These patients should be managed closely by an interdisciplinary team. Perioperative optimization prior to surgery is essential to reducing mortality, provided there is no

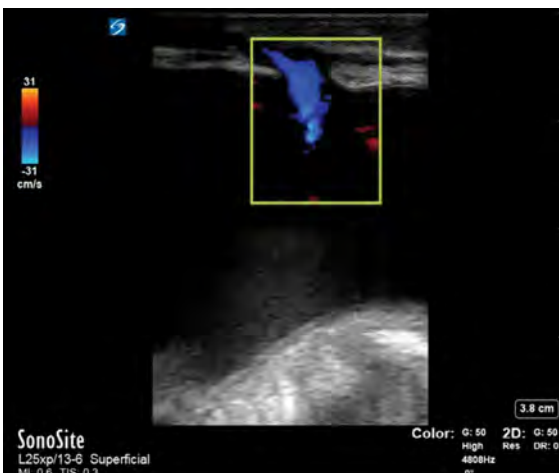




ULTRASOUND FIGURE 1: Sinus tract with hyperchoic bowel noted in far field. An asterisk (\*) denotes the abdominal wall defect.



ULTRASOUND FIGURE 2: Closer shot of conduit.



ULTRASOUND FIGURE 3: Sinus tract with presence of color Doppler flow (blue signal above elicited with compression; no spontaneous flow towards the transducer was detected in the high color flow velocity range).

indication for emergent surgery.<sup>3,8,10</sup> This includes improving nutritional status, optimizing volume status, correcting electrolyte abnormalities and coagulopathy, replacing albumin, diagnosis of SBP, antibiotics as needed, treatment of hepatic encephalopathy, and arranging postoperative control of ascites.<sup>10</sup>

It is essential that emergency medicine providers promptly recognize and correctly manage Flood syndrome as it carries a high mortality rate with delays in treatment. Disease severity and practice location may influence the need for transfer, admission, and intervention. Timely consultation with a surgeon is critical. Rural and remote emergency departments without surgical coverage should arrange for transfer to a center with higher level of care. Severity of illness presentation and associated complications should be considered and investigated.

An example workup is outlined below:

1. Complete blood count, complete metabolic panel, coagulation studies, lactic acid, infectious workup including blood cultures (as directed by H&P)
2. Diagnostic paracentesis. Send fluid for cell count with differential, gram stain, culture, glucose, LDH, and total protein.
3. Consideration should be made for therapeutic paracentesis (with albumin repletion as needed), or pigtail catheter placement if transfer or intervention will be delayed.<sup>2</sup>
4. Administer empiric intravenous antibiotics with broad-spectrum coverage.
5. Determine fluid status and act accordingly (with diuresis or fluid repletion).
6. Correct electrolyte abnormalities, coagulopathy, hypoalbuminemia, and thrombocytopenia as needed.
7. Apply a sterile dressing or ostomy pouch over the lesion.<sup>2</sup>
8. Consult general surgery and an appropriate medical service (e.g., internal medicine, gastroenterology, or hepatology).
9. Admit or transfer to a facility with the appropriate level of care.

Of course, these outline some basic steps for workup in the emergency department for optimal patient outcomes. This may not be an all-encompassing or adequate list depending on clinical context and practice location.

### CONCLUSION

Patients with cirrhosis complicated by ascites may develop abdominal wall hernias due to chronically elevated intra-abdominal pressures and weakening of the abdominal musculature. Acute care providers should be aware of the complications of umbilical hernias in patients with cirrhosis, as their perioperative mortality is high. It is crucial that all cirrhotic patients with umbilical hernias be evaluated for potential surgical repair to prevent life-threatening complications.<sup>3,5,10</sup> ★



# Freedom from Outside Ownership

All of our physicians are equitable owners who are motivated to experiment with, develop, and rapidly deploy solutions to today's biggest healthcare challenges. They are empowered to make decisions that are best for their patients and communities.

**That's what makes us different, and in today's healthcare, that's a good thing.**

Find out why a physician-owned partnership makes sense for you. Learn more at [vitivity.com/careers/physicians](https://vitivity.com/careers/physicians)





# Sustainability in Health Care: What is the Role of Small-Scale Accountability?

**Sabrina Ciervo**

Medical Student, MS-3

Sidney Kimmel Medical College at Thomas Jefferson University

## BACKGROUND

In the United States, the health care sector alone contributes 8.5% of greenhouse gas emissions, according to a 2022 White House report.<sup>1</sup> Global and national climate concerns are reaching the forefront of public and environmental health discussions, opening the doors of opportunity to encourage accountability and action toward environmental sustainability within the health care industry.

Health care is uniquely interconnected with the state of the environment, as factors like pollution, temperature and weather extremes, and food insecurity are all issues at the heart of climate change that threaten public health. The Centers for Disease Control and Prevention

endorses that climate disturbances are linked to the burdens of respiratory disease, cardiovascular disease, infectious disease, injury, premature death, and stressors affecting mental health.<sup>2</sup> Ongoing efforts to mitigate the carbon footprint of the health care sector are outlined in the Biden administration's Health Sector Climate Pledge, which includes various sustainability commitments made by private and public health systems, suppliers, and medical associations to work toward a goal of net-zero emissions by the year 2050.

On the other hand, not all entities within the health care sector are aligned with this national agreement, likely due to competing stakeholder financial and political priorities.

## OPPORTUNITIES FOR SMALL-SCALE SUSTAINABILITY

Amid a push for large-scale commitments to sustainability, small-scale interventions seem to be de-emphasized — although I would argue that environmental responsibility starts at the individual and team level. In my experience as a medical student rotating through multiple departments and locations within a multi-state nonprofit health system, I noted firsthand various unsustainable practices in everyday workflow, with potential for improvement requiring minimal buy-in. For example, hundreds of pages of single-sided discharge paperwork passed through my hands in just 3 weeks of working in an emergency department



that discharges more than 47,000 patients annually, per departmental data collected in fiscal year 2020.

Initiatives aimed at reducing unnecessary paper usage are low-hanging fruit for sustainability-friendly change at the department level, and these small-scale opportunities can lead to large-scale impact in a nation that documented more than 30,000 ED “treat-and-release” discharges per 100,000 persons in the population, according to 2018 data published by the Agency for Healthcare Research and Quality.<sup>3</sup>

Opportunities abound to tackle reducing paper usage related to discharge summaries ED patients. In an ED that currently prints single-sided discharge summaries for patients upon departure, switching to double-sided summaries is a straightforward solution with the potential to reduce annual paper usage by up to 50%. This is a quick, low- to no-cost solution for departments with printers already equipped with double-sided capabilities.

However, this may prove a more difficult task to implement in a facility that must purchase new printers, as this requires organizational buy-in for upfront costs and technological support during the transition period. (Based on my experience working with a team to submit a proposal for a similar initiative, achieving buy-in at the administrative level is a critical obstacle to implementing any initiative requiring expenditures, regardless of projected savings or gains over the long term.)

Another approach involves condensing information included in a standard discharge summary to reduce the number of pages printed per discharge. This approach requires little to no expense, bypassing the potential financial obstacles of an administrative approval process. However, there are limitations to consider regarding what information can be abbreviated or excluded from the discharge summary without compromising patient education and outcomes.

## CONCLUSION

Ultimately, adopting double-sided printing practices for discharge paperwork can accomplish significant reduction in paper usage without compromising informational content. Adequate budgeting and technological support for implementation, achieved through organizational buy-in, is key to the success of this type of initiative. In the long term, double-sided printing in the emergency department has cost-savings potential despite up-front costs for new equipment, as reducing paper usage will reduce the need for, and expense of, purchasing paper supplies for the duration of the equipment’s lifetime. Simple cost-effective interventions leading to small-scale success toward sustainability are excellent starting points to establish environmental accountability beginning at the department level, with the potential to inspire system-wide change. ★

# Case-con

Medical Student and Resident Case Study Contest

Sign up and start prepping for  
**Case-Con at ACEP24 in Las Vegas!**

You’ll present interesting and notable EM cases in this modern take on poster sessions.

Three winners per category!



More info & registration details coming soon



# CASE STUDY: Pediatric GI Bleed With Meckel's Diverticulum Diagnosis Disposition is Critical in Determining Urgency

**Daniel Epperson, MD**

Resident, PGY-3  
Emergency Medicine  
Indiana University School of Medicine

**Sandra Schwab, MD**

Assistant Professor of Clinical Emergency Medicine  
Indiana University School of Medicine  
Department of Emergency Medicine

## OVERVIEW

A 7-month-old infant with a history of recurrent ear infections and a family history of von Willebrand disease presented to the emergency department with dark tarry stools. The family reported that symptoms started approximately 24 hours prior to arrival, prompting them to go to a local emergency department. At that time, the patient had a normal exam and normal abdominal X-ray, but a positive fecal occult blood test. The patient, a female, was discharged home with a pantoprazole prescription and urgent outpatient pediatric gastroenterology referral.

At her primary care follow-up the next morning, the patient appeared pale. Point-of-care hemoglobin was 8.4 mg/dL. Due to ongoing symptoms and significant anemia, the patient was sent to the pediatric tertiary care hospital for further evaluation.

In the emergency department, the family reported a total of three episodes of melanic stools, decreased appetite, and increased sleepiness. The parents denied abdominal discomfort, constipation, vomiting, hematemesis, easy bruising or bleeding, sick contacts, or fevers. She did have an ear infection treated with penicillin 2 months prior but no other recent illness. Parents

denied recent travel, ill contacts, or exposures to farm animals or reptiles.

## FINDINGS AND WORK-UP

**Vital signs:** Temp=36.40C, HR=173, RR=34, BP=122/68, SpO<sub>2</sub>=100%

**Physical exam:** The patient was pale but nontoxic-appearing and was smiling and interactive, in no acute distress. The oral mucosa was moist. Cardiac exam was significant for tachycardia but without cardiac murmurs or gallops. She had normal peripheral perfusion. She had no increased work of breathing with clear and equal lung sounds. Her abdomen was soft, non-tender, non-distended



with normal bowel sounds. There were no masses or hepatosplenomegaly. A large amount of dark black tarry stool was in the diaper with blood-tinged/maroon-colored stool around the buttocks and perianal region. There was no skin breakdown, anal fissure, or hemorrhoids. The patient's skin was pale. No rashes, bruising, or petechiae were present.

**Initial Work-Up:** Shortly after the patient arrived, an IV was placed. A weight-based dose of pantoprazole was given due to concern for GI bleed of unknown etiology. Repeat complete blood count in the emergency department demonstrated a hemoglobin of 7.8 gm/dL and a white blood cell count of 15k. Platelet count, PT/INR, and renal function were within normal limits. A type and screen was sent to the blood bank. Rapid stool studies were negative for pathogens, and a stool culture was sent. Emergent transabdominal ultrasound was performed with no abnormalities found. Pediatric general surgery and gastroenterology were consulted.

### MANAGEMENT

The patient's family was updated with the labs, radiologic findings, and the medical teams' concern for GI bleed possibly due to a Meckel's diverticulum. The case was discussed with the on-call surgeon and gastroenterology specialist. The patient was admitted for a nuclear medicine Meckel's scan and serial abdominal exams as well as monitoring for hemodynamic instability. The findings of the Meckel's scan were consistent with ectopic gastric mucosa in the right central abdomen, consistent with a Meckel's diverticulum. Diagnostic laparoscopy was performed and confirmed a Meckel's diverticulum with surrounding inflammation. The area was resected (diverticulectomy).

The patient tolerated the procedure well without complication. Post-operatively, she tolerated a normal diet, had no significant pain, and no additional melanotic stools. She was discharged the next day in good condition. No other follow-up information was available.



### DISCUSSION

Pediatric GI bleeding is a somewhat uncommon presentation to the emergency department. Upper GI (UGI) bleeding accounts for approximately 1 to 2 per 10,000 visits per year, and lower GI (LGI) bleeding is slightly more common at 30 per 10,000 visits per year in the ED. There are many causes of UGI and LGI bleeding in children, and the causes vary by age group. The emergency provider's differential diagnosis should be guided by the child's age and appearance (sick vs. not sick).

Common causes of GI bleeding that can present at any age include fissures, infectious gastroenteritis/colitis, polyps, and vascular malformations.

In the neonate (0-30 days), GI bleed should be considered serious until proven otherwise! In a sick-appearing neonate, worrisome and life-threatening diagnoses include necrotizing enterocolitis, malrotation with volvulus, and coagulopathy (Vit K deficiency, inherited). In the well-appearing neonate, the differential includes anal fissures, swallowed maternal blood, and allergic proctocolitis.

In the well-appearing infant/young child (1-5 years), consider fissures, infectious colitis, gastritis, benign polyps, swallowed blood from epistaxis/food or food coloring/medications (cefdinir). In the unwell infant (tachycardic, pale, dehydrated, etc.), the provider must consider intussusception, cryptic

liver disease, esophageal bleeding/hemorrhagic gastritis, vascular malformation, hemolytic uremic syndrome, and Meckel's diverticulum.

Patients with intussusception or Meckel's diverticulum may initially appear well but then decompensate due to rapid blood loss or gut ischemia.

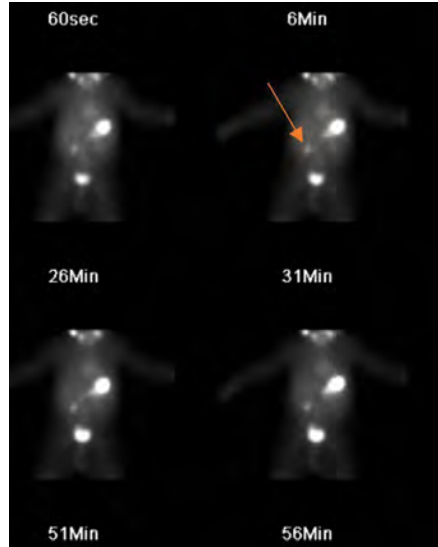
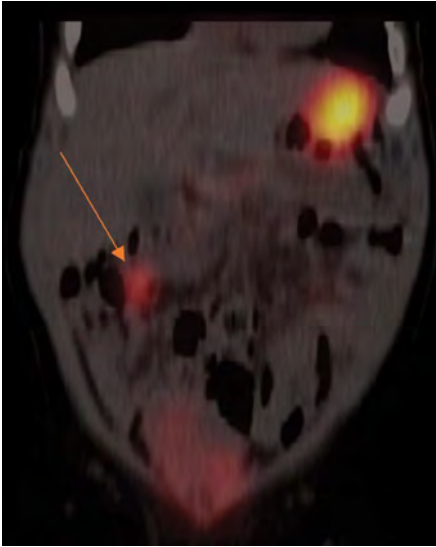
Finally, in the well-appearing older child/adolescent (5-18 years), consider esophageal irritation/gastritis and peptic ulcers. Ill-appearing patients include those with liver disease (varices), severe gastritis, vascular malformation, or inflammatory bowel disease.

This case portrays a young child with GI bleeding who ultimately was diagnosed with a Meckel's diverticulum. Meckel's diverticulum is the most common congenital malformation of the GI tract and one of the most common causes of GI bleeding in the toddler. It is caused by ulceration of the small bowel due to acid secretion by ectopic gastric mucosa within the diverticulum.

These patients (as with the patient in this case) often present with painless LGI bleeding. If the diverticulum is inflamed, it can cause abdominal pain and tenderness. The diagnostic study of choice is a technetium-99m scan (Meckel's scan), but definitive diagnosis is via laparoscopy with tissue biopsy.

The features of a Meckel's diverticulum are easily (or not so easily) remembered by the "Rule of Twos": presents by age 2, affects 2% of the





FIGURES 1 AND 2: Meckel's scan showing right-sided ectopic gastric mucosa signal

population, 2 inches in length, 2 types of mucosae, within 2 feet of the ileocecal valve.

**Disposition is critical for the pediatric patient with a suspected GI bleed.** For the well-appearing child with normal vital signs, minimal/mild bleeding, and a reassuring exam,

diagnostic work-up including stool studies and routine labs can be obtained in the ED, and an urgent pediatric gastroenterology clinic follow-up is often sufficient.

**In the unwell-appearing child regardless of age: Resuscitate!** Proton pump inhibitors may be beneficial

in some conditions such as hemorrhagic gastritis or Meckel's diverticulum. Consider blood transfusion (start with 10ml/kg of packed red blood cells) if the child is unstable or has severe symptoms from anemia. Labs to order include complete blood count, coagulation studies, type and screen, and stool testing/cultures. Imaging may be helpful in some cases (abdominal X-ray or ultrasound, CT scan), but do not delay in consulting your pediatric surgeon, gastroenterologist, and intensivist. These cases often require urgent endoscopy or laparoscopic surgery and pediatric intensive care unit admission.

**CONCLUSION**

For the pediatric patient with a GI bleed: **Think worst first!** Serious causes can be difficult to distinguish at first, so stay vigilant. Bloody stools with abnormal vitals or exam findings are concerning! Remember the age-based differential and consult your specialist team early if your patient has concerning features or findings. ★

**EMRA Resident SIMWARS**

Get your teams together and make plans now to be a part of this highly engaging, head-to-head skills competition!

Back at **ACEP24** on **Sept. 30** in **Las Vegas** — **EMRA's SimWars!**

More info & registration details coming soon

**50** years  
Emergency Medicine Residents' Association

acep Scientific Assembly LAS VEGAS 24



## A Case of Paralytic Shellfish Toxin Poisoning in the Aleutian Islands

### **Sarah Spelsberg, MD, FAWM, FEWM**

PGY1 Campbell/  
UNC Southeastern  
Emergency Medicine  
Residency, PGY-1  
Director of USA  
Operations - World  
Extreme Medicine  
Assistant Professor of  
Orthopedic Surgery  
Mayo Clinic

### **Megan Sarnecki, MD**

Medical Director  
Iliuliuk Family Health  
Services Clinic  
Unalaska, Alaska

### **Sara Filmlalter, MD, CAQSM, FAWM, DIDMM**

Mayo Clinic Florida

### **Abraham Boxx, BCP, BSN, RN, TCRN, CFRN, CCRN, CEN, NRP, FP-C, FAWM**

Former Lifemed  
Alaska Medevac

### **Heather Edmison, FP-C**

Lifemed Alaska  
Medevac

### **Holli Carter, RN, BSN, CCRN, CFRN**

Former Lifemed  
Alaska Medevac

### **INTRODUCTION**

Algal toxins are responsible for between 50,000 and 500,000 human intoxications per year.<sup>1</sup> Globally, there are 2,000 cases of human paralytic shellfish poisoning (PSP) reported per year, and acute intoxication demonstrates from 1.5% to 15% mortality rate in the literature.<sup>1,2</sup>

Paralytic shellfish toxins are found

mostly in bivalve shellfish mussels, clams, oysters, scallops, and snails. Monitoring programs in many countries minimize health risks and have reduced human illnesses and fatalities.<sup>5,15</sup> Paralytic shellfish toxin is 1,000 times more potent than cyanide and was used in some World War II suicide pills for pilots in case they were captured in enemy territory.

We present a case of the first PSP fatality in Alaska since 2010.

### **CASE DESCRIPTION**

A 64-year-old female presented to a clinic in July 2020 on Unalaska Island in the Aleutian Islands. The patient complained of vomiting, generalized weakness, “floating,” and paresthesias around the



lips and face. She had a medical history of hypertension and diabetes. Her list of medications included atorvastatin 20 mg by mouth nightly, flonase nasal spray 1 spray each nares daily, glipizide 5 mg by mouth twice daily, lidocaine 5% patches as needed for pain 12 hours on and 12 hours off, losartan 50 mg by mouth once daily, and metformin 1,000 mg twice daily.

The patient was retired and living with family. She was a never-smoker with no reported alcohol or drug intake. Family members initially thought the patient was having a stroke and called for EMS. The patient was transported to the island clinic via ambulance. A thorough history taken by the lead paramedic noted consumption of mussels and snails at 6 pm that were self-harvested earlier in the day. Samples were taken from the house, brought to the clinic, and placed on ice. The patient estimated that she had eaten 12 mussels and 8 snails. Family noted that she ate more than anyone else; a few family members did not consume any shellfish or snails, and the rest of the family denied symptoms and declined transport.

She presented with Glasgow Coma Scale 15 on arrival to the clinic. She was alert and oriented to her date of birth and location and recognized her son-in-law, but she could not state the year. She was complaining of weakness, floating, perioral numbness, and paresthesias. Intake vital signs were pulse of 95, blood pressure 168/94, temperature 37.2 C, respirations 16/minute, SPO<sub>2</sub> 98%, and BMI 31.8. Her initial neurologic exam included intact cranial nerves, strength 5/5 in all four extremities, and a negative Babinski sign. She required coaching throughout the physical exam and had a dissociated-appearing, slow-motion motor exam. With significant coaching, she was able to demonstrate normal range of motion and 5/5 strength in the extremities but was disoriented and distracted during the exam. She had 2+ patella deep-tendon reflexes and undetectable Achilles tendon reflexes. Sensation was intact to touch bilaterally to the face, upper, and lower extremities. She had palpable radial and dorsalis pedis pulses.

Initial CBC, CMP, troponin, coagulation profile, and urinalysis were within normal limits (**Figure 1**). A

10-panel drug screen was negative. The EKG in the clinic demonstrated a heart rate of 106 bpm, PR interval 192 ms, QRS 90 ms, QT/QTc interval 344/406 ms, P/QRS/T axis of 37/32/26, RV<sub>5</sub>/SV<sub>1</sub> amp 0.695/0.940 mV, and RV<sub>5</sub>/SV<sub>1</sub> amp 1.635 mV, and was read as sinus tachycardia (**Figure 2**).

Due to the history of recent self-harvested shellfish consumption, nonfocal neurologic exam, and lack of obvious metabolic or electro-cardio disturbance, paralytic shellfish poison intoxication was suspected. The differential included paralytic shellfish intoxication, medication overdose, cerebellar stroke, or infection.

Historically, patients with paralytic shellfish poison intoxication may require ventilator support. Intubation was the recommendation of Alaska Poison Control if the patient was in respiratory distress or demonstrated hemodynamic compromise and sodium bicarbonate if the QRS on EKG was >100 ms.

The decision was made to transport the patient 3 hours via air medevac to tertiary care, understanding that the island clinic was not capable of providing the level of life support we were expecting she might require. She was protecting her airway and remained hemodynamically stable so intubation was delayed. On EKG the QRS was 90 ms (<100 ms) so intravenous sodium bicarbonate was held.

Two large-bore intravenous access points were established, and intravenous normal saline was started at a rate of 150 ml/hr in the rural clinic on the island. The patient was given oxygen 2 L via nasal cannula, diphenhydramine 25 mg intravenous, methylprednisolone 62.5 mg intravenous, and metoprolol 10 mg intravenous to treat hypertension. The medevac crew was prepared to intubate in flight if needed. The mussels and snails as well as an initial urine sample were placed in a cooler and sent with the patient for the Alaska State Epidemiology Lab to collect at the tertiary care facility in Anchorage. The commercial medevac company transported the patient on continuous cardiac monitor for the 3-hour flight from Unalaska Island to tertiary care in Anchorage. The medevac team was well-prepared, expecting to intubate and support respirations if needed.

The patient was initially stable during the flight. However, two-thirds of the way to Anchorage, she abruptly stopped speaking to the flight crew and went into simultaneous respiratory and cardiac arrest with asystole. There was no precipitating respiratory distress, hypoxia, hypotension, or rhythm, nor change in any vital signs, before the arrest. Advanced Cardiac Life Support protocol was initiated in the medevac plane. She was resuscitated 3 times enroute to Anchorage by the flight crew with return of spontaneous circulation after cardiopulmonary resuscitation the first round and two total doses of epinephrine on subsequent rounds of cardiopulmonary resuscitation.

The patient was brought to the emergency department in Anchorage resuscitated but subsequently went back into asystole alternating with atrial flutter and was resuscitated a reported 8 more times in the ED (11 total). She was on norepinephrine, epinephrine, and sodium bicarbonate infusions in the ED and received calcium, magnesium, and vasopressin additionally. Return of spontaneous circulation was obtained after seconds of cardiopulmonary resuscitation during several episodes of arrest before epinephrine could be administered. The patient was pronounced deceased in the ED. Final comprehensive metabolic panel demonstrated elevated liver function (ALT 781, AST 712) consistent with shock/coded liver and calcium of 12.4 up from 9.7. Sodium was 145 up from 136. EKG in Anchorage demonstrated atrial flutter with rapid ventricular response, left bundle branch block, prolonged QTC, with a ventricular rate of 147 bpm, QT interval of 396 ms, corrected QT interval of 619 ms, QRS axis of 78 degrees, and T axis of 240 degrees.

Family members were repeatedly offered in-clinic monitoring or transport off the island for evaluation but declined and agreed to be monitored for symptoms remotely for 48 hours. They self-reported eating fewer mussels and snails than the patient had consumed (some ate zero) and denied symptoms.

State epidemiology lab personnel picked up the samples for analysis, and





the state's medical examiner took control of the patient for autopsy. The cause of death was determined to be from respiratory and cardiac arrest secondary to paralytic shellfish poison intoxication. The Alaska State Epidemiology Laboratory determined that the samples contained 12,000 mcg/kg. With such a high toxin level in the tested mussels, it was very surprising that family members who had consumed the shellfish did not also become ill.

#### DISCUSSION

Paralytic shellfish poisoning is caused by eating filter feeders contaminated by paralytic shellfish toxin from algae.<sup>1-6</sup> The toxin cannot be destroyed by cooking or freezing.<sup>2</sup> Paralytic shellfish toxin causes reversible binding of sodium and calcium channels with prolongation of the gating of potassium channels; this causes respiratory paralysis and can stop

the heart.<sup>2</sup> Toxin levels contained in a single shellfish can be fatal to humans, and shellfish in the same area can contain widely variable levels of toxin.<sup>2</sup>

Favorable coastal conditions cause increased harmful algae blooms, which lead to more species containing high marine biotoxin burden.<sup>16</sup> Extreme weather events including warmer ocean temperatures in the region have been associated with increased harmful algae blooms and increased contaminated seafood.<sup>16</sup> In 2019, Barbosa et al demonstrated that, given static harmful algae bloom exposure, certain species of fish had higher biotoxin burden if the temperature of the water was higher.<sup>16</sup> In 2019 and 2020, the Southern Bering Sea surface water temperatures reached record highs.<sup>17</sup> The Qawalangin Tribe of Unalaska historically collects data on water temperatures and samples mussels in the Aleutian Islands (**Figure 3**).

The levels found in the mussels obtained from the patient analyzed by the State of Alaska Environmental Lab were 12,000 mcg/kg. Twelve thousand mcg/kg is 150 times the safe consumption limit of 80 mcg/kg. The death was confirmed in the autopsy report by the Alaska State Medical Examiner to be from "paralytic shellfish poisoning after consuming mussels and snails contaminated with paralytic shellfish toxin self-harvested from Unalaska Island, Alaska". This was the first paralytic shellfish poisoning fatality reported in Alaska since 2010.

Paralytic shellfish toxin has no known rapid analysis, abnormal laboratory values, or typical vital signs findings. EKG changes, including QRS >100 ms, are late findings. The history and subjective clinical presentation should be thorough and raise suspicion for paralytic shellfish poisoning. Patients should be sent with samples of the suspected paralytic



<b>FIGURE 1</b>	Globulin 3.3 g/dL	Absolute Lymphocytes 3.77 K/uL
Na 136 mmol/L	WBC 13.4 K/uL	Absolute Monocytes 1.09 K/uL
K 3.9 mmol/L	RBC 4.14 M/uL	Absolute Eosinophils 0.11 K/uL
Cl 113 mmol/L	Hemoglobin 10.7 g/dL	Absolute Basophils 0.02 K/uL
CO2 20 mmol/L	Hematocrit 33 %	Lipase 38 U/L
Anion Gap 3 mmol/L	MCV 79.7 fL	Magnesium 1.5 mg/dL
Glucose 196 mg/dL	MCH 25.8 pg	Prothrombin Time 11.1 seconds
BUN 13 mg/dL	MCHC 32.4 g/dL	INR 0.9
Creatinine 0.86 mg/dL	RDW-CV 14.6 %	Troponin 0.0 ng/mL
eGFR > 60 mL/min/1.73 m2	Platelet Count 272 K/uL	
Calcium 9.7 mg/dL	MPV 10.9 fL	
Albumin 4.7 g/dL	% Neutrophils 62.9	
Bilirubin 0.5 mg/dL	% Lymphocytes 28.1	
Total Protein 8 g/dL	% Monocytes 8.1	
AST 51 U/L	% Eosinophils 0.8	
ALT 61 U/L	% Basophils 0.1	
Alkaline Phosphatase 61 U/L	Absolute neutrophils 8.44 K/uL	

FIGURE 1

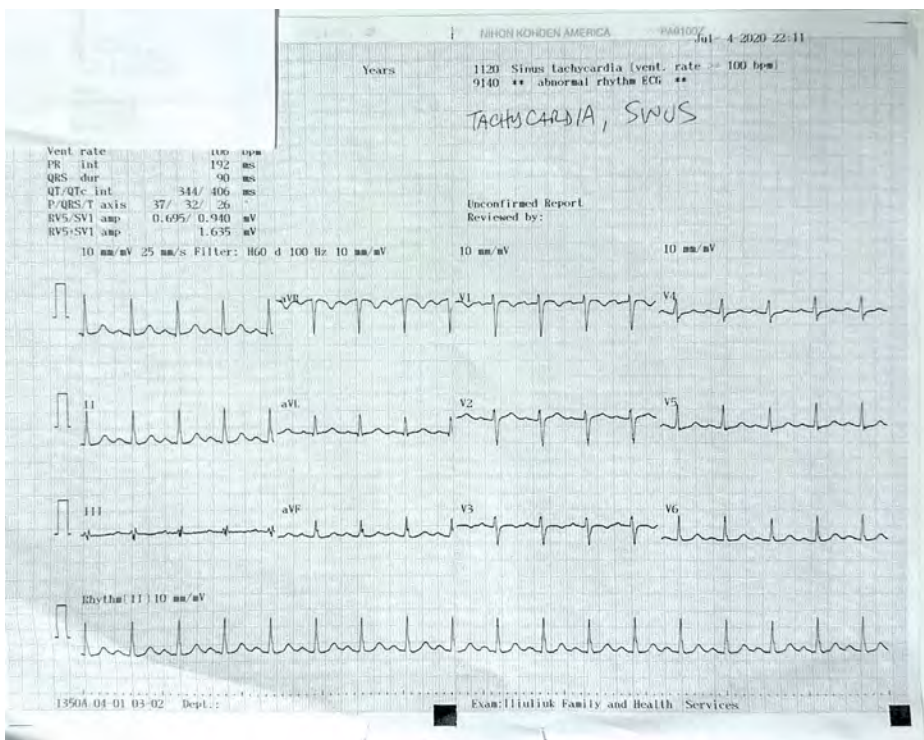


FIGURE 2

shellfish toxin-containing products consumed, if available, as well as initial urine samples. State epidemiology lab personnel should be notified.

Symptoms of paralytic shellfish poisoning can present within minutes to hours. Symptoms include tingling of the lips and tongue, tingling of fingers and toes, loss of muscle control in the arms and legs, difficulty breathing, sense of floating, nausea and vomiting, and

autonomic instability. Symptoms can mimic a stroke, so a thorough history is tantamount. The muscles of the chest and abdomen can become paralyzed anywhere from minutes to hours from exposure. With high toxin exposures, death can occur in as little as 2 hours via cardiorespiratory failure.<sup>2</sup>

In an Alaska case report review, patients who have access to respiratory support can survive paralytic shellfish

intoxication. This case is unusual because we were not expecting a simultaneous respiratory and cardiac arrest to occur 8.5 hours after ingestion with her mental status, monitor, and vitals being stable until the arrest. Pre-transport intubation should be considered. As previously mentioned, we chose not to take the patient’s airway and the medevac team was well-prepared to intubate in flight.

Serial peak flow measurements could be used to monitor impending respiratory collapse, and intubating pre-emptively should be considered. Approaching this intoxication similarly to a combined pill-based sodium and calcium channel blocker intoxication might offer further treatment options, including intravenous sodium bicarbonate independent of QRS duration, giving a fluid bolus with diuresis to more rapidly evacuate the toxin from the system, and standard treatments for pill-based calcium channel blockade intoxication via poison control including intravenous calcium. Treatment with sodium bicarbonate is indicated for a QRS duration >100 ms. On intake, our patient had a QRS duration of 90 ms and, other than tachycardia, with a rate of 106 beats per minute, there were no other EKG abnormalities initially in the clinic or during the flight until the abrupt arrest. There is no way to ascertain initially whether the PSP patient will have brief paresthesias only, require respiratory support, or abruptly go into full respiratory and cardiac arrest as was the case with our patient. One contaminated mussel can be fatal.

**CONCLUSION**

Research is ongoing into the cause of increased toxic algae blooms in the Aleutian Islands, but the exact combination of conditions that cause blooms is not yet known. The current situation of rising temperatures in the Bering Sea appears to coincide with increased algae blooms and concerning toxin measurements throughout the Aleutian Islands and surrounding Alaska.<sup>2</sup> Cases of paralytic shellfish poisoning are fortunately rare since the advent of monitoring systems.<sup>7-14</sup> Considering the mechanism of paralytic shellfish toxin and future treatment options, a review

of sodium channel blocker overdose treatment and calcium channel blocker overdose treatment was conducted.

In a sodium channel blocker overdose, the standard treatment is intravenous sodium bicarbonate. This is traditionally recommended in patients with an EKG QRS duration >100 ms or any suspicious QT prolongation or dysrhythmia.<sup>18</sup> Intravenous sodium bicarbonate will raise the serum pH and increase extracellular sodium. This alkalinization increases the electrochemical gradient across cell membranes, helping to offload sodium channels. Patients should be given 1-2mEq/kg as a bolus dose.<sup>18</sup> Bolus doses can be administered until the QRS duration is <100 ms. This can be followed with a continuous infusion of sodium bicarbonate of 2-3 50mEq ampules in 1 liter of D5W.<sup>18</sup> Extracorporeal membrane oxygenation was used in a case of sodium channel blocker overdose that was not responding to treatment and resulted in a survival.<sup>19</sup>

Calcium channel blocker intoxication causes bradycardia, hypotension, conduction disturbances, and escape rhythms.<sup>20</sup> Treatment of a calcium channel blocker intoxication consists of monitoring only in an asymptomatic patient with normal vital signs and a normal EKG; in symptomatic or known high-dose cases, intravenous calcium chloride or calcium gluconate with or without insulin, methylene blue, lipid emulsion, and glucagon. Catecholamines are recommended if severe hypotension.<sup>20</sup> Hemodialysis is ineffective against a calcium channel blocker overdose.

In a series of 7 cases, Hurley et al intubated the first patient but monitored the remaining 6 patients with serial peak flow measurements.<sup>21</sup> They did not collect height and weight on their patients, so they were unable to calculate values for recommendations.<sup>21</sup> Serial peak flow measurements might offer some promise in the future to have an early warning on impending respiratory collapse.

In conclusion, we propose consideration of early intubation, bolus of sodium bicarbonate, calcium, and extracorporeal membrane oxygenation if available. In remote areas with low resources, consideration of intravenous

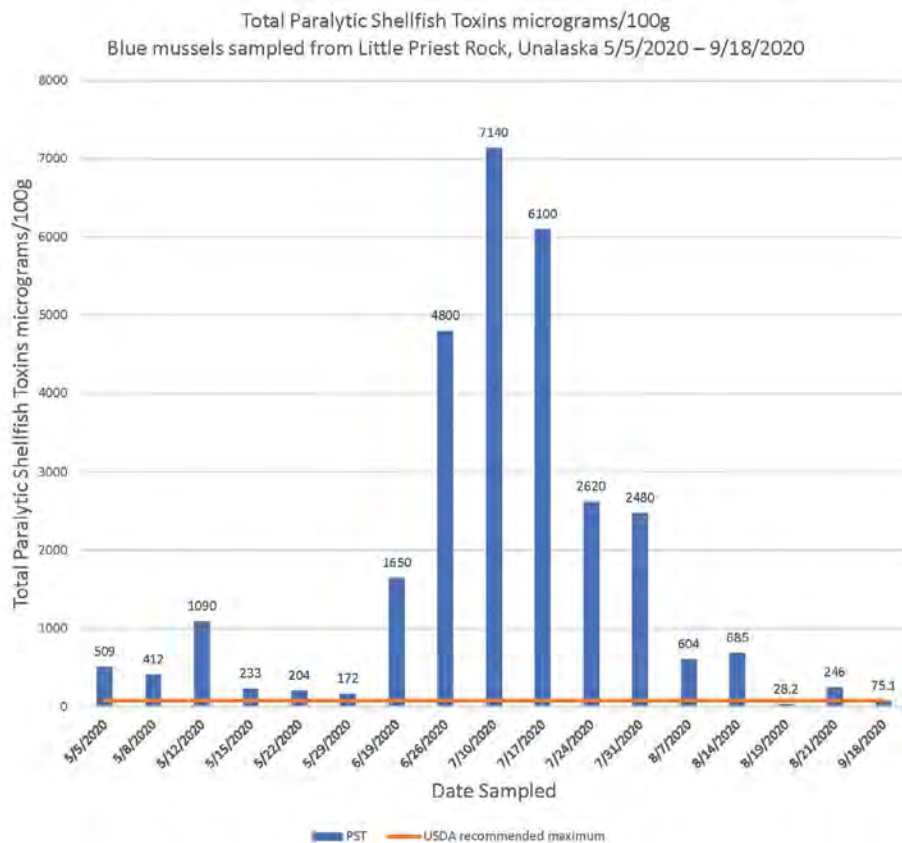


FIGURE 3: The Qawalangin Tribe of Unalaska historically collects data on water temperatures and samples mussels in the Aleutian Islands. (Graph prepared by Chandra Poe, environmental program director for Qawalangin Tribe of Unalaska using data from analysis conducted at the State of Alaska Environmental Health Laboratory in Anchorage. Funding for 2020 sampling and analysis was provided through Knik Tribe and U.S. Environmental Protection Agency.)

fluid bolus and high-dose diuretic can be made to possibly assist in flushing the toxin out of the system. Consider serial peak flow measurements to assist with an early indication of impending respiratory compromise. Continue life support measures if there is a chance that the toxin can be flushed out of their system and the patient can survive the intoxication. Paralytic shellfish poisoning is technically reversible if they can survive the paralysis and system shutdown.<sup>7-10</sup> \*

#### ACKNOWLEDGEMENTS

The authors would like to acknowledge the Alaska State Epidemiological Lab, Environmental Health Laboratory Anchorage, Providence Alaska Hospital, Lifemed Alaska Medevac, Iliuliuk Family Health Service Clinic, Unalaska Fire and Rescue Emergency Medical Services, Chandra Poe, Qawalangin Tribe of

Unalaska, Knik Tribe of Alaska, and the United States Environmental Protection Agency.

#### AUTHOR CONTRIBUTIONS

Sarah Spelsberg was the attending provider for the patient and lead author. Megan Sarnecki assisted with state laboratory and tribe communication, patient test results compilation and editing. Sara Filmlter assisted with literature review and editing. Abraham Boxx assisted with literature review, writing, and editing. Heather Edmison was the attending paramedic on the Lifemed Alaska Medevac plane for the patient and assisted with paper edits. Holli Marie Carter was the attending nurse on the Lifemed Alaska Medevac plane for the patient and assisted with paper edits.





## The Art of Negotiation: Workshop Reflections for the EM Physician

### Richard Ngo, DMD

Medical Student, MS-3  
Emergency Medicine  
University of California, San Francisco

### Andrew Luo, MD, MBA

Resident, PGY-2  
Emergency Medicine  
Harvard-Affiliated Emergency Medicine  
Residency

### Christina Brown, MD

Resident, PGY-2  
Emergency Medicine  
Christiana Care

### Karan Bains, MD, MBA

Resident, PGY-4  
Emergency Medicine  
University of California, San Francisco

### Savanah Harshbarger, MD, MBA

Resident, PGY-3  
Emergency Medicine  
Harvard-Affiliated Emergency Medicine  
Residency

### Carly Rosen, MD

Resident, PGY-3  
Emergency Medicine  
Mount Sinai Morningside West

### Nicholas Stark, MD, MBA

Associate Physician & Clinical Instructor  
Emergency Medicine  
University of California, San Francisco

Emergency physicians use negotiation skills everyday — with both patients and peers. Building strong negotiation skills early can make long-term impacts on career progression.

EMRA’s Administration and Operations Committee hosted a panel discussion on “Negotiation for the EM Physician” at CORD Academic Academy 2023 in Las Vegas. The goal of the workshop was to give physicians, residents, and medical students a basic framework to consider when engaging in a negotiation.

Negotiation experts leading the workshop included:

- Nicholas Stark, MD, MBA, UCSF faculty associate emergency medicine attending physician and clinical instructor
- Savanah Harshbarger, MD, MBA, Harvard-affiliated emergency medicine resident physician
- Jaskaran Bains, MD, MBA, UCSF emergency medicine resident physician

To begin the workshop, Dr. Stark led a discussion to teach an important lesson: Negotiation is a skill that can be practiced. The discussion was followed by a real-world simulation of a negotiation

encounter led by Drs. Harshbarger and Bains.

### PRE-NEGOTIATION ADVICE

Dr. Stark provided guidance on how to put your best foot forward prior to obtaining and negotiating a job offer.

Curriculum vitae (CV): Maintain two separate CVs: running and job-specific. A running CV is longer and continuously edited over time, whereas a job-specific CV is shorter, around two to three pages, and is tailored to fit the specific role or job opportunity. Position your name, contact information, and earned degrees at the top of the document. Create different sections to highlight various strengths and experiences — such as a section for leadership or operations experiences. Lastly, remove high school and undergraduate accomplishments.

Cover letter: Include the position you’re applying for, a personal connection to the specific job or location, relevant skills, and how your experience fits with the desired role. Cover letters should be brief — roughly three to four paragraphs — and should maintain a positive and professional tone throughout.

Digital footprint: Be aware of your online presence and all search results that exist under your name, as employers likely will review them in advance.

### NEGOTIATION STYLES

As part of the workshop, Dr. Stark also discussed various negotiation styles and general tactics to deploy during a negotiation.

One form of negotiation is **positional negotiation**, which is position-focused and more adversarial, with two sides: hard versus soft. The hard position focuses on aspects such as being adversarial, victorious, misleading, pressuring, and gain-seeking; the soft side focuses on friendship, agreement, disclosure, flexibility, and acceptance of losses.

In contrast to positional negotiation, **principled negotiation** is interest-focused and seeks to maximize benefit for all parties involved. This kind of negotiation focuses on solving problems, seeking wise outcomes, avoiding bottom lines, remaining open to reason, and inventing options for mutual gain. Principled negotiation centers upon objective criteria, such as market value, precedent, professional standards, and costs. Those who focus on principled negotiation build relationships with open communication and trust over time.

In a situation with positional negotiation, focus on developing your relationship with the other person, ask open-ended questions, and humanize the other party. Asking for a phone call or video conference is more effective in building relationships than email communication. Generally, understanding the other party's values, goals, and desires is vital. Thinking outside the box and involving your mentors to obtain feedback can help you negotiate an ideal position.

When considering potential attending jobs, use both hard and soft factors. Hard factors can include criteria such as hours worked and shift buy-down. Soft factors can include time and financial support to attend conferences and professional society meetings, titles to bolster your résumé, and office space.



### TERMINOLOGY

**Target price:** Each party (recruiter or physician) has an ideal target range.

**Walk-away price:** Each party has a walk-away price at which they would not be willing to go higher (recruiter) or lower (physician).

**Zone of possible agreement (ZOPA)** is the range at which a recruiter and physician can potentially agree. The difference between the recruiter's and physician's walk-away price is known as the ZOPA. For example, if the highest price a recruiter is willing to pay is \$10, and the lowest price the physician is willing to accept is \$5, then the ZOPA would be the difference: \$10-\$5 = \$5.

**Best alternative to a negotiated agreement (BATNA)** is what you should do if both parties fail to reach an agreement. Thinking about this before the negotiation can help you resist any pressures in real time. You can leverage factors such as other job offers or opportunities to best position yourself in a negotiation.

### COGNITIVE TRAPS

Dr. Stark described cognitive traps that are obstacles to a successful negotiation. Being mindful of these traps and thinking through potential pitfalls are excellent ways to address this issue. If you encounter these cognitive traps, it's helpful to try to reframe your thinking and view things differently. Getting outside perspectives from trusted mentors and research resources are also

great ways to overcome cognitive traps.

**Implicit bias:** a cognitive trap where one maintains attitudes and stereotypes toward others without conscious knowledge. Examples can include gender, race, sexual orientation, and other identity factors. Awareness is the first step in dismantling these biases and can have a great impact on one's relationship with others.

**Anchoring:** occurs when one gives disproportionate weight to the first information that is received. Anchoring biases can be minimized by viewing the problem through as many perspectives as possible and by thinking through problems before asking others for help.

**Status quo trap:** a cognitive trap in which the decision-maker is biased toward options that are similar to the current situation. Sometimes, the status quo may or may not be the best choice. It is important to think through and consider other potentially viable options.

**Framing:** It is important to be mindful of how information is presented to your audience, as this can greatly impact behavior. Dr. Stark recommends framing consequences as gains that incentivize behavior and as losses that disincentivize behaviors. Presenting problems as neutral is another method that could work.

### PRACTICE MAKES PERFECT

To close out the negotiations workshop, participants engaged in a hands-on session to put some of the principles outlined above into practice.

Participants were split into two groups: interviewees and hiring managers. Both groups were given specific parameters and preferences for negotiation. For example, hiring managers could only offer salaries up to 80 percent of the candidates' ask, but could give concessions on geographic location — and interviewees were able to negotiate more attractive practice settings or paid-time-off (PTO) days if they were willing to give up a higher salary.

By engaging in this exercise, each group balanced different negotiation styles and leveraged techniques to help arrive at an agreement. ★



# Close Call After a Fall: Splenic Rupture and its Life-Threatening Consequences

**Cheri Lotfi**

Medical Student, MS-3  
Lake Erie College of Osteopathic Medicine

**Charles Adams**

Medical Student, MS-3  
Lake Erie College of Osteopathic Medicine

**Reginald Saint-Hilaire, MD**

Medical Director,  
TGH Emergency Center Brandon  
Vice Chief of Emergency Medicine,  
Tampa General Hospital



## BACKGROUND

Splenic rupture refers to the disruption of the splenic capsule or tearing apart of the spleen, a vital organ responsible for filtering blood and fighting infections. This condition is considered a medical emergency, as it can cause significant and potentially life-threatening internal bleeding.<sup>1</sup>

Splenic rupture occurs primarily as a result of blunt trauma to the abdomen, such as from a car accident or a fall. Certain medical conditions that affect the spleen — including mononucleosis (EBV), leukemia, or lymphoma — are less common but still important causes of splenic rupture.<sup>1</sup>

## CASE REPORT

A 71-year-old male with a history of hypertension and hyperlipidemia was brought to the emergency department by his wife after experiencing a mechanical fall at home. The patient had been recovering from a recent viral illness and had been experiencing balance issues. He had been taking apixaban for the past year due to an episode of atrial fibrillation in addition to his antihypertensive medication. His Glasgow Coma Scale was 15 at the time of arrival at the ED. When questioned, the patient denied losing consciousness during the fall.

The physical exam revealed an elderly gentleman in acute distress with a 4-cm laceration noted to the left temporal scalp. No depressed skull fracture was noted. The exam was otherwise within normal limits. The patient's vitals were HR 74 bpm, RR 20/min, BP 94/62 mmHg, and O<sub>2</sub> sat 95%. An ECG was normal sinus





FIGURE 1: CT abdomen with contrast revealing a large subcapsular hematoma compressing the spleen, with mild to moderate serosanguineous ascites. Subcapsular venous extravasation noted under the lateral splenic capsule.



FIGURE 2: CT abdomen with contrast revealing a large subcapsular hematoma compressing the spleen, with mild to moderate serosanguineous ascites. Subcapsular venous extravasation noted under the lateral splenic capsule.

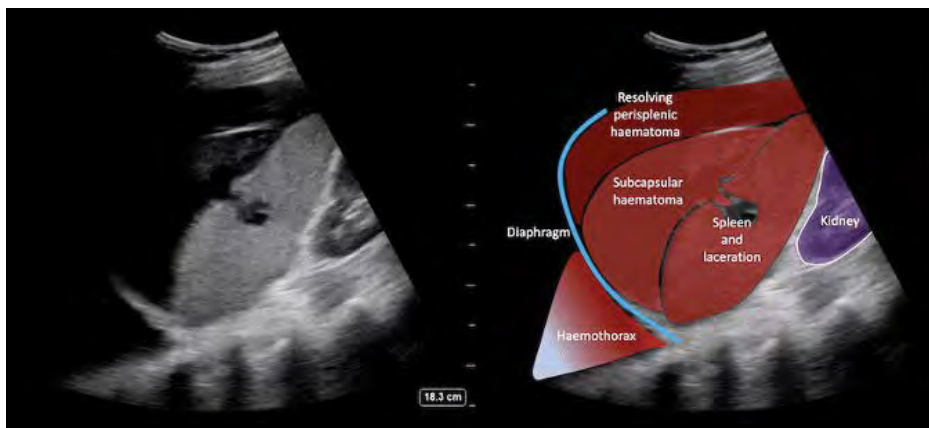


FIGURE 4: FAST left upper quadrant view showing that there is heterogeneous predominantly hyperechoic perisplenic hematoma as well as subcapsular hematoma. The echogenic area in the mid-portion of the spleen disturbing the usual homogeneous echotexture suggests a laceration.<sup>11</sup> Image used with permission. Disclaimer: The FAST images provided are not the FAST images from our patient, but rather a positive FAST in the LUQ.

rhythm without ectopic or ischemic changes, and a viral panel was positive for influenza A. A complete blood count (CBC) revealed a low hemoglobin of 10.7 g/dl and hematocrit of 32.8%. A CT of the head without contrast was performed to rule out cerebral hemorrhage, and there was no acute intracranial abnormality noted. The patient received staples for his scalp laceration and was discharged from the ED.

Nine hours later, however, the patient returned to the ED complaining of dizziness and lightheadedness that

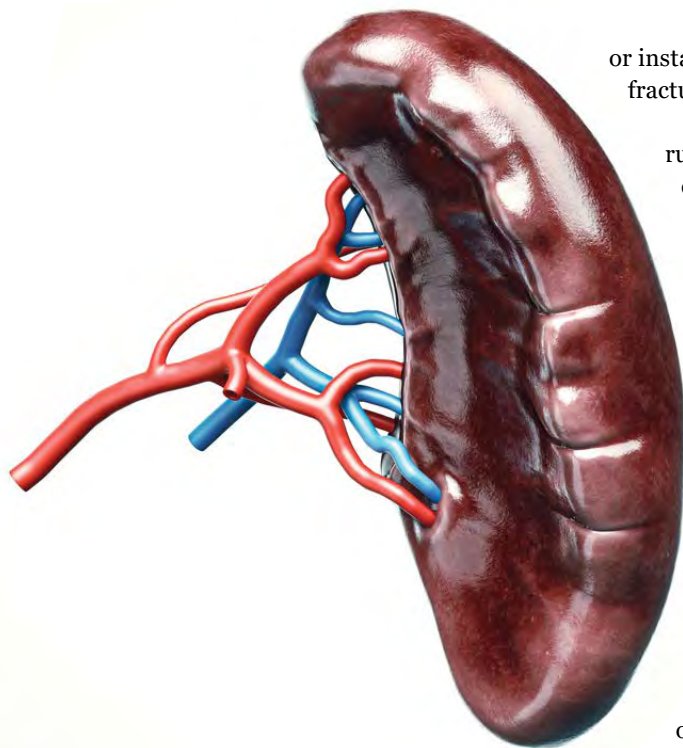
intensified with any change in body position. The only abnormality on the patient's physical exam at this time was the pallor of his skin. Although he had a regular rate and rhythm, he had a worrisome blood pressure of 69/48 mmHg. He was given a normal saline fluid bolus, and a CBC, complete metabolic panel (CMP), and troponin were ordered. Two serial ECGs both showed normal sinus rhythm with no immediate ST-T changes, and the troponin levels came back within normal limits. However, the CMP results showed that the patient's BUN



FIGURE 3: Left upper quadrant (splenorenal) view. (a) Transducer placement at the left upper quadrant (LUQ). (b) Illustration of transducer placement and relevant anatomy. (c) Normal ultrasound image of the splenorenal space or left upper quadrant. (d) Illustration of important structures visualized in the ultrasound image including the kidney, diaphragm, and spleen. Artwork (a) created by Emily Evans © Cambridge University Press. Illustration (d) by Laura Berg, MD.<sup>10</sup> Images used with permission. Disclaimer: The images provided in Figure 3 are not the FAST images from our patient, but rather a demonstration of a negative FAST in the LUQ.

and Cr levels were elevated. On the review of the repeat CBC, the patient's hemoglobin levels had plummeted to 6.0 g/dl and hematocrit to 19.2%.

The emergency physician immediately ordered a CT scan of the chest and abdomen with contrast to pinpoint the source of the bleeding. Soon thereafter, the physician received a call from the radiologist, who informed him that the patient had a ruptured spleen. The CT scan of the abdomen revealed a large subcapsular hematoma compressing the spleen, with mild-to-moderate serosanguineous ascites. Subcapsular venous extravasation was noted under the lateral splenic capsule. To stabilize the patient, the team sent a type and crossmatch and administered 4 units of blood before transferring him via medevac for immediate surgical intervention.



or instability due to rib fractures.<sup>3</sup>

Atraumatic splenic rupture (ASR) is less common but can occur in a wide age range, from teenagers to the elderly. The majority of cases are “pathologic” ASRs, meaning they develop in a diseased spleen due to infection, coagulopathy, or neoplasm.<sup>7</sup> In some cases, ASR represents the initial manifestation of an underlying disease. Alternatively, “idiopathic” ASR can occur

in a normal-appearing spleen without predisposing factors. Anticoagulation is a common cause of idiopathic ASR, accounting for up to 9% of cases.<sup>7</sup> Patients with ASR may present with variable degrees of upper or left-sided abdominal pain, tachycardia, and hypotension, followed by malaise, vomiting, generalized abdominal tenderness, peritonitis, and progressive hemodynamic shock.<sup>8</sup>

In the case of this patient, there were many variables that likely contributed to his splenic rupture: his fall, anticoagulation therapy, and a recent history of influenza A. Key details surrounding the nature and mechanism of this patient’s fall — such as his position at the time of the incident, the height of the fall, and what triggered the fall — remain limited. On his initial presentation, the patient’s hypotension and history of a recent fall did raise the suspicion for another injury apart from his scalp laceration; however, he denied any abdominal pain on physical exam. His past medical history of atrial fibrillation and anticoagulation with apixaban increased his risk for spontaneous bleeding and, theoretically, for atraumatic splenic rupture.

Similarly, his recent viral illness also could have played a role in causing ASR.<sup>9</sup>

While the exact cause of this patient’s splenic rupture was most likely the combination of his anticoagulation therapy and his fall, this case is presented as a noteworthy example of how splenic rupture can occur in the absence of overt physical exam findings. On physical exam, the patient had negative Kehr’s sign, negative Fox’s sign, and no abdominal pain or rebound tenderness to palpation. This demonstrates that splenic rupture cannot be excluded from the differential due to an unremarkable physical examination in the appropriate clinical scenario. A Focused Assessment with Sonography in Trauma (FAST) was not deemed to be warranted on his initial presentation due to the absence of any positive physical exam findings; however, perhaps his hypotension should have prompted further pursuit of an explanation apart from the fact that he took his blood pressure medications earlier that morning. Nonetheless, the FAST exam is a critical diagnostic tool that should always be considered in a patient presenting with hypotension with or without a low hemoglobin.

#### CASE CONCLUSION

In summary, splenic rupture is generally classified into two categories: traumatic and atraumatic. The former is typically the result of blunt abdominal trauma, while the latter can occur due to a variety of pathologic causes, such as infection, malignancy, and systemic anticoagulation. This patient’s case of splenic rupture was interesting as he not only had a history of trauma and anticoagulation use, but he also had a recent history of viral illness. This case serves as a sobering reminder that even in the absence of any remarkable findings on a physical abdominal exam, it is essential for emergency physicians to keep the possibility of splenic rupture in mind and consider performing a FAST in the setting of unexplained abnormal vital signs. ★

#### CASE DISCUSSION

Splenic rupture is generally categorized into traumatic and atraumatic causes. Traumatic splenic rupture typically results from blunt abdominal trauma, including compressive forces against the abdomen or shearing forces created by sudden deceleration.<sup>2</sup> The most susceptible patients are older adults, alcoholic patients, and in the case of motor vehicle accidents, those wearing safety belts without shoulder attachments.<sup>3</sup> Lacerations of the spleen can occur from fractured ribs or pelvic bones, and a history of trauma to the left upper quadrant, left rib cage, or left flank should increase suspicion of splenic injury.<sup>4</sup> Patients with traumatic splenic rupture may present with left upper abdominal, left chest wall, or left shoulder pain from diaphragm irritation, also known as Kehr’s sign.<sup>3,5</sup> Fox’s sign may be present as bruising over the outer aspect of the thigh, delineating that there is active retroperitoneal bleeding.<sup>6</sup> Other physical manifestations include left upper quadrant or generalized abdominal tenderness, abdominal wall contusion or hematoma (e.g., seatbelt sign), and left lower chest wall tenderness, contusion,

*Cheers to*

**50** years

**A CELEBRATION IN 2024 AS  
WE HONOR 50 YEARS OF EMRA!**

Look for special events and promotions at ACEP24 in Las Vegas and throughout the year as we mark 50 years of serving emergency physicians-in-training, medical students, fellows, and EMRA alumni.

**MORE INFO**







## Dangerous Pill to Swallow: A Case Report

### Alaina Royalty, MD

Chief Resident, PGY-3  
Emergency Medicine  
University of Louisville

### Matthew Eisenstat, MD, FAAEM

Associate Program Director  
Emergency Medicine  
University of Louisville

**A** 44-year-old male with a past medical history of substance use disorder presented to the emergency department following an overdose. The patient was reported to have taken 1 gram of heroin and 22 mg of illicitly purchased “Xanax” orally in an effort to avoid police detection. EMS noted that he was initially alert on scene but became somnolent en route. He was given 8 mg IN naloxone prior to arrival to the ED with no clinical improvement. He was subsequently given an additional 4 mg IV naloxone in the emergency department when he arrived. Despite this, he remained obtunded with minimal respiratory effect and was intubated for airway protection.

In the ED, on telemetry the patient was noted to be developing bradyarrhythmias. An initial EKG was performed and was notable for bradycardia with multiple PVCs of variable morphology, including ventricular couplets (**Figure 1**). Telemetry continued to show dynamic changes in his rhythm remaining bradycardic with HR 40-50s; therefore, an EKG was repeated within minutes, this time showing ventricular bigeminy (**Figure 2**).

The patient was admitted to the ICU for continued management. Four hours after admission, his EKG showed bradycardia with QTc prolonged to 648 (**Figure 3**). Due to his unique

presentation, an extended toxicology panel of testing was ordered to investigate contaminants with possible cardiac effects.

The patient was found to have a quantitative etizolam level of 160 ng/mL and its major metabolite alpha-hydroxyetizolam (at 100 ng/mL). No other tested novel psychoactive substances — including a large number of illicitly manufactured fentanyl (IMF) — were detected. The patient had intermittent episodes of bradycardia following his overdose that resolved by hospital day 3. QTc remained >600 for several days but was 460 by the second week of his stay. On the last day of his hospital stay, his EKG was normal

sinus rhythm with a rate in the 70s and normalized QTc.

## DISCUSSION

Etizolam is an illicit benzodiazepine, not medically approved in the United States. To our knowledge, no novel illicit benzodiazepine has been associated with bradycardic dysrhythmias.

Studies have shown that the use of novel psychoactive substances, including illicit benzodiazepines, has been on the rise in the United States.<sup>1</sup> According to the National Poison Data System, there was a 330% increase in incidence from 2014 to 2017, and this trend has likely continued.<sup>2</sup> Although the use of illicit benzodiazepines is rising, users may not know they are taking them. Illicit benzodiazepines have been reported in candy-like pills, and other times users (like the patient in our case) may think they are buying a different drug.

Benzodiazepines can now be found for sale online without restrictions.<sup>4</sup> The

These factors significantly raise the risk of respiratory depression and accidental overdose when compared with FDA-approved versions of these medications. There are more than 50,000 online pharmacies, and 80% of all rogue web-based pharmacies target English-speaking countries.<sup>5</sup>

Recognizing illicit benzodiazepine overdose is challenging for the emergency physician because these substances often are not identified on routine drug screening, and clinicians must rely on patients to self-report use. Such substances can be identified on lab-based testing; however, that process does not produce information quickly enough to help in the acute setting and requires a level of suspicion to pursue.<sup>3</sup>

Emergency physicians are very familiar with benzodiazepines and may encounter frequent cases involving patient use, but the novel substances introduce a myriad of unknowns. While illicit benzodiazepines are structurally derived from medically approved

benzodiazepines, they are not medically licensed and likely have symptoms and effects that still need to be classified. Our case is an example of potential cardiac effects.

## CONCLUSION

Recent literature shows that illicit benzodiazepines have been associated with significant impairment, have higher potencies than standard benzodiazepines, and are harder to identify via screening methods routinely used for standard benzodiazepines.<sup>1</sup> Novel illicit benzodiazepines are becoming a contaminant of concern, both alone and in combination with opioids.

Further research must be conducted on novel illicit benzodiazepines. Until more is known about these substances, it is important to monitor their prevalence and update data routinely, as they have already proven to be a threat to public safety. ★



FIGURE 1

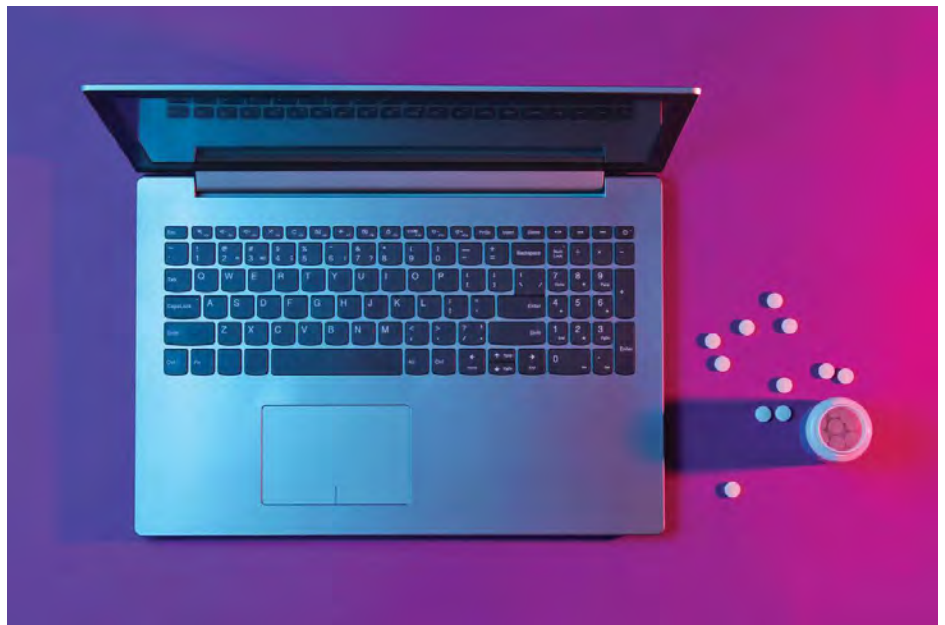


FIGURE 2



FIGURE 3

FDA Office of Criminal Investigation reported 130 criminal action cases against counterfeiting organizations from 2016 to 2021. Of these cases, 64.6% involved products being sold online, and in 84.6% of cases, the counterfeit medications could be obtained without a prescription. The counterfeit medications identified in these cases were most frequently in the sexual dysfunction, opioid, stimulant, anabolic steroid, and benzodiazepine drug classes. The counterfeit benzodiazepines were found to include non-FDA-approved active ingredients with different pharmacokinetics. The medications sold often had inconsistencies in the dosage of active ingredients from pill to pill.





# Luck is on Your Side

A

Attend **EMRA Events @ACEP24!**

**Sept. 28-Oct. 2**

*The Mandalay Bay Convention Center, Las Vegas*



Your favorite events are back, including Case-Con, MedWAR, SimWars, Quiz Show, and the EMRA Party! Attend the Job & Fellowship Fair! Plus, special events to celebrate 50 years of EMRA!



**More Info**





# Contact Lenses, a Hot Tub — and a Case of Corneal Keratitis in the ED

## Emergent Management Needed to Prevent Vision Loss

**Bryn Dhir, MD**

Resident, PGY-1  
Emergency Medicine  
Ascension Genesys Hospital

**Jared Hicken, DO**

Resident, PGY-2  
Emergency Medicine  
Ascension Genesys Hospital

**Arthur J. Tatge, DO**

Attending Physician  
Great Lakes Eye Associates, PC  
McLaren Lapeer Region Hospital

### INTRODUCTION

Identifying ocular infections and potential severity is a critical challenge in the clinical management of patients in the emergency department. Ophthalmology cases are important in the education and management of patient care as randomized, controlled clinical trials in ocular studies are limited and rely on retrospective case studies, case reports, and series.

We present a case in which emergent action was taken with a patient who presented with a significant vision-threatening corneal keratitis (also known as a corneal ulcer) with extended contact lens wear after hot tub use.

### CASE

A 49-year-old male with a previous medical history of controlled hypertension and tobacco use presented to the emergency department with difficulty seeing from his right eye. The patient reported he had been experiencing pain and difficulty seeing for approximately the past 3 days after using his hot tub. The onset of pain and vision loss was gradual. He stated that he installed a new hot tub; however, he did not chemically treat the water with chlorine or follow through with maintenance of pH balance or alkalinity after filling it with well water.

The patient also reported he was

wearing contact lenses while in the hot tub. He stated that his contacts are FDA-approved for extended use and that he had them in for approximately 2 weeks. After using the hot tub, he kept the contact lens in his eyes for approximately 3 days despite increasing discomfort, pain, and difficulty seeing through his right eye.

The patient was discharged from the emergency department with instructions to follow up for specialized outpatient eye care. Following the ED visit where the critical action was made to identify the hypopyon and notify an ophthalmologist for specialized eye care, an ophthalmologist specializing in ocular

diseases saw the patient approximately 24 hours later in clinic.

### INVESTIGATION

Knowledge of potential differential diagnoses of the ocular pathology is essential to start appropriate therapy in order to optimize outcomes.

Investigation of the patient's head, ears, throat, and left eye was within normal limits and noncontributory. A focused exam of the cheek, nose, and brow was unremarkable. External examination of the right eye and orbit were grossly negative for asymmetry. Visually, the right eye presented with erythema in the conjunctiva and sclera with a remarkable opaque circular disc in the cornea overlying the pupil appearing to be within the mucus, water, and oil layers of the surface, on initial exam.

Focused investigation with a Marco 2b Ultra slit lamp of the right eye was conducted with adjusting

with gentle and slow movements of the ocular muscles, moving eye medial, lateral, above and below, as well as examination of the upper lid and fornix. The upper eyelids were manually held in place and a cotton-tipped applicator was used to aid movements to minimize discomfort during the exam. No foreign bodies were seen in the eye orbit or within the eye architecture.

Examination of the cornea revealed an extraordinarily significant opaque circular corneal ulcer overlying the pupil, iris, and limbus measuring approximately 3.5mm x 3.5mm in size (seen using a slit lamp in **Images 1 and 2**). No thinning of the center or borders was appreciated in the dense inflammatory cells forming the hypopyon. The eye was negative for hyphema, or other hematologic pathology. The illumination was shifted to an oblique angle, using a narrow beam to produce the recommended

The patient was instructed to not wear contact lenses until the infection of his eye had improved. The patient was advised to wear his regular glasses as needed. Instructions for the management of the excessive discharge included to refrain from rubbing the eye or from putting liquids or materials other than the prescribed medications into the right eye. It was also recommended that the patient not use his hot tub without the recommended water treatment due to the potential for the water source to contain infectious organisms and contaminants.

Due to the vision-threatening status of the patient's eye and severity of case presentation, the patient was aggressively medically managed with ciprofloxacin 0.3% ointment before bedtime and oral ciprofloxacin 500 mg twice a day. In addition, for the first 2 weeks, the patient alternated between gentamicin 0.3% and moxifloxacin 0.5% topical eye drops every hour around the clock. On day 3,

**Identifying ocular infections and potential severity is a critical challenge in the clinical management of patients in the ED. Ophthalmology cases are important in the education and management of patient care as randomized, controlled clinical trials in ocular studies are limited and rely on retrospective case studies, case reports, and series. We present a case in which emergent action was taken with a patient who presented with a significant vision-threatening corneal keratitis (also known as a corneal ulcer) with extended contact lens wear after hot tub use.**

the illumination of beam light, on rheostat, to 50% and 10x magnification. Visualization of the eyelid, eyelashes, meibomian glands, palpebral and bulbar conjunctiva, and upper and lower lids was conducted. The conjunctiva and sclera of the anterior globe presented with erythema, positive ciliary flush, which was highly suggestive of anterior uveitis.

The patient reported copious white discharge around his conjunctiva and sclera at night and while he slept. He was advised to not aggravate the infected site and, if in discomfort, he could gently wipe away the excess with a clean tissue from the lower eyelid, making sure not to apply pressure to the globe itself for risk of puncture or perforation.

Due to the sensitivity of eye movements, the patient was assessed

optical cross section of the cornea. This technique, as outlined by Allen and Parker, allows for partial reflection as the light passes through the tear film, epithelium, stroma, descemet's membrane, and endothelium.<sup>1</sup>

Using this method, the presence of keratic precipitates were appreciated on the internal endothelium of the inner surface of the cornea toward the anterior chamber and were evident on the farthest layer from illumination. Careful slow sweep of illumination was conducted from temporal to medial nasal sites, using vertical slit beam and then with cobalt blue filtered light using a fluorescein stain without other irregularities except as otherwise discussed above. Fluorescein staining showed significant keratitis of the right eye (**Image 3**).

prednisone acetate 1% twice a day was started. After approximately 3 weeks, the regimen was decreased to alternating the gentamicin and moxifloxacin drops to every 2 hours. At that time, the steroid was increased to 3 times a day. Approximately 6 weeks after initial presentation to the clinic, the patient was started on moxifloxacin and tobramycin 4 times a day, and erythromycin ointment 0.5% for management of corneal toxicity, discussed further below.

The patient followed up daily in the clinic for the first 2 weeks, then biweekly and weekly thereafter. On day 2 of presentation to the clinic, the patient reported he had drained and emptied the hot tub and it was no longer in use. Over the course of 2 weeks, the patient's corneal ulcer remained stable without worsening symptoms or growth of ulcer.



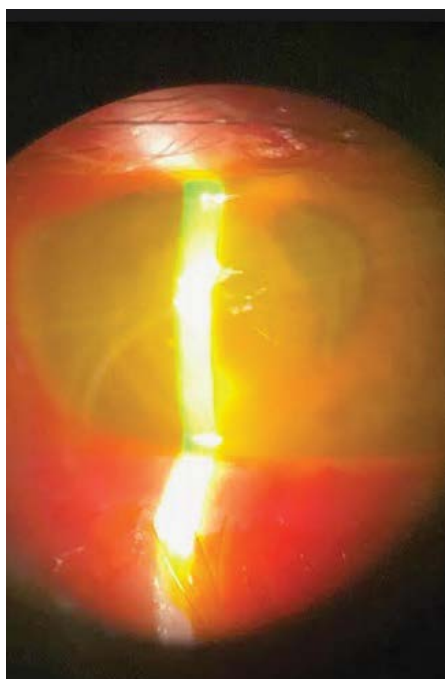


IMAGE 1: First presentation of corneal ulcer, right eye



IMAGE 2: Approximately day 4 corneal ulcer, right eye

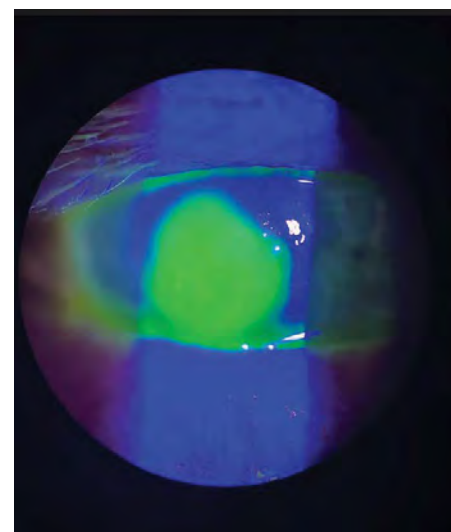


IMAGE 3: Day 14 of right-eye corneal ulcer

There was minimal change in size to the ulcer over the first week. Potential differential diagnoses were discussed and investigated. They included, but were not limited to, Acanthamoeba keratitis, petrifying pseudomonas secondary to Pseudomonas aeruginosa infection, herpetic keratitis, and mycotic keratitis.

With the patient's improvement with aggressive treatment and close monitoring, case assessment, and case history, the working diagnosis of corneal ulcer secondary to pseudomonas aeruginosa was made. Continued care and management of the patient's eye was discussed, with emphasis on the critical importance of continued adherence to the therapy regime. Further, future considerations for corneal transplant with an amniotic graft using stem cells was discussed with the patient, as well as the possibility of complete loss of vision in the eye. Discussions such as these can be emotionally upsetting. However, all potential outcomes need to be discussed with patients, as was done in this case.

#### DISCUSSION

The slit lamp is formally known as a stereoscopic biomicroscope that emits a focused beam of light with variable

height, width, and angle that allows for 3D visualization and measurement of the anterior segment and adnexa of the eye.<sup>2</sup> When used with handheld lenses, the poster segment of the eye can also be visualized. The use of slit lamps for ophthalmology cases in the ED is the mainstay of eye examinations.<sup>3</sup> It is critical for EM residents and emergency physicians to understand the function and operation of a slit lamp in order to allow for a complete and accurate examination in the ED (**Image 1**). Although literature investigating the classification of different corneal ulcer types has been pursued previously,<sup>4</sup> disseminating research to physicians and into clinical practice among the non-ophthalmological specialties may still be lacking.

The World Health Organization previously reported that about 6 million people around the world are affected by cornea-related blindness or moderate/severe visual impairment.<sup>5</sup>

Hot tubs and jacuzzis are popular forms of recreation and relaxation in the United States and provide health care benefits such as stress and muscular tension release, lower blood pressure, and improved sleep. The

more commonly known pseudomonas infections associated with hot tubs and water sources include hot tub folliculitis, otitis externa, and varicose ulcers; these infections are mostly superficial and not life- or organ-threatening. Humidifiers<sup>6</sup> and whirlpools<sup>7</sup> are also sources of contamination and disease risk.<sup>8</sup> There are only a few published reports of severe P. aeruginosa infections occurring in previously healthy persons without underlying diseases.<sup>12</sup> Other disease processes, such as acute prostatitis and urosepsis after sexual relations in a hot tub, have previously been reported.<sup>9</sup>

Ocular infections, including keratitis, pose a high risk for permanent vision loss and scarring. Therefore, management is time-sensitive, emergent medical care is critical, and identification of disease is imperative in the ED. Ocular infections are often difficult to pinpoint due to the availability of specialized resources, training level of care-givers, and lengthy time requirements to culture ocular strains. Cases such as this one are time-sensitive, and immediate aggressive management will assist in preserving some, if not all, eye function.

Usually, corneal infections are assumed to be bacterial until proven

otherwise by laboratory studies or until a therapeutic trial is unsuccessful.<sup>10</sup> Major common organisms that emergency physicians and medical students need to be aware of are *Staphylococcus*, *Streptomonas*, *Moraxella*, and *Serratia*. In addition, in similar case presentations, consider *Acanthamoeba*, a common parasitic organism in the environment, and *Pseudomonas Aeruginosa*, a bacteria that adheres to and infiltrates the cornea. Both *Acanthamoeba* and *Pseudomonas* are found in soil, swimming pools, hot tubs, and freshwater bodies (ponds, lakes, creeks). Warm water in hot tubs, particularly untreated water, is naturally conducive to the growth of thermophilic organisms. Prompt action in initial treatment with broad spectrum therapy is critical, as was displayed in this case.<sup>10</sup>

This patient presented to the clinic with a classic presentation of pseudomonas keratitis with a rapidly progressive, suppurative infiltrate with a hypopyon and mucopurulent discharge after extended contact lens and hot tub use as well as ocular pain, photophobia,

decreased vision, discharge, and inability to wear contact lenses. In comparison to common presentation of *Acanthamoeba* infections, the infiltrate in this case was a focal white opacity in the corneal stroma with stromal loss and overlying epithelial defect which stained with fluorescein, indicating an ulcer. In addition, the infiltrate was densely opaque without the ability to visualize beyond the ulcer to the iris.

Although the patient did not present with the signs of an acanthamoeba infection, it was a consideration as a differential diagnosis, which requires time to deduce. This is among the challenges in diagnosing patients in the ED, where length of time to monitor over extensive periods while aggressively treating organisms is crucial to patient care. Patients with *Acanthamoeba* keratitis are often highly compromised due to extremely severe and persistent ocular pain as well as vision loss. Often, the protozoa will infiltrate the keratin and stromal layers and create a ring-shaped infiltrate

in weeks 3 to 8. On slit lamp, the appearance of the corneal protozoan is more HSV in character rather than a bacterial ulcer.<sup>10</sup> Patients will require extensive time for treatment and healing as well as meticulous monitoring and frequent follow-up visits, as seen with this patient. Patients may require other invasive surgeries, including corneal grafts, which may interfere with the quality of a meaningful personal and professional life.<sup>11</sup> Although rare, fatalities due to hot-tub-associated *Pseudomonas aeruginosa* infections are possible, as previously reported in literature in a case involving a healthy woman with a contaminated hot tub.<sup>12</sup>

The patient had reported he drained the hot tub of water and that it was no longer in use. Although this knee-jerk proactive measure ensured he and no one else would be in contact with the infectious contaminants in the water, this also hindered the case by making it difficult to investigate organisms in the water source. The ability of culturing and isolating water samples for screen and subtyping isolates as recommended by many states<sup>13</sup> was not possible in this case.

The EMRA Antibiotic Guide outlines basic treatment and dosing requirements for corneal abrasions for contact lens and non-contact lens wearers before progression to ulcers.<sup>14</sup> Physicians should be made aware of safely preserving water samples for containment testing, as well as encouraging the exercising of caution in homes with hot tubs and children. In this case, extra care was taken to minimize aggravation or provocation of the eye with invasive instrumentation in order to offset any potential of puncturing or perforating the fragile cornea. Daily monitoring by an ophthalmologist was critical in attempting to preserve this patient's eyesight. Furthermore, some patients may delay seeking care as they are unaware of the risk of permanent vision loss or potentially life-threatening nature of these ocular infections. Often, this delay in care increases the severity of the disease process.





**TAKE-HOME POINTS**

- Corneal ulcers from infectious agents, such as *Pseudomonas aeruginosa* and *Acanthamoeba* from water sources such as hot tubs and pools, can be vision-threatening — especially in cases involving extended-use contact lenses. Knowledge of presentation and signs is important when differentiating between these two organisms.
- Daily evaluations for vision-threatening ulcers are critical, as is measurement of the size and shape of infiltrated space.
- Patient education about hot tub ownership, maintenance, and safe operation is an important preventative health care measure. Patients with hot tubs should be advised regarding weekly maintenance with water-treatment formulas (at minimum), chemical treatments, and the cost, time, and effort necessary for safe hot tub use. The risks of not maintaining hot tubs and pools, koi ponds, and other man-made water bodies involve infections with organisms such as *pseudomonas*.
- The general public may be unaware of public health concerns with water treatment and possible infectious organisms in their geographic areas.
- Despite FDA-approved contact lenses for extended wear, patients may be unaware of the individual personalized care necessary for their own extended use, including in activities such as hot tub use.
- EM residents and health care providers should be aware of long-term use of steroids and antibiotics in patients treated for corneal ulcers. Potential risks include corneal toxicity. Awareness of this side effect is crucial in order to alternate with other necessary antibiotic and medical therapy for ongoing care. Pain management is also recommended in patients with a corneal ulcer.
- Health care providers should be aware of the emotional and psychological strain that long-term management of a corneal ulcer may have on the patient and family. Waking up to administer eye drops will affect sleep patterns. Patients may have anxiety for the long-term effects if there is a complete loss of vision in one eye. Quality of life may decrease with inability to enjoy normal activities. This can be difficult to process and may require gentle reassurance and compassionate care. ★

# CALLING ALL ARTISTS!

Deadline to submit your entry is **May 15**

Join us in celebrating EMRA's 50th Anniversary by entering a piece of artwork into the contest!

Check out the website for details!



*Sculpture and paintings created by Miriam Eagleson, MD*





# AI in EM: The Byte-Sized Benefits and Glitches

**Austin Michael Miller**

Medical Student, MS-4

Ohio University Heritage College of Osteopathic Medicine

**A**rtificial intelligence (AI) is increasingly being used in emergency medicine and critical care to improve clinical decision-making, patient outcomes, and operational efficiency. AI algorithms have shown superior diagnostic accuracy in conditions like stroke, sepsis, cardiac arrest, and COVID-19. AI can alleviate physician burnout by automating administrative tasks and optimizing resource allocation. Furthermore, AI can generate personalized treatment plans based on vast amounts of patient data, potentially mitigating health care bias.

However, the use of AI in health care raises concerns about data privacy and security, accountability for errors, transparency in decision-making, and

the potential to perpetuate and amplify existing biases.

Addressing these challenges may involve developing robust data security measures, creating transparent AI systems, and establishing guidelines to identify and correct biases in AI data and algorithms.

## INTRODUCTION

AI is rapidly permeating various sectors, including business, security, and health care. More specifically, the use of AI in emergency medicine and critical care has been steadily increasing over the years.<sup>1</sup> AI is being used to augment clinical decision-making, improve patient outcomes, and enhance operational efficiency. However, its adoption is not

without obstacles. This article explores the advantages and disadvantages of utilizing AI in emergency medicine.

## ADVANTAGES OF USING AI IN EM

As physicians, our job is to heal. Of course, this is easier to do when our diagnoses are correct. AI algorithms have demonstrated superior performance in diagnosing certain medical conditions compared to human clinicians. AI has shown significant promise in diagnosing stroke, sepsis, and cardiac arrest more accurately — crucially important in the emergency department where time is of the essence.<sup>2</sup> Likewise, AI has been shown to have higher diagnostic accuracy than radiologists in diagnosing patients with COVID-19 via CT scan<sup>3</sup> and 90.8%

accuracy in diagnosing COVID-19 pneumonia.<sup>4</sup> This improved diagnostic accuracy can greatly impact those “time is brain” or “time is muscle” moments in the emergency department by allowing us to initiate appropriate treatment quickly.

Physician burnout has been attributed to many factors, but evidence shows that administrative burden significantly contributes to this issue.<sup>5</sup> AI may play a role in solving emergency medicine’s burnout crisis. Work documentation and communicating with staff members account for 55% of emergency physicians’ time on shift, while only 25% is spent directly caring for patients.<sup>6</sup> AI can streamline workflows in emergency departments by automating administrative tasks and optimizing resource allocation. AI algorithms can predict patient flow, which helps reduce overcrowding,<sup>7</sup> improve patient care,<sup>8</sup> and increase staff satisfaction.<sup>9</sup> AI can also majorly enhance operational efficiency in prehospital environments and triage which, in the end, help facilitate better flow in the emergency department.<sup>10</sup>

Treating patients holistically has become more prominent in contemporary medical practice. With the understanding that patients do not all fit into certain molds or categories, the incentive to create personalized treatment plans has been integrated into our health care system. AI systems can analyze vast amounts of data to generate personalized treatment plans, considering individual patient characteristics, comorbidities, and past medical history.<sup>11</sup>

In a survey of Canadian physicians’ expectations of AI in emergency medicine, most respondents felt that AI would likely be able to complete personal therapy/medication plans. One current focus of using AI in emergency medicine is to do just that.<sup>12</sup> This utilization of AI can further help emergency physicians deliver higher quality, efficient health care to their patients, regardless of background, past medical history, and other patient characteristics. If algorithmic predictions are set correctly,

this may even help mitigate bias in health care, especially for at-risk populations.<sup>13</sup>

#### DISADVANTAGES OF USING AI IN EM

Advancements in technology and security systems have aided in keeping hackers away from patients’ private data. Nevertheless, every system has its faults, and data breaches have continued to rise in health care systems.<sup>14</sup> AI systems require large amounts of data, thus raising concerns about patient privacy and data security. There are potential risks of data breaches and misuse of private patient information.<sup>15</sup> Weaknesses in a system’s digital security can be detrimental because these inadequacies are typically only found after a breach.<sup>16</sup> Designing AI systems with data privacy concerns in mind during software development is thus extremely important.

A separate yet equally important topic of discussion is regarding liability. Given that artificial intelligence cannot be held responsible legally, the question of “Who is responsible?” also becomes essential to ponder when AI makes an error.<sup>17</sup> Possible solutions to these concerns include creating a framework for error monitoring and, perhaps, predicting errors that can occur before

they happen, as well as initially designing AI systems with concern for flawed logic and using algorithms based on the most up-to-date practice guidelines.

Transparency in health systems is extremely valuable to patients. Using AI in high-risk environments like the emergency department and trusting the output demands steep accountability.<sup>16</sup> AI algorithms, particularly deep learning models, are often described as “black boxes” due to their lack of explainability. This can be an issue in clinical settings where understanding the “why” behind a diagnosis or treatment decision is crucial.<sup>18</sup> The operation of an AI system can also be difficult to comprehend for those with limited technical expertise. This lack of understanding can make it difficult for physicians and patients alike to trust the implementation of AI in health care delivery.<sup>19</sup>

All humans — including physicians, advanced practitioners, and other clinical staff — have implicit biases. AI systems can perpetuate and amplify existing health care biases if they are trained on biased data. Information currently available for AI coding is modeled from human behavior and decision-making. No current guidelines or frameworks are in place to report and fix these







biases when they are discovered.<sup>20</sup> If these biases are amplified by continuous feedback generated from AI systems, this could lead to disparities in care for certain patient populations.<sup>21</sup>

#### CONCLUSION

Artificial intelligence in emergency medicine offers significant potential to revolutionize patient care, enhance diagnostic capabilities, and streamline the overall operational efficiency of

the emergency department. The ability to quickly and accurately diagnose conditions, mitigate physician burnout, and personalize patient treatment plans are among the major advantages of AI integration.

However, this technological advancement is not devoid of challenges. Concerns regarding data privacy and security, the logic of AI applications, lack of transparency in AI decision-making, and the potential for AI to perpetuate and amplify existing biases in health care remain significant obstacles to its full integration into our current system.

Although AI promises to be a game-changer in emergency medicine, these challenges must be systematically addressed. This may involve developing robust data security measures, creating transparent AI systems, and establishing guidelines to identify and correct biases in AI data and algorithms. As we move toward a more technologically advanced future in health care, we must ensure that these systems are safe, reliable, and equitable for our patients. ★

**CALLING ALL**  
Past and Present EMRA Members!

Deadline to submit your entry is  
**May 15**



Be a part of EMRA's 50th Anniversary celebration by sending us a piece of EMRA history!

*Check out the website for details!*





# Role of POCUS in Ruptured Ectopic: A CASE REPORT

**Ava Roth, DO**

Resident, PGY-1  
Emergency Medicine  
Prisma Health-Upstate, Greenville, SC

**Sarah E. Fabiano, MD, FACEP, FAAEM**

Attending Physician  
Emergency Medicine  
Prisma Health-Upstate, Greenville, SC

## INTRODUCTION

An ectopic pregnancy (EP) is synonymous with extrauterine pregnancy that signifies implantation of a developing blastocyst outside the endometrial cavity, where normal implantation and development should occur.<sup>1</sup>

While modern technology and advancements make diagnosing and treating this pathology more efficient, EPs are not a new phenomenon, with the first documented case occurring by the surgeon Albucasis in 963 AD.<sup>1</sup>

EPs occur in approximately 2% of pregnancies in the United States.<sup>2</sup> About 95% of EPs occur in the fallopian tubes.<sup>1</sup> Most EPs can be located to the ampullary portion of the fallopian tubes rather than the fimbria or isthmus.<sup>1</sup> Unfortunately, EPs located in the fallopian tubes pose the greatest risk for maternal death and morbidity.<sup>2</sup>

Ultrasound is a primary tool in the evaluation and management of EPs. Ultrasound coupled with  $\beta$ -human chorionic gonadotropin ( $\beta$ -hCG) are the standard of care in the workup of EP, with an expected doubling of  $\beta$ -hCG in 48 hours.<sup>2</sup>

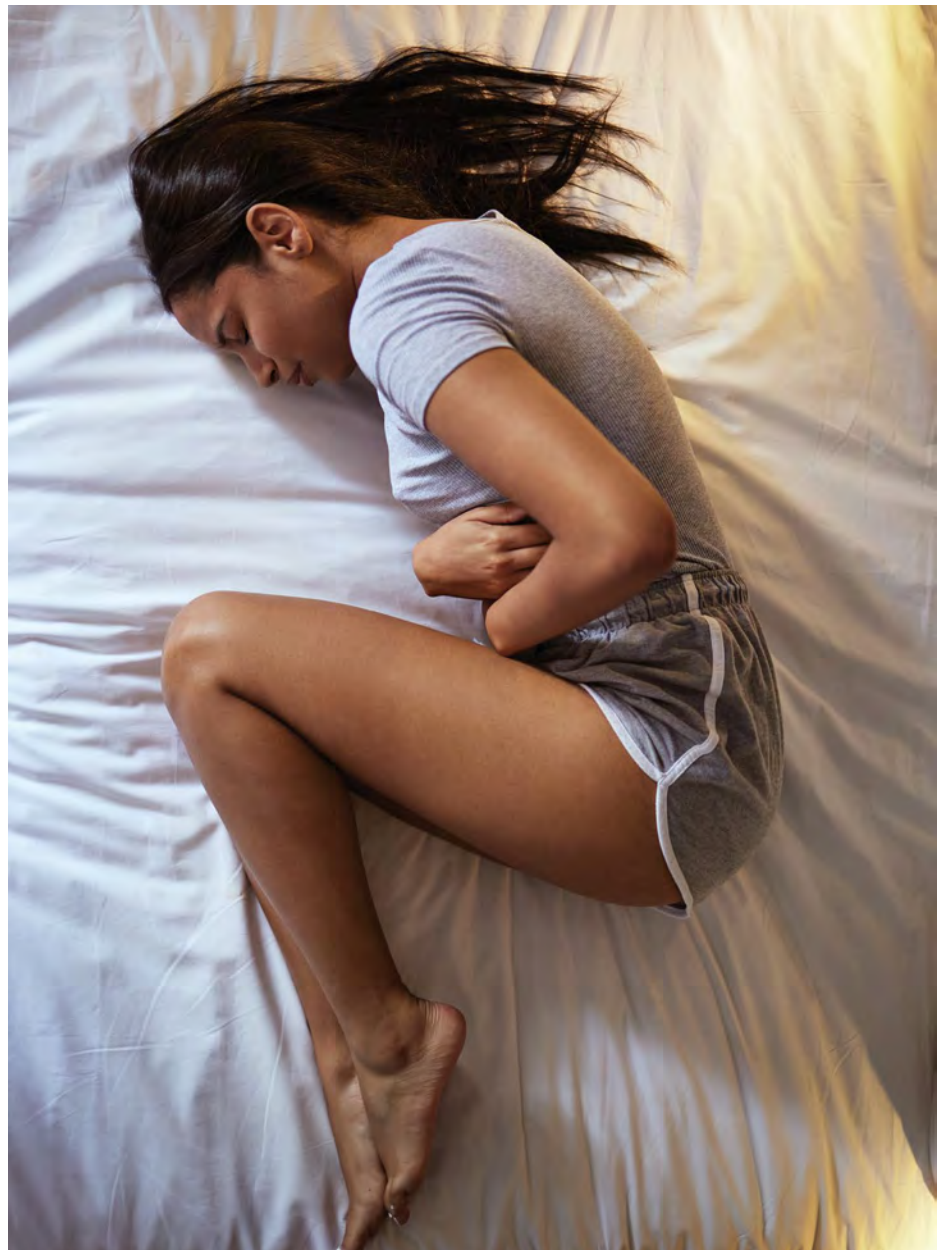
Despite significant improvements in techniques for early diagnosis and management of EP, research and case reports remain crucial, as the incidence of EP has increased sixfold in the past 25 years, affecting more than 100,000 patients each year.<sup>3</sup> Some reasons for the increase include higher prevalence of risk factors such as sexually transmitted infections leading to pelvic inflammatory disease, intrauterine device use, pelvic surgeries including tubal ligation, in vitro fertilization, and previous EP. Another explanation for increasing prevalence is improvement in diagnosis, advancement

in technologies such as laparoscopy, and improved ultrasound techniques, which lead to more diagnoses. Also, the recent trend of women having children later in life, when the risk of EP is highest, has

contributed to increased prevalence.<sup>3</sup>

## CASE REPORT

A 28-year-old female with a past medical history of polycystic ovarian



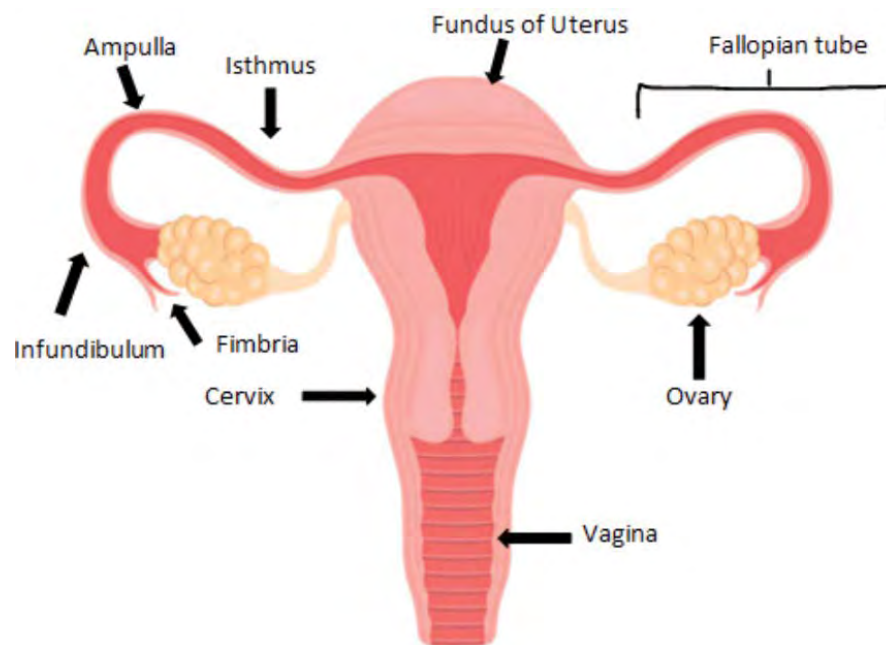


IMAGE 1

syndrome presented to the emergency department with acute abdominal pain, lightheadedness, nausea, vomiting, and syncope. The pain started about 1 week prior to presentation and worsened 3 days prior to initial evaluation. The patient had an unknown last menstrual period, but stated she was spotting the day of her ED encounter. She was sexually active and did not use any form of contraception.

Upon her arrival at the ED, she was noted to be pale in appearance and hypotensive. Her first set of vital signs included blood pressure 87/49, heart rate 75, respiratory rate 33, and oxygen saturation 99% on room air. Her physical exam demonstrated a patient who was in acute distress, ill-appearing, diaphoretic, and pale. The exam also demonstrated dry mucous membranes and an abdomen that was soft but diffusely tender. Point-of-care (POC) labs were urgently collected, and an ultrasound was obtained within minutes of the patient's arrival due to concern for ruptured EP versus hemorrhagic corpus luteum cyst.

POC labs demonstrated a hemoglobin of 6.2, hematocrit of 18.2, and RBC of 2.11. A type and screen was collected, and 2 units of emergency release blood

were given. Her quantitative  $\beta$ -hCG turned out to be 12,098. The bedside transabdominal ultrasound was obtained and demonstrated a massive amount of free fluid in the pelvis with suspicion for clot surrounding the uterus. There was free fluid in the upper quadrants of the abdomen with no visible intrauterine pregnancy in the uterus.

The obstetrics and gynecology attending was contacted emergently to evaluate the patient and ultimately decided this patient was appropriate for the operating room (OR). Her preoperative diagnosis included hemoperitoneum, suspected ruptured EP, and anemia. The postoperative diagnosis was a ruptured right EP. In the OR, a diagnostic laparoscopy was performed with a right salpingectomy. There were approximately 3.3 liters of blood and clots in the abdomen upon entry, but minimal bleeding during the actual procedure.

After the operation was performed, the patient's POC hemoglobin was 9.2, so 1 unit of plasma was given. By post-op day 1, the patient was meeting all post-operative goals. She was ambulating, voiding without difficulty, and tolerating oral intake. She was discharged home in stable condition. She was seen 2 weeks

after discharge and seemed to be doing well without complications, including no vaginal bleeding and a stable hemoglobin of 12.0.

The pathology report for the right fallopian tube described the specimen as a disrupted fallopian tube measuring 5.5 cm in length by up to 2.0 cm in diameter, with a fimbriated end. The serosal surface was purple-tan and smooth with a full-thickness disruption and protruding red-tan and spongy soft tissue admixed with clotted blood. Sectioning revealed a moderately dilated lumen containing spongy red-tan soft tissue admixed with clotted blood. No true fetal parts were grossly identified.

## DISCUSSION

When a female of reproductive age comes to the ED presenting with nonspecific symptoms including lower abdominal pain, vaginal bleeding, syncope, or weakness, EP needs to remain on the differential.<sup>4</sup> Despite advancement in modern medicine, the rate of EPs is approximately 15% in Western countries, with a retrospective study showing an increased rupture rate during the COVID-19 pandemic.<sup>5,6</sup> The rise in rupture rate during the pandemic is thought to be due to delay in presentation to the ED, with 1 retrospective cohort study demonstrating that more women presented with sonographic evidence of high fluid volume in the abdomen than prior to the pandemic.<sup>5</sup>

While some EPs can be treated with medication, some develop long enough without early diagnosis to the point of rupture, which then needs to be addressed surgically. Usually, an EP grows up to 1.5-3.5cm, and any size greater than this will lead to rupture.

This case reports an EP that measured 5.5 cm by 2 cm and ultimately ruptured. This stresses the importance of securing the diagnosis early prior to development into a size with potential to rupture.<sup>7</sup>

The current standard for diagnostics includes ultrasound imaging coupled with  $\beta$ -hCG level monitoring. With ultrasound becoming more advanced,

it is important to be aware of the typical features that can be found with ultrasound. Some features include presence of a pseudo-gestational sac, thickened endometrium, fluid in the posterior cul-de-sac, and the tubal ring sign.<sup>4</sup>

Occasionally, an EP with chronic insidious bleeding will appear as an organized, expansive clot on ultrasound, as seen in this case report.<sup>2</sup> Another case report of a 17-week gestational age fetus also demonstrated this finding of clotted blood in the patient's abdomen.<sup>7</sup> Although a scant amount of intraperitoneal fluid can be normal, significant intra-abdominal fluid raises the suspicion for hemoperitoneum, which was also seen in this case report.<sup>2</sup> One interesting publication found that ED patients with a ruptured EP who received a POCUS first had shorter times to diagnosis, obstetric consultation, and OR arrival compared with those who received radiology department-performed ultrasound, stressing the importance of obtaining the ultrasound fast in the emergency department.<sup>8</sup> In this case report, the ultrasound was at bedside by almost the same time that IV access was obtained.

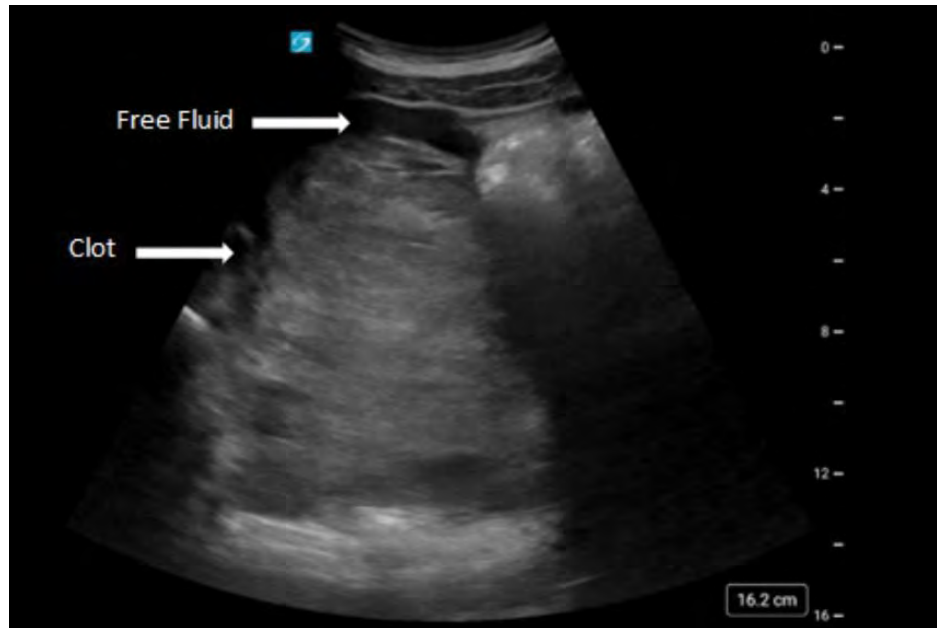


IMAGE 2

#### CONCLUSION

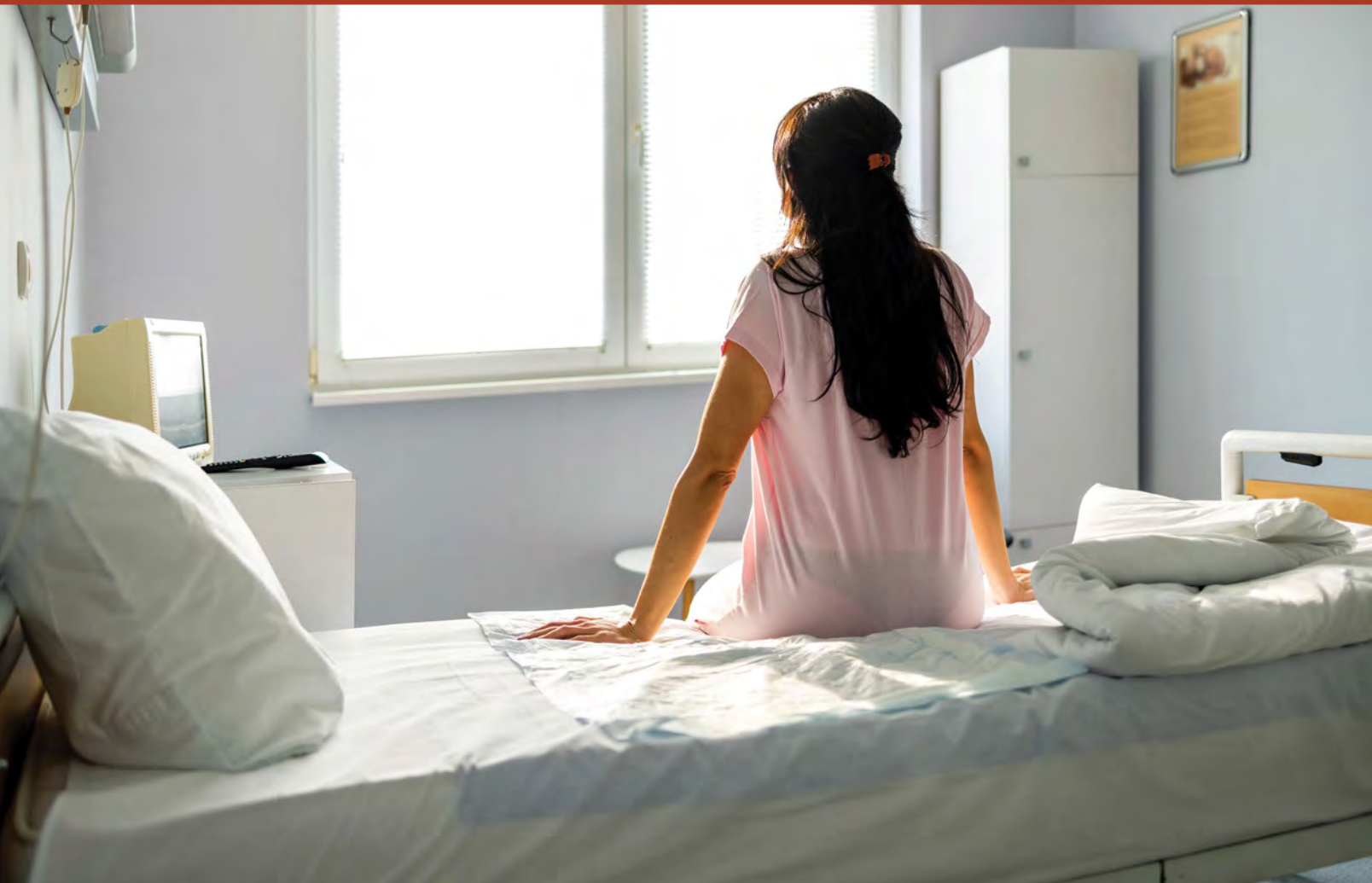
EPs are the leading cause of maternal mortality within the first trimester of pregnancy.<sup>5</sup> The standard of care for workup and diagnosis of EPs includes a quantitative  $\beta$ -hCG and ultrasound imaging. Several studies, including this case report, emphasize the importance of ultrasound utilization in the quick

diagnosis and management of EPs. This case demonstrates a ruptured ectopic in a patient who was able to be safely discharged 1 day post-operation, after emergency physicians were able to quickly diagnose with ultrasound at bedside and get the obstetrics team to take the patient to the OR in a timely manner. ★

# Ectopic Pregnancy







## Unique Psychiatric Care: The Role of EmPATH Units

### George V. Koshy, DO, MPH

Resident, PGY-2  
Emergency Medicine  
Geisinger Medical Center

### Eric Melnychuk, DO

Associate Professor  
Emergency Medicine  
Critical Care Medicine  
Geisinger Medical Center

*You're starting your day shift with a full waiting room and encounter a patient with a chief complaint of "psychiatric evaluation." You talk with the patient and realize they are struggling with suicidal ideations and auditory hallucinations. You provide a medical evaluation, discuss the case with psychiatry, and decide to admit them to an inpatient psychiatric unit for medication optimization and psychiatric management. You message the inpatient psychiatry team, and they notify you that the patient is in queue but, due to lack of bed availability, the patient might be boarding in the ED for the foreseeable future.*

**T**he steady increase in the number of psychiatric patients boarding in EDs has been a persistent challenge for health care systems nationwide. In the past decade, the

number of patients presenting with psychiatric diagnoses has significantly increased, with an estimated prevalence of 10.9% in 2017 rising to 21.9% in 2020.<sup>1,2</sup> Patients presenting with

suicidal/homicidal ideations, debilitating mental illnesses, and/or psychiatric crises often face prolonged wait times and uncoordinated care due to the increased demand for psychiatric

services. Without proper avenues to safely provide care for these patients, many end up boarding in the ED, unable to receive ideal comprehensive psychiatric care. These situations further strain the already stressed resources in the ED.

One potential answer to this challenging issue may lie in the development of Emergency Psychiatric Assessment, Treatment, and Healing (EmPATH) units. Proposed as part of the 2022 Hospital and Outpatient Guidelines, EmPATH units represent a unique and innovative approach to address the challenges of psychiatric patient boarding.<sup>3</sup>

An EmPATH unit is a clinical space designed as a treatment zone with the goal of enhancing ED efficiency and patient flow, specifically tailored to address behavioral health crises. It is a specialized facility within or adjacent to an emergency department, staffed with mental health professionals, and equipped to provide immediate and comprehensive psychiatric assessment, treatment, and stabilization for patients presenting with psychiatric emergencies.

Patients are assessed promptly upon arrival, enabling rapid identification of the severity of their condition to coordinate and deliver appropriate interventions. The care team aims to be multidisciplinary and includes psychiatrists, psychiatric nurses, social workers, and other mental health professionals with expertise in acute intervention. Moreover, patients receive care within a more therapeutic and secure environment, potentially improving their overall experience and willingness to engage in treatment. There is also the goal of close collaboration with outpatient mental health providers. This helps ensure a seamless transition to ongoing care, after the crisis requiring acute intervention has been mitigated.

By better coordinating care of patients with acute psychiatric conditions, health care systems can allocate resources more efficiently — which benefits all patients. In a study by Kim et al, implementation of an EmPATH unit in an academic medical center for patients presenting with

psychiatric crises reduced boarding time for medically cleared psychiatric patients by 66% and increased 30-day follow-up care by 60%.<sup>4</sup> Similar studies by Zeller et

al and Parwani et al also demonstrated reduced boarding times and less need for psychiatric hospitalization after implementation of EmPATH units.<sup>5,6</sup> ★

**TAKE-HOME POINTS**

- Most EDs are not designed to provide comprehensive psychiatric care, leading to suboptimal treatment for psychiatric patients, particularly those with suicidal ideations.
- Boarding in the ED often results in prolonged delays in accessing specialized psychiatric services, potentially exacerbating patients' distress.
- EmPATH units offer a unique solution by providing specialized, timely, and comprehensive care to these patients, with the potential to decrease the need for inpatient psychiatric care.







## Nowhere to Go: Addressing the Boarding Crisis in the Emergency Department

### **Richard Ngo, DMD**

Medical Student, MS-3  
Emergency Medicine  
University of California, San Francisco

### **Carly Rosen, MD**

Resident, PGY-3  
Emergency Medicine  
Mount Sinai Morningside West

### **Christina Brown, MD**

Resident, PGY-2  
Emergency Medicine  
Christiana Care

### **Andrew Luo, MD, MBA**

Resident, PGY-2  
Emergency Medicine  
Harvard-Affiliated Emergency Medicine  
Residency

### **Savanah Harshbarger, MD, MBA**

Resident, PGY-3  
Emergency Medicine  
Harvard-Affiliated Emergency Medicine  
Residency

### **Karan Bains, MD, MBA**

Resident, PGY-4  
Emergency Medicine  
University of California, San Francisco

### **Nicholas Stark, MD, MBA**

Associate Physician & Clinical Instructor  
Emergency Medicine  
University of California, San Francisco

**E**MRA's Administration & Operations Committee hosted a panel discussion titled "Nowhere to Go: Addressing the Boarding Crisis in the Emergency Department" at ACEP23 in Philadelphia. Panelists explored the critical issue of overcrowding in EDs.

Boarded patients, who are often the most critically ill in the ED and

require inpatient admission, create competition for ED resources, leading to crowding. This crowding, in turn, results in delayed or unavailable resources for other incoming emergencies in the ED. This phenomenon transcends being a mere local concern, serving instead as a significant symptom of larger systemic issues within the health-care sector.

The panel underscored the profound impacts of ED crowding on aspects such as patient safety, welfare of medical staff, and efficiency of health-care systems overall.

ED crowding experts leading the panel included:

- Gabor Kelen, MD, chair of emergency medicine, The Johns



Hopkins School of Medicine

- Eric Legome, MD, chair of emergency medicine, Mount Sinai Morningside West
- Lauren Nentwich, MD, vice chair for clinical affairs of emergency medicine, Massachusetts General Hospital
- Andrew Leubitz, DO, MBA, US Acute Care Solutions

## INTRODUCTION

During this pivotal panel discussion, leading experts urgently called for a paradigm shift in how ED crowding is perceived and addressed. Far from being a mere inconvenience, ED crowding poses a serious threat to patient safety, demanding immediate and concerted attention.

Hospitals across the nation, regardless of size, have witnessed a significant increase in ED boarding, leading to compassion fatigue among clinicians. Dr. Legome emphasized the national scale of this issue, stressing the scarcity of resources and the necessity for a collective response to understand and address the root causes.

Panelists united in their view that ED crowding should not be an unexpected crisis but a foreseeable and manageable challenge. They strongly advocated for the adoption of proactive surge plans, comparable to those used in disaster response, to effectively counteract the detrimental effects of crowding.

## CONTRIBUTING FACTORS

Building on the understanding of ED crowding as a critical issue, the panel discussion delved into causes and contributing factors, revealing a complex interplay of hospital efficiency, economic challenges, and staffing issues.

### Hospital Crowding and Efficiency

A key factor identified was the critical threshold of hospital utilization impacting safety and efficiency. The panel outlined a clear delineation: Hospitals operate optimally at an occupancy rate below 85%, ensuring that waiting areas remain manageable and the number of patients awaiting beds (boarders) is minimal. However,

as the census climbs to 85-95%, the system becomes stressed, with increased boarding reducing ED functional space. Beyond 90%, extensive crowding leads to unsafe conditions, overcrowded waiting rooms, and the practice of “waiting room medicine.” This phenomenon aligns with queuing theory, where the challenge lies in matching fixed resources with unscheduled demand. Even the most efficient hospitals struggle to keep utilization below the critical 87% threshold, a testament to the complexity and severity of this issue.

### Economic and Structural Challenges

Panelists highlighted the fundamental misalignment in health-care economics as a root cause. Hospitals, driven by financial incentives, prioritize patients contributing to revenue, creating bottlenecks in EDs and endangering patient safety. This misalignment extends to health-care financing, where skewed incentives and reimbursements exacerbate crowding. Dr. Legome



emphasized that this issue is more accurately described as hospital, rather than ED, crowding. Inpatient wards fill up, causing backups in the ED, and not all available inpatient beds are allocated to ED patients. Compounding this are the challenges with skilled nursing facilities selectively admitting patients, decreased availability of hospice care, and lack of accessible primary care, all contributing to increased ED visits.

Furthermore, panelists drew a parallel between the situation in hospitals and the “tragedy of the commons,” a concept that illustrates how individual departments, by focusing on their own safety metrics and operational efficiency, may inadvertently amplify risks for patients in the ED. This occurs as other services, in an effort to protect their own operational integrity, inadvertently concentrate risks and burdens in the ED.



This systemic problem underscores the need for a more integrated and holistic approach to hospital management, where the welfare of ED patients is given equal consideration in the broader context of hospital operations.

#### Staffing Issues and Patient-Care Concerns

Staffing challenges, including high turnover and burnout of vital staff, further exacerbate the situation. Panelists noted alarming incidents of violence against staff and mistrust of physicians as indicative of the immense strain on health-care workers. Dr. Kelen and Dr. Legome remarked on the worsening post-pandemic situation, highlighting how COVID-19 exacerbated boarding issues, staffing shortages, and reduced availability of nursing facilities and hospice care.

Overall, patient care is debilitated by the institution's inability to keep up with the high volume of new ED patients in addition to the many boarders. Many doctors practice "waiting room medicine" in which they order a workup for a patient without a proper history and exam as a way to expedite care. Furthermore, in some regions of the country, nursing ratios are nonexistent, and a single nurse could be responsible for upwards of 25 patients at one time. Ultimately, these operational inefficiencies lead to increased morbidity and mortality, impacting both patient experience and health-care costs.

#### PROPOSED SOLUTIONS AND STRATEGIES

Continuing from a previous discussion on the complexities of ED crowding, the panel at ACEP23 shifted focus to potential solutions and strategies, emphasizing the inadequacy of traditional approaches and the need for innovative operational and systemic changes.

#### Operational Improvements

A key recommendation put forth by the panel, as articulated by Dr. Leubitz, was streamlining operational processes. A prime example of this is the simplification of patient intake

forms, a seemingly small change that can significantly expedite efficiency and improve the flow of patients. This approach is part of a broader strategy to optimize hospital operations and mitigate ED congestion. Panelists strongly advocated for more dynamic management of inpatient capacity, aiming to prevent the critical overloads that often precipitate ED bottlenecks.

Another key strategy emphasized was the centralization of patient flow management across the hospital. By doing so, hospitals could more effectively coordinate their resources and capacities, ensuring a smoother and more efficient process for handling patient admissions and transfers. Dr. Nentwich proposed expanding patient care options, including implementing a home hospital program for delivering hospital-level treatment at home and establishing an EM program to manage high-utilizer patients, thereby reducing their frequent ED visits.

#### Systemic and Administrative Changes

In terms of systemic changes, Dr. Nentwich posited the critical need to integrate the ED more fully into the broader hospital capacity management decision-making. Panelists stressed the importance of fostering open lines of communication with various medical specialties. A novel approach discussed was the utilization of temporary boarding solutions in inpatient hallways, aimed at alleviating immediate space constraints.

Dr. Kelen also emphasized the crucial role of senior hospital leadership, especially hospital CEOs, in championing these changes. He specifically noted that visible commitment and proactive measures from top-level management are necessary for enacting meaningful and lasting change.

Another pressing issue raised was the marked increase in psychiatric cases, a concern highlighted by Dr. Leubitz. He advocated for the expanded use of telemedicine as a means to reduce the time from patient arrival to treatment. Additionally, he suggested enhancing disposition planning and considering options like community hospital transfers to manage this rise effectively. These recommendations reflect a deep

understanding of the multifaceted challenges faced by EDs and underscore the panel's commitment to finding innovative and practical solutions.

#### Staff Well-Being and Morale

The panel also focused on the importance of maintaining staff well-being and morale. Strategies to alleviate physician frustration were explored, with an emphasis on fostering a culture of gratitude and teamwork. Dr. Leubitz highlighted the importance of building connections with patients, while Dr. Nentwich stressed the need to prioritize staff experiences for retention and protection. Dr. Legome emphasized the crucial need for increased nursing resources. In the closing remarks, Dr. Kelen inspired physicians in the audience by reminding them of their invaluable role as health-care heroes, emphasizing self-recognition and resilience amid challenges.

#### ADVOCACY AND FUTURE DIRECTION

Panelists emphasized the critical role of national-level advocacy in addressing emergency department crowding. They recognized the powerful influence of organized medicine and bodies like EMRA in driving systemic change. Panelists urged for concrete actions, calling for regulatory reforms from key institutions such as The Joint Commission (TJC), the Centers for Medicare & Medicaid Services (CMS), and the Accreditation Council for Graduate Medical Education (ACGME). These reforms should specifically address the consequences of ED crowding on patient safety, the potential rise in violence, and the adverse impact on staff well-being.

In summarizing challenges and potential solutions for ED crowding, the panel underscored the need for a collaborative, multifaceted approach. This strategy not only aims to improve ED operations but also focuses on enhancing the well-being of medical staff. Implementing these recommendations presents a tangible opportunity to evolve the health-care system into one that is more efficient, equitable, and patient-centered. ★



Emergency Medicine Residents' Association

# EMRA Job & Fellowship Fair

Live @  
**ACEP24**

Attend the **EMRA Job & Fellowship Fair** on **Sept. 29** in **Las Vegas**. It's the premier event for your career journey! Connect with employers and fellowship programs across the nation!

*Are you a fellowship director or employer? Join us!*

Contact Heather Deja · 469.499.0167 · [hdeja@emra.org](mailto:hdeja@emra.org)



Visit [emra.org/exhibitors/job-fellowship-fair](https://emra.org/exhibitors/job-fellowship-fair) for more information.



Announcing our...

# EMRA Annual Award Winners!

EMRA would like to extend a big and heartfelt CONGRATULATIONS to our most recent award winners. These honorees exemplify excellence within the EM specialty.

Academic Excellence Award, **Mohamad Ali Cheaito, MD**, University of Toledo  
ACEP Scientific Assembly Travel Scholarship, **Shane Solger, MD**, Kings County/SUNY Downstate Combined EM & IM Program  
ACEP Scientific Review Subcommittee Appointment, **Aslam Akhtar, MD, PhD**, Harbor UCLA  
ACEP/CORD Teaching Fellowship Scholarship, **Jeanne Rabalais, MD, MHA**, University of Fla. College of Medicine-Jacksonville  
ACEP/EMBC Indy Class Scholarship, **Alex Wellford, MD**, Ochsner in New Orleans, LA  
Assoc. Residency Director of the Year, **Alexis Pelletier-Bui, MD**, Cooper Univ. Hospital/Cooper Med School of Rowan University  
Augustine D'Orta Humanism Award, **Melanie Yates, MD**, University of Cincinnati  
Chief Resident of the Year, **Ashleigh Omorogbe, MD**, George Washington University Hospital  
Chief Resident of the Year, **John Organick-Lee, MD, MBA**, George Washington University  
Chief Resident of the Year, **Ryan Skrabal, MD**, George Washington University Emergency Medicine  
CORD Academic Assembly Travel Scholarship, **Danielle Andrews, MD, MPH**, Emory Emergency Medicine Residency  
Dr. Alexandra Greene Medical Student of the Year, **Trupti Patel**, Philadelphia College of Osteopathic Medicine  
EMRA Chair of the Year, **Michael Chansky, MD**, Cooper University Health Care  
EMRA EMBRS Scholarship, **Christian Wade, MD**, Department of Emergency Medicine at Madigan Army Medical Center  
EMRA Resident of the Year, **Alex Lucas, MD**, Advocate Christ  
EMRA/ACEP EDDA Travel Scholarship, **Diana Rodriguez, MD**, University of Cincinnati  
EMRA/ACEP EDDA Travel Scholarship, **Nicolas Semenchuk, MD, MS**, Advocate Christ Medical Center  
EMRA/ACEP EDDA Travel Scholarship, **Faraz Khan, MD, MBA**, UCLA Department of Emergency Medicine  
EMRA/ACEP EDDA Travel Scholarship, **Jeremy Sobocinski, MD**, Univ. of Cincinnati Dept. of EM Residency Program  
EMRA/ACEP EDDA Travel Scholarship, **Aaron Katrikh, MD**, Harbor-UCLA Medical Center  
EMRA/ACEP EDDA Travel Scholarship, **Mahlaqa Butt, DO, MPH**, Maimonides Medical Center  
EMRA/ACEP Med. Student Elective in Health Policy, **Jacqueline King**, Sidney Kimmel Med. College at Thomas Jefferson University  
EMRA/ACEP Med. Student Elective in Health Policy, **Nicole Savidge**, Sidney Kimmel Med. College at Thomas Jefferson University  
EMRA/ACEP Resident - Fellow Health Policy Elective in DC, **Neha Sikka, MD**, Icahn School of Medicine at Mount Sinai  
EMRA/EDPMA Travel Scholarship, **John Organick-Lee, MD, MBA**, George Washington University  
EMRA/EDPMA Travel Scholarship, **Erica Christenson, MD, MBA**, Detroit Receiving Hospital/Wayne State University  
Faculty Mentor of the Year, **Gordon Chien, MD**, Maimonides Medical Center  
Faculty Teaching Excellence Award, **Abdullah Bakhsh, MBBS**, King Abdulaziz University, Jeddah, Saudi Arabia  
Fellow of the Year, **Sophia Spadafore, MD**, Icahn School of Medicine at Mount Sinai, The Mount Sinai Hospital ED  
Jean Hollister Contribution to Pre-Hospital Care Award, **Erica Cohen, MD**, NYU Langone Health  
LAC Travel Scholarship, **Jennifer Reyes Lin, MD, MPH**, Washington University in St. Louis  
Residency Director of the Year, **Tara Cassidy-Smith, MD**, Cooper Med. School or Rowan Univ. and Cooper Univ. Health Care  
Rosh Review One Step Further, **Jordan Sell, MD**, University of Michigan  
SAEM Annual Meeting Scholarship, **Cresse Vuong, MD, MPH**, Advocate Christ Medical Center  
Sherrill Mullinex Residency Coordinator of the Year, **Cinda Kirker**, Madigan's Emergency Medicine  
Stephen Tantama, MD, Military Excellence Award, **Anant Shukla, MD, FS**, Dartmouth-Hitchcock Medical Center



#EMRAAwardWinners

*Recognition and Reward!*

# EMRA Awards & Scholarships

Recognize excellence in emergency medicine by nominating yourself or colleagues for a coveted EMRA Award. Winners are selected for the following awards:

**CORD Academic Assembly Travel Scholarship**

**LAC Travel Scholarship**

**EMRA/ACEP EMBRS (Emergency Medicine Basic Research Skills) Scholarship**

**EMRA/EDPMA Scholarship**

**SAEM Travel Scholarship**

**ACEP Travel Scholarship**

**ACEP/CORD Teaching Fellowship Scholarship**

**Augustine D'Orta Humanism Award**

**Stephen Tantama, MD, Military Excellence Award**

**EMRA/ACEP Resident-Fellow Health Policy Elective in Washington, DC**

**EMRA/ACEP Medical Student Elective in Health Policy**

**Academic Excellence Award**

**ACEP Scientific Review Subcommittee Appointment**

**ACEP/EMRA National Outstanding Medical Student Award**

**Dr. Alexandra Greene Medical Student of the Year Award**

**Jean Hollister Contribution to Pre-Hospital Care Award**

**Fellow of the Year Award**

**EMRA Resident of the Year**

**Rosh Review "One Step Further" Award**

**Faculty Teaching Excellence Award**

**Faculty Mentor of the Year Award**

**Joseph F. Waeckerle, MD, FACEP - Alumni of the Year Award**

*And more!*

For application forms, nomination deadlines, and details about the EMRA Awards, visit

[emra.org/awards](http://emra.org/awards)



**#EMRAAwards**



## Valacyclovir-associated Neurotoxicity in End-Stage Renal Disease

### Chad Barnhart, MD, EMT-P

Chief Resident, PGY-3  
Dept. of Emergency Medicine  
Henry Ford Hospital

### Matthew Ball, MD

Senior Staff Physician  
Dept. of Emergency Medicine  
Henry Ford Hospital

### Michael B. Holbrook, MD, MBA

Miami Valley Emergency Specialists

### INTRODUCTION

Valacyclovir-associated neurotoxicity (VAN) is a relatively rare phenomenon. It was first cited in 1984, mainly observed in patients with renal impairment and primarily in patients on peritoneal dialysis (PD) rather than hemodialysis (HD).<sup>1</sup>

Typical symptoms of VAN include hallucinations, confusion, lethargy, and ataxia.<sup>2-5</sup> Classically, there is a 24- to 72-hour onset of symptoms from treatment initiation.<sup>3,6,7</sup> Although the exact mechanism of these neuropsychiatric

symptoms is unclear, it is thought to be secondary to one of its metabolites, 9-carboxymethoxymethylguanidine (CMMG).<sup>8</sup>

### CASE

We present the case of a 51-year-old woman with a past medical history of end-stage renal disease (ESRD) on HD, coronary artery disease, hypertension, anemia, insulin-dependent diabetes, and hypercholesterolemia. The patient presented to the emergency department for concerns of weakness, slurred speech,

facial numbness, and expressive aphasia for two days.

Initial physical exam was noteworthy for a fluctuating neurologic exam with right lower extremity sensory deficits, dysarthria, and aphasia, resulting in an National Institutes of Health Stroke Scale (NIHSS) of 3. The patient denied family history of stroke, transient ischemic attacks, or other neurologic illnesses. Her social history was significant for a historical 6.25 pack-year smoking history; she denied ethanol or recreational drug use.



Laboratory evaluation showed normal point of care glucose, mildly elevated potassium to 5.7 without electrocardiogram changes, normal liver profile, and negative ethanol and toxicological panel. Computed tomography (CT) of the head, CT angiography head and neck, and CT head perfusion were unremarkable for acute pathology. Neurology was consulted and recommended a brain MRI, which was also without infarct or other acute abnormality. During her stay, the patient noted subjective intermittent facial numbness with a subsequent NIHSS of 1 scored for sensory deficit. Notably, her previous symptoms had resolved at this time. She ambulated with a mildly ataxic gait; however, given a largely unremarkable workup and with family at the bedside ensuring a safe disposition and return plan, she was discharged.

The patient returned that same afternoon after missing her dialysis appointment due to an inability to ambulate and visual hallucinations. Before her arrival, the ED received a message from her dialysis clinic nephrologist that treatment with valacyclovir had been started the day prior for what was thought to be a vesicular rash in a dermatomal pattern

resembling varicella zoster. Of note, her treatment regimen was not adjusted to account for her renal dysfunction. Laboratory evaluation on the bounceback ED presentation was similar to the day prior, and nephrology was consulted for concern of VAN. The patient was subsequently dialyzed and experienced complete resolution of neurologic symptoms.

#### DISCUSSION

Valacyclovir is an antiviral agent that targets herpes viruses. It is a pro-drug that undergoes first-pass metabolism in the gastrointestinal tract to L-valine and acyclovir, with more than 85 percent excreted as acyclovir renally, through both glomerular filtration and active tubular secretion.<sup>9,11</sup> Valacyclovir is dosed once daily as opposed to acyclovir's three times daily dosing, making it a much more favorable treatment option for patient adherence.<sup>6</sup> After conversion to acyclovir, its half-life of 2.5-3.3 hours in adults with normal kidney function may increase as much as 14-20 hours in patients with ESRD.<sup>11</sup> As such, dose adjustments should be made to account for a patient's kidney function. In our case, the patient was given the traditional 1,000 mg three times daily regimen,

whereas they would've better benefitted from dose adjustment to 500 mg once daily.<sup>11</sup>

The treatment of VAN involves dialysis and cessation of the offending agent. HD is often preferred over PD for the treatment of VAN, given its higher clearance.<sup>3,12</sup> There have been case reports, however, of increased frequency of PD exchanges being shown to have similar therapeutic benefits.<sup>2,9</sup> In contrast to typical presentation of non-focal neurological complaints, this patient presented with atypical stroke-like symptoms. Of particular importance was that these symptoms waxed and waned throughout her course before definitive treatment. There are multiple case reports of VAN, primarily in PD patients, though none described focal neurologic symptoms.

#### CONCLUSION

This case report details a unique presentation of VAN in an HD-dependent patient. It underscores the importance of a broad differential and consideration of drug toxicity in ESRD patients who present with neurological complaints, particularly when stroke symptoms wax and wane, are non-physiologic, or are otherwise atypical. ★



# EMRA QUIZ SHOW



Challenging medical conundrums, wacky graphics, fun and games with a little pop culture thrown in for good measure.

Who knows their stuff and can think fast?

***Come find out at the EMRA Quiz Show!***

*This is a popcorn-throwing,  
crank-up-the-music,  
guaranteed-fun event.*

**Sept. 30, 2024**

EMRA Events at ACEP24  
in Las Vegas



Emergency Medicine Residents' Association

**RoshReview**  
A BLUEPRINT PREP COMPANY

Thank you to Rosh Review for supporting this event



**#EMRAQuizShow2023**

**[emra.org/quiz-show](http://emra.org/quiz-show)**

Congratulations!

# EMRA 2024 Committee Leaders

**CONGRATULATIONS** and welcome aboard to our newly appointed committee chairs, chairs-elect, vice chairs, and assistant vice chairs. EMRA is happy to have you at the helm!

## Administration & Operations

Chair Andrew Luo, MD, MBA  
Chair-Elect Savannah Harshbarger, MD  
Vice Chair Karan Bains, MD  
Vice Chair Puja Singh, MD  
Vice Chair Neha Gupta, MD  
Assistant Vice Chair Richard Ngo, Medical Student  
Assistant Vice Chair Josue Minaya, MD

## Critical Care

Chair Dustin Slagle, MD  
Chair-Elect Alexandra Hallagan, MD  
Vice Chair Alex Lucas, MD  
Vice Chair Gabriel Colon, MD  
Vice Chair Alan (Josh) Wild, DO  
Vice Chair Luxi Qiao, MD  
Assistant Vice Chair Eleni McCaffery, MD  
Assistant Vice Chair Marcus Gresham, MD  
Assistant Vice Chair Kenneth Felsenstein, MD  
Assistant Vice Chair Szymon Kutyla, MD  
Assistant Vice Chair Dominique Gelmann, MD

## Diversity & Inclusion

Chair Daniel Ayorinde, MD  
Chair-Elect Jessica Andre, MD  
Vice Chair Keiry Rodriguez, MD  
Vice Chair Dante Robinson, MD  
Vice Chair Janee Murray, MD

## Education

Chair Hannah Seyller, MD  
Chair-Elect Kayla Basedow, MD  
Vice Chair Katelyn Hagstrom, MD  
Vice Chair Revelle Gappy, MD  
Vice Chair Kendrick Lim, DO  
Vice Chair Andres Lopez, MD  
Assistant Vice Chair Dakota Burke, MD  
Assistant Vice Chair Denise Manfrini, MD  
Assistant Vice Chair Jasmeen Randhawa, MD

## Government Services

Chair Eric Kretz, MD  
Chair-Elect Kyler Osborne, MD  
Vice Chair Michael Shulby, DO  
Assistant Vice Chair Morgan Denecke, MD  
Assistant Vice Chair Ryan Leone, MD

## Health Policy

Chair Melanie Yates, MD  
Chair-Elect Nicholas Melucci, DO, MPH  
Vice Chair Stephanie Berg, MD  
Vice Chair Phillip Groden, MD  
Vice Chair Katarina Jones, MD  
Vice Chair Alberto Perez, MD  
Assistant Vice Chair Nicholas Nasser, MD  
Assistant Vice Chair Angelica Rego, MD  
Assistant Vice Chair Jonathan Graff, DO

## International

Chair Sara Teising, MD  
Chair-Elect Ekiomoado Olumese, MD  
Vice Chair Vanya Zvonar, MD  
Vice Chair Evan Miller, DO  
Assistant Vice Chair Kelly Mackenzie, MD

## Pediatric EM

Chair Rebecca Leff, MD  
Chair-Elect Lauren Altomare, DO  
Vice Chair Ashley Sholmire  
Assistant Vice Chair David Surace, DO

## Prehospital & Disaster Medicine

Chair Luke Wohlford, MD, MPH  
Chair-Elect Shilpi Ganguly, MD  
Vice Chair Sriram Venkatesan, MD, FAWM  
Vice Chair Matthew Lyons, DO  
Vice Chair Elizabeth Mangin, MD  
Assistant Vice Chair James Nardini, MD  
Assistant Vice Chair Alicia Stobenau, DO  
Assistant Vice Chair Kyle Essex, DO

## Research

Chair Charles Sanky, MD, MPH  
Chair-Elect Anna Heffron, MD  
Vice Chair Michael Makutonin, MD  
Assistant Vice Chair Katrina Muraglia, MD  
Assistant Vice Chair Laura Harding-Jackson, DO  
Assistant Vice Chair Jose Reyes, MD

## Simulation

Chair Reed Colling, MD  
Chair-Elect Elizabeth Yim, MD  
Vice Chair Kyle Cohen, DO  
Vice Chair Danier Ong, MD  
Assistant Vice Chair Christian Casteel, DO  
Assistant Vice Chair Salil Phadnis, MD

## Social EM

Chair Molly Curtiss, DO  
Chair-Elect Alessandra Della Porta, MD  
Vice Chair Darrow Traylor, MD  
Vice Chair Margaret Hayslip, MD  
Vice Chair Phuong Vo, DO  
Assistant Vice Chair Haley Furman, MD  
Assistant Vice Chair Natalie McConnell, MD

## Sports Medicine

Chair Joshua Rayburn, MD  
Chair-Elect Christian Holland, MD  
Vice Chair Eric Swanson, MD  
Vice Chair Teresa Crow, MD  
Assistant Vice Chair Lauren Brady, MD  
Assistant Vice Chair Benjamin Gold, MD

## Technology, Telehealth & Informatics

Chair Mitchell Blenden, MD  
Chair-Elect Sidra Speaker, MD  
Vice Chair Ryan Korn, MD  
Assistant Vice Chair Austin Schoeffler, MD

## Toxicology

Chair E. Mason Jackson, MD  
Chair-Elect Laura Szczesniak, MD  
Vice Chair Brittany Garza, DO  
Assistant Vice Chair Katherine Markin, MD  
Assistant Vice Chair John Michael Sherman, MD  
Assistant Vice Chair Caroline Wight, MD

## Ultrasound

Chair Louisa Weindruch, DO  
Chair-Elect Olivia Williams, DO  
Vice Chair Sean Beckman, DO  
Vice Chair Justine Milligan, MD  
Vice Chair Ochan Kwon, MD  
Assistant Vice Chair Ryan Bellinger, MD  
Assistant Vice Chair Daniel Castro, MD

## Wellness

Chair Jessie Cable, DO  
Chair-Elect Diana Gregoriou, MD  
Vice Chair Melina Kanji, MD  
Vice Chair Danielle Andrews, MD  
Assistant Vice Chair Kadeen Forrest, MD

## Wilderness

Chair Joseph Mueller, MD  
Chair-Elect Jackson Anderson, MD  
Vice Chair Jacques Lowe, MD  
Vice Chair Mariko Ching, MD  
Vice Chair Carlos Enciso Lopez, MD  
Assistant Vice Chair Danusha Sanchez, IMG  
Assistant Vice Chair Brian Legvold, MD  
Assistant Vice Chair Erin Kinney, MD  
Assistant Vice Chair Megan Barthels, MD  
Assistant Vice Chair Ian Brodka, MD





# Eclipse Study: Can Celestial Forces Affect ED Visits and Acuity?

## Or is a Solar/Lunar Connection Complete Lunacy?

**Aaron J. Grossberg, DO**

Resident, PGY-2  
Emergency Medicine  
Florida State University Emergency Medicine  
Residency Program

**Jessie K. Cable, DO**

Resident, PGY-2  
Emergency Medicine  
Florida State University Emergency Medicine  
Residency Program

**Rakael D. Brown, DO**

Resident, PGY-1  
Emergency Medicine  
Florida State University Emergency Medicine  
Residency Program

**Sagar C. Galwankar, MBBS**

Attending Physician/Faculty  
Emergency Medicine  
Florida State University Emergency Medicine  
Residency Program

**Ali Z. Al-Rawi, MD**

Attending Physician/Faculty  
Trauma Surgery  
Sarasota Memorial Hospital

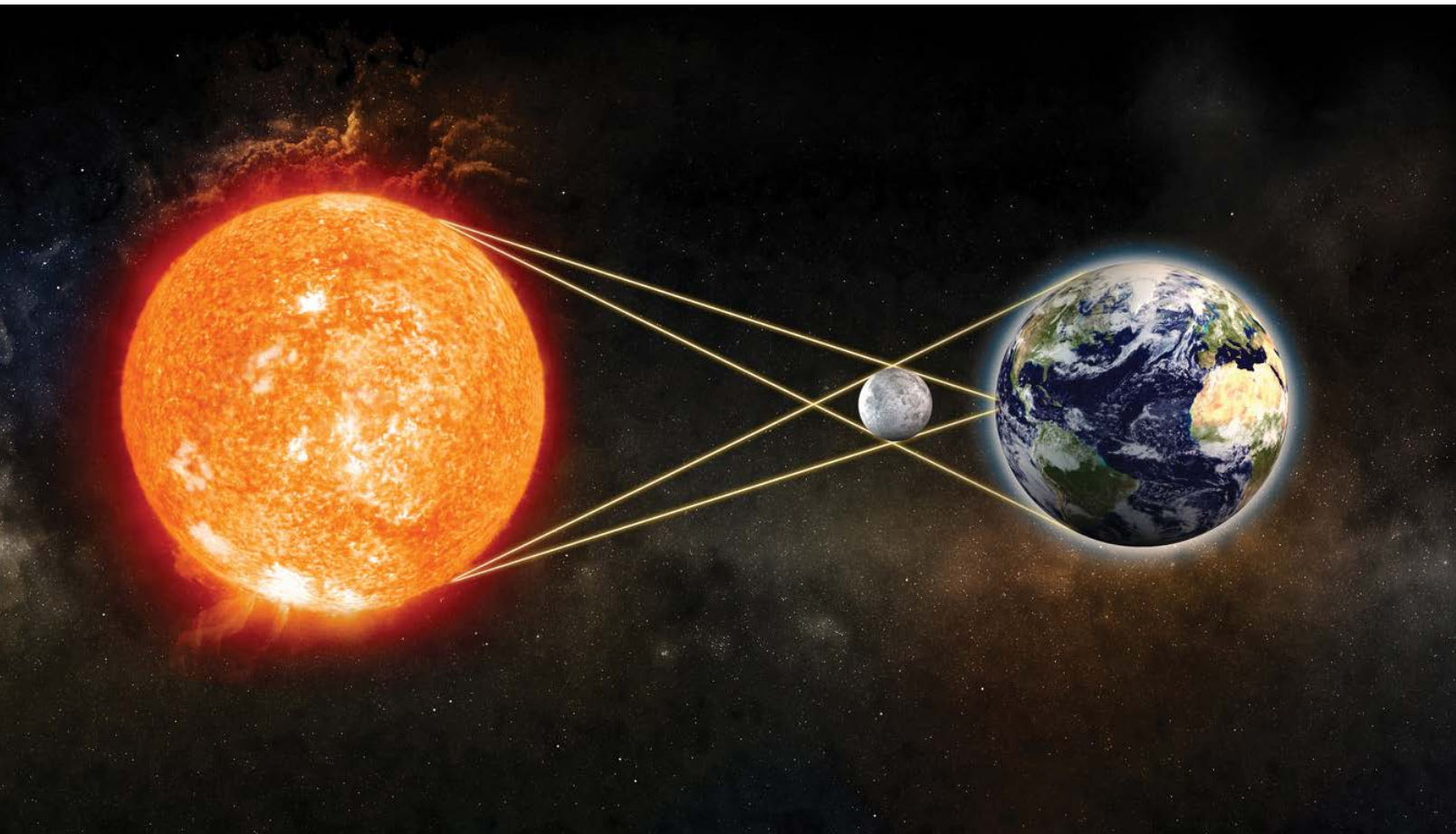
**BACKGROUND**

Civilizations have observed and documented eclipses for as long as humans have roamed the Earth. Myths and superstitions regarding the impact of eclipses have existed for millenia. In ancient China, they believed that an

eclipse was caused by a dragon trying to eat the sun. A Vietnamese legend proclaims that a giant frog eats the sun while trying to escape his master. The Greeks believed that eclipses occurred when gods were angry with humans. The Inuit people believe that an eclipse

occurs when the moon god Anningan catches up with the sun goddess Malina after an argument, during which the sun goddess walks away.<sup>1</sup>

Our understanding of the cause of these eclipses has changed with time. A solar eclipse occurs when the moon



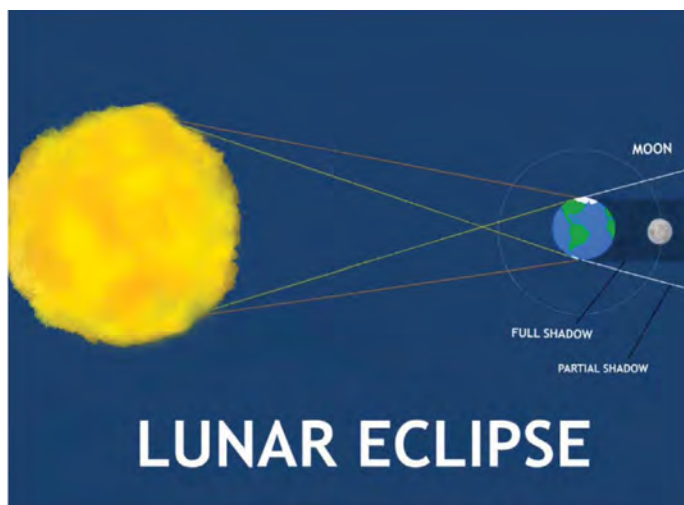


IMAGE 1: Lunar Eclipse

passes between the sun and the Earth, casting the moon's shadow on Earth. A lunar eclipse occurs when the Earth is between the sun and moon, causing the sun to cast Earth's shadow onto the moon. A total lunar eclipse lasts a few hours because of the large size of Earth in comparison to the moon. Meanwhile, a solar eclipse is very brief, lasting seconds to minutes.

There are also Mercury and Venus transits, which occur when Mercury or Venus cross directly between the sun and Earth. These are both very rare events.<sup>2-3</sup> Today's society often associates celestial phenomena with a harbinger that something bad is on the verge of happening.<sup>4</sup> However, previous research examining the relationship between the moon's phases and incidence of ED-related trauma has found a weak link: Thompson et al, for example, found no statistically significant difference in the number of emergency department patient visits, ambulance runs, or ED admissions between full moon and non-full moon days.<sup>5</sup> Similarly, Coates et al also found no statistically significant difference in number of trauma admissions.<sup>6</sup> Harstone-Rose et al examined the behavior of 17 animal species at a South Carolina zoo during a solar eclipse. While abnormal behavior was observed in 13 of the 17 species, behavior described as "anxious" was observed in only 5 species. The most extreme examples included a giraffe

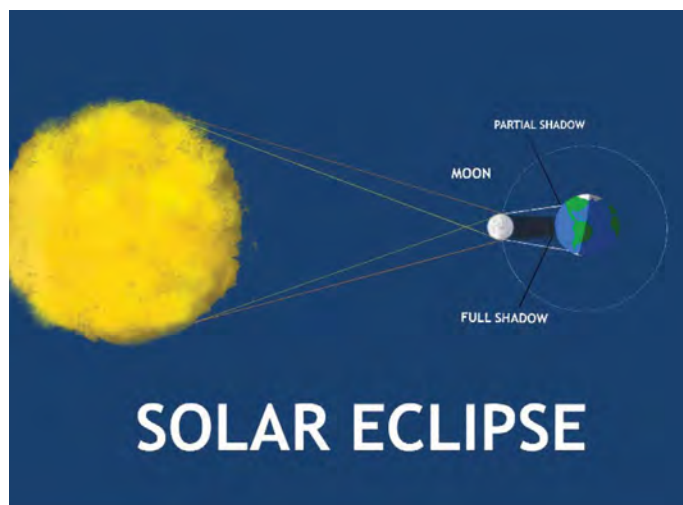


IMAGE 2: Solar Eclipse

and baboon who paced back and forth for more than an hour after the eclipse ended.<sup>7</sup>

*Yet no research study has ever examined how eclipses — solar or lunar — or planetary transits impact volume and acuity of patients presenting to the emergency department.*

The aim of our study is to examine how eclipses affect human behavior in terms of emergency department visits and acuity.

#### METHODS

This was a 7-year retrospective, observational, case-control study performed by querying the electronic medical record and trauma registry from Jan. 1, 2016, to Dec. 31, 2022, at a large county hospital with more than 900 beds in Florida.

Eclipse days were defined as a solar eclipse, lunar eclipse, or mercury transit visible in our geographical region.<sup>8</sup> The following conditions were searched for on days of eclipses and averaged over the 7-year period:

- emergency department census
- hospital admissions
- ambulance arrivals
- number of visits for altered mental status
- suicidal ideation
- drug overdose
- strokes
- cardiac arrests
- births

- falls
- total trauma activations
- level 1 trauma activations
- level 2 trauma activations
- gunshot wounds
- stabbings
- motor vehicle accidents

An unpaired T-test was performed using social science statistical software.<sup>9</sup> Statistical significance was defined as a p-value less than 0.05. Institutional ethical approval was obtained for this study from the Institutional Review Board at the hospital.

#### RESULTS

From Jan. 1, 2016, to Dec. 31, 2022, there were 767,220 visits to the emergency department, 476,517 hospital admissions, and 121,331 ambulance arrivals.

During the 7-year period, there were 6,376 individuals treated following motor vehicle accidents, 21,093 falls, 27,560 births, 1,687 cardiac arrests, 102 gunshot wounds, 9,571 strokes, 281 stabbings, 15,355 trauma activations, 2,248 level 1 trauma activations, 13,107 level 2 trauma activations, 10,434 visits for altered mental status, 5,182 for suicidal ideation, and 1,918 for drug overdose.

There were 13 eclipses during this time: 2 mercury transits, 10 lunar eclipses, and 1 solar eclipse. On average, there were 309.85 visits to the ED on eclipse days, and 300.28 visits on no-eclipse days.

There were averages of 299.3 visits

TABLE 1: ED VOLUME AND VISITS BY ECLIPSE VS. NO-ECLIPSE DAYS

AVERAGE NUMBER PER DAY	No Eclipse	Eclipse	Lunar	Solar	Mercury	P-value comparing Eclipse to No-Eclipse Visit Numbers
ED Visits	300.28	309.85	299.30	340.00	347.50	0.2746
Hospital Admissions	186.50	191.92	178.40	192.00	210.00	0.4968
Ambulance Arrivals	47.49	47.45	46.56	49.00	54.00	0.4115
Strokes	3.75	0.54	0.70	0.00	0.00	< 0.00001
Cardiac Arrests	0.66	0.15	0.20	0.00	0.00	0.0060
Births	10.79	10.46	9.40	18.00	12.00	0.4312
Drug Overdoses	0.75	1.00	0.80	3.00	1.00	0.2774
Suicidal Ideation	2.03	1.46	1.46	0.00	0.00	0.3304
Total Trauma Activations	6.01	6.62	6.20	6.00	9.00	< .00001
Level 1 Trauma Activations	0.88	0.61	0.50	0.00	1.50	< .00001
Level 2 Trauma Activations	5.13	6.00	5.70	6.00	7.50	< .00001
Gunshot Wounds	0.04	0.00	0.00	0.00	0.00	< .00001
Assaults with a Sharp Object	0.11	0.08	0.10	0.00	0.00	< .00001
Motor Vehicle Accidents	2.50	1.46	1.90	0.00	0.00	0.1794
Falls	8.26	4.62	6.00	0.00	0.00	0.2097

on lunar eclipse days, 347.5 visits on mercury transit days, and 340 visits on the single solar eclipse day.

There were averages of 0.54 strokes and 4.62 falls on eclipse days, whereas there were 3.75 strokes and 8.26 falls on no-eclipse days.

Average numbers of births, level 1 trauma activations, gunshot wounds, stabbings, visits for motor vehicle accidents, stroke, cardiac arrest, and suicidal ideation were all higher on days without an eclipse.

There were more hospital admissions and drug overdoses on eclipse days.

**DISCUSSION**

A significantly lower number of trauma and stroke patients were seen on eclipse days compared to days without an eclipse. On no-eclipse days, there were more visits for falls, births, motor vehicle accidents, cardiac arrests, and suicidal ideation — although the difference was not significant. A non-significant volume of patients was seen on eclipse days, with an average of 309.85 patients vs. 300.28 on no-eclipse days.

A significantly higher number of trauma patients was seen on eclipse vs. no-eclipse days. Total numbers of trauma activations, level 1 trauma activations,

gunshot wounds, and stabbings all were significantly higher. There were more visits for motor vehicle accidents on no-eclipse days, but the difference was not significant.

The number of ambulance arrivals was similar on eclipse and no-eclipse days at 47.45 and 47.49, respectively. More patients were admitted on eclipse days than no-eclipse days, although the results were not statistically significant. Similarly, there was a non-significant higher number of drug overdoses on eclipse days.

**LIMITATIONS**





This study had several limitations. First, the study was underpowered as the sample size was quite low, given there were only 13 eclipses — including just 2 mercury transits and 1 solar eclipse. Overall, the low volume of penetrating trauma presenting to the emergency department likely resulted in sampling bias and chance association as demonstrated by the lower numbers of traumatic visits on eclipse days. Other confounding variables included the day of the week and weather, which likely influenced the acuity and volume of presenting patients.

A multicenter study across a diverse geographical region would be ideal to further elucidate the relationship between emergency department visits and the occurrence of an eclipse.

The driving factor for the higher patient volume on eclipse days is unclear. As mentioned above, sampling bias may

be a factor, given the association did not reach significance. An interesting part of the study involves examining the data from the single solar eclipse. The local area experienced approximately 80% totality — meaning 80% of the sun's surface was obscured by the moon. This event was considered a once-in-a-lifetime phenomenon, as a solar eclipse occurs in the same location once every 375 years.<sup>7</sup> On the day of the solar eclipse, there were higher numbers of births, drug overdoses, ED visits, ambulance arrivals, and hospital admissions compared to no-eclipse days, but the numbers of trauma activations, strokes, and cardiac arrests were all lower.

#### CONCLUSION

Ultimately, the results of our study suggest that the presence of an eclipse did not detrimentally affect human behavior. Human beings are sentient

individuals capable of responding to their environment out of their own free will, rather than being driven by astrological phenomena. Despite a significantly higher number of trauma activations and penetrating traumas on eclipse days, the absolute difference is quite minimal, and it is apparent that the volume and acuity of patients presenting to the emergency department is relatively unaffected by the presence of an eclipse.

In this 7-year retrospective, observational, case-control study involving 767,220 visits to the emergency department, no significant differences were noted between the volume or acuity of patients on eclipse and no-eclipse days. The overall number of ED visits on eclipse days was insignificantly higher; however, the numbers of trauma activations, gunshot wounds, and stabbings were all significantly lower on eclipse days. ★

# Not all Weakness is Stroke: Difficult Diagnosis of Cerebellar Abscess Without MRI Ability

**Samuel Orchard, MD**

Resident, PGY-3  
Emergency Medicine  
University of South Carolina-Greenville

**Sarah E. Fabiano, MD, FACEP, FAAEM**

Clinical Assistant Professor  
Department of Emergency Medicine  
University of South Carolina-Greenville

## CLINICAL PRESENTATION, DIAGNOSIS

A patient in his 60s with a history of COPD, type 2 diabetes mellitus, hypertension, hyperlipidemia, and spinal stimulator presented to the emergency department for weakness. The patient's family had found the patient on the floor, minimally responsive. When EMS arrived, he was not using his right side and had a leftward gaze. Vital signs were stable, he was afebrile, and BGL was normal.

The patient had been discharged

5 days earlier from a brief admission after being diagnosed with anemia and liver lesions that did not demonstrate neoplastic process on biopsy. A CT scan of the head at this encounter revealed a large, left-sided cerebellar mass with edema resulting in displacement of the fourth ventricle and hydrocephalus. Mannitol and dexamethasone were given in the ED, and neurosurgery was consulted. The patient's mental status continued to deteriorate and he was intubated, allowing neurosurgery to place

an EVD. The patient was admitted to the neuro ICU with initial considerations favoring subacute stroke vs. mass.

The patient was unable to have an MRI due to a spinal cord stimulator and had serial CT scans. He was taken to the OR 3 days later and found to have purulent drainage, making the diagnosis of a brain abscess. Cultures grew strep intermedius, and he was started on vancomycin, ceftriaxone, and metronidazole.



IMAGE 1: Hospital day 1

## BRAIN ABSCESS REVIEW

### Pathogenesis

The most common pathogenesis of bacterial brain abscesses is a result of contiguous spread, which makes up about 50% of all cases. The next most common cause is hematogenous spread, which represents about one-third of cases, and the remainder of cases remain unknown.<sup>1</sup> Historically, case fatality rates had been as high as 40%, but over the past few decades we have seen drastic improvements to as low as 10% fatality. Full recovery has also increased from 33% to 70%.<sup>1</sup> Immunocompromising



IMAGE 2: SP-craniotomy

conditions such as HIV can predispose patients to brain abscesses from not only bacterial sources, but also fungal and protozoan infections.<sup>2</sup>

#### Clinical Manifestations

Unfortunately, like with this patient, these infections can initially be difficult to diagnose, and the classic triad of headache, fever, and altered mental status are only present in about 20% of cases.<sup>1</sup> Especially in abscesses near the brainstem or cerebellum, symptoms such as changes in gait, cranial-nerve palsies, or changes in mental status secondary to hydrocephalus can assist in diagnosis and work-up.<sup>3</sup> Fever and other infectious symptoms can be present in patients who have hematogenous spread. With cerebellar abscesses specifically, 93% of cases in one study were secondary to odontogenic abscess spread.<sup>3</sup>

#### Diagnosis

Cranial imaging is the gold standard for diagnosing brain abscesses. Initially, CT imaging is likely to be performed to evaluate for hemorrhage, multiple lesions, masses, hydrocephalus, etc., but eventually MRI is preferred. Diffusion-weighted MRI has been shown to have a sensitivity and specificity of differentiating abscess from primary malignancy of 96% and 98%, respectively.<sup>4</sup>

#### Treatment

Treatment of brain abscesses consists primarily of neurosurgical intervention



in conjunction with antibiotic therapy. Initial antibiotic treatment is broad and meant to cover the most common organisms including staphylococcus and streptococcus species but should be broadened out to cover opportunistic infections caused by HIV or other immunocompromised states when

critically ill and was eventually able to be weaned off both of these. His hospital course was complicated by incidental bilateral pulmonary embolisms as well as NET found during PEG tube placement. He was able to be discharged just over 1 month following his presentation to the ED. He was readmitted 5 months later following a tonic-clonic seizure and was started on an AED. ★

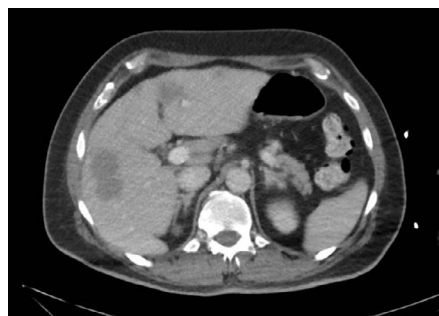


IMAGE 3: Liver lesions, hospital day 2

present.<sup>3,5</sup> The abscess aspirate should be cultures following neurosurgical intervention to determine an organism and guide therapy.<sup>6</sup>

#### CASE RESOLUTION

The patient continued antibiotic therapy for about 2 months for his brain abscess as well as liver abscesses. He had a tracheostomy and peg tube placed while

#### TAKE-HOME POINTS

- Brain abscesses can be difficult to diagnose and often mimic other intracranial pathology such as stroke or malignancy.
- These patients may not exhibit infectious symptoms such as fever, leukocytosis, etc.
- Keep this diagnosis in mind when initial imaging is unclear, especially in an immunocompromised patient who may need more specific antibiotics for opportunistic infections.



# Board of Directors Openings

Elections will take place during  
the Representative Council meeting  
on Sept. 30 at ACEP24 in Las Vegas.

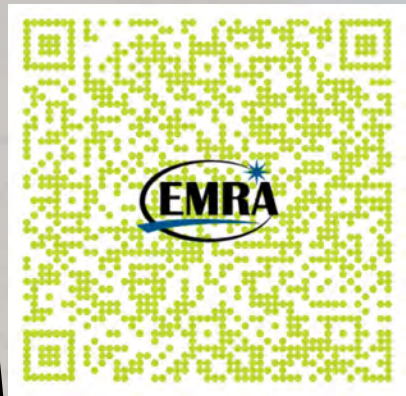
## Annual Board Positions

- President-elect (3-year term that matriculates to President, then Immediate Past-President)
- Vice Speaker (2-year term that matriculates to Speaker of the Council)

## Even-Numbered Year Elections

- Resident Rep to ACEP
- Director of Leadership Development
- Director of Health Policy

WANT  
MORE  
INFO?



## RepCo Fall Deadlines

### Fall Representative Council and Business Meeting - Sept. 30, 2024

(In conjunction with ACEP's Scientific Assembly)

#### 45 Days prior to Representative Council Meeting:

- Resolution Submission Deadline
- Bylaws Resolution Submission Deadline
- Election Candidate Deadline

#### 30 Days Prior to Representative Council Meeting:

- Vote Cut-Off Deadline
- Conference Committee Volunteer Deadline

#### 10 Days Prior to Representative Council Meeting:

- Late Resolution Deadline

APPLY HERE



Welcome Aboard!

# EMRA 2024 Medical Student Council

**CONGRATULATIONS** to our newly appointed Medical Student Council.  
EMRA is grateful for your leadership!

Chair **Jinger Sanders**, American University of Integrative Sciences  
Vice Chair **David Gordon**, Sidney Kimmel Medical College At Thomas Jefferson University  
Editor **Allison Gasnick**, Case Western Reserve University School of Medicine  
Legislative Coordinator **Kyle Avery**, University of Arizona College of Medicine - Phoenix  
Mentorship Coordinator **Atira Shenoy**, Nova Southeast University Health Science Osteopathic Medicine  
Osteopathic Coordinator **Kelly Dinh**, Rocky Vista University College of Osteopathic Medicine - Southern Utah Campus  
Student Advising Coordinator **Zoe Castro**, University of Nevada, Reno School of Medicine  
Web Tech Coordinator **Katie Tucker**, Oklahoma State Univ. Center for Health Sciences College of Osteopathic Medicine  
AMA MSS Representative **Kailey Jacobson**, Nova Southeast University Health Science Osteopathic Medicine  
AMA MSS Alternate **Danielle Sychowski**, Midwestern University Chicago College of Osteopathic Medicine  
West Coordinator **Colton Crawford**, Washington State University Elson S. Floyd College of Medicine  
Pacific Regional Rep **Ellis Jang**, California Northstate University College of Medicine  
Southwest Regional Rep **Tushank Chadha**, Burrell College of Osteopathic Medicine at New Mexico State University  
Midwest Coordinator **Mohammad Abuakar**, Idaho College of Osteopathic Medicine  
Great Plains Regional Rep **Thomas Johnston**, Southern Illinois University School of Medicine  
Great Lakes Regional Rep **Payton Wolbert**, Central Michigan University College of Medicine  
Northeast Coordinator **David Bronstein**, George Washington University School of Medicine and Health Sciences  
Northeast Regional Rep 1 **Derick Goff**, New York Medical College  
Northeast Regional Rep 2 **Breanna Sharp**, Okla. State Univ. Center for Health Sciences College of Osteopathic Medicine  
Mid-Atlantic Regional Rep **Eli Brennan**, University of Massachusetts Medical School  
Southeast Coordinator **Kristina Pagano**, Florida International University Herbert Wertheim College of Medicine  
Southeast Regional Rep 1 **Babayode Bakare**, Morehouse School of Medicine  
Southeast Regional Rep 2 **Cristina Sanchez**, Florida State University College of Medicine  
Southcentral Regional Rep **Samantha Jacobson**, Edward Via College of Osteopathic Medicine - Louisiana Campus  
International Representative **Benice Louis**, Saint James School of Medicine

EMRA's Medical Student Council is the voice of medical students pursuing emergency medicine — the voice of the future of the specialty. Applications for MSC leadership positions are due Nov. 1 of each year. Each year, we welcome new MSC leaders, who serve a one-year term beginning Jan. 1 and ending Dec. 31.

EMRA would like to extend a big, heartfelt welcome and congratulations to our incoming MSC leaders for 2024!



[more info](#)





# Medical Students!

*EMRA's got good stuff for you!*

## Attend our Virtual Medical Student Forum

Held in the spring and fall.  
Talk with residency PDs, faculty, and  
other mentors, and learn more about  
emergency medicine!

Get more  
info and  
register!







# ***EMRA Residency Program Fair***

***Attention med students!*** The EMRA Residency Program Fair is an awesome event at ACEP Scientific Assembly. The Fair is included as a benefit with your EMRA membership! We're excited to provide you an amazing experience that personally connects you with more than **160** emergency medicine programs.

*Scan the QR code for more info!*

**Save the Date!**  
**Sept. 28**  
**at ACEP24**  
**in Las Veas!**

# ***EMRA Medical Student Workshop Day***

Join **EMRA at ACEP24** for an exciting day of hands-on medical student workshops on **Saturday, Sept. 28**, from **9 am - 1 pm** Eastern at the Mandalay Bay Convention Center in Las Vegas.

Sign up for sessions led by current emergency medicine residents and faculty!



**Scan the QR code for more info!**



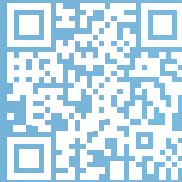
Emergency Medicine Residents' Association

Before you embark on your  
EM journey, check out...

# EM*bark*



**EMRA's Career Planning Center.**  
Information, Resources, & Advice.



[emra.org/embark](http://emra.org/embark)



Now accepting  
article submissions.

More info:

[emra.org/embark/submit-an-article](http://emra.org/embark/submit-an-article)





# Access the BEST

## emergency physician career center!

ACEP and EMRA present the new emCareers, a full-service career support network for emergency physicians and residents. emCareers connects jobseekers with open EM positions, and employers with thousands of active and passive EM jobseekers. Explore emCareers to sign up for job alerts, get specialized job search results, and discover new educational resources and networking opportunities.

Take the next step in your emergency medicine career with emCareers.





# Emergency Medicine Residents' Association

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

## EMRA Takes Care of You

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

## EMRA Is Your Community

- Networking
- Mentorship
- Advising
- Friendships

## EMRA For a Lifetime

- Medical Students
- Residents
- Fellows
- Alumni

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

# #EMRAFamily



# PERKS

## for our #EMRAfamily

You know about our chock-full EMRA Member Kit boxes. But how about better mortgage and student loan rates? Or special pricing for exam prep? Plug in to all the valuable discounts, access, and information you get through EMRA.

### *Board Prep*

Hippo EM  
PEERprep  
Rosh Review

### *Education*

EM:RAP  
Annals of EM  
EB Medicine  
EMCrit  
Resuscitative TEE Workshop

### *Financial*

Laurel Road  
Doctors Without Quarters  
Integrated WealthCare  
Jay Weinberg Financial Services

### *Wellness*

Headspace

### *Professional Development*

ACEP  
emCareers

Visit [emra.org/benefits](https://emra.org/benefits)  
and get the most from your membership



Medical Students | Residents | Fellows | Alumni  
Oldest & Largest EM Resident Association

EMRA Congratulates

CORD

on their

35<sup>th</sup>

Anniversary





# EMRA ECG Challenge



**Alec Good, DO**  
Resident, PGY-2  
Emergency Medicine  
Trident Medical Center

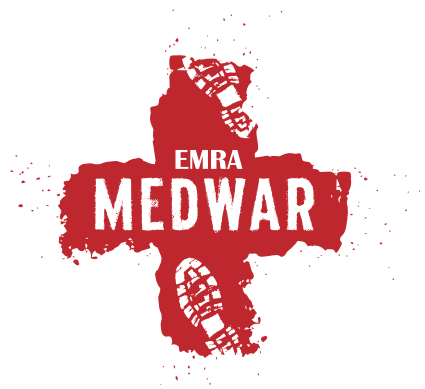
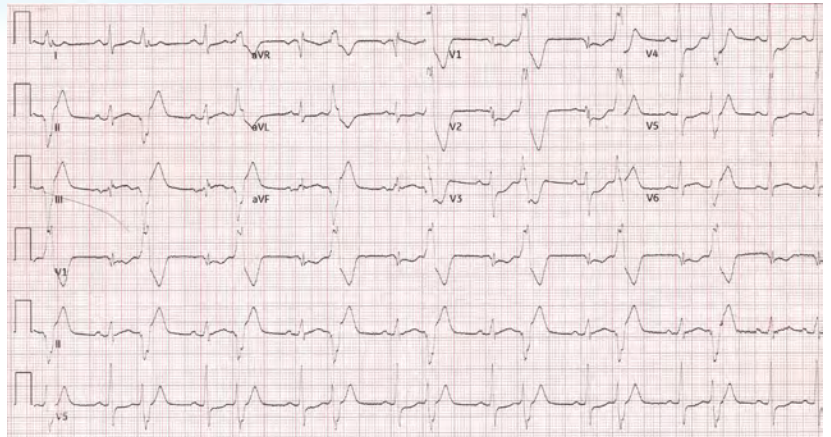
**Daniel Regino, DO**  
EM faculty  
Trident Medical Center

**Jeremy Berberian, MD**  
Associate Director of EM Resident Education  
Department of Emergency Medicine  
ChristianaCare

## CASE

A 64-year-old male with past medical history of HTN, CAD, and prior MI presents due to substernal chest pain.

**What is your interpretation of his ECG?**  
See the ANSWER on page 66.



**MedWAR is back Oct. 2 at ACEP24 in Las Vegas!** Get your teams organized and your volunteers together **NOW!**



More info & registration details coming soon



# ECG Challenge

## ANSWER

This ECG shows sinus rhythm with a ventricular rate of 96 in a pattern of ventricular bigeminy. In the sinus (ie, narrow complex) beats, there is STE in lead III with STD in leads I, aVL, and V1-V5. These findings are consistent with a posterior, and likely concurrent inferior, MI that warrants emergent cardiac catheterization.

## DISCUSSION

Although the STE in lead III with reciprocal STD in leads I and aVL is concerning for an impending/developing inferior MI, these findings do not meet traditional STEMI criteria. Another abnormal finding is the obliquely straight ST-segment and T-wave upstroke seen in leads II and aVF. This morphology is called the checkmark sign<sup>1</sup> or R-T sign, and it suggests MI if new from prior, seen in contiguous leads (especially if there are reciprocal STD), and the patient's presentation is concerning for ACS.

The STD in leads V1-V3 are consistent with a posterior MI. Prior to 2022, the ACC guidelines mandated use of a posterior ECG to diagnose a posterior MI, but this changed with the 2022 ACC Guidelines, which now recognize the following criteria as an indication for immediate angiography:<sup>2</sup>

- Horizontal STD in leads V1-V3
- Dominant R-wave (R/S ratio >1) in lead V2
- Upright T-waves in anterior leads
- Prominent and broad R-wave (>30 msec)

The 2022 guidelines also state that a posterior MI can be confirmed with a posterior ECG, but this is not mandated as a criterion for emergent cardiac catheterization.

This case occurred prior to the 2022 guidelines, so a repeat ECG with posterior leads was obtained (see **Figure 2**). The repeat ECG shows STE in leads II, III, and aVF, with STD in leads I and aVL that meet STEMI criteria and underscore the importance of obtaining serial ECGs in patients with an equivocal initial ECG and a presentation concerning for ACS. This ECG also shows STE in leads V7-V9, diagnostic of a posterior MI.

The diagnostic criteria for a posterior MI<sup>2</sup> differ from traditional STEMI criteria in 2 important ways:

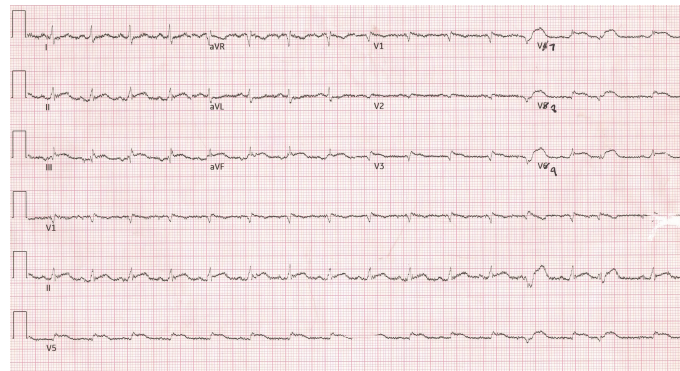


FIGURE 2: Posterior ECG

- There only needs to be STE in 1 posterior lead
- The STE only needs to be  $\geq 0.5$  mm

Another change in the 2022 ACC guidelines is the removal of the STE cutoff of  $\geq 1$  mm for men < 40 years old. Placement of posterior leads is described in the Learning Points below.

Posterior MIs are typically seen with a concurrent inferior or lateral MI, but an estimated 5-10% of MIs are isolated posterior MI. The blood supply for the posterior wall is supplied by the posterior descending artery which can be supplied by the RCA (~80% of the population), the LCx (~10% of the population), or by both the RCA and LCx (~10% of the population). These anatomic configurations are referred to as right dominant, left dominant, and co-dominant circulation, respectively. Isolated posterior MI are commonly missed because they don't manifest STE on a traditional 12-lead ECG and may only manifest subtle STE on a posterior ECG. Accordingly, it is important not to misdiagnose STD in leads V1-V4 as anteroseptal ischemia and miss an isolated posterior MI that warrants emergent cardiac catheterization.

## CASE CONCLUSION

This patient was taken to the catheterization laboratory, where a 100% occlusion of the left circumflex artery was successfully stented.

## POSTERIOR MI LEARNING POINTS

- Consider whenever there is STD in leads V1-V4, especially if there are concurrent prominent R-waves and/or upright T-waves in these leads
- Use posterior leads V7-V9 (see **Figure 3**) to evaluate for posterior MI if there is diagnostic uncertainty regarding STD in leads V1-V4
  - V7: left posterior axillary line at the 5<sup>th</sup> intercostal space
  - V8: left midscapular line at the 5<sup>th</sup> intercostal space
  - V9: left paraspinal border at the 5<sup>th</sup> intercostal space
- STE  $\geq 0.5$  mm in posterior leads V7, V8, or V9 is diagnostic
  - Does not require 2 contiguous leads

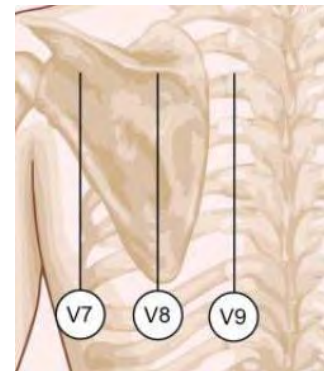


FIGURE 3: Posterior lead placement

*Disclaimer: Dr. Good and Dr. Regino are employed by HCA Healthcare and/or an HCA Healthcare-affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.*



# NEWS & NOTES IN EMERGENCY MEDICINE

## ABEM SETS IN-PERSON CERTIFYING EXAM

The American Board of Emergency Medicine (ABEM) is requiring a new in-person certifying exam in 2026 as the second step for physicians to become certified. Exam-takers will need to appear in-person at the AIME Center, a professional assessment center in Raleigh, NC. After 2025, the current virtual oral certification exam will no longer be available. The qualifying (written) exam will still be required for certification.

According to ABEM, the new certifying exam will be innovative, assess additional competencies valued by the specialty and important to patient care, and maintain the highest standards in the EM specialty. More information can be found on [abem.org](http://abem.org).

EMRA has released a statement on ABEM's new certifying exam; the statement can be found on [emra.org](http://emra.org).

## HERE'S YOUR CHANCE TO FLY HIGH, RESIDENCY APPLICANTS!

The University of Texas Medical Branch (UTMB) in Galveston, TX, has launched the first-of-its-kind emergency medicine/aerospace medicine combined residency program. ABEM and the American Board of Preventive Medicine recently approved the 4-year joint residency program, which integrates essential aspects of EM and aerospace medicine for a unique educational and training experience.

This program will equip trainees with a dual skill set in preparation for emergency medical care both on Earth and in space. Curriculum includes immersive rotations, hands-on experiences, and collaborations with experts and organizations in the field. Residents will engage in cutting-edge research, policy development, and training to provide support for space missions.

Applications are being accepted for the inaugural class, which will consist of 2 EM/AM residents and will begin in July. Applicants must be U.S. citizens. For more details about additional eligibility criteria and the application process, visit the program website or [utmb.edu](http://utmb.edu). Interested candidates should also email Dietrich Jehle, MD, FACEP, RDMS, at [dijehle@utmb.edu](mailto:dijehle@utmb.edu) and Yvette Schultz at [ryschulz@utmb.edu](mailto:ryschulz@utmb.edu) to express their intent to apply.

## FOEM SELECTS RESIDENT DIRECTOR

Chinwe Anyanwu, DO, MPH, has been appointed the first EMRA representative to serve on the Foundations of EM (FoEM) directors team. Dr. Anyanwu will focus on resident advocacy during her 1-year term.

Dr. Anyanwu is a resident at Baylor All Saints Medical Center in Fort Worth and a graduate of University of the Incarnate Word School of Osteopathic Medicine.

As resident director, Dr. Anyanwu will serve as a

spokesperson for resident priorities related to FoEM curricula and projects. She also will lend her perspective to optimize the resident experience by coordinating learning resources and FoEM collaborations, among other duties.



CHINWE ANYANWU, DO

FoEM is a national, free, open-access, online EM curriculum that has been widely adopted in the United States. FoEM offers standardized, level-specific, core content courses for EM residents utilizing learner-centric educational strategies.

## ABEM: PDS MUST COMPLETE NEW ATTESTATION FOR GRADUATING RESIDENTS

The ABEM Board of Directors has approved a new attestation that program directors will be required to complete for each graduating resident beginning in 2024. The new attestation must be completed in addition to questions listed on traditional verification forms. The updated online attestation form requires program directors to attest to the successful completion of individual competencies.

In 2024, responding negatively about a resident's individual competencies will not affect that resident's eligibility to apply for initial certification. The 2024 data will help inform ABEM about whether changes should be made, if any, to the verification form that will go into effect in 2025 and count toward board eligibility.

For more information, visit [abem.org](http://abem.org).

## ABEM EXECUTIVE DIRECTOR TO RETIRE

Earl J. Reisdorff, MD, will step down as ABEM executive director after serving in that role for 14 years. His retirement is effective Dec. 31.

Dr. Reisdorff joined ABEM in 2010 as its third executive director in 31 years. He actively sought innovations that would make certification more relevant and convenient for emergency physicians and implemented a system of physician-focused engagement and service.

The search for a new executive director is underway. ★



# Board Review Questions

PEERprep for Physicians is ACEP's gold standard in self-assessment and educational review.

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

Order PEERprep at [acep.org/peerprep](http://acep.org/peerprep)

PEERprep  
on sale  
**NOW!**

**1. Which medication would treat spontaneous bacterial peritonitis for a patient developing hepatorenal syndrome?**

- A. Albumin
- B. Cefotaxime
- C. N-acetylcysteine
- D. Octreotide

**2. Which laboratory abnormality is expected in primary adrenal insufficiency?**

- A. Hyperglycemia
- B. Hypocalcemia
- C. Hypokalemia
- D. Hyponatremia

**3. A mother brings in her 5-month-old baby because he has been constipated for the past week. She says he has been eating less for the past 3 days and seems "sluggish and weak." He has had no fever, vomiting, rash, or other concerns. His vital signs are BP 107/74, P 111, R 22, and T 36.6°C (97.9°F); SpO<sub>2</sub> is 100% on room air. The child is awake and interactive but lies still during the examination. Examination findings are otherwise negative except for diffuse decreased tone. Deep tendon reflexes are normal. What pharmacotherapy should the treatment include?**

- A. Botulism immune globulin 0.5 mL/kg/hr
- B. Dexamethasone 0.6 mg/kg
- C. Normal saline bolus 10 mL/kg
- D. Vancomycin 15 mg/kg

**4. A 41-year-old woman presents via ambulance after being found down on the sidewalk. She is cooperative but somnolent and confused. Her vital signs include BP 110/70, P 95, and R 12; SpO<sub>2</sub> is 96% on room air. An empty bottle of lorazepam, filled the day before with 60 tablets, is found in her pocket. What is the most appropriate initial step in management?**

- A. Administer flumazenil 0.2 mg IV
- B. Administer naloxone 0.2 mg IV
- C. Order a head CT scan without contrast
- D. Perform a capillary blood glucose check

**5. A 68-year-old man presents with lower abdominal pain and a distended abdomen. He has been unable to void for the past 6 hours. He denies previous hematuria. Bedside ultrasonography reveals an enlarged bladder with 250 mL of fluid. The nurse is unable to pass a 14-Fr Foley catheter. Placement of which catheter is the best next step in management?**

- A. 12-Fr Foley catheter
- B. 14-Fr Foley catheter over guidewire
- C. Coudé catheter
- D. Suprapubic catheter

# Quality Questions. Advanced Analytics. A Name You Trust.

All for a Budget-Friendly Price.

Learn more, email [peer@acep.org](mailto:peer@acep.org)



## For Your Residents:



### **NEW: Mobile App**

Your residents can take tests from anywhere they have their phones!



### **Aligns with all 3 Foundations of EM**

Your residents can test their skills with weekly PEER quizzes aligned with each Foundations of EM unit.



### **Over 2,500 Questions and Counting**

About 50 questions added each month plus current questions continue to be reviewed and refined.

## For You and Your Program:



### **State-of-the-Art Dashboard**

Monitor and strengthen your residents' progress.



### **Create Custom Quizzes**

Bolster weak areas that need improvement.



### **Earn CME Hours**

You can earn CME hours as you help your residents with their board prep needs.

No other EM board prep today has the quality, capabilities, AND decades of experience in launching EM careers that PEERprep does. [acep.org/PEERprep](http://acep.org/PEERprep)



# Annals of Emergency Medicine

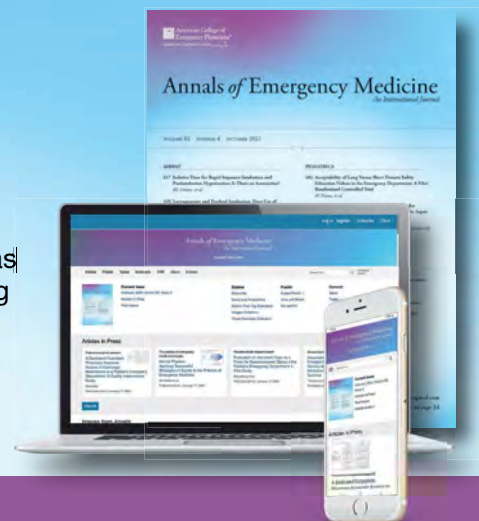
An International Journal

## Resident Editorial Board Fellowship Appointment

### Description

The Resident Fellow appointment to the Editorial Board of **Annals of Emergency Medicine** is designed to introduce the Fellow to the peer review, editing, and publishing of medical research manuscripts. Its purpose is not only to give the Fellow experience that will enhance his/her career in academic emergency medicine and in scientific publication, but to develop skills that could lead to later participation as a peer reviewer or editor at a scientific journal. It also provides a strong resident voice at **Annals** to reflect the concerns of the next generation of emergency physicians.

**Application Deadline:** July 15, 2024



Learn More at: [www.annemergmed.com](http://www.annemergmed.com)



 American College of  
Emergency Physicians®  
ADVANCING EMERGENCY CARE 

## RESIDENT VIP CLUB

### BUILDING BONDS, CREATING OPPORTUNITIES

Support EM research and attend EMF's special events at LAC24 and ACEP24 with a \$120 donation for membership to the Resident VIP Club.



[emfoundation.org](http://emfoundation.org)



**EMF** Emergency  
Medicine  
Foundation®  
research → education → patient care





“Being a **physician-led and APP-led group** means that our **clinicians are making the decisions**; that we’re giving our clinicians the **tools they need.**”

— **JEFFREY RABRICH, DO, MBA, FACEP, FAEMS**  
SVP, Emergency and Hospital Medicine

## What’s Your Vision for a Stronger Emergency Medicine Career?

Emergency Medicine physicians turn to Envision to grow their careers because we create practice environments that support their success, professional growth and wellness.

- Physician-led group on the local, regional and national levels
- Leadership development and mentoring programs
- Partnerships at respected facilities in attractive locations nationwide
- Opportunities for clinical and scientific research
- Flexible and equitable scheduling that supports work-life balance
- Full-time, part-time, per diem and ENVOY Ambassador Team opportunities
- Robust support for professional wellness
- Experienced clinical leaders who understand your career goals

### Transition To Practice

Schedule an Envision Transition to Practice Event for your residency program. Our clinical leaders will answer your most pressing questions and review what to consider when looking for your ideal career opportunity.

To schedule an event, contact Jessica Esposito, National Residency Recruitment Manager, at **608.216.6087** or **Jessica.Esposito@EnvisionHealth.com**.



### Earn While You Learn

**Earn up to \$2,500 a month** in your final year of training. This opportunity is site- and specialty-specific, so talk with your recruiter to learn more.

## Featured Emergency Medicine Physician Opportunities

**Centerpoint Medical Center**  
Independence, Missouri

**HCA Florida Oviedo Medical Center**  
Oviedo, Florida

**Spotsylvania Regional Medical Center**  
Fredericksburg, Virginia

**Corpus Christi Medical Center**  
Corpus Christi, Texas

**Methodist Hospital Texan**  
San Antonio, Texas

**Valley Regional Medical Center**  
Brownsville, Texas

**HCA Florida Lawnwood Hospital**  
Fort Pierce, Florida

**MidHudson Regional Hospital**  
Poughkeepsie, New York

**Yuma Regional Medical Center**  
Yuma, Arizona



**Ready to strengthen your EM career?**  
Speak with our experienced recruiters today.  
**833.493.0164**  
**Envision.Health/EMRA24**

**Envision**  
PHYSICIAN SERVICES

**COME FOR THE JOB  
STAY FOR THE Lifestyle**

- › Signing Bonus
- › Flexible Scheduling
- › Pre-tax CME Account
- › Med Mal & Tail
- › Membership in ACEP & FCEP
- › Company Paid Health w/HSA, Life, 401K & Disability
- › RVU Production Bonuses
- › Competitive Pay
- › Partnership Opportunity
- › Quality Lifestyle

**EMPROS**  
emergency medicine professionals, p.a.  
Emergency Physicians for AdventHealth-North Division

[emprosonline.com](http://emprosonline.com)

## Emergency Medical Services Fellowship



- Exceptional experiences: ground, air, large scale public events, and more...
- ACGME accredited and satisfies the requirements for ABEM EMS certification
- Decades of NIH funded EMS research
- Energetic fellowship-trained faculty
- Located in a vibrant metropolitan area with population > 1 million

For more information contact Program Director, Tim Lenz, MD, MPH at [tilenz@mcw.edu](mailto:tilenz@mcw.edu).

Discover all of the Department of Emergency Medicine Fellowships at <https://www.mcw.edu/departments/emergency-medicine/education/fellowship-programs>



**Talking about the issues that matter.**

**Listen today!**



[emracast.org](http://emracast.org)

Supported by **VAPOTHERM®**

# Annals of Emergency Medicine is now exclusively digital.



## Register for eAlerts today

- Immediate access to new content for journal subscribers
- Search articles by specialty or subject area
- Access to multimedia

*Annals of Emergency Medicine* is an official journal of the American College of Emergency Physicians. Full online access and bonus digital features for all ACEP members can be found at [annemergmed.com](http://annemergmed.com).



American College of  
Emergency Physicians®  
ADVANCING EMERGENCY CARE



# LIVE. WORK. PLAY.

**Advocate Health is seeking  
Emergency Medicine physicians  
to join us throughout Illinois  
and Wisconsin.**

### Highlights:

- Multiple locations with easy access to Milwaukee and Chicago
- Strong support staff including RNs and APCs
- Competitive compensation with robust benefits package
- Student loan forgiveness and/or sign on bonuses available at select locations
- Full time, part time and float opportunities to fit your lifestyle
- Wide variety of cases with diverse patient populations
- Supportive specialists available in all specialties

**For more information, contact Veronica at  
[veronica.dupuis@aah.org](mailto:veronica.dupuis@aah.org) or visit [docjobs.aah.org](http://docjobs.aah.org).**

 Advocate Health Care® |  Aurora Health Care

Now part of  **ADVOCATEHEALTH**





**Emergency Medicine Residents' Association**

4950 W. Royal Lane

Irving, TX 75063

972.550.0920

[emra.org](http://emra.org)

PRSR STD  
U.S. POSTAGE PAID  
Madison, WI  
Permit No. 1457

# Committing To A Greener Future For Everyone

USACS is the First Physician Group to Sign the HHS Climate Pledge

## Experience the Future of Healthcare with USACS!

At US Acute Care Solutions (USACS), we're not just caring for your well-being today; we're dedicated to securing a healthier tomorrow—for you, your loved ones, and our precious planet.

### Why Choose USACS?

Leaders in Sustainability: We're the FIRST large physician group to take the US Department of Health and Human Services Climate Pledge. Our commitment to the environment reflects our dedication to a sustainable future.

**Exceptional Patient Care:** Our mission is to provide top-quality patient care while safeguarding the health and well-being of communities across the nation and the world.

### Join Our Journey Towards Sustainability:

Ready to be part of a team that's making a difference? Explore career opportunities with USACS today! Together, we can shape a greener, healthier future.



Visit [usacs.com/careers](http://usacs.com/careers) to learn more and join us in our mission.



**EM CAREERS  
NATIONWIDE**



**All full-time physicians are provided:**

Company stock ownership | 10% company-funded 401(k) | 24/7 on-shift clinical support

Great locations nationwide | The best health and wellness benefits | A mission that has real meaning

Learn more at: [usacs.com](http://usacs.com)