

# EM Resident

Official Publication of the Emergency Medicine Residents' Association

October/November 2019

VOL 46 / ISSUE 5

*Celebrating*



**years**



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*Richard T. Logue*

**RICH LOGUE, MD, FACEP**  
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# EMRA-fied and Proud

## 45 Years of Resident-Driven Publications

Tommy Eales, DO

Editor-in-Chief, *EM Resident*

Indiana University

@tommyeales

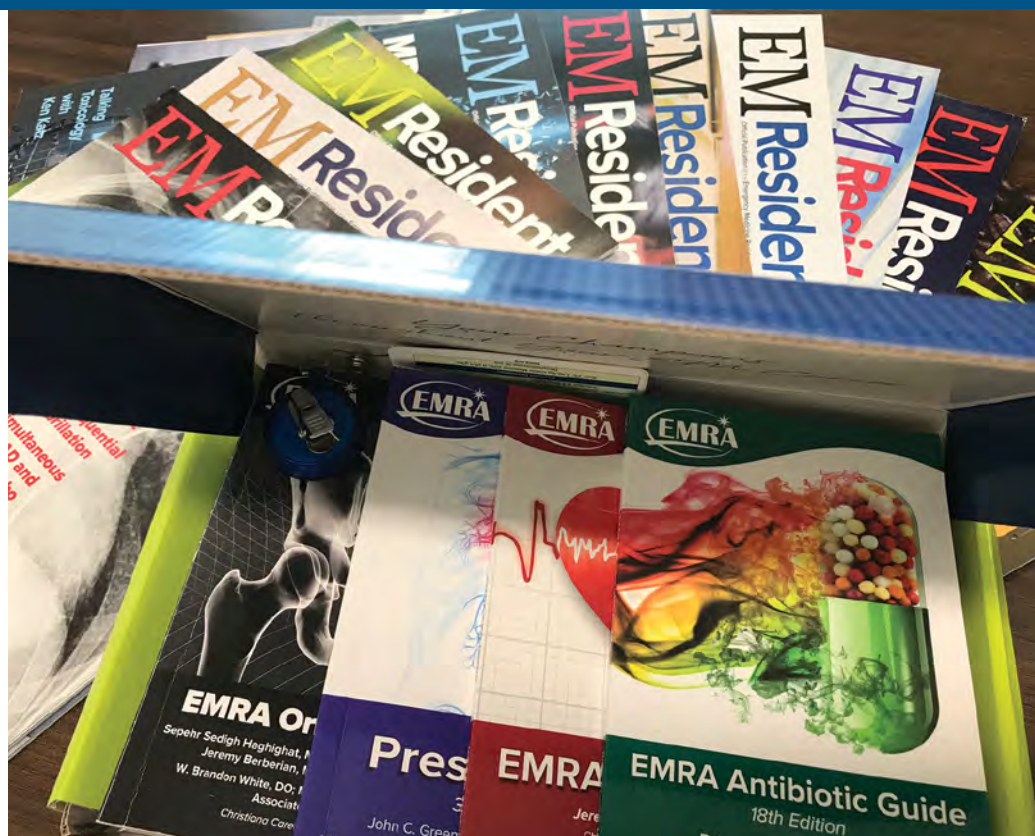
**A**s we celebrate the 45th anniversary of EMRA by recognizing 45 exceptional young leaders in the specialty of emergency medicine, it's worth taking a step back and reflecting on one of the greatest accomplishments of the organization.

Of course, we're talking about EMRA publications.

Since its first print-only newsletter iterations, *EM Resident* has grown into the largest resident-led publication in the country, with nearly 20,000 individual print subscribers and more than 30,000 unique monthly visitors to the online edition. We earned recognition on a national stage this year for our plea to address gun violence in America, winning the highest honors among a pool of entries that included commentary from U.S. ambassadors and massive, influential groups such as the AARP.

This publication not only offers a forum for clinical education and discussion of current events in the world of emergency medicine, but also paves the way for the advancement of the specialty through original research and scientific discovery. It is a channel through which EM's newest authors can develop their skills, find their voices, and contribute a vital perspective to the house of medicine.

Far from the early days as a one-person operation, *EM Resident* now has a high-functioning team of resident and fellow editors who work together every month to create the magazine in your hands. Each article we receive undergoes a rigorous peer revision process that ensures the content is not only up-to-date and accurate, but high-yield and easy to read on the go. Our team is lucky to include generous faculty members who donate their time and expert perspective on critical topics such as emergency cardiology and toxicology to ensure that residents are reading the most clinically



sound, cutting-edge, evidence-based material. With such a passionate and talented group, it will be exciting to see how far *EM Resident* will go in the next 45 years.

Magazines aside, the real magic of EMRA publications comes in the form of our popular clinical guides.

From the iconic Antibiotic Guide (a staple in every teaching ED) to new offerings like the smash-hit Ortho Guide, EMRA owes our great success with these resources to our volunteer authors and chief editors, whose dedication to helping residents succeed is unmatched.

Incredibly, every clinical resource we produce starts off as a simple pitch from a passionate EMRA member. Through a series of pilots and drafts, these wild ideas go on to become bedside references used to make life-and-death decisions. As clinicians ourselves, we understand the gravity of this and put every page of each guide through a painstaking peer review process that includes multiple

rounds of edits and ongoing revisions to ensure that the most current evidence is reflected.

That vaunted EMRA box you receive when you join the EMRA family is more than just a few quick-reference guides to make every shift easier; it represents a collective dedication to lifting up the specialty in so many ways. As with *EM Resident* magazine, our clinical library is built with the help of medical students, residents, fellows, and faculty all working together to distill complex, nuanced concepts into clear, actionable guidance. EMRA staff members offer support and assistance, and the end result is a collection that helps you become a better doctor.

So, as I conclude my term as Secretary of the Board of Directors and Editor-in-Chief of *EM Resident*, I would like to express my most sincere gratitude for the privilege of working with the incredible authors, editors, and staff that make EMRA publications world-class.

Here's to another 45 years! ★



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## UPCOMING EVENTS

- Oct. 24: EMRA Resident Councilor Mixer  
Oct. 25: Medical Student Meet-Up  
Oct. 26: Fall Medical Student Forum  
Residency Program Fair, *sponsored by Laurel Road*  
Oct. 27: EMRA Resolution Review  
Oct. 27: EMRA Committee Workshops  
Oct. 27: EMRA Job & Fellowship Fair, *sponsored by emCareers.org, Laurel Road, TeamHealth, and Vituity*  
Oct. 27: Case-Con Poster Competition  
Oct. 28: Fall Representative Council Meeting  
Oct. 28: EMRA Resident SIMWars  
Oct. 28: EMRA Party, *sponsored by Envision Physician Services*  
Oct. 29: 20 in 6 Resident Lecture Competition, *sponsored by Hippo Education*  
Oct. 29: EMRA Airway Stories, *sponsored by Vituity*  
Oct. 30: EMRA MedWAR, *sponsored by BTG*

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

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Emergency Medicine Residents' Association

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**45** EMRA  
*years*  
established 1974



# EMRA FY 2019 Annual Report

Membership: 15,625

**90%+**

of EM Residents are EMRA members

**200+** 

programs with 100% membership

**\$3M+**

annually invested into members

**14%**

revenue growth between 2018 - 2019

EMRA helps you become the **BEST DOCTOR** you can be.

**1** new comprehensive app, **MobileM**, launching winter 2019



**6** new publications



**32** books, reference cards, & mobile apps

**6** major EM conferences with EMRA presence (ACEP, LAC, CORD, EEM, EDPMA, FemInEM & EmCrit)

AND **30+** regional meetings funded in collaboration with ACEP

**21,000+**  **CAST** downloads since July 2018

**30,000+** **EMResident** unique monthly online views and print distribution of **16,000**

**500,000+**  **Match** searches of EMRA Match & Clerkship Match, Fellowship Match in development

EMRA helps you become the **BEST LEADER** you can be.

**3** new committees



totaling **20** committees

**40+** awards, scholarships & grants totalling **\$125,000+**

**120+** funded national leadership opportunities for members

**204** Leadership Academy fellows 

**400+**  **45 UNDER 45** nominations received

**5,016** members of EMRA's 20 Committees

EMRA helps EM become the **BEST SPECIALTY** we can be.

**1** All EM Resident & Student Organization, **AEROS**, created by EMRA to foster collaboration

**6** EMRA and ACEP Health Policy Academy Fellows

**9+** partnerships to advance our mission (ACEP, EMF, EMAF, NEMPAC, EDPMA, AFFIRM, FemInEM, PolicyRx, AMA)

**100+** programs with active representation in our policy-making Representative Council

**SVI** oppose further study of AAMC SVI pilot project

**Defends**

the value of residency training on the ACEP Workforce & PA/NP Scope of Practice Task Forces

Advocating for residents and faculty in the ACGME's **Program Requirements**

# Thank You!

to our **EMRA** **SPONSORS**  
**FOR A GREAT YEAR!**



SEE YOU IN DALLAS AT ACEP20!



# 45 EMRA years

established 1974

That's how long EMRA has supported physicians like you with resources in emergency medicine. You are the doctors on the front lines, holding hands and saving lives.

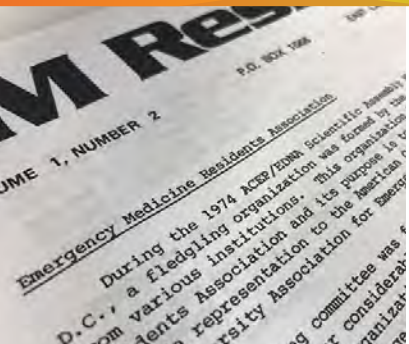


PHOTO COURTESY OF THE KANSAS CITY STAR



Residents meet with surgeon general



## 45 YEARS OF EMRA Honoring Excellence

Emergency medicine has been on a path of excellence and achievement since its inception, and EMRA has been at the forefront of that evolution from its very first meeting in 1974. We are honored to spend this year celebrating where we've been and looking forward to where we'll go in the next 45 years.

From the determined work of our original 5-member Executive Committee, EMRA has grown to be 16,000 strong. From hard-fought battles to victories that pierce the fabric of the specialty with new and innovative ideas, EMRA continues to raise the bar and be the voice for emergency medicine trainees around the globe.

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

# EMRA at ACEP19



In the 45 years since a dozen residents banded together to represent trainees at organized EM conferences, EMRA's offerings have grown a bit. We'll be hosting nearly 100 meetings and events in Denver, and we want you to be there!

## EMRA Headquarters at ACEP19

Embassy Suites, across the street from the Denver Convention Center

### Full event details

<https://emra.org/acep>

## Highlights of the Week

### Saturday, Oct. 26

7 am – Noon

1:30 – 3:30 pm

**Medical Student Forum**

**EMRA Residency Program Fair**

### Sunday, Oct. 27

9 – 11 am

10 – 11:30 am

12:30 – 5:30 pm

**Leadership Academy** — *Supported by Vapotherm*

**Resolution Review & Public Hearing**

**EMRA Committee Meetings**, including

- ★ TEE Workshop, hosted by Critical Care Committee
- ★ Pediatric Airway Skills Lab, hosted by PEM, Ultrasound, and Simulation committees
- ★ Tox in TV, hosted by Toxicology Committee
- ★ Panel discussions, competitions, planning sessions, and more!

**EMRA Case-Con Competition**, hosted by the Research Committee

**EMRA Job & Fellowship Fair**

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

12:30 – 5:30 pm

5 – 7 pm

### Monday, Oct. 28

7 am – 12:30 pm

**EMRA Representative Council and Town Hall**

- ★ Resolution debate and vote
- ★ Election of 5 new EMRA board members

9 am – 3 pm

**EMRA Resident  
SIMWARS**

10 pm – 2 am



*Supported by Envision Physician Services*

### Tuesday, Oct. 29

1 – 3 pm



5 – 7 pm

**EMRA Airway Stories** — *Supported by Vituity*

### Wednesday, Oct. 30

8 am – 5 pm



*Supported by BTG*

# EXCELLENCE IN EM

## Honoring EMRA's Fall Award Winners

As EMRA celebrates a 45-year milestone, we draw particular attention to our Fall 2019 EMRA Award recipients. Their contributions stand out in a field of high achievers, and we are proud to honor these dedicated members.

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

Jeremy Berberian, MD | Christiana Care Health System

### **Faculty Mentor of the Year**

Joshua Moskovitz, MD, MBA, MPH, FACEP | Jacobi Medical Center

### **Faculty Teaching Excellence Award**

Kelly Young, MD, MS | Harbor-UCLA Medical Center

### **Steve Tantama, MD, Military Excellence Award**

Mia Geurts, MD | Madigan Army Medical Center

### **Augustine D'Orta Humanism Award**

Kimberly Chernoby, MD, JD, MA | Indiana University School of Medicine

### **Clinical Excellence Award**

David Gregory, MD | Wellspan York Hospital

### **FOAM(er) of the Year**

Joshua Niforatos, MD, MPH | Johns Hopkins University

### **Be The Change Project Grant**

Timothy Henderson, MD | Advocate Christ Medical Center

### **EMRA Simulation Research Grant**

William Weber, MD, MPH | The University of Chicago

### **Honorary Lifetime Members**

Jeremy Berberian, MD  
Arlene Chung, MD, MACM  
John C. Greenwood, MD  
Alison J. Haddock, MD, FACEP  
Sepehr Sedigh Haghighat, MD  
Robert Hsu, MD, FACEP  
Zach Jarou, MD  
Kenneth D. Katz, MD, FACEP, FAAEM, FACMT  
Joseph Habboushe, MD, MBA

Christie A. Lech, MD, MHPE  
Brian J. Levine, MD, FACEP, FAAEM  
Richard M. Levitan, MD, FACEP  
Nathaniel Schlicher, MD, JD, MBA, FACEP  
Krystle Shafer, MD  
Laura Welsh, MD

### **TRAVEL SCHOLARSHIPS**

#### **EMRA Congressional Health Policy Fellowship**

Gururaj Shan, MD | SUNY Downstate/Kings County

#### **EMRA/ACEP Resident-Fellow Health Policy Elective**

Sachin Santhakumar, MD | SUNY Upstate Medical University

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

Blake Denley | LSU Health Sciences Center New Orleans  
Erik Kramer | Yale School of Medicine

#### **EMRA/EDPMA Scholars**

Allen Chang, MD | Stanford University Hospital  
Nicholas P. Cozzi, MD, MBA | Spectrum Health/Michigan State University  
Tehreem Rehman, MD, MPH | Advocate Christ Medical Center

#### **International EM Rotation Scholarship**

Antony Gatebe Kironji, MD, MPH, MEd | Boston University Medical Center

#### **EDDA Travel Scholars**

Nicholas P. Cozzi, MD, MBA | Spectrum Health/Michigan State University  
Mitchell Kentor, MD | Advocate Christ Medical Center  
Aidin Masoudi, MD | Maimonides Medical Center  
Arnab Sarker, MD, MBA | New York University/Bellevue Medical Center  
Natasha Thomas, MD | Harbor-UCLA Medical Center

### **CORD AA Travel Scholars**

Madeline Brockberg, MD | Boston University Medical Center

### **LAC Travel Scholars**

Michael Tetwiler, MD, MPH | Harbor-UCLA Medical Center

### **Airway Lab Scholarship**

Robert Allen, MD | SUNY Downstate/Kings County  
Matt Aronson, MD | Advocate Christ Medical Center  
Mary Bolgiano, MD | Baylor College of Medicine  
Stephanie DeMasi, MD | University of Alabama at Birmingham  
Ye Jung Ho Ferrabolli, MD | Mount Sinai St. Luke's Roosevelt Hospital Center  
Anne Flower, DO | University of Kentucky  
Timothy Henderson, MD | Advocate Christ Medical Center  
Megan Hoffer, DO | Ohio Valley Medical Center  
Stephanie Huang, MD | Mount Sinai St. Luke's Roosevelt Hospital Center  
Diana Huynh, MD | Baylor College of Medicine  
Lucinda Lai, MD | Harvard Affiliated Emergency Medicine Residency  
Yevgeniy Maksimenko, MD | Boston University Medical Center  
Kevin McGurk, MD | John H. Stroger Hospital of Cook County  
Manuel Bernal Mejia, MD | Advocate Christ Medical Center  
Carl Preiksaitis, MD | Stanford University Hospital  
Tehreem Rehman, MD, MPH | Advocate Christ Medical Center  
Bethany Ruby, DO | University of Arkansas for Medical Sciences  
Rachel Solnick, MD | University of Michigan  
David Toomey, MD | Harvard Affiliated Emergency Medicine Residency  
Olivia Zoph, MD | Emory University ★

**Monday, Oct. 28**  
**10 pm - 2 am**

*Club Vinyl*

**EMRA**

**PARTY**

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Visit Envision Physician  
Services' Booth #811  
First 500 residents receive a  
wristband for a free drink at the party.



Scientific Assembly **19**  
DENVER

The logo features a large, stylized number '45' in white with a blue shadow effect, set against a background of overlapping blue and white geometric shapes. To the right of the '45' is the text 'EMRA'S' in a smaller blue font, followed by 'UNDER 45' in a large, bold, blue font. Below this, the text 'INFLUENCERS IN EMERGENCY MEDICINE' is written in a smaller, blue, all-caps font.

**45** EMRA'S  
**UNDER 45**  
INFLUENCERS IN EMERGENCY MEDICINE

**As EMRA celebrates  
45 years of supporting the future  
of emergency medicine, we recognize  
45 Under 45 Influencers in Emergency  
Medicine (#EMRA45u45).**

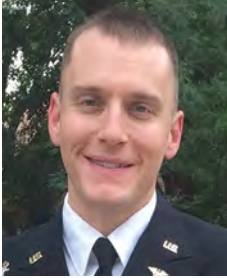
**We're excited to introduce you to these  
outstanding young physicians whose  
contributions embody the spirit of the  
specialty. We can't wait to experience  
the world they will bring us!**

**Let's peek into the future...**

*More than 400 applications were reviewed by the selection committee, comprising Steven J. Stack, MD, MBA, FACEP; Zach Jarou, MD; Omar Z. Maniya, MD, MBA; Hannah Hughes, MD, MBA; Ven Subramanyam, MD; Erin Karl, MD; and Jazmyn Shaw. The selection committee was blinded to EMRA and/or ACEP membership status. Care was taken to ensure both a diverse applicant pool and awardee group. For any questions, contact Cathey Wise at [cwise@emra.org](mailto:cwise@emra.org).*

## Michael April, MD, PhD, MSc, FACEP

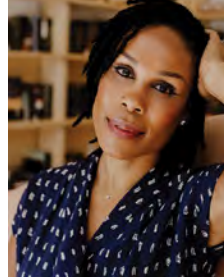
Major, United States Army  
San Antonio Uniformed Services Health  
Education Consortium



Decorated veteran Mike April is a United States Military Academy graduate, an American Rhodes scholar (2005), and an alumnus of the University of Oxford and Harvard Medical School. As Assistant Residency Program Director for Research he not only fosters current research but also prepares medical scholars of the future.

## Uché Blackstock, MD

NYU School of Medicine  
Advancing Health Equity, LLC



Addressing inequity in health care has become the focus of Uché Blackstock's career — as a clinician, an educator, a public speaker, and the founder of Advancing Health Equity, LLC. Reaching out and standing up for those in need is a legacy passed from Dr. Blackstock's parents (especially her forever role model, her late mother) to her students, colleagues, and the next generation of physicians.

## Nicole Battaglioli, MD, FAWM

University of Kentucky  
ALiEM



As outgoing ALiEM Wellness Think Tank COO, Nicole Battaglioli has devoted considerable time and brainpower to defining and improving resident wellness. Along with being an Assistant Professor of Emergency

Medicine, Dr. Battaglioli is the CEO/founder of Komorebi Coaching, lover of wilderness medicine, and promoter of super-heroines, living life as “an energetic force for good” in EM.

## Kimberly A. Chernoby, MD, JD, MA

Indiana University Emergency Medicine  
Chief Resident



After earning a master's degree in bioethics from NYU, Kimi Chernoby became the first graduate of the combined MD/JD program at the University of Florida. In addition to chief resident duties at IU, she is serving on the AMA Council on Ethical and Judicial Affairs and as a trustee for the Indiana State Medical Association. She advocates passionately for patients' rights.

*She is one of the rare types whose spirit shines through in all the work she does.*

## Arlene Chung, MD, MACM, FACEP

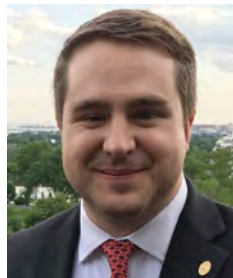
Maimonides Medical Center EM Residency  
Program Director



Nationally recognized speaker and educator Arlene Chung has championed physician wellness through lectures, teaching, policy development, and innovation. She's editor-in-chief of the EMRA Wellness Guide, outgoing Chief Strategy Officer for the ALiEM Wellness Think Tank, chair of the ACEP Well-being Committee, and one of the most effective motivators in medicine.

**Christian Dameff, MD, MS**

*UC San Diego Health  
Clinical Informatics Fellow*



Hacker, security researcher, and CyberMed Summit co-founder Christian Dameff is making waves in the world of medical cybersecurity, aiming to protect the integrity of medical devices and infrastructure. He is a clinical informatician and oft-quoted researcher who is defining the still-emerging role of Medical Director of Cybersecurity — all while pioneering technology-based innovations.



**Cedric Dark, MD, MPH, FACEP**

*Baylor College of Medicine  
Policy Prescriptions®*



Policy Prescriptions® founder/executive editor Cedric Dark is a well-known presence in health policy circles, producing a podcast for AAEM, leading the EMRA+PolicyRx Health Policy Journal Club, and writing a regular column for *ACEP Now*. Called the “Obi-Wan Kenobi of health policy,” his work inspires the next wave of advocates as he demonstrates how to turn theory into action.

**Hilary Fairbrother, MD, MPH, FACEP**

*McGovern School of Medicine  
UTHealth – Houston*



Hilary Fairbrother is a strong believer in every individual’s ability to make a difference. It’s how she frames her work in academic medicine, her leadership as chair of the AMA’s Young Physicians Section, and her approach to helping new leaders rise. When not focused on patients and policy, she’s enjoying life with her husband, toddler, 2 Italian greyhounds, and 3 post-Hurricane Harvey cats.

**Carrie de Moor, MD, FACEP**

*Code 3 Emergency Partners*



The nation’s 4th-busiest airport (DFW International) made history in 2018 when it became the first in the world to have its own emergency room, thanks to Carrie de Moor’s Code 3 ER and Urgent Care. Focusing on “patients, not profit,” she’s at the forefront of free standing EDs, urgent care provision, and medical entrepreneurship, standing up for the independent practice of medicine and revolutionizing the future of the specialty.

**Jeremy Faust, MD, MS, MA**

*Harvard Medical School  
ACEP Now*

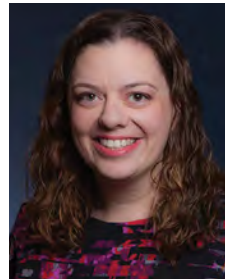


As a noted music scholar, board president of a Grammy-winning vocal ensemble, and worldwide author/editor, Jeremy Faust embraces the humanities as a common denominator among all humans. Look to this newly minted *ACEP Now* medical editor-in-chief to frame the specialty’s key conversations with evidence, practicality, compassion, and inspiration or, depending on the day, sarcasm).

*Her power to influence action is strengthened by the way she mentors rising leaders.*

### **Alison Haddock, MD, FACEP**

*Baylor College of Medicine  
ACEP Board of Directors*



ACEP Board member Alison Haddock has been a health policy enthusiast since her days as an EMRA Board member, and she's instilling the same regard in her students and residents at Baylor College of Medicine.

As an editor-in-chief of EMRA's Advocacy Handbook, Dr. Haddock teaches the specialty why advocacy matters — and how to get involved.

### **Cleavon Gilman, MD**

*Weill Cornell Medical College  
Emergency Medicine Resident*



Cleavon Gilman was 12 when he attended LL Cool J's summer camp and discovered rap music eased his battle with stuttering. Fast-forward through school, then a Marine Corps deployment to Iraq as a

combat medic, then EM residency, and you now find a physician passionate about helping colleagues and patients unburden themselves through "scholar rap."

### **Amy Faith Ho, MD**

*John Peter Smith Hospital  
Integrated Emergency Services*

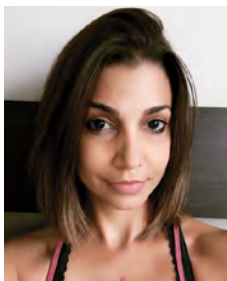


Fans of "Untold Stories of the ER" will recognize Amy Faith Ho as a physician who goes the extra mile to answer her patients' questions and set their minds at ease. Those traits serve her well as an educator, lecturer, podcaster, and defender of patients'

right to equal care. Her influence extends through national media and direct mentorship in EM.

### **Alin Gragossian, DO, MPH**

*Drexel University College of Medicine  
Emergency Medicine Resident*



Resiliency has a face: In less than 12 months, Alin Gragossian went from being a busy resident planning for a critical care fellowship to being a heart transplant recipient. Then, mere days before resuming

"life after transplant" with a return to shifts, her residency program at Hahnemann University Hospital disintegrated. And yet, she says, "life is beautiful."

### **Paul Jhun, MD**

*University of California San Francisco  
Hippo Education*



If you thrive on learning outside the lines in EM, you've likely benefited from Paul Jhun's work. He is an award-winning educator who is well-versed in learning theory — and motivated to make medical education a

multimedia experience. He believes in death to PowerPoint (instead of death by PowerPoint), conversational learning, and the power of having someone believe in you.



**Dara Kass, MD, FACEP**

*Columbia University  
FemInEM Founder*



Gender equity — for physicians and patients alike — drove Dara Kass to found FemInEM, co-author “Olivia Otter Builds Her Raft,” lecture around the globe, and become a social media influencer. She campaigns tirelessly to lift up women in EM. This fearless educator and clinician reached peak fierceness, as a living donor when her son needed a liver transplant.

**Alicia Mikolaycik Kurtz, MD**

*Mercy San Juan Medical Center  
Real Talk podcast*



Spend 5 minutes with Alicia Kurtz and you'll believe she can change the world. Spend 10 minutes with her and you'll know *you* can, too. Such is the gift of this natural motivator whose favorite approach to the status quo is to shake it up. Her leadership helped EMRA to level up, and she has turned that energy toward practice-changing improvements in health care administration.

**Seth Kelly, MD, MBA**

*University of Maryland  
Emergency Medicine Resident*



Seth Kelly remembers the patient who pushed him out of his business career/volunteer firefighter role and into full-time medicine. That same experience — when he calmed and freed a child trapped in wreckage — is what propels him toward an EMS fellowship and a career in prehospital medicine. Always quick to highlight teammates and strive for the greater good, he leads through service.

**Aisha Liferidge, MD, MPH, FACEP**

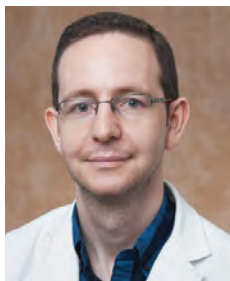
*George Washington University  
Dr. Aisha Liferidge Minority Women  
in Science Foundation*



ACEP Board member Aisha Liferidge is shining a light on diversity and inclusion through mentorship, leadership, and advocacy. She is the director of the Health Policy Fellowship at George Washington University and CEO of a nonprofit that empowers the dreams of future leaders interested in a career in science.

**Alex Koyfman, MD, FACEP**

*UT Southwestern  
emDocs*



FOAMed got a boost when Alex Koyfman co-founded emDocs, a website dedicated to the timely discussion of current evidence for practicing emergency medicine. With a keen interest in resident and faculty development, he also serves on ACEP's Education Subcommittee, writes for Emergency Physicians Monthly, and keeps a sharp eye out for future authors.

*“What makes him an influencer? Commitment, passion, humility, integrity, and vision - he's an inspiration.”*

## Michelle Lin, MD, MPH, MS, FACEP

Icahn School of Medicine at Mount Sinai  
Mount Sinai Beth Israel



As Chair-Elect of the Clinical Emergency Data Registry Committee, Michelle Lin helps direct the largest qualified clinical data registry in EM. She is also VP of Communications for the Academy of Women in

Academic Emergency Medicine and has served as a fellow and consultant within the Centers for Medicare and Medicaid Innovation (CMS/CMMI) Seamless Care Models group.

## Jessica Mason, MD

UCSF Fresno  
EM:RAP



Jess Mason has been seeking better ways to learn (and teach) since medical school, rising from a student podcaster to Deputy Editor of EM:RAP. She directs the EM Education Fellowship at UCSF-Fresno, influencing

the educators of tomorrow and pushing the boundaries of med-ed innovation. Within her community, she takes to the airwaves to promote public health and careers in medicine.

“Many emergency physicians influence EM regionally, but how many change the care of an entire country?”

## Abhi Mehrotra, MD, MBA, FACEP

University of North Carolina



Abhi Mehrotra, Vice Chair of Operations and Strategic Initiatives at UNC EM and chair of ACEP's CEDR Committee, strives to improve patients' lives through health care administration — and a

healthy dose of teamwork. Entrepreneurship is high on his list of accomplishments, as is research and public service. He has become known for an old email signature: “No act of kindness, no matter how small, is ever wasted.”

## Andrew (Andy) Little, DO

EMP of Franklin County/Doctors Hospital  
EM Over Easy



FOAMED star Andy Little tackles topics from every spectrum of EM. When he's not teaching on shift you can find him planning weekly conference at Doctors Hospital, podcasting for the show EM Over Easy (one

he co-founded in 2016), planning regional and national events, and mentoring the folks from EMRA•Cast. He believes in hard work, accepting a helping hand, and paying it forward.

## Rockefeller Acheampong Oteng, MD, FACEP, FGCS

University of Michigan



Ghana-born and Washington, D.C.-raised Rockefeller Oteng has built emergency medicine in his native country one trainee at a time — starting with global health outreach and continuing through a Fogarty Fellowship

supported by the National Institute of General Medical Sciences. He is working to improve care throughout sub-Saharan Africa and establish lasting roots for the specialty of EM.

**Rick Pescatore, DO, FAAEM**

*Crozer-Keystone Health System  
Mullica Hill Advanced Therapies*



If you've ever deconstructed Disney movies to form a differential for the main characters, you need to compare notes with Rick Pescatore. He's fully immersed in academic medicine and evidence-based practice (not to mention parenting). With podcasts, research articles, commentaries, and social media, he boldly drives conversation about public health — and pineapple on pizza.

**Salim Rezaie, MD, FACEP**

*Greater San Antonio Emergency Physicians  
REBEL EM and The Teaching Institute*



Double-boarded EM/IM attending Salim Rezaie changed the specialty when he founded Rational Evidence Based Evaluation of Literature in Emergency Medicine (REBEL EM). His contribution to FOAMed is legendary — as is mentorship: “He let me shadow him (my first EM shifts ever). I didn't know I was in the presence of greatness, because that's not how he carries himself.”

**Ali Raja, MD, MBA, MPH, FACHE**

*Massachusetts General Hospital  
Harvard Medical School*



Ali Raja, a world-renowned researcher focusing on ED resource utilization, is the current editor-in-chief of *NEJM Journal Watch* and a frequent lecturer at conferences ranging from ACEP Scientific Assembly to

FemInEM Idea Exchange. His path to medicine also includes time in the United States Air Force, where he was deployed as critical care air transport commander.

*He is the epitome of a FOAM community influencer, often cited on “who to follow” lists.*

**Megan Ranney, MD, MPH, FACEP**

*Brown University  
AFFIRM, Founder*



Though it was the NRA's infamous “stay in your lane” tweet that galvanized the medical community, Megan Ranney has been focused on gun violence prevention since 26 children and staff members were shot to death

at Sandy Hook Elementary School. Following the Las Vegas shooting of 2017 she co-founded AFFIRM, and she serves as a positive, uniting presence in the national debate of gun safety.

**Ryan Ribeira, MD, MPH**

*Stanford University  
SimX*

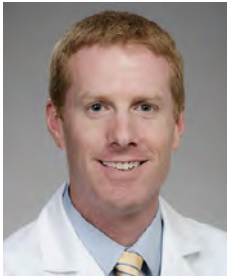


As a clinical instructor, a recent AMA board member, a leader in California organized medicine, and a businessman, Ryan Ribeira is working to improve medicine from nearly every angle. That same 360-thinking led him to

found med-ed tech startup SimX, devoted to high-def virtual training using VR and AR, with an eye on tomorrow's advancements today.

## Jeff Riddell, MD

*University of Southern California*



EMRA's Quiz Show and 20 in 6 Resident Lecture Competition — dreamed up during Jeff Riddell's time on the EMRA Board — illustrate his approach to engaging, dynamic education. He has become

a well-known lecturer with Essentials of EM and ALiEM, while also publishing widely within the specialty. He encourages a broad approach to improving patient care by improving the training experience.

## Hon. Nathaniel Schlicher, MD, JD, MBA, FACEP

*Northwest Emergency Physicians of TeamHealth*



When the University of Washington balked at admitting 17-year-old college graduate Nathan Schlicher to medical school, he used the time (2 whole years) to get a law degree. He was the youngest member of the

State Senate in Washington, president of multiple associations, editor-in-chief of the Advocacy Handbook, and a tireless voice for patients.

## Hon. Jon Santiago, MD, MPH

*Boston Medical Center  
Massachusetts Legislature, 9th Suffolk District*



During his final year of residency, Jon Santiago unseated a veteran Massachusetts legislator to become the State Representative from the 9th Suffolk District, becoming one of a handful of EM

physicians-turned-lawmakers. He wants to focus on recognizing health care disparities in the community and working to combat the opioid crisis.

## Gillian Schmitz, MD, FACEP

*F. Edward Hebert School of Medicine,  
Uniformed Services University  
Brooke Army Medical Center | UT-San Antonio*



As a recipient of EMRA's Faculty Mentor of the Year Award, ACEP Board member Gillian Schmitz is widely known as someone willing to take the time to mentor, connect with colleagues, and advocate for patients and the

specialty on every level - making the phrase "I wouldn't be where I am without her" common in many circles.

*“She is a truly stellar role model, both for leadership style and clinical skills.”*

## Jeremiah Schuur, MD, MHS, FACEP

*Alpert Medical School,  
Brown University/Lifespan*



Jay Schuur, chair of Emergency Medicine at the Alpert School of Medicine, has become a noted force in health policy and quality improvement. He led emergency medicine to adopt the Choosing Wisely

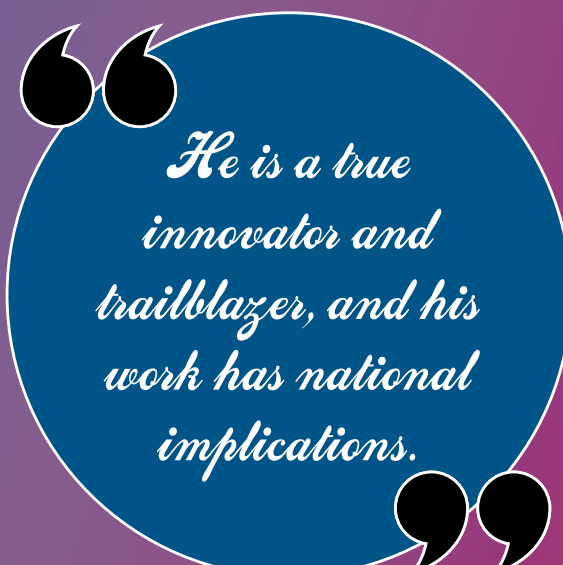
campaign, and his list of publications and editorial roles scrolls for miles. Equally important are the understanding and guidance he offers his colleagues and students alike.

**Kirstin Woody Scott, MPhil, PhD**

Harvard Medical School  
University of Washington visiting scholar



Fourth-year medical student Kirstin Scott has a passion for public health, research, and policy — and the experience to impact all three. She serves on the Liaison Committee on Medical Education, is a visiting scholar at the Institute for Health Metrics and Evaluation, and is a senior research fellow for the University of Global Health Equity in Rwanda.



*He is a true innovator and trailblazer, and his work has national implications.*

**Rahul Sharma, MD, MBA, CPE, FACEP**

New York Presbyterian – Weill Cornell Medicine



One of the many ways Rahul Sharma hopes to improve patient care — in addition to training excellent physicians under his leadership as Chair of Emergency Medicine — is by increasing access to that care. The telemedicine programs he has piloted are directly impacting patients in New York, and his ED Express Care Service is held up as a model of the future of medicine.

**Ryan Stanton, MD, FACEP, FAAEM**

Central Emergency Physicians  
Lexington Fire/EMS



Fans of ACEP Frontline know Ryan Stanton has a big voice — which he uses to tackle the topics EM physicians face in the trenches. He also brings medicine to the masses through “The Doc Is In,” a TV program airing in 6 markets. His 28 years of media experience inform his service to the specialty as he works daily to serve his community via clinical shifts.

**Donald Stader III, MD, FACEP**

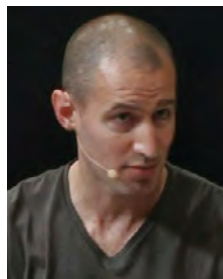
Swedish Hospital, CarePoint  
Stader Opioid Consulting



The Emmy award-winning 24/7/365: *The Evolution of Emergency Medicine* documentary owes its existence to former EMRA President Don Stader, who has gone on to produce the soon-to-be-released *Palliative* and serve as editor-in-chief of ACEP’s 50th anniversary tome *Bring ‘Em All*. Clinically, he is a national leader in developing guidelines to prevent opioid overuse.

**Reuben Strayer, MD, FRCPC, FACEP, FAAEM**

Maimonides Medical Center  
EMupdates.com



Nearly-native Texan Reuben Strayer trained in Montreal — where “balmy” weather helped him focus on a flashcard project that gave rise to the popular EMupdates.com blog. Current interests (on top of FOAMed) include airway management, procedural sedation, “sweeping generalizations, and jalapeno peppers.”

**Anand Swaminathan, MD, MPH, FACEP**

*St. Joseph's Emergency Medicine  
EM:RAP, REBEL EM, EMA*



You can't go more than 2 clicks in the FOAMed world without running into Anand Swaminathan. REBEL EM, EM:RAP, EMA, Life in the Fast Lane, emDOCs, Core EM, The SGEM — he's contributed to all of those and more — all while excelling at his "day job" as Fellowship Director of both the Clinical Educator and Medical Education fellowships at St. Joseph's.

**Scott Weingart, MD, FACEP, FCCM**

*Renaissance School of Medicine  
at Stony Brook  
EMCrit*



"Titles and Other Bulldung" is the headline for the autobiography page on Scott Weingart's website. It's vintage for this critical care specialist and med-ed giant whose podcast, EMCrit, has become a staple for every student and practitioner interested in critical care medicine and resuscitation.

**Seth Trueger, MD, MPH, FACEP**

*Northwestern University  
JAMA Network Open*



When JAMA Network Open needed a digital media leader, they sought out Seth Trueger, who reaches 28,500+ people on Twitter as @MDAware, and thousands more as a social media editor for Emergency Physicians Monthly. While dynamic and entertaining, he is also fundamentally committed to improving patient care through policy, evidence-based practice, and simple common sense.

**Jennifer Wiler, MD, MBA, FACEP**

*University of Colorado*

*UCHealth CARE  
Innovation Center™*



Jennifer Wiler is the lone EM physician on the HHS committee tasked with recommending physician-focused payment models. She is also Executive Vice

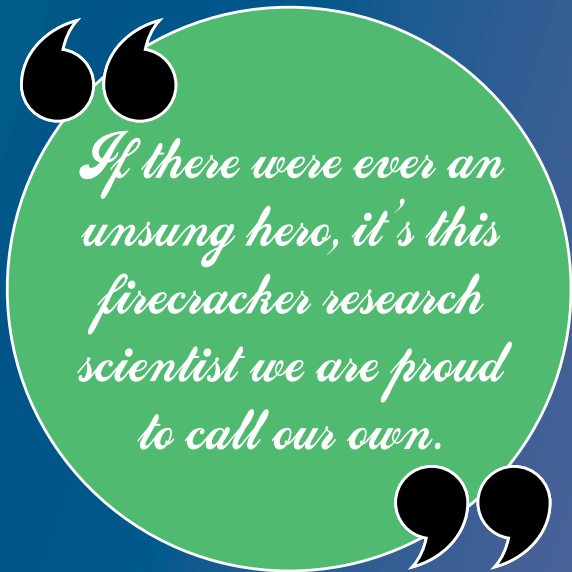
Chair for EM at the University of Colorado, a professor in the School of Business, and co-founder/executive director of UCHealth CARE Innovation Center, a unique venture that brings together health care and technology innovations.

**Arjun Venkatesh, MD, MBA, MHS**

*Yale Emergency Medicine*



When residents seek you out to help them with mock fellowship interviews and even residency roasts, it's a sign you have arrived in academic medicine. Arjun Venkatesh fills those roles while leading E-QUAL, a CMS-funded initiative for quality improvements in more than 1,000 EDs in America. A powerhouse of EM policy, he has garnered \$6 million+ in funding to improve the specialty nationwide, and his work will impact generations of physicians.



# 45 EMRA years

established 1974

That's how long EMRA has supported physicians like you with resources in emergency medicine. You are the doctors on the front lines, holding hands and saving lives.

**1974** Joseph F. Waeckerle, MD and others had an idea to form an organization for emergency medicine residents. EMRA was born.

**1975** Residents joined this new organization for \$15. By the end of the decade, EMRA boasted 269 resident and 14 medical student members.

**1982** EMRA officers manned a booth at Scientific Assembly that featured a bulletin board with job opportunities.

**1988** Hurricane Gilbert hit Jamaica. EMRA members secured and transported medical supplies to Montego Bay.

**1994** EMRA hosted the first Medical Student Forum. Membership soared to 2,581.

**2000** Membership explodes to 4,320. By the end of the decade, another 2,145 were added to the EMRA membership roster.

**2005** Hurricane Katrina strikes the U.S. Gulf Coast. EMRA collected textbooks for residents and medical students to replace those lost at LSU and Tulane University.

**2013** EMRA debuted the landmark documentary, *24/7/365 – The Evolution of Emergency Medicine*. The film tells the story of the specialty's maverick founders.

**2016-PRESENT** Multiple on-shift guides and publications are published including EMRA's *EM Fundamentals*, *EKG Guide*, and *EMRA and ACMT Medical Toxicology Guide*. Membership exceeds 15,000 and EMRA now funds 111 leadership positions.





# So I Watched CHERNOBYL... Now What?

## Revisiting Acute Radiation Syndrome

### Leslie Crosby, MD

Crozer Chester Medical Center Emergency  
Department  
@LeslieCrosbyMD1

### Laura Roper, MD

EMRA Toxicology Committee Chair, 2019-2020  
Crozer Chester Medical Center Emergency  
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### Dorian Jacobs, MD

Crozer Chester Medical Center Emergency  
Department, Medical Toxicology

### Introduction

Although more than 119 million U.S. residents live within 50 miles of a nuclear power plant, most emergency physicians are unfamiliar with management of radiation-related injuries, including mass casualty from nuclear accidents.<sup>1</sup> Military attacks or natural disasters affecting civilian nuclear power plants are extremely unlikely. However,

physicians ought to be prepared to care for the more plausible patient injured from working in an industrial, military, research, or medical setting with known radiation risks. Alternatively, cases of radiation sickness have occurred as a result of patients unwittingly handling discarded radiation sources.<sup>2</sup>

### Pathophysiology of the Effects of Radiation

Radiation injury is caused by deposition of energy in tissues, which promotes free radicals and disruption of DNA and other cellular structures. Radiation exposure can occur through inhalation, ingestion, and transdermal absorption.<sup>3</sup> However, body parts and tissues are not affected equally. Rapidly proliferating cell lines such as intestinal mucosa and bone marrow are most immediately sensitive to radiation

and manifest the symptoms of Acute Radiation Syndrome. Exposure to less than 1 Gy (1 Gy = 100 rads) is unlikely to produce symptoms, whereas greater than 10 Gy is fatal. Exposure to radiation over time increases the risk of eventual malignant transformation.<sup>4</sup>

### Progression of Illness

The *prodromal phase* of acute radiation sickness occurs within minutes to days of exposure to at least 1 Gy. During the *latent phase*, symptoms appear to improve or abate for several days to a month. The *manifest phase* lasts from hours to months and features the most severe symptoms.<sup>3</sup> Increasing doses of radiation leads to acceleration of the timeline such that exposure to higher levels of radiation can lead to immediate prodromal symptoms as well as progression to the manifest phase



within hours to days. This accelerated sequence is almost uniformly fatal.

## Management

### CONSULT SPECIALISTS

As soon as possible, recruit the help of your designated hospital radiation safety officer and toxicologist.

The Radiological Assistance Program of the U.S. Radiation Emergency Medical Management (REMM) has a 24-hour hotline available at **202-586-8100**, which offers specialized assistance and reporting.

The U.S. Department of Energy Radiation Emergency Assistance Center/Training Site (REAC/TS) is also available to assist 24/7 at **865-576-1005**.

Colleagues from radiology, hematology-oncology, trauma surgery, and burn centers may provide additional expertise in these cases.

### DECONTAMINATION

Personal protection equipment should include disposable scrubs with taped seams, shoe covers, hats, masks, and goggles. Staff should wear a personal dosimeter to monitor exposure. The goal of decontamination is to reduce the level of contamination to twice the level of background radiation or until subsequent attempts fail to reduce the level of contamination by less than 10%, or according to consultant guidance.<sup>4</sup> Removal of clothing should reduce the level of external contamination by 90%.<sup>7</sup> Residual radiation contamination is then evaluated by passing a Geiger counter at a constant distance from the skin over the entire body. Residual contamination is then removed by gently cleaning the skin and hair with soap and warm water to avoid damaging the skin.

Cover any open wounds to prevent further contamination via runoff. Irrigate abrasions and puncture wounds with saline. Lacerations may require excision if standard irrigation is ineffective. Wounds containing impacted radioactive shrapnel require special care in order to avoid healthcare staff exposure. At times, amputation may be required to adequately remove the source of radiation from the penetrating wound.<sup>4,6</sup>

### BIODOSIMETRY

A detailed history, including the source of radiation, the distance from the source, and how the patient was exposed, is critical to determine the course of treatment. Time to onset of symptoms can help estimate the exposed dose of radiation. Severity of exposure can be estimated based upon time to emesis; survival is inversely related to radiation dose. Emesis that occurs greater than 4 hours after exposure typically predicts a more mild course of sequelae. Emesis within 2 hours predicts at least 3 Gy dose of radiation. Clinicians typically closely follow the absolute lymphocyte count, since it predictably correlates with the amount of exposure to radiation in a dose-dependent manner. Though less frequently used in clinical practice, the gold standard for biodosimetry is the lymphocyte chromosomal dicentrics assay. The assay requires a culture of 48-72 hours to yield results and may be ordered through the Radiation Emergency Assistance Center/Training Site.<sup>8,9,10</sup> The REMM App has useful decision tools for quickly estimating exposure of radiation based upon time to emesis, lymphocyte kinetics, and chromosomal dicentrics assay.

### Treatment

Manage ABCs first. Treatment of life-threatening conditions has priority over treatment of radiation-related injuries.<sup>11</sup> As soon as possible, obtain

baseline CBC with differential and platelet count and repeat every 2-3 hours for the first 48 hours to continue to monitor for declines in lymphocytes. Obtain type and screen for HLA typing, in case transfusions are required. Obtain routine urinalysis and basic metabolic panel to determine baseline renal function. Swab body orifices to determine whether internal exposure has occurred. Collect 24 hour sample of urine for 4 days for radionuclide identification.<sup>12</sup>

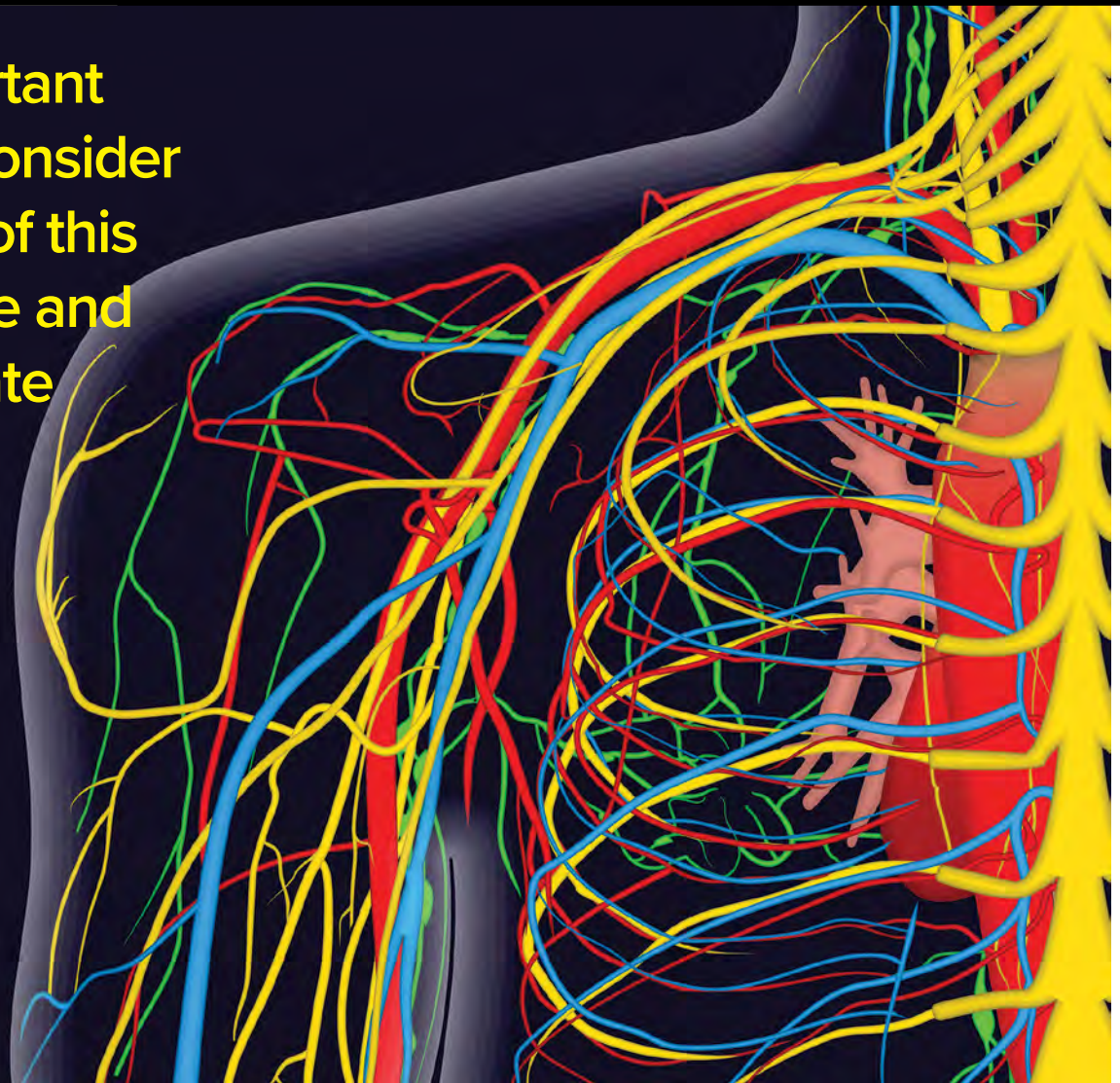
Supportive care and resuscitation should include antidiarrheals, fluids, electrolytes, non-NSAID analgesics, and burn care. Radiation experts may recommend cathartics, gastric lavage, and activated charcoal if ingestion is suspected. Any surgical intervention should occur within 36 hours of exposure.<sup>3,14,12</sup>

Any blood products administered should be leukoreduced and irradiated. Internal contamination treatment is determined by the specific radionuclide contaminant. For instance, if the patient was exposed to radioiodines, potassium iodide should be administered within 4-6 hours of exposure.<sup>3</sup> If estimated exposure is greater than 2 Gy, consider human leukocyte antigen testing in anticipation of future pancytopenia management. Consult radiation experts and hematology to determine if granulocyte colony stimulating factor is indicated and the recommended regimen.<sup>12</sup> ★

### TAKE-HOME POINTS

- Radiation injury promotes free radicals and disruption of DNA and other cellular structures
- Rapidly proliferating cell lines such as intestinal mucosa and bone marrow are most immediately sensitive to radiation
- Recruit help as soon as possible from local and national institutions, including your toxicology service, radiation safety officer, REMM and REAC/TS.
- Decontaminate
- Download the REMM app to estimate the amount of radiation exposure
- Important diagnostic tests are CBC with differential repeated every 2-3 hours for the first 48 hours to continue to monitor for declines in lymphocytes, type and screen, urinalysis and basic metabolic panel
- Treat with supportive and symptomatic care including antidiarrheals, IVF, replete electrolytes, non-NSAID analgesics, and burn care
- If blood products are administered, they should be leukoreduced and irradiated.

It is important that we consider the risks of this procedure and appropriate patient selection.



## Risk Awareness in the Interscalene Nerve Block

**Heather Roesly, MD**  
Denver Health  
Emergency Medicine Residency

**Spencer Tomberg, MD**  
Emergency Medicine/  
Sports Medicine Physician  
Denver Health Medical Center

Interscalene nerve blocks have recently been popularized as a technique to facilitate shoulder reductions in the emergency department. The procedure involves recognizing the brachial 5th, 6th, and 7th roots of the brachial plexus where they lie between the anterior and middle scalene muscles on the inferior/anterior neck. After the 5-7th roots are visualized,

anesthetic is infiltrated around the nerves. This procedure has been shown to be of particular utility in shoulder reductions in the ED, with multiple studies illustrating decreased emergency room length of stay with the use of regional anesthesia compared to procedural sedation.<sup>1</sup> While this is an important finding, especially among emergency physicians working in overcrowded EDs with long wait times, **it is important that we consider the risks of this procedure and appropriate patient selection** prior to popularizing its use, just as we have done with procedural sedation. While

the benefits of the procedure are being promoted, the risks of the procedure have not been fully explored in the emergency medicine literature.

Interscalene nerve blocks were developed for analgesia prior to shoulder surgeries. As emergency physicians have broadened their skill sets with ultrasound (US)-guided regional nerve blocks, the procedure has become a tool available in the ED. When performed under direct real time visualization, there has been an increase in its success rate in the hands of less experienced physicians, and there has been a significant decrease in the

potential risks of the procedure.<sup>2</sup>

Traditionally, interscalene blocks are performed under US guidance in the emergency department. This should only be considered after complete neuromuscular examination of the extremity, as regional anesthesia will limit any further assessment after administration. A complete view of the brachial plexus should be obtained in the interscalene position with administration of anesthetic performed under in-line visualization until envelopment of the brachial plexus is identified. Choice of anesthetic agent varies given the different length of actions; however, use of shorter-acting anesthetics seems to make sense in the setting of a short procedure with limited post-procedural pain. Prior to anesthetic administration, it is important to identify all important nearby structures to ensure these are avoided during the procedure.

### Vasculature

The addition of US guidance and Doppler imaging has greatly assisted in the identification of vasculature in the area. Prior to administration of anesthetic, it is important to identify the carotid artery and the internal jugular vein. These are often out of the in-line view as they are more medial structures, but should be identified prior to initiation so that the performing physician can be aware and comfortable with their location. These should be avoided throughout the procedure, not only to decrease risk of bleeding or vessel injury, but also to ensure against inadvertent intravascular injections of anesthetic which can have a dose-dependent direct cardiovascular toxic effect.

### Phrenic Nerve

While the phrenic nerve is often a considered structure in this area, its vicinity cannot be appreciated enough, especially when considering potential candidates for this procedure. As the phrenic nerve courses along the brachial plexus on its path to innervating the diaphragm, consideration of its paralysis or injury must be emphasized. Paralysis of the phrenic nerve secondary to anesthetic administration or direct injury can lead to hemiparalysis to the

diaphragm. This is thought to be more directly correlated with anesthetic volume and cranial spread of anesthesia along the muscle fascia rather than secondary to direct injury.<sup>3</sup>

Several studies have shown decreased pulmonary function in the majority of patients post-interscalene blocks, suggesting that phrenic nerve paralysis can be an expected consequence of this procedure.<sup>4</sup> There was no observed difference in this rate in comparison of the anterior or posterior US-guided approach. It is postulated that decreasing volumes of anesthetic may decrease this effect.<sup>4</sup>

While this may not have a huge role in otherwise healthy individuals, it can have drastic effects on ventilation in patients with already limited pulmonary function. Its effect on obese patients, those with

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**As emergency physicians have broadened their skill sets with ultrasound (US)-guided regional nerve blocks, the procedure has become a tool available in the ED.**

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hypoventilation, and those with primary lung disease (especially with oxygen requirements) must be considered prior to the procedure.

### Dorsal Scapular Nerve

Although phrenic nerve injury is a well-known and respected possible complication of interscalene blocks, the long thoracic and dorsal scapular nerves are less often discussed. The dorsal scapular nerve (DSN) supplies innervation to the levator scapulae and rhomboid muscles. It is derived from the 5<sup>th</sup> cervical nerve root and can be identified via US at the 6<sup>th</sup> cervical root level, usually as a hyperechoic structure within the middle scalene muscle.<sup>5</sup>

Injury can lead to a chronic pain syndrome in these patients, with upper

back and shoulder pain and varying levels of functional impairment.<sup>6</sup> Traditionally, injury to the scapular nerve was avoided by the use of muscle stimulation/twitching, which is not usually utilized in the emergency department. This makes awareness and US identification all the more important so this structure can be avoided.

### Long Thoracic Nerve

The long thoracic nerve (LTN) innervates the serratus anterior and is derived from the 5<sup>th</sup> and 6<sup>th</sup> cervical roots. It runs in close proximity to the DSN as described above, but is generally deeper, usually between the 6<sup>th</sup> and 7<sup>th</sup> cervical roots within or close to the middle scalene muscle. Injury of LTN can also contribute to a chronic pain syndrome with serratus anterior palsy. This can impair shoulder elevation and can lead to impingement syndromes.<sup>6</sup>

**It is important to consider all structures near the brachial plexus when performing interscalene blocks.** One Korean study showed that during a standard US-guided posterior brachial plexus block approach, the DSN was encountered as much as 60% of the time, and the long thoracic nerve was encountered up to 21% of the time.<sup>7</sup> While this finding was identified under nerve stimulation and may overestimate associated risk of injury, it is important to consider this as a very viable complication of the procedure, even under US guidance, especially when the nerves are not identified prior to performing the procedure.

The utility of interscalene blocks in shoulder reductions is being recognized in the emergency department. It is important to be clear of surrounding neurovascular structures and to understand potential complications of this procedure prior to adopting it. Vascular structures should always be identified and avoided under US guidance. Potential patients should be screened for underlying pulmonary disease prior to the administration of anesthetic as phrenic nerve paralysis can be an expected complication of the procedure. Being able to recognize the DSN and LTN can help avoid damage to these important structures. ★



# Multiple Myeloma

ED management of multiple myeloma should focus on medical stabilization and symptomatic relief. However, there are potential complications that require special consideration.

## Diagnostic and Treatment Considerations in the ED

Daniel Patino-Calle, MD  
University of Connecticut

Shawn London, MD, FACEP  
Program Director  
University of Connecticut  
Emergency Medicine Residency

### Case Presentation

A 65-year-old male with a past medical history of peptic ulcer disease presents to the emergency department with 2 months of generalized weakness, constipation, and weight loss. Initial vitals include temperature 98.7 degrees Fahrenheit, heart rate 111, blood pressure 191/88, and oxygen saturation 98% on room air. On physical exam, he appears cachectic and ill-appearing. He has evidence of conjunctival pallor. His abdominal exam

is positive for distention. He also has bony tenderness over the lumbar spine. Digital rectal exam reveals guaiac negative brown stool and normal rectal tone. Laboratory studies are significant for creatinine 15.9 mg/dL, calcium 13.4 mg/dL, hemoglobin 4.7 g/dL, and total serum protein 10.3 g/dL (normal range 6 – 8.3 g/dL). A skeletal survey performed in the ED demonstrates scattered lytic lesions and an L1 compression fracture. The patient receives resuscitation with intravenous fluids, analgesics, and 2 units of packed red blood cells. Nephrology and hematology are consulted and the patient is admitted with a presumed diagnosis of multiple myeloma.

### Discussion

Multiple myeloma (MM) is a cancer of plasma cells that results in the production of abnormal antibodies (ie, paraproteins), which accumulate in the bone marrow and other vital organs. MM accounts for 1-2% of all cancers and results in approximately 106,000 deaths per year worldwide.<sup>1</sup> It is known as a cancer of the elderly, with a median diagnosis age of 66 years. The precise etiology is unknown, but an increased incidence has been linked with environmental exposures including agricultural pesticides, sheet metal, and wood dust.<sup>2</sup>

Patients will often present with non-specific symptoms such as weight loss, fatigue, generalized weakness, and bone

pain.<sup>3</sup> A definitive diagnosis is rarely made in the ED but there are certain features of the disease that should raise your level of suspicion. The classic tetrad of **hypercalcemia, renal failure, anemia, and bony lytic lesions** are important components of the diagnostic criteria. Total serum protein is a nonspecific marker but an elevated level may suggest MM in the appropriate setting. In order to make a formal diagnosis, the presence of paraproteins must be confirmed via serum, urine, and/or bone marrow biopsy. This is often not an appropriate or feasible test to perform in the ED, so it is usually performed by the admitting medical team.

### Management

ED management should focus on medical stabilization and symptomatic relief. However, there are potential complications that require special consideration.

#### Spinal Cord Compression

Although a rare occurrence, bony infiltration of the spinal column can result in vertebral fractures, spinal cord compression, and rapid progression to paralysis. Patients with a known or presumed diagnosis of MM who complain of back pain should undergo a thorough evaluation to assess for neurological deficits. If cauda equina is being considered, assessment of rectal tone, lower extremity reflexes, and sensory deficits of the perianal area should be documented.

In patients with bladder dysfunction, a bladder ultrasound can be performed to assess for post void residual (PVR). PVR >50 mL (may be up to 100 mL in age > 65 years) is considered abnormal. MRI of the spine is the diagnostic modality of choice and prompt neurosurgical consultation is required in patients with suspected epidural involvement.<sup>4</sup>

#### Renal Failure

Acute kidney failure is a common complication and poor prognostic indicator in patients with MM. Renal dysfunction is caused by precipitation of paraproteins within the distal tubules as well as direct toxic effects to the proximal tubules and glomeruli. Adequate fluid hydration, correction of electrolyte derangements, and early consultation with nephrology are paramount. Some patients may arrive to the ED in extremis and will require dialysis on initial presentation.<sup>3</sup>

#### Hypercalcemia

Hypercalcemia is primarily caused by local osteolysis triggered by malignant plasma cells. Patients will present with symptoms of hypercalcemia: abdominal cramps, nausea, vomiting, constipation, and fatigue. Associated nephrocalcinosis (calcium deposition in kidneys) and dehydration further aggravates the overall decline in renal function. Characteristic EKG findings include QT shortening, AV blocks, QRS widening, and occasionally Osborn waves. Prior to initiating treatment, ionized

### C.R.A.B. SYMPTOMS

- Calcium Elevation
- Renal Insufficiency
- Anemia
- Bony Lytic Lesions

calcium levels should be obtained as non-ionizing calcium can bind to paraproteins, resulting in a falsely elevated number.

### Intravenous fluid hydration, adequate analgesia, and cardiac stabilization should be the priority in the ED.

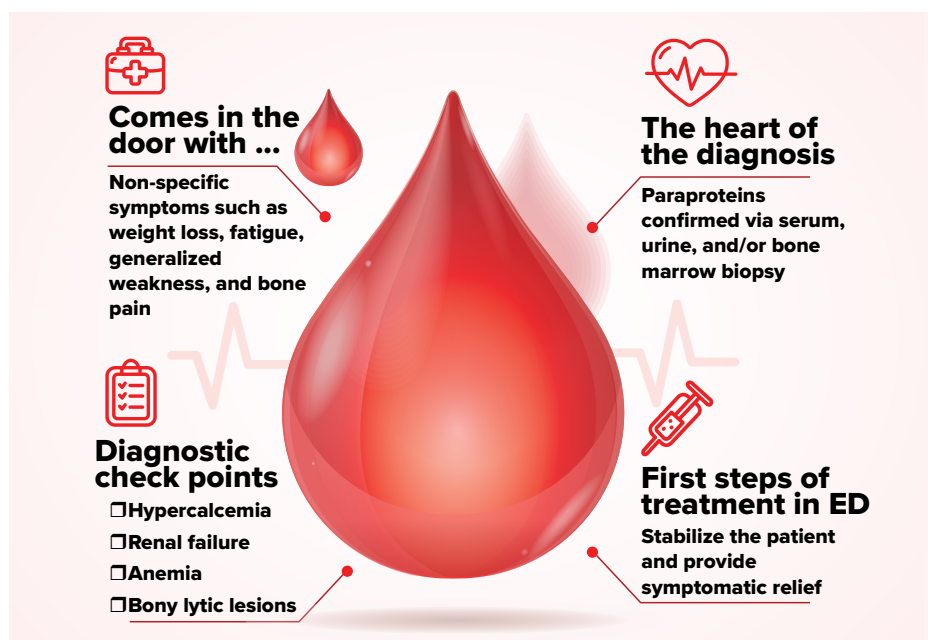
Diuretics can be considered but only in patients with clear evidence of volume overload. In severe cases, bisphosphonates and calcitonin can be administered with guidance from nephrology.<sup>3</sup>

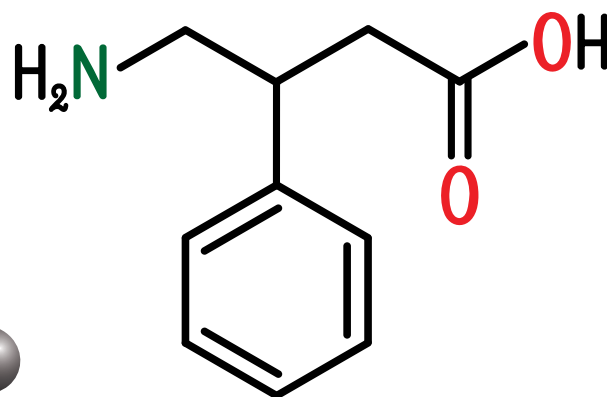
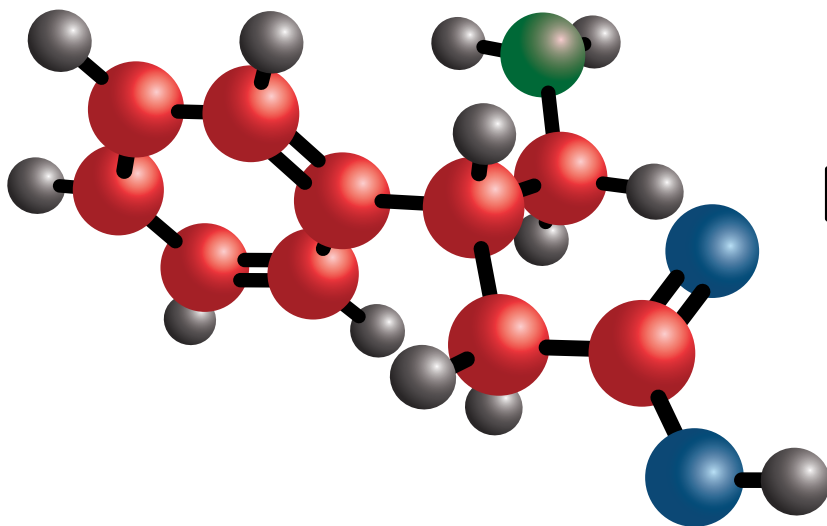
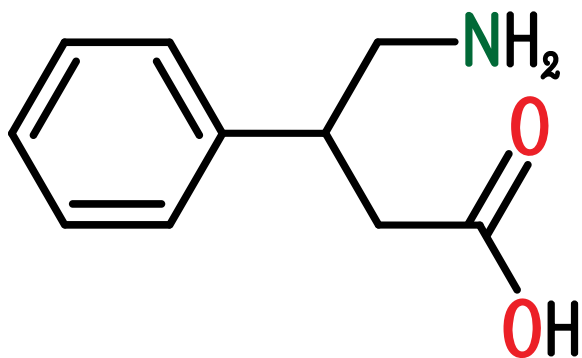
#### Hematologic Complications

Bone marrow infiltration can result in a wide array of hematologic abnormalities. Leukopenia and antibody dysfunction can increase the risk of life-threatening infections. Chemotherapeutic intervention further exacerbates immunosuppression leading to sepsis. Patients should be treated accordingly with fluid hydration and broad-spectrum antibiotics. Thrombocytopenia and anemia are also common, and patients may require appropriate transfusions to maintain hemodynamic stability. Finally, hyperviscosity syndrome can also occur secondary to aggregation of paraproteins within blood vessels. Patients can present with neurological symptoms ranging from a headache to a stroke. The paraproteins can also lead to coagulation pathway disruption which can result in spontaneous bleeding from mucous membranes. Treatments of choice include plasmapheresis and chemotherapy.<sup>3</sup>

#### Case Conclusion

During the patient's hospital course, additional diagnostic testing was performed, which revealed a predominance of IgA in the serum and a bone marrow aspirate with 97% clonal plasma cells, confirming the diagnosis of multiple myeloma. He received intravenous bisphosphonates for hypercalcemia and an additional two units of packed red blood cells for persistent anemia. He was started on chemotherapeutic medications that consisted of cyclophosphamide, dexamethasone, and subcutaneous bortezomib. He remains hemodialysis-dependent. ★





# PHENIBUT OVERDOSE

## Coming to an ED Near You

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### PHENIBUT: WHAT IS IT?

Phenibut ( $\beta$ -phenyl- $\gamma$ -aminobutyric acid) is a GABA analogue that was first introduced in Russia in the 1960s. Its primary use in Russia has been as an anxiolytic and nootropic medication. The toxidrome of phenibut most closely resembles that of medications in the benzodiazepine class, but its effects are poorly studied apart from limited case reports.<sup>1</sup>

**A**fter listing a few common home medications, a young, reasonably healthy patient recently reported that he used a supplement called phenibut for anxiety. During the interview, he was quite anxious with pressured speech. A few minutes later, he became acutely hypotensive and unresponsive. He received a standard workup for altered mental status, which was essentially negative aside from marijuana on a drug screen. Revisiting his medication list, a quick search of phenibut showed that it was not a supplement but a resurrected Russian medication now available over the counter.

## What does an overdose look like?

All documented case reports demonstrate somnolence or unresponsiveness as the primary presenting symptom with otherwise unremarkable laboratory workup. Case reports from Australia and more recently the U.S. have demonstrated significant toxicity and withdrawal symptoms, some of which have required intubation and ICU care.<sup>2-6</sup>

## Learning from Australians — something we're all familiar with

Phenibut came to media attention in Australia following a well-publicized phenibut overdose in seven college students. In February 2018, the Australian Department of Health made phenibut a Schedule 9 substance, citing “reports of anxiety, insomnia, hypertension, hyperhidrosis, psychosis, tachycardia, widening of QRS complex, as well as CNS depression, delirium, seizures — potentially requiring intubation and ventilation.”<sup>7</sup>

## How does it work?

Phenibut's clinical effects may be better understood in light of two well-studied medication classes: benzodiazepines and anti-spasmodics.

## Clinical effects similar to benzodiazepines

Both benzodiazepines and phenibut exert their effects by activating GABA receptors in the central nervous system, which results in the anxiolytic effects experienced with both medications. Phenibut is identical to GABA with the addition of a benzene ring. This allows it to cross the blood brain barrier more easily and bind to GABA<sub>B</sub> receptors in the central nervous system.<sup>1</sup>

## Structurally similar to baclofen

Phenibut's structure most closely resembles baclofen, another GABA

analog. Baclofen has been used to treat muscle spasticity, and despite its similar structure, does not have significant anti-anxiety effects. Baclofen has poor crossing of the blood brain barrier due to an additional chloride moiety which makes its crossing stereoselective.<sup>8</sup> This may be why baclofen does not have the same marked anxiolysis that phenibut has, but still may have neurotoxicity in high doses. Phenibut is able to cross easily, so it is able to have effects in the central nervous system.

## Why are Phenibut overdoses on the rise?

Phenibut has recently grown in popularity in the United States for its anxiolytic properties and its easy availability without a prescription. Tolerance has been noted to develop quite quickly, and this leads to escalation of the dose to achieve the desired anxiolytic effects.<sup>9,10</sup> This gives the drug significant abuse potential and increases the risk of toxicity from unintentional overdose and withdrawal. Additionally, it has been demonstrated that patients may experience significant withdrawal symptoms, including agitation and even psychosis.<sup>9,10</sup>

## How can a phenibut overdose be treated in the ED?

With the information currently available, Phenibut overdoses or phenibut withdrawal should be treated the same way that benzodiazepine overdose or withdrawal is treated—typically with supportive measures. Depending on the severity of symptoms and any changes in vital signs, this may range from observation alone to intubation and monitoring in the intensive care unit. The half-life of phenibut in plasma is 5.3 hours.<sup>1</sup> In most case reports, patients have been admitted to the intensive care unit for monitoring.

## Can phenibut be detected on laboratory studies?

Two case reports have confirmed the diagnosis using gas chromatography-mass spectroscopy, but the diagnosis in the ED must typically be made clinically, as phenibut is not detected in commercially available urine drug immunoassays.<sup>2,11</sup> The benzene ring of phenibut may interfere with methamphetamine testing on urine drug screen, so an unreportable methamphetamine screen might hint at the diagnosis.

## Be wary of supplements

Phenibut is a controlled substance internationally, but available in the U.S. online for around \$20. Patients are frequently unaware of the dangerous implications of supplements purchased online or over the counter. For medications and supplements not controlled by the Food and Drug Administration, consumers frequently rely on anecdotal online reviews and clever marketing. Many young patients do not follow with primary care doctors and instead self-medicate for many physical or mental conditions. For a young patient with anxiety, this will seem like an easy solution, and it may alleviate their symptoms. However, there is a reason that it has not been approved by the FDA for use as a medication in the U.S. — development of rapid tolerance makes it a poor choice for any long-term applications, especially when superior medications are available. In the U.S., over-the-counter supplements are commonplace, but in the emergency department we must be increasingly alert and aware of those supplements which are likely to cause clinical effects.

## Back to the patient

After an unremarkable workup and fluctuating responsiveness in the ED, he was admitted to the intensive care unit, treated supportively, and able to be safely discharged home two days later after making a full recovery. ★

**Phenibut, first introduced in Russia in the 1960s, has recently grown in popularity in the United States for its anxiolytic properties and its easy availability without a prescription.**

# Management of Atrial Fibrillation in Hypertrophic Cardiomyopathy

Vase Bari, MD

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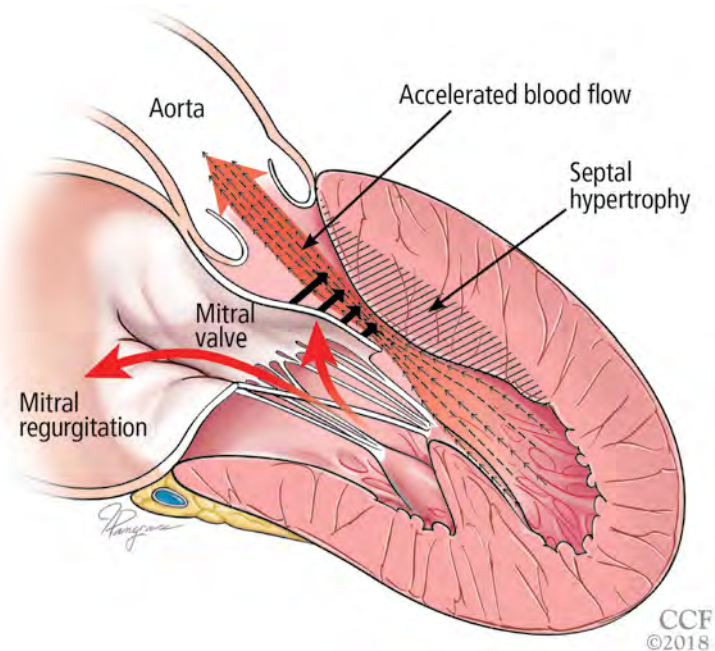
B. Bryan Graham, DO

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**A** 46-year-old female presents by EMS with tachycardia and hypotension. En route the patient received two rounds of adenosine with no improvement. On initial assessment, the patient is somnolent but arousable and protecting her airway. The first set of vital signs reveals a blood pressure of 70/30 and the monitor shows atrial fibrillation with a rapid ventricular rate between 160 to 180 bpm. The patient receives a 1 L bolus of normal saline without significant improvement of her heart rate or blood pressure. The decision is then made to perform a synchronized cardioversion. She is sedated with etomidate and an initial 150 J biphasic shock is delivered without any change in rhythm. A second shock at 200 J is delivered, which is again unsuccessful. Further chart review reveals that the patient has a history of hypertrophic cardiomyopathy with severe left ventricular outflow tract obstruction.

## Hypertrophic Cardiomyopathy

Hypertrophic cardiomyopathy (HCM) is a genetically determined autosomal dominant disorder that causes abnormal development of cardiac myocytes and



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intramural coronary arterioles.<sup>1</sup> Left ventricular (LV) hypertrophy is a defining characteristic of HCM. Depending on the specific morphology, patients can develop one or more of the following: LV outflow tract (LVOT) obstruction, diastolic dysfunction, myocardial ischemia and mitral regurgitation.<sup>2</sup> LVOT obstruction is caused by systolic anterior motion of the mitral valve against a hypertrophied septum.

Broadly, patients will present with symptoms related to heart failure, chest pain and dysrhythmias. Dyspnea, chest pain, and syncope with exertion should raise suspicion for HCM particularly in younger patients with a family history of early sudden cardiac death. Physical exam findings can be non-specific and associated with the degree of LVOT obstruction. A systolic murmur that increases with valsalva and going to an upright position from supine is suggestive of HCM.

While management of HCM can be complex and based on several factors, initial therapy in symptomatic patients is focused on reducing the LVOT obstruction and reducing myocardial oxygen demand. This is done by optimizing preload and through the use of negative inotropic agents such as beta blockers, nondihydropyridine calcium channel blockers, and disopyramide. Further down the algorithm are invasive measures such as pacemakers, automatic

## KEY POINTS

- Approximately 20% of patients with hypertrophic cardiomyopathy will have atrial fibrillation.
- HCM patients in AF with RVR are at high risk for hemodynamic collapse as a result of decreased filling time, worsened LVOT obstruction and decreased cardiac output.
- In a hemodynamically unstable HCM patient with AF, in addition to performing synchronized cardioversion, ensure that the patient has adequate preload.
- Phenylephrine can be used to augment blood pressure after fluid resuscitation, but positive inotropic drugs should be avoided.
- Amiodarone can be considered in atrial fibrillation refractory to electrical cardioversion.



**Atrial fibrillation is 4-6 times more common in HCM patients than in the general population, and it carries an eightfold increase in the risk of stroke.**

implantable cardioverter-defibrillators (AICDs) and septal myomectomies, which are beyond the scope of this discussion.<sup>5</sup> Here we will focus on dysrhythmia as a complication of HCM.

**Atrial Fibrillation in HCM**

Atrial fibrillation (AF) is the most common dysrhythmia, both in the general population and in patients with HCM.<sup>3</sup> However, atrial fibrillation is 4-6 times more common in HCM patients than the general population. Approximately 20% of HCM patients will go on to develop AF.<sup>3</sup> AF is an independent predictor of all-cause mortality in HCM and carries an eightfold increase in risk of stroke.<sup>3</sup> Barring contraindications, all HCM patients with AF should receive anticoagulation.

Patients with HCM and AF who go into rapid ventricular response are particularly high risk for hemodynamic collapse. This is in large part due to preload dependence in the heart with HCM. In the setting of

atrial fibrillation, there is a loss of atrial kick, which subsequently reduces preload. In combination with a high ventricular rate, there is a decrease in cardiac output secondary to a reduction in LV filling time. This physiologic response becomes life-threatening in the setting of baseline end-diastolic dysfunction as in HCM. It is imperative to ensure that preload is optimized by giving IV fluids and if needed, phenylephrine. Positive inotropic agents such as dopamine, dobutamine and norepinephrine should be avoided. An unstable patient with HCM and AF with RVR still requires electrical cardioversion, but it may fail if preload is not addressed. If the patient is still refractory to electrical cardioversion, amiodarone can be administered. The dose will be 150 mg IV bolus followed by a continuous infusion at 1 mg/min. If at this point, the patient is still refractory, cardiology should be emergently consulted for further management.

**Case Resolution**

*Cardiology is consulted and comes emergently to the bedside. The patient is given an additional 2 L of normal saline. A 150 mg bolus of IV amiodarone is given followed by a continuous infusion rate of 1 mg/min. Following this, a third shock is delivered at 200J which successfully converts the patient to sinus rhythm. Her blood pressure and mental status improve. She is started on a heparin drip and transferred to the cardiac intensive care unit. During her hospital course, an AICD is placed for primary prevention of sudden cardiac death. Subsequently, she undergoes a septal myectomy, mitral valve repair with papillary muscle reorientation, pulmonary vein isolation, and placement of left atrial appendage clip. She is continued on her beta blocker and anticoagulation.*

**Acknowledgements**

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## A SUGAR RUSH

# Managing Pediatric Diabetic Ketoacidosis

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### **Case 1**

*A 4-year-old girl presents to the ED with nausea and vomiting. The family notes that for the past week the patient has been more tired than usual and having decreased appetite. She has had 3 days of runny nose, cough, vomiting, and abdominal pain. Her vitals are T: 38.7, BP: 95/60, HR: 123, RR: 35, O2 sat: 97%. On exam, you notice that the patient is sleepy-appearing, but arousable. Her abdomen is soft without focal tenderness. She is tachypneic and taking deep breaths.*

### **Case 2**

*A 14-month old toddler presents to the ED with fever. His dad reports that the patient has had fever, cough, and vomiting for one week. Today, the patient has been sleeping*

*all day and breathing heavily. The patient's vitals are T: 39, BP: 75/40, HR: 145, RR: 40, O2 sat: 91%. On exam, you notice the patient is lethargic, tachypneic, and not responding to painful stimuli.*

### **Case 3**

*A 15-year old girl with history of diabetes on an insulin pump presents to the ED with vomiting and a syncopal episode. She was at a family party when she collapsed. There was no head trauma or seizure-like activity. Over the past 2 days, she had been intermittently vomiting with some abdominal discomfort and had told her mother her blood sugar readings ranged between 150-250 mg/dL. The patient's vitals are: T: 37.5, BP: 100/67, HR: 120, RR: 32, O2 sat: 98%. On exam, you see a talkative*

teenager with a soft, non-tender abdomen, an insulin pump in the lower abdomen, and no signs of trauma. Her urine pregnancy test is negative and her EKG shows sinus tachycardia.

## Epidemiology and Pathophysiology

Diabetic ketoacidosis (DKA) is a severe complication of diabetes. Approximately 30% of children in the United States present in DKA at the initial time of diagnosis of type 1 diabetes, and commonly present in this state to the ED.<sup>1</sup> Although less common, DKA may also occur in children with type 2 diabetes. DKA tends to be precipitated by factors such as concurrent infection, particularly if the patient is affected by vomiting and dehydration. It may also be precipitated by missed insulin doses or social factors such as alcohol or illicit drug use.

In DKA, insulin deficiency leads to hyperglycemia. Without insulin, cells and tissues are unable to take up and use blood glucose as an energy source. Instead, adipose tissue gets broken down into free fatty acids that are converted into ketoacids by the liver, causing a metabolic acidosis. The presence of high extracellular hydrogen ions causes potassium to shift out of cells into the blood. Potassium is lost due to hyperglycemia driven osmotic diuresis, causing patients to develop a depletion of total body potassium.<sup>2</sup> Overall, a counterregulatory hormonal stress response occurs with subsequent worsening insulin resistance, hyperglycemia, and hypovolemia.

## Signs and Symptoms

The presentation of a child in DKA can be very insidious, especially those less than 5 years of age who tend to present with a delayed diagnosis of severe DKA. Polyuria and polydipsia may not be appreciated at this age. Initially, the diagnosis of DKA may be delayed or missed in infants or toddlers presenting with concurrent infections such as pneumonia or bronchiolitis, causing the duration of their symptoms to be even longer and putting them at risk of severe acidosis, dehydration, and altered mental status. They may present with increased irritability, weight loss, and physical signs of hypovolemia. A severe *Candida* diaper rash can be a leading clue towards a diagnosis of diabetes.<sup>3</sup>

Children older than 5 years old tend to present with polyuria, polydipsia, and vomiting that leads to dehydration. They can also present with weight loss. Many may have non-specific symptoms such as nausea, vomiting, and abdominal pain that could be misinterpreted as appendicitis. Children may also exhibit hyperpnea as a compensatory effort to counterbalance their ongoing metabolic acidosis.

On exam, children may show signs of dehydration such as decreased skin turgor and dry mucous membranes. If severely dehydrated, they may exhibit tachycardia, decreased capillary refill, and potentially hypotension. A careful, thorough examination should be done to find a possible inciting cause that may have precipitated this event.

According to the International Society for Pediatric and Adolescent Diabetes (ISPAD) 2018 consensus statement,<sup>4</sup> DKA is defined by the presence of all of

the following in a patient with diabetes (Table 1).

The severity of a patient with DKA can be determined by a measurement of the venous pH and their serum bicarbonate (Table 2).<sup>5</sup>

Clinical signs of dehydration tend to be inaccurate, hence markers such as an elevated blood urea nitrogen (BUN) or elevated hematocrit can be helpful.

## Management and Treatment

The most important goal in DKA treatment is to restore the body's glucose regulation back to normal and replace the losses. It is not as simple as giving an insulin bolus because dehydration and a child's sympathetic activation may interfere with insulin absorption. It's also critical to address any possible precipitating factors that may have caused a patient to go into DKA. This may include infection, medications, drugs or alcohol, or missed insulin doses in known diabetics.

The management of DKA involves the following 3 steps:<sup>6</sup>

- 1. Correct dehydration:** Average water losses in children with DKA are around 70cc/kg.<sup>7</sup> When calculating fluids, children with mild to moderate DKA and those with severe DKA should be assumed to have 5-7% dehydration and 7-10% dehydration, respectively. The amount of fluids to give to a pediatric patient in DKA is very controversial given the concern of precipitating cerebral edema.<sup>8</sup> In general, an initial IV fluid bolus of 20cc/kg of 0.9% normal saline should be given. The goal of initial rehydration is not euvolemia, but to maintain adequate perfusion of end organs. When the patient is hemodynamically stable, judicious replacement of the remaining fluid deficit should be given over 24-48 hours in addition to maintenance fluids. A recent large randomized controlled trial from the Pediatric Emergency Care Applied Research Network (PECARN) showed that neither the rate of fluid administration nor the sodium chloride content of IV fluids significantly affect neurological outcomes in children with DKA

**TABLE 1. Biochemical Criteria of DKA**

Laboratory Features	
Hyperglycemia	<ul style="list-style-type: none"> <li>Blood Glucose &gt;200 mg/dL</li> </ul>
Metabolic Acidosis	<ul style="list-style-type: none"> <li>Either               <ul style="list-style-type: none"> <li>Venous pH &lt;7.3</li> <li>Serum bicarbonate &lt;15 mEq/L</li> </ul> </li> </ul>
Ketosis	<ul style="list-style-type: none"> <li>Either               <ul style="list-style-type: none"> <li>Beta-hydroxybutyrate ≥3 mmol/L</li> <li>Moderate to large urine ketones</li> </ul> </li> </ul>

**TABLE 2. Severity of DKA in Children**

Features	Mild	Moderate	Severe
Venous pH	7.2 to <7.3	7.1 to <7.2	<7.1
Serum bicarbonate (mEq/L)	10 to 15	5 to 9	<5

during treatment or after recovery.<sup>9</sup> However, it must be noted that the range of IV fluid protocols used in the study may have been too narrow to notice a difference.

**2. Correct hyperglycemia:** Continuous IV insulin infusion should be administered at 0.1 unit/kg/hr. No “bolus” or loading dose is necessary. When the serum glucose reaches 250 mg/dL, dextrose should be added to the IV fluids and insulin should be continued until the ketoacidosis completely resolves. Insulin infusion may be discontinued once the serum anion gap is  $12 \pm 2$  mEq/L or beta-hydroxybutyrate is  $\leq 1$  mmol/L, venous pH  $>7.3$  or serum bicarbonate  $>15$  mEq/L, blood glucose  $<200$  mg/dL, and the patient is tolerating oral intake.

**3. Correct electrolyte abnormalities:** Serum sodium should correct by 1.6 mEq/L for every 100 mg/dL decrease in glucose. Children with DKA have total body deficit of potassium, despite levels appearing to be normal or increased initially. Insulin infusion stimulates intracellular uptake of potassium, putting the patient at risk of hypokalemia. If the patient is hypokalemic (below 3.3 mEq/L), 40 mEq/L of potassium at least should be given and insulin therapy should be delayed as long as possible until potassium levels increase closer to a normal range. If the patient is normokalemic (3.3-5.3 mEq/L) and voiding, 20-30 mEq/L of potassium should be added to the IV fluid maintenance infusions while patient is started on an insulin drip. If the patient is hyperkalemic (above 5.3 mEq/L), potassium should be withheld in the initial fluids. Potassium should be replaced with both potassium phosphate and either potassium chloride or potassium acetate to reduce risk of hyperchloremic metabolic acidosis.<sup>2,6</sup> Insulin also stimulates intracellular uptake of serum phosphate leading to hypophosphatemia, putting the patient at risk for rhabdomyolysis, muscle weakness/paralysis, and hemolytic anemia, hence it should also be aggressively repleted. Mild hypocalcemia and hypomagnesemia can occur as well, requiring monitoring and repletion as needed.

**PEARL**

**What needs to be monitored and how often?**

Continuously: Vitals, intake and output  
 Every hour: Glucose (while on insulin), neurologic examinations (including cranial nerves)  
 Every 2 – 4 hours: Electrolytes and venous blood gas

**PEARL**

**What are the signs of cerebral edema and how can it be treated?**

The most concerning complication from treating DKA is cerebral edema. Clinically significant cerebral edema occurs in up to 0.9% of DKA episodes in children, with a mortality rate of 20-25%.<sup>10,11</sup> Though rare, children less than 5 years of age with severe DKA are at the highest risk of developing cerebral edema, often due to delayed diagnosis. It is most commonly found in children with severe acidosis or hypocapnia. The key is to treat early. Suspicious signs and symptoms include bradycardia, headache, vomiting, incontinence, fluctuating level of consciousness, posturing, decreasing GCS, abnormal pupillary response, and abnormal respiratory patterns (Cheyne-Stokes, grunting). Treatment of cerebral injury consists of avoiding hypoxia and hypotension, and immediately giving mannitol at 0.5-1 g/kg IV over 15 minutes. This can be repeated in 30 minutes. Hypertonic 3% NaCl at 2.5-5 mL/kg is only reserved as a second line intervention due to one retrospective study that showed higher mortality rates in patients treated with hypertonic saline versus mannitol.<sup>12</sup>

**PEARL**

**Should a Head CT scan be done to confirm cerebral edema prior to treating?**

No. Cerebral edema is a clinical diagnosis with high morbidity and mortality. Treatment should not be delayed. In addition, cerebral edema may not be visualized on initial imaging and may only be apparent hours to days later after neurological decline. Imaging may be helpful to find other etiologies for altered mental status, but if there is high suspicion for cerebral edema, treatment should be initiated immediately.

**PEARL**

**Should fluids be withheld for fear of causing cerebral edema?**

Administration of IV fluids should not be withheld due to concerns of causing cerebral edema, especially if the patient looks clinically dehydrated. Fluids should be adjusted to maintain a normal blood pressure to optimize cerebral perfusion in all DKA patients with or without concerns for cerebral edema.

**PEARL**

**What if the ketoacidosis does not improve despite insulin and IV fluids?**

Look for another cause of persistent metabolic acidosis such as sepsis, or possibly incorrect preparation/administration of the insulin infusion.

**PEARL**

**Should pediatric patients with DKA receive bicarbonate infusion to correct for acidosis?**

No. Bicarbonate infusions have been associated with increased risk of cerebral edema and worsening hypokalemia. The rapid correction of acidosis can also decrease the stimulus for hyperventilation and lead to increased carbon dioxide in the brain causing a decrease in cerebral pH as carbon dioxide crosses the blood-brain barrier.<sup>11,13</sup> In very rare situations, bicarbonate can be considered, especially if the child is in severe acidosis, hemodynamically unstable, hyperkalemic, or about to go into cardiac arrest.<sup>4</sup>

### Case 1 Conclusion

Your patient's fingerstick blood sugar level reads 456 mg/dL and you draw a set of blood and urine samples, while starting her on IV hydration. Her pH is 7.1 with a high beta-hydroxybutyrate result, and positive urine ketones. You hear crackles on lung examination and the chest x-ray shows a right middle lobe infiltrate concerning for pneumonia. After an initial bolus of IV fluids, your patient appears more alert, has not vomited, and is watching clips of Baby Shark on her family's cell phone. You start her on antibiotics, maintenance fluids, and an insulin drip. However, 2 hours later, you find that your patient's repeat blood sugar drops to 220 mg/dL. At this time, you add D10 to your maintenance fluids while continuing the insulin drip given that the gap has not closed. The glucose levels continue to drop to 150 mg/dL, so you decrease the insulin drip next. One hour later, you find your patient is more shaky and sleepy with concerns for symptomatic hypoglycemia. You stop the insulin drip for 10 minutes and then restart at a lower rate with more dextrose. She is admitted to the

ICU for further monitoring and titration of an insulin regimen for newly diagnosed diabetes.

### Case 2 Conclusion

You suspect a critically sick child and bring him to a resuscitation room. He gets IV access and his fingerstick glucose is >400 mg/dL with a blood gas showing pH 6.9 and a bicarbonate of <5. You immediately start fluid resuscitation, empiric antibiotics, and an infectious work-up given your concern for septic shock with his fever and hypotension. You are initially worried about meningitis as a cause of his altered mental status, but recall cerebral edema complications in DKA. He is having more difficulty breathing and worsening lethargy with unimproved blood gases, and you have growing concern for herniation. You talk to the family about a definitive airway and start mannitol. You prepare to intubate with the understanding that the apneic pause during intubation may worsen his acidosis. Fortunately, you visualize the airway without difficulty and rapidly intubate him. You ensure that the respiratory rate on the ventilator is

set close to the rate that the patient was breathing at prior to being intubated to compensate for metabolic acidosis. The patient is then transferred to the ICU. After one repeat dose of mannitol, continued hydration, electrolyte repletion, and improving blood sugar levels, the patient is extubated after 2 days, with a normal MRI scan. He is diagnosed with type 1 diabetes and transitioned to subcutaneous insulin therapy.

### Case 3 Conclusion

After further interviewing, you find the patient had lied to her mother about her blood sugar ranges at home, for fear of needing to go to the hospital. On her blood tests, she had a blood glucose of 649 mg/dL, a pH of 7.1, and a potassium level of 3.0 mEq/L. You turn off her insulin pump and start her on potassium repletion and IV fluids without dextrose. Each hour, her glucose checks and blood gases improve, and she gets started on 1.5 x maintenance IV fluids with dextrose and an insulin infusion at 0.1 units/kg/hour. She is transferred to the ICU. The patient's insulin pump was interrogated and found to be dysfunctional and her insulin pump gets switched. ★



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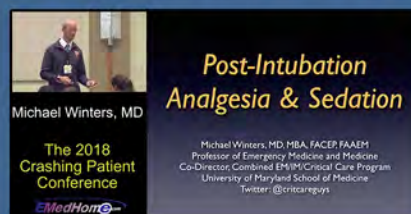




FIGURE 1

# Unique Presentation of Fracture Blisters

**Will Hockett**

Oregon Health & Sciences  
University Medical School  
Class of 2020

**Delvin Akins**

Oregon Health & Sciences  
University Medical School  
Class of 2021

**Craig Warden, MD, MPH**

Oregon Health & Sciences University

**F**racture blisters are tense vesicles, or bullae that result from a loss of integrity at the dermal-epidermal junctions secondary to increased interstitial pressure following trauma.<sup>1,2</sup> Fluid accumulation combined with the risk of venous stasis following vessel damage contribute to the formation of these blisters. Fracture blisters can present as clear-fluid, or blood-filled lesions, thought to be dependent on the extent of dermal-epidermal separation.<sup>3</sup> The most common sites at risk for fracture blister formation are the skin overlying the foot, ankle, tibia shaft, tibial plateau, and elbow.<sup>4</sup>

## Case

A 70-year-old female presented to the emergency department after a 16-hour wilderness evacuation for a trimalleolar fracture and posterior dislocation of the right ankle.

The patient was backpacking when she fell while descending an area of

broken, loose rocks. She was unable to ambulate, and without cell phone reception, she waited on the trail until a runner was able to activate search and rescue. She arrived at the ED 18 hours after sustaining her injury.

Search and Rescue used a Structural Aluminum Malleable (SAM) splint around the ankle directly on top of the patient's sock and secured the splint with an ACE wrap. The splint stabilized her injury as she rode a mule, a commonly used method of transport in this region, 8.5 miles along the trail to an ambulance. At the rural ED, the wilderness splint was removed, showing several tense blisters, the largest measuring 5 x 9 cm.

## Discussion

The blisters were initially thought to be secondary to inadequate placement of padding under the SAM splint and shear forces of the splint material on the skin. Further inspection, however, showed these to be consistent with fracture blisters in their common anatomic locations (Figure 1).

The SAM splint was a suitable treatment in this situation, but there are several important tips to remember for prehospital injury immobilization. All splints should be well-padded, as bulky dressings can aid in immobilizing the

extremity, while controlling swelling via gentle compression.<sup>5</sup> Distal pulses should be quickly checked prior to application of any splint materials to achieve a baseline assessment of circulation. Space between the extremity and the splint should be filled with padding to help immobilize the injury and potentially reduce swelling. The splint should provide support proximal and distal to the site of injury. Circulation, motor response, and sensation should be rechecked after application of splint materials and adjusted if there is a change from their initial examination.

Fracture blisters carry an increased risk for infection and are best left intact. They complicate surgical management, and no clear consensus exists on when to surgically repair. When fracture blisters are present preoperatively, there is a higher incidence of postoperative wound infection.<sup>2</sup> A detailed skin assessment should be documented and relayed to your consulting orthopedic surgeon.

## Outcome

The ankle was reduced in the ED and the patient was transferred the next day to a tertiary center. Orthopedics completed an open reduction internal fixation and required a wound vac to assist with blister management. ★

# What is Aerospace Medicine?

**Emily Stratton, MD**

SUNY Upstate Medical University  
AMSRO Vice President

Acting Vice President, ACEP Aerospace Medicine  
Section

**H**ave you ever wondered what kind of doctor supports the United States space program? Who monitors the health and wellbeing of astronauts on the International Space Station and stands at the ready for their launch and return? Who helps to plan the upcoming Lunar and Mars missions alongside engineers, pilots, and other brilliant scientists? This is the field of Aerospace Medicine.

With the White House asking Congress for an additional \$1 billion for an accelerated lunar program,<sup>1</sup> this is definitely an exciting time to be involved with the field of Aerospace Medicine. Also, with the birth of the commercial space flight industry, there is an even greater need for highly trained Aerospace Medicine physicians. However, this subspecialty is not just about space medicine; these physicians also care for the health of pilots and flight crewmembers. Many also study the physiology of microgravity on the human body and how it can help to fight conditions here on Earth (for example, the NASA Twins Study with Scott and Mark Kelly<sup>2</sup> and the evaluation of increased intraocular pressure in space assessed by an ultrasound located on the International Space Station).

The Aerospace Medicine specialty

members are like a close family, with yearly scientific meetings hosted by its largest organization, the Aerospace Medical Association (AsMA). There is even a section for students and residents: Aerospace Medicine Student and Resident Organization, with scholarships and mentoring events.

## Origins

This specialty has been around for many years, and the term “space medicine” was first used in the late 1940s during the Mercury and Gemini missions.<sup>3</sup> Currently, there are 4 accredited U.S. residency/fellowship programs for Aerospace Medicine:

- U.S. Air Force Residency in Aerospace Medicine at Wright-Patterson Air Force Base in Dayton, OH
- U.S. Army/Navy Residency in Aerospace Medicine in Pensacola, FL
- University of Texas-Medical Branch in Galveston, TX
- Mayo Clinic in Rochester, MN

Participants also often receive a Master of Public Health (MPH) degree with board certification. Aerospace Medicine fellows can hail from any specialty, but according to current recommendations from one of the civilian programs, fellows must be a U.S. citizen with an MD or DO degree with clinical residencies (typically in Internal Medicine, Family Medicine, or Emergency Medicine) — although other residencies can be considered on a case-to-case basis.

## WANT MORE INFORMATION?

- ✓ Join the new **ACEP Aerospace Medicine Section!** (First meeting is at ACEP19: Monday, Oct. 28, 10-11:30 am, Denver Convention Center Rm 604)
- ✓ Visit [asma.org](http://asma.org)
- ✓ Do a clerkship with NASA (even if you're an attending)! [asa.gov/feature/aerospace-medicine-clerkship](http://asa.gov/feature/aerospace-medicine-clerkship)

## Why should this interest me?

These doctors not only often work clinically, such as in the ED, they also help support the future of space travel through research and operations. Additionally, they are crucial to the entire aviation industry.

Because Aerospace Medicine is a subspecialty of Preventive Medicine, the field works to avoid disease/emergencies. This is not always a familiar concept to emergency physicians. Yet it can be an invaluable skill to learn how to prevent bounce-back patients to the ED. In fact, Aerospace Medicine physicians often decide fitness for duty, while traveling and working in austere environments to prevent accidents and keep the pilot (or astronaut) as fit as possible for the mission. In the same way, Aerospace Medicine physicians do mishap investigations and toxin exposure analysis if an emergency does occur. Additionally, they work with engineers to create an efficient system for launches and descent. They also focus on performance maximization through optimal sleep scheduling, task assignment and delegation, wellness activities, and functional downtime to make use of crew time in the most efficient manner possible. This is applicable to the shift work in the ED.

Aerospace Medicine works with other fields to prevent emergencies through disaster preparation, specific crew training, and kit design.

Given these connections to the ED and the need for Aerospace Medicine physicians in the future, this is definitely an interesting specialty to look into after graduating from an EM residency. ★

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## A NEW BEGINNING

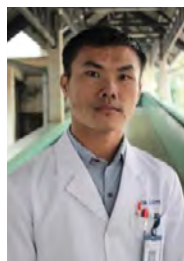
# Emergency Medicine in Lao PDR

### **Anouphet Yentavanh**

Mouavang Xiapao  
Thepbandith Sydavong  
*EM Residents in Lao PDR*

In 2017, the inaugural Lao emergency medicine residency was born from a collaborative project between the Lao University of Health Sciences; Lao Ministry of Health; central hospitals in the capital, Vientiane; and the NGO Health Frontiers. These residents and their colleagues are working incredibly hard as they prepare to take on the immense challenge and responsibility of being the first emergency medicine specialists in Lao PDR when they graduate in 2020. It is an incredibly exciting time for the field of emergency medicine in Lao PDR.

**Dr. Mouavang Xiapao** joined the residency from Xaysomboun Provincial Hospital, located in the northwest portion of the country.



### **Why did you choose a career in medicine?**

I chose medicine because I enjoy being a doctor and being able to restore people back to their lives after physical injury and disability. I enjoy treating both adults and children alike and ultimately will endeavor to keep on learning.

### **What do you like best about working in the ED?**

EM doctors are the first to receive and examine patients. We are the ones to decide whether their condition is severe or mild and what kind of assistance is

well-suited for their symptoms. As EM providers, we have to act fast to stabilize patients in order to save a human life. This, to me, is a priceless experience and I believe that every hospital in Laos should have an EM specialist on staff.

### **What would you like physicians in other countries to know about Laos and about emergency medicine in Laos?**

Health care professionals in Laos, especially in the ED, hurry to assist patients. However, there is no national standard of care: doctors and hospitals have different approaches to most everyday cases. There is a lack of standardized protocols, guidelines, or training available. This sometimes means that they take the same approach towards all patients for all diseases rather than manage them appropriately according to their specific diagnosis.



## Dr. Anouphet Yengtavanh

joined the residency program from Tahteng District Hospital in Sekong province, which is located in the southeast part of the country. It is one of the poorest, most ethnically diverse, and most sparsely populated provinces in Laos.



### Why did you choose a career in medicine?

I think that robust healthcare and medical expertise are essential to national development. Many Laotian citizens reside in rural areas of the country and need care that specialist doctors provide. However, at the moment, specialists do not travel to visit patients residing in rural areas. Speaking as a rural doctor myself, I consider it to be important that multi-ethnic people receive coverage nationwide. Thus, I studied medicine to be a part of this development.

### How will emergency medicine improve patient care in Laos?

Specialized emergency care at this time is lacking, but it is essential as Laos is in the process of relieving itself of its status as a least developed country (LDC). The rising population, vehicular

traffic, and industrialization need to be paralleled by a developing and improving healthcare system. Emergency medicine and emergency management are critical to this process.

### What is the most difficult part of EM training?

Medical training in Laos is faced with all kinds of difficulties such as a lack of equipment, a lack of specialized knowledge and lessons, linguistic difficulties, and doctors being unaware of reliable sources of knowledge.

### What do you like best about working in the ED?

Emergency medicine is highly challenging because it is an area of work which has to cater to patients of all kinds. As a doctor, I recognize the importance of the emergency department and often parallel it to the military: a fence to protect a country.

### What would you like physicians in other countries to know about EM in Laos?

I would like them to know about the solidarity and unity we share as a work-family — solidarity where everything takes place peacefully — and the mutual respect we have for each other. I believe this helps us as coworkers during difficult times. However, we still lack knowledge, equipment, and expensive medications, all of which remains a problem in Lao medical facilities.

## Dr. Thepbandith Sydavong

worked in the ED of Setthathirath Hospital, a central hospital in Vientiane Capital, before she was chosen for the EM residency.



### Why did you choose a career in medicine?

I enjoy providing health care services to patients who come in to receive them. It is challenging work and there is a great need for trained personnel. There are insufficient numbers to meet healthcare demands. It makes me feel proud and happy each time I play a part in this.

### How do you think EM will improve patient care in Laos?

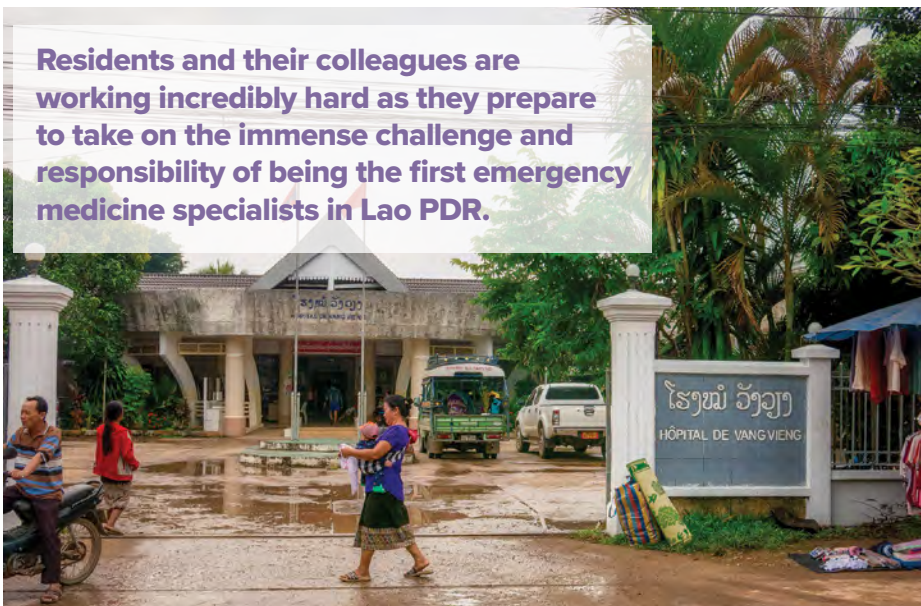
The ED is right on the front-line of the hospital, so every day our ED meets people in all kinds of conditions, from minor to severe. Therefore, if the ED works systematically and uniformly, we are able to act fast in diagnosing the patient and performing the treatment in time. This reduces mortality and morbidity rates and the need for inpatient treatment.

### What would you like physicians in other countries to know about Laos and about Emergency Medicine in Laos?

Laos is a developing country with a high demand for health care to adequately cater to the needs of the population. Emergency care is important and challenging for all our hospitals, as the supply of trained personnel and necessary emergency equipment are often insufficient. This leads to delays in diagnosis and treatment and significant morbidity. The lack of EM specialists also makes education difficult for EM residents like myself.

*If you would like to support Emergency Medicine in Lao PDR, we are looking for financial contributions and volunteers. More information can be found on the Health Frontiers website: [www.healthfrontiers.org](http://www.healthfrontiers.org). \**

**Residents and their colleagues are working incredibly hard as they prepare to take on the immense challenge and responsibility of being the first emergency medicine specialists in Lao PDR.**



# Do Sports Have an Effect on Gang Violence?

Dustin Harris, MD

EMRA Sports Medicine Committee Chair  
Sports Medicine Fellow  
Stanford-O'Connor Hospital

“*Idle hands are the devil's playthings.*” These words pass through my mind while I am on the sideline — a football game in progress in front of me. The Phillips Academy High School football team was doing what they usually do: winning. Just several city blocks down the street you would find the University of Chicago Medical Center, a Level I trauma center that can average multiple gunshot wound victims a night. The field where the football team play is not a stone's throw from the old Ida B. Wells Homes housing community where 5-year-old Eric Morse was murdered after being held outside a 14-story window by 10- and 11-year-old boys.

The city of Chicago is no stranger to crime. Its homicide rate consistently ranks among the highest in the United States.<sup>1</sup> But a disproportionate amount of crime emanates from the South Side of Chicago. In 2018, according to the Chicago Police Department statistics,

the South Side of Chicago witnessed 391 shootings, 103 murders, 1,227 vehicle thefts, and 1,017 aggravated batteries.<sup>2</sup> It's difficult to find Chicago's specific crime rates when it comes to teenagers. But rates of teen arrests in the United States have steadily increased for murder and nonnegligent manslaughter, from 2.2/100,00 persons in 2012 to 2.7 in 2017.<sup>3</sup> **Instead of increasing the number of police units and the number of years in mandatory sentencing, could there be a benefit in sports programs?** Sports often provide a positive influence on students, so it is easy to make the assumption that they would have a positive effect on crime. Are there studies showing sports have a positive impact on teen crime?

In 2008, a study from Northeastern University College of Criminal Justice looked into the effects of church and non-school activities like sports on delinquent behavior (such as violent acts like carrying a weapon or fighting). **There was a significant decrease in delinquency rates among the 1,400 teens studied who participated**

**in activities outside of school.**<sup>4</sup>

A secondary finding was the effect of positive or negative outlooks on school environment. If a student had a positive outlook on his or her school environment, that would decrease rates of risky or delinquent behavior.<sup>4</sup> The majority of the previous population were upper middle class. One could argue the results could not be directly translated to teens from a more impoverished area.

Another study in the early 2000s, out of the University of Michigan, found similar results in a more diverse sample of students. Rates of major crime and school suspension were lower in schools with higher rates of sports participation while controlling for school location and student:teacher ratios.<sup>5</sup> The trend over the several-year study was that as rates of sports participation increased, a converse decrease occurred in major crime and school suspension. Lastly, a large meta-analysis published in 2016 analyzed 51 studies with more than 130,000 adolescents and found no significant difference in juvenile delinquency among those who did or did not participate in sports.<sup>6</sup> Even when separated by gender or by team sports, the results were not significant. Multiple studies did show a positive effect, but the significance did not have enough power to outweigh other studies.

Regardless of study findings, no one is arguing against the positive effects of sports. They increase bonding, promote following rules, and can offer positive mentorship. It's possible the data might change if certain sports that may increase aggression were separated from studies. Also, in neighborhoods without access to other after-school programs, sports may actually have a significant effect. More research can still be done, and I hope to look further into this topic in the future. ★



**Parth Gandhi, DO**

Christiana Care Health System

@parthsgandhi

Instagram: the doctorsapron

Dear attending,

**T**oday you looked at me with a face that begged the question, “Are you OK?” Yes, attending — yes, I am... because of you.

Attending, I have been a doctor for only a few weeks and I’m still nowhere near the level of skill and competency I’d like to be at. I still walk from one side of the hospital to the other with a confused look as I try to navigate the hallways. When the clerk asks me, “Are you the DOCTOR taking care of the patient in room 6?” I sheepishly respond with, “Yes, that’s me.” As the consultant asks me more questions about the patient, I nervously shuffle through my notes as I try to provide an answer. However, as I go through my shifts I remember your words — “**This is normal**” — and finally, after all this time, I’m starting to believe you.

I’m trying my absolute best, dear attending. Some days I believe I’m smart and capable, while other days this is not the case. There are days when I still struggle to find the right order in an EMR that seems harder to decipher than *The Da Vinci Code*. I hear you asking the fourth-year student questions and I hear that student rattling off answers with a confidence that I’m sure I once possessed. **Where did all that information go? Did I lose it all? Am I really this... bad now?** These are just some of the questions that plague me.

Dear attending, I’ve been dealing with these insecurities for quite some time now — but you’ve been there to reassure me that this is all just a part of the process. The first time I walked into a patient’s room I found myself hesitating as I introduced myself. As I peered over my shoulder, I saw the imposter sitting there mocking me. Thoughts of inadequacy and self-doubt rushed into my mind as I reassured my patient. I came out of the room wanting to rule out every likely diagnosis and prove to you that I am someone who has considered all the possibilities. To my surprise, and to that of the imposter’s, you agreed with me. That day I gained a little more confidence and finally smirked and said to myself,



## Dear Attending...

PHOTO BY RENEE FERNANDES, WITH PERMISSION FROM PARKLAND HEALTH & HOSPITAL SYSTEM

**“Maybe I’m not an imposter.”**

Dear attending, you amaze me every day with your poise and clinical acumen. You show me every day what hard work and dedication can amount to. Keeping this in mind, I try to shape my behavior and ultimately in a sense, I try to emulate you. As a medical student, I looked at the residents I worked with as being light years ahead of me. Now, as a resident, I don’t feel light years ahead of my former self. You, however, remind me every day that I am. After all, you’ve been where I am — you’ve done what I’m doing. You know better than anyone else what I am feeling and because of this, you know exactly what to say to me when I’m my own worst critic.

So, I write this letter to you and for you, dear attending. I promise to wake up every morning with a reinvigorated drive to become better, smarter, and more capable. I know now that my struggles are not just mine — they are *ours*. You have shown me that we are on a journey together and only by lifting each other up can we continue to move forward. Although I don’t feel quite that confident yet, I am starting to realize I am in fact not terrible. It’s true; I still struggle with the EMR, I still take the long way to

get to the cafeteria, and I still trip over my words when talking to consultants. Luckily for me, though, I have an attending who doesn’t do any of these things and is willing to teach me.

I doubt there will ever come a day when I will not need you at all, because even when I’m all grown up, I’ll think back to the lessons you’ve taught me and use them to guide my approach in treating patients. My only hope is that through my failures I can grow and slowly learn to not be terrible. After all, dear attending, you’ve taught me that if you could get through it, then so can I.

I know you said I will do all these things by myself, but I do not believe this is true. I have the support of all my upper-year residents, ED personnel, and co-interns.

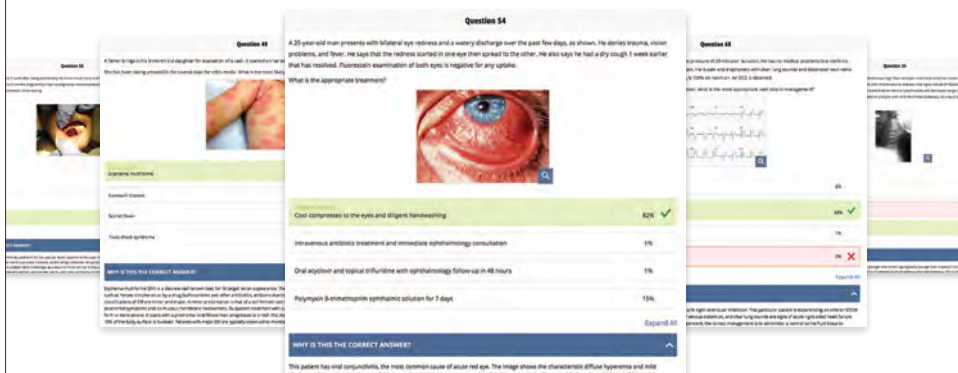
And so, dear attending, to answer your question: “Am I OK?” Although I still look lost the majority of the time — *Yes I am*. I still have doubts and fears, but certainly they are not as overwhelming as what I felt in the beginning of July, and if I keep working hard, and if you keep inspiring me the way you have been, I have no doubt that one day I will be able to make you proud of the capable attending I will become. ★

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# ECG Challenge

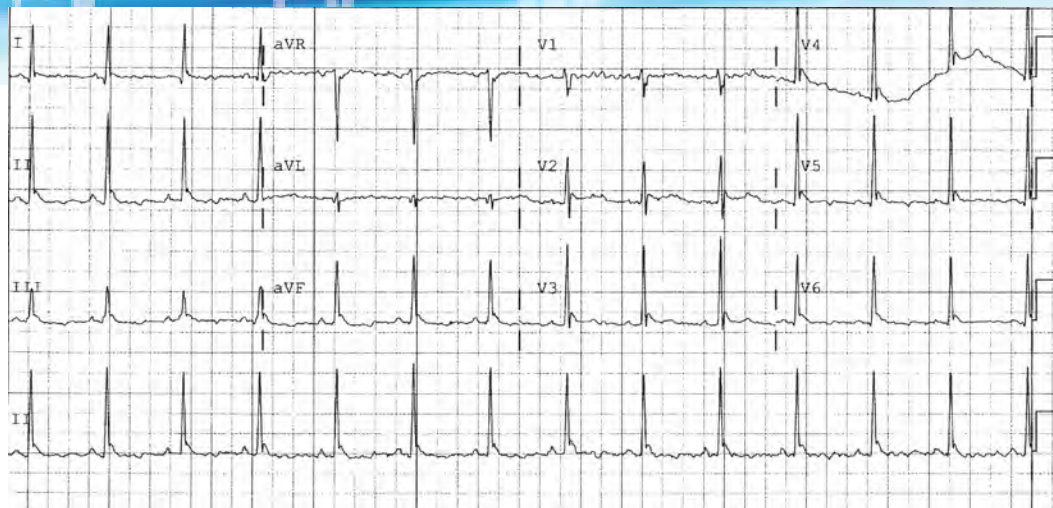
**Benjamin Golden, MD**  
 Christiana Care Health System  
 @bgolden19

**Jeremy Berberian, MD**  
 Associate Director of Resident Education,  
 Dept. of Emergency Medicine  
 Christiana Care Health System  
 @jgberberian

**CASE.** A 22-year-old male with a history of sickle cell disease is brought to the ED by police after he was found altered and naked outside on a rainy night.

**What is your interpretation of the following ECG?**

**See the ANSWER on page 44**



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# ECG Challenge



## J Waves (Osborn waves)

This EKG shows a normal sinus rhythm with a ventricular rate of 80, a normal axis, and early R-wave transition in the precordial leads. There is diffuse T-wave flattening and some baseline artifact that makes calculating the QTc difficult, but it is prolonged when measured in V2. J waves, also called Osborn waves, are present in leads V2-V6 and the inferior leads.

J waves are positive deflections at the terminal junction of QRS and beginning of the ST-segment takeoff resembling a dome or hump.<sup>1</sup> They are often seen in the hypothermic patient and the amplitude and duration have been shown to correlate with the degree of hypothermia. They are most commonly seen in the inferior (particularly lead II) and lateral precordial leads but can be seen in any or all leads depending on the degree of hypothermia.

In 1953, Dr. John Osborn described J waves as an “current of injury” concerning for impending ventricular fibrillation in the setting of hypothermia.<sup>2</sup> Although J waves had been reported before this in hypercalcemia and hypothermia, the J wave became known as the Osborn wave as a testament to his work. There is no consensus on which name to use, and some use Osborn wave when seen with hypothermia and J wave in all other settings.

Despite Dr. Osborn’s research, the association of J waves with life-threatening dysrhythmias in the hypothermic patient is unclear. As well, the presence of J waves is not pathognomonic for hypothermia. J waves can be seen with hypercalcemia,<sup>3</sup> cardiac ischemia, and CNS injury (eg, SAH). There is even a case report describing J waves in the setting of Todd’s paralysis.<sup>4</sup> Accordingly, the presence of J waves on an ECG warrants a broad differential diagnosis, including environmental exposure, cardiac ischemia, electrolyte abnormalities, and neurologic pathology.

## LEARNING POINTS

### ECG Findings in Hypothermia

#### General Features

- Findings most commonly seen at < 32°C

#### EKG Features

- Bradydysrhythmias
  - Atrial fibrillation with slow ventricular rate
  - Sinus bradycardia with 1st degree AV block
  - Junctional rhythms
- Prolongation of PR, QRS, and/or QT intervals
- J waves (also called Osborn waves)
  - Positive deflection at the terminal junction of QRS and beginning of the ST-segment takeoff (see Figure)
  - Most commonly seen in the inferior and lateral precordial leads

#### Clinical Significance

- Amplitude and duration of J waves typically correlate with the degree of hypothermia
- J waves can also be seen with hypercalcemia and intracranial hemorrhage



## Case Conclusion

The presence of J waves made us concerned about hypothermia, and the patient’s core temperature was found to be 29.5°C. His workup was notable for multiple traumatic injuries. The patient was placed on a rewarming protocol and transferred to the Surgical ICU for further management of his traumatic injuries.

For more on the J wave, please see pages 55-56 of the *EMRA EKG Guide*. ★

# Board Review Questions



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1. A 64-year-old man presents with gradual onset of swelling in his face, a cough, a headache, shortness of breath, and, that morning, blue lips. When asked, he says that he smokes "not quite two" packs of cigarettes per day. Which test will most likely reveal the diagnosis?
  - A. Brain MRI with diffusion-weighted imaging
  - B. Chest CT with contrast
  - C. Lower-extremity Doppler ultrasonography
  - D. Lumbar puncture and CSF cell count
2. When managing an acute aortic dissection, which medical therapy should be initiated first?
  - A. Esmolol
  - B. Nicardipine
  - C. Nifedipine
  - D. Nitroprusside
3. Which statement regarding *Bordetella pertussis* infection is correct?
  - A. Blood cultures are an effective means of identifying patients with active disease
  - B. Identifying disease in infants is difficult because apnea can be the only symptom
  - C. Previous infection confers lifelong immunity for subsequent infection or disease
  - D. Treatment to prevent infectivity is most effective during the paroxysmal phase
4. Which statement about the metabolism of ethanol is correct?
  - A. Approximately 20 mg/dL is eliminated per hour in nontolerant individuals
  - B. Cytochrome P450 is responsible for the majority of metabolism
  - C. Elimination occurs predominantly by renal metabolism
  - D. It is characterized by zero-order kinetics at lower concentrations
5. Which structure is best evaluated for traumatic injury using noncontrast CT?
  - A. Pancreas
  - B. Small bowel
  - C. Spine
  - D. Stomach ★

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

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**South Bend - Memorial Hospital of South Bend.** Stable, Democratic, 23 member group seeks additional BC/BE Emergency Physicians. 60K visits, Level II Trauma Center, double, triple and quad physician coverage, also micro-hospital opening fall 2019. Equal pay, schedule and vote from day one. Over 400K total package with qualified retirement plan; group health and disability insurance; CME reimbursement, etc. Favorable Indiana malpractice environment. University town, low cost of living, good schools, 90 minutes to Chicago, 40 minutes to Lake Michigan. Teaching opportunities at four year medical school and with FP residency program. Contact Joseph D'Haenens at [southbendemergency@gmail.com](mailto:southbendemergency@gmail.com).

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## Emergency Medicine



## Central Wisconsin—Stevens Point

**Wisconsin Emergency Medical Services Associates, SC (WEMSA) is seeking BC/BE Emergency Medicine Physicians to staff the new Aspirus Free Standing ED in Stevens Point, WI (with some cross coverage and onboarding completed at Aspirus Wausau Hospital in Wausau, WI).**

### Aspirus Stevens Point Emergency Department (Free Standing)

- ✓ New, state of the art facility opened July 2018
- ✓ Over 6,000 visits in first year
- ✓ 12 hour shifts (rotating day and night)
- ✓ 12 shifts per month
- ✓ As volume increases, Advanced Practice Providers will be recruited to assist

### Aspirus Wausau Hospital Emergency Department

- ✓ Level II Trauma Center with all specialties available
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- ✓ Advance Practice Provider support

Aspirus Wausau Hospital and Aspirus Stevens Point are 30 minutes apart. (Travel between is easily accessible.) Come join an experienced and collaborative group in a new endeavor at Aspirus! **To learn more and apply, contact Jamie Dahl, Physician Recruiter, at 1-800-792-8728 or e-mail a copy of your CV to [Jamie.Dahl@aspirus.org](mailto:Jamie.Dahl@aspirus.org).**

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## SEEKING EMERGENCY DEPARTMENT PHYSICIANS

The busiest ED in North Carolina, and one of the top 15 busiest in the nation, treats 95k adult and 35k pediatric cases annually in its 92 beds. We are currently seeking residency trained BC/BE emergency physicians to work in the 75 bed adult ED. This ED serves a high acuity patient population with 28% annual admission rate. There are over 90 hours of adult physician coverage daily and over 110 hours mid-level coverage daily. It is a Level III Trauma Center with robust hospitalist service, interventional cardiology 24/7, cardiac surgery, neurosurgery, etc. The facility is Chest Pain and Stroke accredited. The EMS system is hospital owned and managed with an award winning paramedic program. Of note, the Pediatric ED is separate and has 17 dedicated beds with an additional 24 hours of physician coverage and 20 hours of mid-level coverage. We welcomed our inaugural class of Emergency Medicine Residents in July 2017. Opportunities exist for both clinical and academic emergency physicians.



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or [adowl@capefearvalley.com](mailto:adowl@capefearvalley.com) for additional information.





## ACADEMIC EMERGENCY PHYSICIAN

Rutgers New Jersey Medical School, Newark, NJ

The Department of Emergency Medicine at Rutgers New Jersey Medical School in Newark is actively recruiting talented, full-time BC/BE Emergency Physicians at the Assistant or Associate Professor level interested in professional growth opportunities.

Join an enthusiastic faculty of academic emergency physicians in an expanding and dynamic department committed to scholarship, education, research, and outstanding clinical care. Clinical services are provided at University Hospital in Newark, NJ, a busy Level I Trauma Center and Comprehensive Stroke Center with 95K annual visits. The hospital cares for the large underserved population of Newark as well as its surrounding suburban communities.

Newark, a diverse city and the largest in New Jersey, has undergone substantial rejuvenation. It has world-renowned cuisine, a burgeoning arts scene, is a tech sector hub for the northeast corridor, and is minutes away from New York city by rail or car.

Applicants should have a desire for clinical, academic, or administrative excellence. As the department continues to thrive, candidates with subspecialty training, research interests, or simply aspirations for a career in academic emergency medicine are encouraged to apply.

For more information or to submit a CV:

**Lewis S. Nelson, MD**  
Chair, Department of Emergency Medicine  
185 South Orange Avenue, MSB E609  
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Lewis.Nelson@rutgers.edu

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- working at one of the top hospitals in Boston in a brand new Emergency Department that opened in October 2019
- the benefits of NSMC's membership in the Partners Healthcare System, founded by Massachusetts General Hospital and Brigham and Women's Hospital
- our annual adult ED volume of 80,000 visits provides an array of pathology with a fast track and PA program in place and excellent multispecialty back up
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Huntsville Hospital is a Level I Trauma Center and the Regional Referral Center for North Alabama and Southern Tennessee. Huntsville Hospital is Alabama's only Top 50 Heart Hospital by Truven Health Analytics and one of America's 50 Best Cardiac Surgery Programs by HealthGrades.

Huntsville is situated in the fastest growing major metropolitan area of Alabama, and with the highest per-capita income in the Southeast, Huntsville is the best place to live, learn, and work. We are a community on the move, rich with values and creative talents. These unique characteristics will certainly provide a place for you and your family to flourish. With a population of 385K, we are a high-tech, family-oriented, multicultural community with excellent schools, dining, and entertainment - all nestled in the foothills of the beautiful Appalachian Mountains.

**For further information, please contact Suzanne LeCroix  
at (256) 265-9639 or [suzanne.lecroix@hhsys.org](mailto:suzanne.lecroix@hhsys.org)**





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**Application Procedure:** Complete the online faculty application at <http://www.gwu.jobs/postings/68602> and upload a CV and cover letter. Review of applications will be ongoing beginning August 30, 2019 and will continue until positions are filled. Only complete applications will be considered. Employment offers are contingent on the satisfactory outcome of a standard background screening. Questions about these positions may be directed to Department Chair, Robert Shesser M.D., at [rshesser@mfa.gwu.edu](mailto:rshesser@mfa.gwu.edu).

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## Emergency Medicine & Toxicology Faculty

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The department has a well-established, three-year residency program and an Emergency Ultrasound fellowship. The department is seeking physicians who can contribute to our clinical, education and research missions.

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For consideration, please send a letter of intent and a curriculum vitae to:

**Robert Eisenstein, MD, Chair, Department of Emergency Medicine  
Rutgers Robert Wood Johnson Medical School**

**1 Robert Wood Johnson Place, MEB 104, New Brunswick, NJ 08901**

Email: [Robert.Eisenstein@rutgers.edu](mailto:Robert.Eisenstein@rutgers.edu)

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- 24/7 OB/GYN, Pediatrics, Interventional Cardiology, and Anesthesia coverage
- Vibrant, diverse community provides a picturesque setting with a downtown that is the center of commerce and community living

**Chestnut Hill Hospital** is a 148-bed facility located near Philadelphia with inpatient and outpatient, diagnostic and treatment services including minimally-invasive laparoscopic and robotic-assisted surgery, cardiology, gynecology, oncology, orthopedics, primary care practices, two Women's Centers, and an off-site physical therapy center. The hospital has openings for Emergency Medicine Physicians; day/evening and nocturnal positions available.

## Chestnut Hill Hospital:

- 40,000 patient visits annually
- 22-bed main ED plus eight fast-track beds
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- Observation experience is a plus

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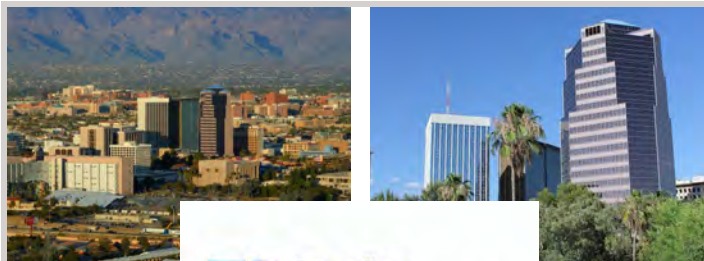
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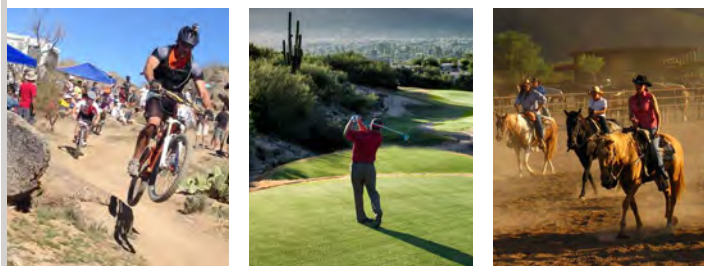
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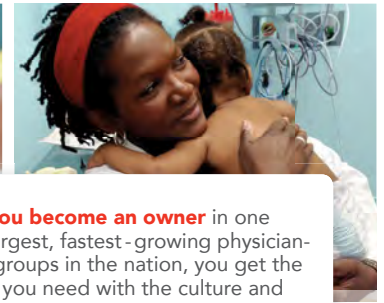
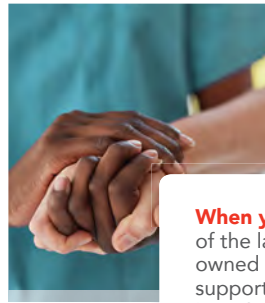
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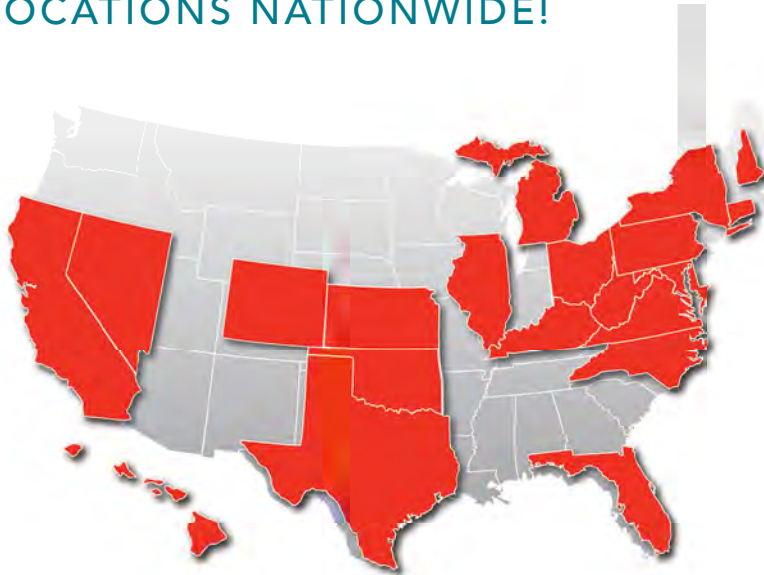
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### CarolinaEast Medical Center

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### Carteret Health Care

Morehead City, NC | 49,000 pts./yr.

### Catholic Medical Center

Manchester, NH | 33,000 pts./yr.

### + Doctors Hospital

Columbus, OH | 72,000 pts./yr.

### Fairfield Medical Center

Lancaster, OH | 37,000 pts./yr.

### Lake Health System

Cleveland, OH | 10-34,000 pts./yr.

### Mercy Health System

Cincinnati, OH | 9-53,000 pts./yr.

### MedStar St. Mary's Hospital

Leonardtown, MD | 49,000 pts./yr.

### Meritus Medical Center

Hagerstown, MD | 68,000 pts./yr.

### Saint Francis Hospital

Tulsa, OK | 107,000 pts./yr.

### Sentara RMH Medical Center

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### Sharon Regional Medical Center

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### Springfield Regional Medical Center

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### Stamford Health

Stamford, CT | 56,000 pts./yr.

### Summa Health System

Akron, OH | 7-81,000 pts./yr.

### Valley Children's Hospital (PEM)

Madera, CA | 113,000 pts./yr.

### + University Medical Center

Las Vegas, NV | 79,000 pts./yr.

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# Yale University School of Medicine Department of Emergency Medicine Fellowship Programs



For specific information including deadlines and requirements, visit <http://medicine.yale.edu/emergencymed>

The **Implementation Science** fellowship is a 2-3 year program that will train investigators in the principles and practice of dissemination and implementation science. Supported by a K12 grant from NIH's National Heart, Lung, and Blood Institute, fellows will receive training at the new Yale Center for Implementation Science (YCIS), the Yale Center for Clinical Investigation, and the National Clinician Scholars Program. Eligible candidates may receive a Masters in Health Sciences degree. Mentors come from the Yale Schools of Medicine, Nursing, and Public Health, as well as many community-based organizations in New Haven. For further information, contact **Steven L. Bernstein, MD**, [steven.bernstein@yale.edu](mailto:steven.bernstein@yale.edu).

The **Research** fellowship is a 2-3 year program focused on training clinician scholars as independent researchers in Emergency Medicine. Scholars will earn a Master of Health Sciences degree from Yale combining clinical experience with extensive training in research methods, statistics, and research design. With the guidance of research content experts and professional coach mentors, the scholar will develop a research program, complete a publishable project and submit a grant application prior to completion of the program. The program is credentialed by the Society for Academic Emergency Medicine. For further information, contact **Steven L. Bernstein, MD**, [steven.bernstein@yale.edu](mailto:steven.bernstein@yale.edu).

The **Yale Drug use, Addiction, and HIV Research Scholars (DAHRS)** Mentored Career Development Program (NIDA K12) provides a 3 year post-doctoral interdisciplinary, research training experience preparing investigators for careers focusing on drug use, addiction, and HIV prevention and treatment in general medical settings. Scholars earn the Master in Health Sciences degree that combines vigorous research methodology, statistics and design didactics in small group sessions and seminars covering topics related to drug use, addiction and HIV, leadership, grant writing and responsible conduct of research. Candidates complete mentored research project(s), multiple manuscripts, and apply for independent funding. For further information, visit [www.medicine.yale.edu/dahrs](http://www.medicine.yale.edu/dahrs) or contact **Gail D'Onofrio, MD, MS**, [dahrs@yale.edu](mailto:dahrs@yale.edu).

The fellowship in **Emergency Ultrasound** is a 1 or 2 year program that will prepare graduates to lead an academic/community emergency ultrasound program. The 2-year option includes a Master of Health Sciences or Master of Public Health with a focus on emergency ultrasound research. This fellowship satisfies recommendations of all major societies for the interpretation of emergency ultrasound, and will include exposure to aspects of program development, quality assurance, properties of coding and billing, and research. The program

consists of structured time in the ED performing bedside examinations, examination QA and review, research into new applications, and education in the academic/community arenas. We have a particular focus on emergency echo and utilize state of the art equipment, as well as wireless image review. Information about our Section can be found at <http://eus.yale.edu>. For further information, contact **Rachel Liu MD**, [rachel.liu@yale.edu](mailto:rachel.liu@yale.edu), or apply online at [www.eusfellowships.com](http://www.eusfellowships.com).

The **Administration** fellowship is a 2-year program that will prepare graduates to assume administrative leadership positions in private or academic emergency medicine as well as hospitals and health systems. The fellow will acquire experience in all facets of emergency department clinical operations, with close mentorship from department and hospital administrative leaders. Fellows will complete the recently #1 ranked Executive MBA program at the Yale School of Management. In addition, the candidate will assume graduated leadership roles on one or more projects supporting departmental activities usually culminating as Assistant Medical Director in the second year of the fellowship. For further information, contact **Arjun Venkatesh, MD, MBA, MHS**, [arjun.venkatesh@yale.edu](mailto:arjun.venkatesh@yale.edu).

The **Global Health and International Emergency Medicine** fellowship is a 2-year program offered by Yale in partnership with the London School of Hygiene & Tropical Medicine (LSHTM). Fellows will develop a strong foundation in global public health, tropical medicine, humanitarian assistance and research. They will receive an MSc from LSHTM, a diploma in Tropical Medicine (DTM&H) and complete the Health Emergencies in Large Populations (HELP) course offered by the ICRC in Geneva. In addition, fellows spend 6 months in the field working with on-going Yale global health projects or on an independent project they develop. For further information, contact the fellowship director, **Hani Mowafi, MD, MPH**, [hani.mowafi@yale.edu](mailto:hani.mowafi@yale.edu).

The fellowship in **EMS** is a 1-year program that provides training in all aspects of EMS, including academics, administration, medical oversight, research, teaching, and clinical components. The ACGME-accredited program focuses on operational EMS, with the fellow actively participating in the system's physician response team, and all fellows offered training to the Firefighter I or II level. A 1-year MPH program is available for fellows choosing additional research training. The fellowship graduate will be prepared for a career in academic EMS and/or medical direction of a local or regional EMS system, and for the ABEM subspecialty examination. For further information, contact **David Cone, MD**, [david.cone@yale.edu](mailto:david.cone@yale.edu).

The **Medical Simulation** fellowship is a 1-year program that provides training in all aspects of healthcare simulation, including high fidelity

mannequin simulation with computer program training, acquisition of debriefing and teaching skills, use of novel wearable technologies, and procedural simulation. The fellow will participate in all educational programs for medical students, nurses, residents and faculty at the Yale Center for Medical Simulation. The program includes options to train in research methodology through the Research Division of the Department of Emergency Medicine and participate in medical education coursework through Yale School of Medicine. The fellowship will include attendance of the one-week Comprehensive Instructor Workshop at the Institute for Medical Simulation in Boston. For further information, contact **Leigh Evans, MD**, [leigh.evans@yale.edu](mailto:leigh.evans@yale.edu).

The **Educational Leadership** fellowship is a 1 or 2-year program that provides the training and education to develop academic emergency physicians to have the skills, knowledge and experience to be strong educators and leaders in Emergency Medicine education with the focus on developing leaders in EM residencies or in Undergraduate Medical Education. The fellow will be an Assistant Residency Program Director and an integral member of the education faculty. They will be supported to attend leadership training as well as using other internal resources, COR and ACEP to further their education. For further information, contact **David Della-Giustina, MD, FACEP, FAWM**, [david.della-giustina@yale.edu](mailto:david.della-giustina@yale.edu).

The **Wilderness Medicine** fellowship is a 1-year program that provides the core content of medical knowledge and skills in being able to plan for and to provide care in an environment that is limited by resources and geographically separated from definitive medical care in all types of weather and evacuation situations. The fellow will be supported to obtain the Diploma in Mountain Medicine and other Wilderness Medical education. The fellow will become a leader and national educator in the growing specialty of wilderness medicine. For further information, contact **David Della-Giustina, MD, FACEP, FAWM**, [david.della-giustina@yale.edu](mailto:david.della-giustina@yale.edu).

The **Clinical Informatics** fellowship is a 2-year program that provides ACGME-approved training in all aspects of clinical informatics. The program is administered through the Yale Department of Emergency Medicine. In the first year, the fellow will rotate between the Yale-New Haven Health and Veterans Affairs. Major blocks will be devoted to electronic health records, clinical decision support, databases and data analysis, and quality and safety. Experiential learning will be combined with didactic classes and conferences. The second year is dedicated to advanced learning and project leadership. The fellow will attend the American Medical Informatics Association annual meeting. The program prepares fellows for Clinical Informatics Board examination. For further information, contact **Ted Melnick, MD, MHS**, [edward.melnick@yale.edu](mailto:edward.melnick@yale.edu).

**All require the applicant to be BP/BC emergency physicians and offer an appointment as an Instructor to the faculty of the Department of Emergency Medicine at Yale University School of Medicine. Applications are available at the Yale Emergency Medicine web page <http://medicine.yale.edu/emergencymed/> and are due by November 15, 2019 with the exception of the Clinical Informatics Fellowship, the Wilderness Fellowship, and the Educational Leadership Fellowship, which are due by October 1, 2019.**

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