

EM Resident

Official Publication of the Emergency Medicine Residents' Association

June/July 2017

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Take-Home Naloxone

p. 12

Prehospital Sepsis Screening

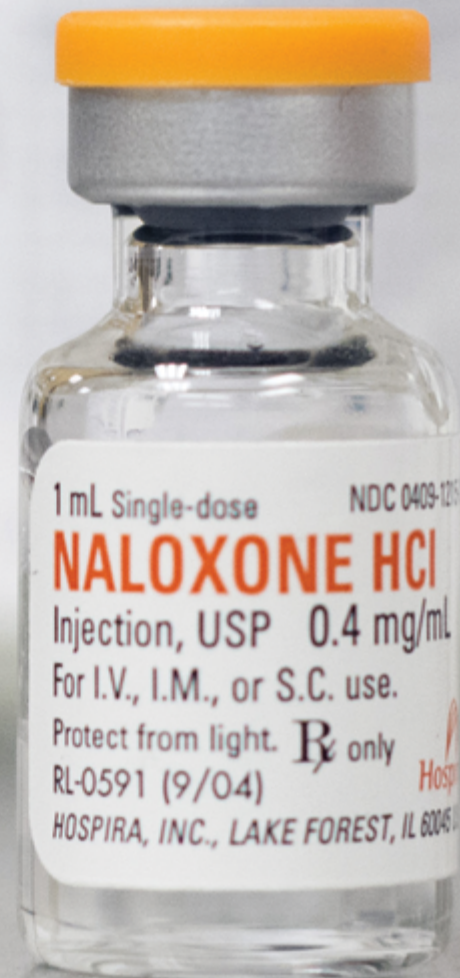
p. 10

SGLT-2 Inhibitors and the Risk for Euglycemic DKA

p. 17

Beyond ATLS: What the Manual Doesn't Tell You

p. 20



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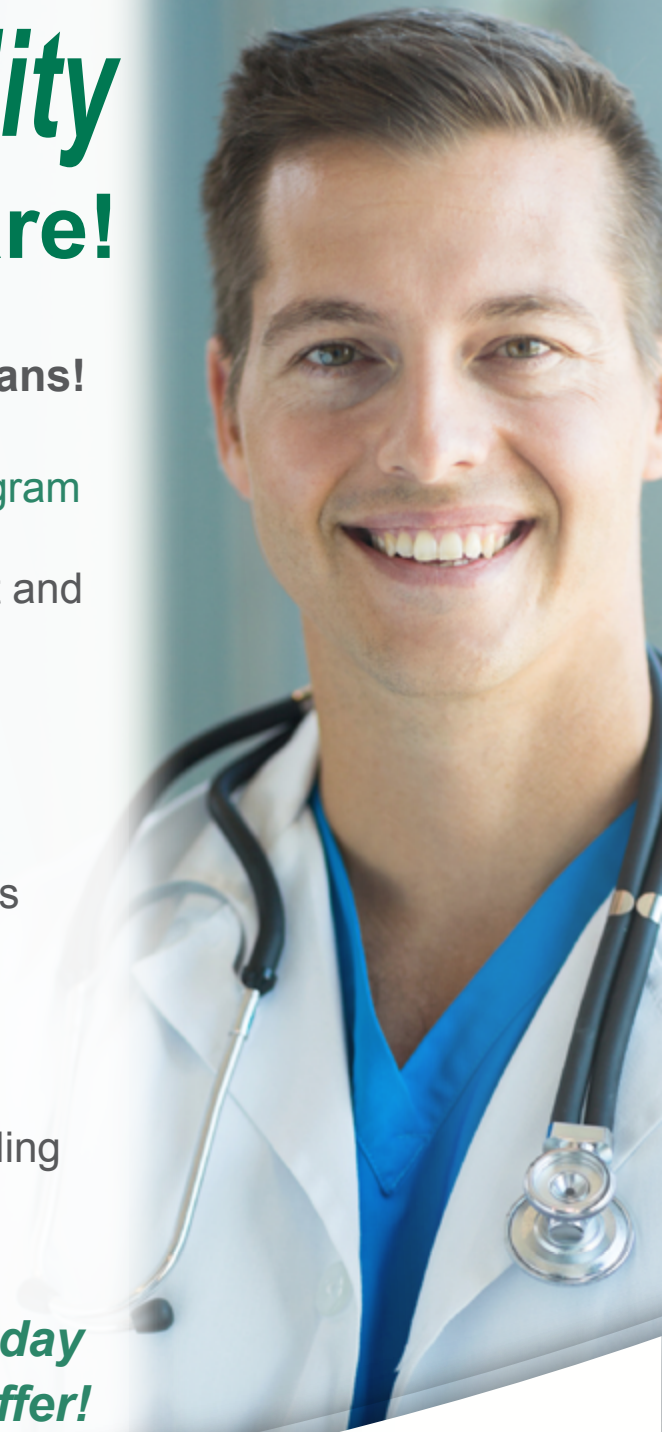
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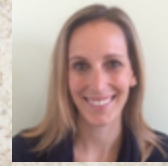


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Letter from the Editor



Abby Cosgrove, MD
Editor-in-Chief, EM Resident
Washington University in St. Louis
St. Louis, MO

There I was, driving giddily to the Social Security Administration office on Delmar Boulevard in St. Louis. It was June 30, and I was a newlywed *doctor* (surely it was a mistake?!) in a new city with a new job, ready to take on a new last name. The windows were down and the radio was blasting as I cruised through beautiful tree-lined streets, past businesspeople dining leisurely outside, and alongside cyclists enjoying an afternoon ride in the park.

But the moment I turned north, the lively green landscape faded abruptly into a new reality. Within *one* block, the trees and people were replaced with abandoned homes, broken windows, and desolate grey concrete. I turned down the radio and slowed to a stop at the intersection of Delmar and DeBaliviere.

No one had told me about the famous Delmar Divide, but now they didn't have to. What I discovered in that moment was that Delmar Boulevard wasn't just any street. It was a tangible line that ran east-west and represented an extreme racial and economic division in one of the most segregated cities in America.

Looking back now, I could not have asked for a better introduction to my new city, and to my intern year. My perspective of the daily struggles of our inner city population was forever shaped by the

three hours I spent waiting my turn in that overheated, run-down, filled-to-capacity Social Security office on Delmar Boulevard.

Fast-forward three years and I have visions of gun violence and social injustice that I will never be able to clear from my head. Like the cop who burst frantically into the waiting room carrying a dead 5-year-old boy who had been shot in the chest. Or the body that had been ripped apart by an automatic rifle, sitting lifeless in the driver's seat while the blaring music in his car played on. Or the silent tears of desperation running down the 13-year-old's face after having had a bullet tear through his leg.

The problem is that it isn't enough to dress a gunshot wound, sew up skin after a stabbing, give naloxone to the heroin overdose, or provide post-exposure HIV prophylaxis to a rape victim.

We must also consider where our patients have come from, and more important, where they are going. Consider that the reason your patient called the ambulance at 1 am for a non-urgent complaint is because that's the only time she had off between jobs, and it was simply too dangerous to take public transportation. Consider that when you discharge that gunshot wound victim home, you are returning him/her to the

same violent environment that encouraged retaliation and recidivism in the first place.

Emergency medicine isn't just about treating an individual patient at one specific moment in time; it is about treating an entire community *over* time. For within the walls of the emergency department exists every disease and injury pattern, in every neighborhood, across all age ranges, within every income level, education level, culture, and lifestyle. And as such, ***we must go beyond our core role of providing acute care to individual patients in order to confront the social complexities that burden the entire population.***

Fortunately, even the smallest interventions can make a difference, many of which are highlighted in this issue. For example, prescribe take-home naloxone (p.12), practice using alternatives to opioids, and provide resources for chemical dependency. On a larger scale, start a hospital-based violence intervention program, set up protocols for frequent ED utilizers, or work with police to develop a tactical emergency medical support (TEMS) team (p.28).

Visit the neighborhoods in which many of your patients live. ***Give your patients the benefit of the doubt.*** The overall health of our communities is as much our responsibility as it is theirs. ★

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Washington University in St. Louis

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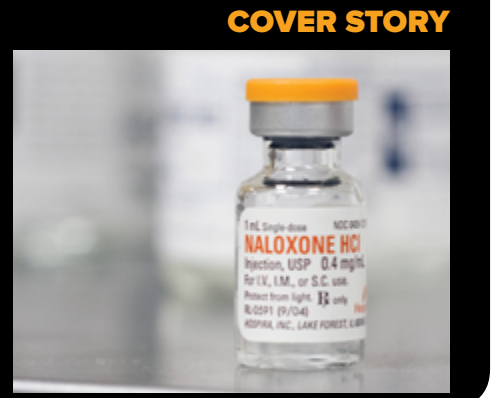
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Emergency Medicine Residents' Association

Categories

12 TOXICOLOGY

Take-Home Naloxone

Preventing Death
in an Era of Abuse



COVER STORY

4 PRESIDENT'S MESSAGE

Wisdom in a Time of Change



14 CRITICAL CARE

Positively Useful

A Brief
ED Guide
to NIPPV



5 VICE-SPEAKER REPORT

EMRA RepCo Goes Digital



17 CLINICAL

SGLT-2 Inhibitors and the Risk for Euglycemic DKA



7 RC-EM ACGME UPDATES

ACGME Updates

New Programs, Resident Well-Being, Parental Leave

9 NEW BOARD MEMBERS

Eric McDonald, MD

RC-EM Representative

Garth Walker, MD, MPH
Member-at-Large

18 CRITICAL CARE

Dual Defibrillation



The Achilles' Heel of Refractory V-Fib?

10 PREHOSPITAL & DISASTER MEDICINE

Prehospital Sepsis Alerts



A STEMI or Stroke Equivalent?

20 CRITICAL CARE

Beyond ATLS



What the Manual Doesn't Tell You

23 INFECTIOUS DISEASE
**Top 10 Zika Facts
for Emergency Physicians**



24 CLINICAL CASE
**Blood Transfusion
Reactions**



TACO, TRALI, and Other
Considerations

26 PREHOSPITAL & DISASTER
MEDICINE
**Prehospital Termination
of Resuscitation**



28 PREHOSPITAL & DISASTER
MEDICINE
**Physician Roles in
Tactical EM Support**



Protecting the Protectors

30 HEALTH POLICY
All About the Benjamins



What You Must Know
About MACRA

32 ACADEMIC AFFAIRS
**Advocating
for
Resident
as Teacher**



33 MEDICAL STUDENTS
**Navigating
International
Waters**



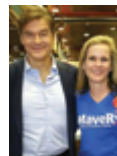
Top 5 FAQs for International Medicine
Graduates Matching into EM

34 SIMULATION
**Introduction to Simulation
in EM Residency**

Medical Simulation 102

39 EMPOWER
**Sharing Our
Stories**

Angela Siler Fisher, MD,
FACEP



40 RESIDENT EDITORIAL
**Reflections on
Becoming a Doctor**



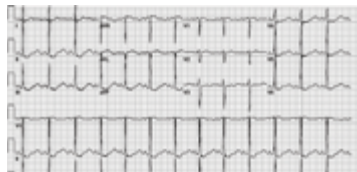
41 CONSULT CORNER
Neurology

Help when seeking input
from other specialists.



42 NEWS & NOTES
ABEM, Stallings, incubatED

43 ECG CHALLENGE



45 BOARD REVIEW
Questions

UPCOMING EVENTS

June 15

20 in 6 Application Deadline

July 15

Fall Awards Nominations Due

June 30

incubatED Applications Due

August 5

EM Resident Magazine Articles Due

Month of September

EM Day of Service

October 5

EM Resident Magazine Articles Due

October 14–17

ABEM Fall Oral Certification Exam

October 26–November 1

EMRA Events @ ACEP *Scientific*

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Washington, D.C.

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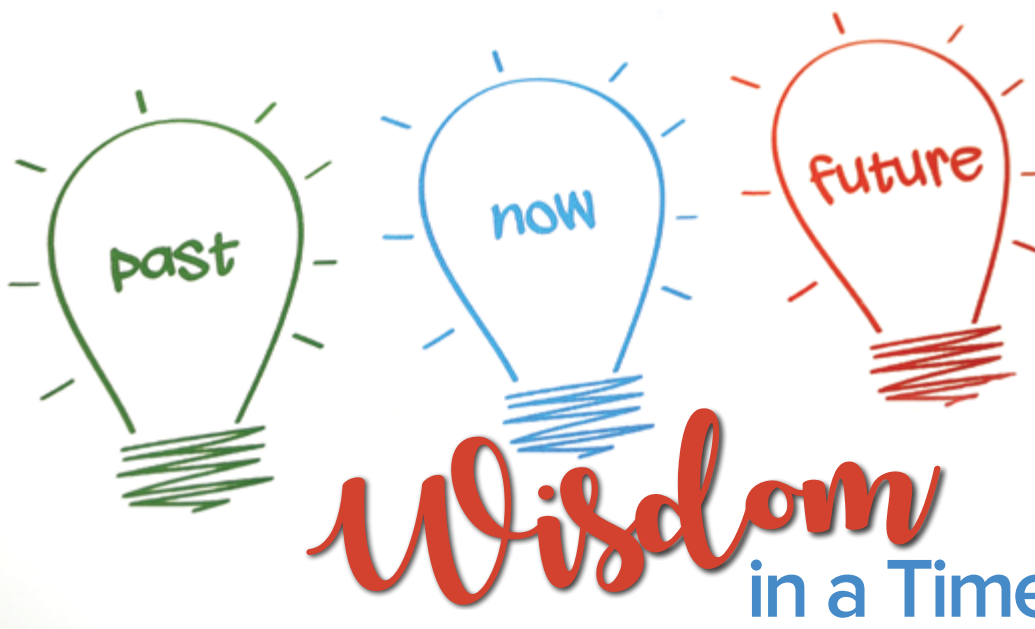
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Alicia Kurtz, MD
EMRA President
UCSF Fresno
Fresno, CA
@aliciakurtz_md

It's hard to believe another academic year is coming to an end. Another crop of medical students who have struggled through the long Match process will finally start out as interns. Junior residents who have become more fluid with procedural and clinical competencies will assume new roles as senior residents, leading and teaching in the ED. And for all of us graduating residents, these next few weeks hold our last moments of residency, which for many of us means saying some bittersweet goodbyes.

While change brings the excitement of starting anew, it also carries the memory of where we've been and those people and experiences that made us who we are. As I get ready to leave Fresno behind, I can't help but remember some things I've been told over the years that come back to me in moments of transition.

"It's easy to be the star. But it's who you are in the darkness, behind the curtain when no one is watching that shows who you really are. Be sure that person is the one who makes you most proud." Sister Dolores, my high school principal, was a woman of few words, but the ones she did say were very intentional. She shared this with me my senior year, and while we were talking at the time about some high school musical drama, the message was clear and remains pertinent as we take on new challenges. It's easy to be an amazing provider to those we readily feel compassion for or the patients who

make us feel appreciated. But it's how we treat those who test our patience, irritate us, or push us to our limits that matters most. It's how we talk about our colleagues and support staff behind closed doors. It's staying late to advocate for a patient or help a teammate when it's the right thing to do. It's being the best you *all* the time, not only when you know people are watching.

"You never know where the road will go. My advice? Take the road."

Dr. Julio Veinbergs, the OB/GYN who delivered me, remains a close friend of my family and is full of sage advice. He shared this with me when I was deciding whether to go back to school to complete a post-bacc and pursue a career in medicine. To accomplish our dreams in life, we often have to give up what is comfortable — move away from our friends and family, leave the neighborhoods we know by heart, and start over in the process of gaining "street cred" and a reputation in our workplace. This process is fraught with uncertainty, which is nobody's favorite feeling, but we have to take the road to discover what life holds in store for us — what amazing people, places, and experiences are waiting just around the corner and often change our lives in ways we could never imagine.

"Fail, my friends! It is only in failure that you grow, and only those who grow will find success." Dr. Fred Kiesner, one of my undergrad professors,

was a huge proponent of celebrating your failures. Nobody is perfect, no matter how hard we try. As doctors, we are *bound* to make mistakes. We will miss diagnoses, order the wrong medications, say the wrong thing at the wrong time, not know the right answer... This is inevitable. But if we let ourselves learn from each mistake, if we rise every time we fall, then every shift we will be smarter and better than we were before until we're truly the experienced and excellent clinicians we set out to be.

"When all eyes are on you... wink."

OK, this one was actually on the bottom of a Mike's Hard Lime cap, but I *love* it and feel like it definitely applies in those moments when you have to be "on" and don't feel 100% confident. As a new intern or senior resident or new attending, we all will have moments when we internally panic but need to be cool and collected on the outside to help everyone else in the room stay calm too. Just remember, EM is a team sport. You're never alone and we're all in this together. No matter where you are, your EM faculty are there in the ED where you trained 24/7/365 — and that's only a phone call away.

Whatever transition you're making this year, here's to it being a smooth one! And on a personal note, a huge thank you to all those who helped shape me into the doctor I am today, and to those who will continue to push me to be a star even in the dark — with every person, every time.

Keep on keepin' on! ★

Comments or Questions?

Contact Dr. Pasichow at vicespeaker@emra.org.



Scott H. Pasichow, MD, MPH
EMRA Vice-Speaker of the Council
Brown University
Providence, RI
@SPMD16

EMRA RepCo GOES DIGITAL

If you attended SAEM17, you probably noticed some changes during the EMRA Representative Council Meeting. After seeing only about 30% of our organization’s representatives at SAEM16 in New Orleans, I knew we had to make a change. With the help of our staff, our board, and you the members, Virtual RepCo was born. It is made up of three parts:

Virtual Reference Committee

We start reviewing resolutions before anyone arrives for the conference. Each resolution submitted as a regular resolution gets uploaded to a secure platform embedded in our website (emra.org). There, after logging in, members are able to read the resolutions and provide comments and feedback. This allows every member of the organization to see what resolutions are being voted on – and to post their opinions, objections, and amendments. This makes every member a more integral part of the meetings, and allows each voice to be heard, even if you are unable to attend our in-person reference committee.

Virtual Representative Council

It wasn’t enough to bring our resolutions into everyone’s home and office. We wanted to bring the whole meeting there, too. We adapted our “EMRA Hangout” model and created a webinar to broadcast the meeting. Each podium and in-room microphone was equipped with a camera and computer microphone, so the entire meeting could be streamed anywhere in the world. From the slides that guide the meeting to the reports and debates, we made sure you could see and hear it all. But what if you wanted to comment as well? The webinar allows you to submit a written comment to be read aloud during debate, or to “raise your hand” and be projected on the screens in the meeting room to make your point. But that still leaves one more connection conundrum unsolved.

Remote Voting

Even if you can’t comment on a resolution before a meeting, or speak on the resolution during the meeting, there is no reason every program representative shouldn’t be allowed to vote on the resolution at a meeting (in accordance with our bylaws and procedures of course). We upgraded our “clicker” system and are now using CloudVote, a completely online voting platform so that every motion and every board election can be voted on from anywhere in the United States. Every program representative gets a unique identifier before each meeting, which is used to log in to the voting software. This creates a secure two-part identification process allowing for fast, seamless, and secure credentialing for our meetings.

Once credentialed, EMRA program reps can watch the webinar of the meeting, and when it comes time to vote, pull up the voting tab on their computer or phone and vote. **This adds an additional level of security to our voting system while allowing representatives anywhere in the country to support their colleagues running for office, or to vote on a resolution they know will change our organization for the better.**



This three-part system debuted at SAEM17, and we learned a lot from that experience.

But none of this happens without all of you.

Please take the time to let me know what you liked and what you didn’t like.

Email vicespeaker@emra.org. ★



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OWN YOUR CAREER

ACGME Updates

New Programs, Resident Well-Being, Parental Leave



Leonard Stallings, MD
RC-EM Representative
East Carolina University
EM/IM/CCM – PGY-6
Greenville, NC
@stallingsemra1

The ACGME Review Committee for Emergency Medicine, charged with overseeing graduate medical education for the specialty, approved additional programs in April – building on progress it made throughout the past year.

April 2017. A range of programs gained approval during the April meeting in Chicago, including:

Emergency Medicine (EM)

University of Central Florida, Ocala, FL
University of Central Florida, Gainesville, FL
Reading Hospital Program, West Reading, PA

Emergency Medicine – Single Accreditation System (SAS)

Desert Regional Medical Center, Palm Springs, CA
Palm Beach Consortium for Graduate Medical Education, Port St. Lucie, FL
Botsford Hospital, Farmington Hills, MI
Mercy Health, Muskegon, MI
Campbell University, Fayetteville, NC
Campbell University, Lumberton, NC
St. Elizabeth Boardman Hospital, Boardman, OH
Integrus Health, Oklahoma City, OK

Emergency Medical Services (EMS)

Stanford University Hospital/Kaiser Permanente Medical Center, Palo Alto, CA
Case Western Reserve University/University Hospitals, Cleveland, OH

Clinical Informatics (CI)

University of California – Irvine, Irvine, CA

Medical Toxicology (Tox)

Lehigh Valley Health Network/University of South Florida, Bethlehem, PA

January 2017. The RC-EM midyear meeting in January tackled some of the extra workload associated with the new applications for EM subspecialties and the SAS applications. The following programs were approved:

Emergency Medicine (EM)

Rush University Medical Center, Chicago, IL
Wyckhoff Heights Medical Center, Brooklyn, NY
St. John's Riverside Hospital, Yonkers, NY

Emergency Medicine – Single Accreditation System (SAS)

Henry Ford – Macomb, Clinton, MI
McLaren Oakland (Macomb), Pontiac, MI
Inspira Medical Center – Woodbury, Woodbury, NJ
St. Barnabus Hospital, Newark, NJ
Good Samaritan Hospital Medical Center, West Islip, NY
Adena Regional Medical Center, Chillicothe, OH
Oklahoma State University Center for Health Sciences, Tulsa, OK
Mountain State Osteopathic Postdoctoral Training Institution, Lewisburg, WV

Passing the Baton

This will be my last article as your RC-EM Representative, as I officially rotate off the RRC-EM on June 30. I have the honor to serve emergency medicine on the ACGME Committee that is now tasked with rewriting the Common Program Requirements of Sections I-V. This will keep me involved with the ACGME until early 2018 and will allow me to contribute not only to trainees in our great specialty but to all future residents and fellows.

It has been my distinct pleasure to serve EMRA as the RC-EM Representative over the last 2.5 years. I am saddened to leave the position, yet extremely proud to hand the role over to my successor, Eric McDonald, MD. He will be a tireless advocate for you on the RC-EM, CRCR, and on the EMRA Board of Directors. I look forward to seeing his contributions to this amazing specialty and to EMRA. ★

September 2016. These programs were approved during the fall meeting:

Emergency Medicine (EM)

Riverside Community Hospital, Riverside, CA
Spectrum Health, Grand Rapids, MI
Grand Strand Regional Medical Center, Myrtle Beach, SC

Emergency Medical Services (EMS)

University of Mississippi, Jackson, MS

Pediatric Emergency Medicine (PEM)

Stanford University Hospitals, Palo Alto, CA
Virginia Commonwealth University, Richmond, VA

EM – Single Accreditation System (SAS)

St. Mary Mercy Hospital Program, Livonia, MI
St. John Macomb – Oakland, Warren, MI
Henry Ford Wyandotte, Wyandotte, MI
Arnot Ogden Medical Center, Elmira, NY
Memorial Health System, Marietta, OH
Kent Hospital Program, Warwick, RI

ACGME COUNCIL OF REVIEW COMMITTEE RESIDENTS

Resident Well-Being

During a CRCR meeting in September, there was a concerted effort to begin focusing on resident well-being via advocacy at the highest level of ACGME leadership. This effort resulted in several summits and new programming that has firmly placed resident well-being at the forefront of every Program Director (PD) and Designated Institutional Official (DIO) that oversee programs and institutional GME resources. Several great workshops were well-attended at the 2017 ACGME Annual Educational Conference in March.

Back-to-Bedside

A previously proposed “Back-to-Bedside” initiative has been revived to find ways to get residents back to the bedside taking care of patients and spending less time on administrative/non-physician oriented tasks that take away from learning. Residents across all specialties commonly note that this can be a problem, so the CRCR is addressing ways to mitigate it at the institutional level. This idea has garnered the attention of the executive leadership of the ACGME Board; a formal presentation was due from CRCR leaders this spring, with updates planned in May.

Parental Leave

There is a proposal being discussed concerning advancing parental leave, which is in its infancy but is being passionately worked on. There should be more to come in the future.

Eric McDonald, MD

RC-EM Representative

University of Mississippi
Jackson, MS

rrcemrep@emra.org

The ACGME Review Committee for Emergency Medicine (RC-EM) provides high-level oversight of EM residency programs – a role that is especially key during this season of transition to a single accreditation system. Eric McDonald, a second-year resident at the University of Mississippi Medical Center, will be the voice of residents on the RC-EM, taking over for Leonard Stallings, MD, whose term closes this year. Dr. McDonald's brings to the role his unique perspective as a firefighter, EMT, and paramedic who is now pursuing a career as a physician.



What's your primary goal in your new role with EMRA and the ACGME?

My primary role is simple. I want to make resident voices heard. I want to remind our current leaders that we are more than just students. We are the future physician workforce and leaders of our field and our country.

Describe your leadership style in 20 words or less.

I believe that leading is nothing more than understanding and utilizing the many strengths of those around you.

If your fellow residents picked a motto for you, what would it be?

Work hard, have fun, be friends, and when that doesn't work--use your dad voice.

Favorite life-balancing hack?

As a husband, father of 7, and physician in training, there are many important things in my life. Priorities are key! Without having my priorities in line, things could go haywire quickly.

Respecting HIPAA, tell us about your most memorable patient encounter.

Years ago, as a paramedic, I was transferring a sweet older lady from a rural county hospital to a cardiac center having an enormous myocardial infarction. The hospital she presented to was nothing more than a critical access facility understaffed and under equipped to care for her. She was in pain. She felt as though she was going to die. I went into action quickly. I found myself scurrying to perform every maneuver, trick, and technique that I'd learned to possibly help her. Nothing worked. It wasn't until I sat down and talked to her, let her know that I cared for her, and learned of her 30+ year career as a school teacher that things changed. Her heart rate slowed. Her pain eased. It was then that I learned the importance of compassion. It was then that I learned there is more to being a provider than books, studying, medications, and procedures.

Best advice you've ever heard?

From an elderly friend – “would you rather be my age and say ‘what if I had?’ or ‘I tried that and it wasn't for me?’”

What goes on pizza?

All of the meat and cheese, although it's hard to mess up pizza.

Wine, beer, coffee, water or something else?

I've certainly had all of the available choices and they serve their purpose, but coffee and water are fundamental parts of my day. Coffee, because I'm a resident and father of 7. Water, because I have to drink something other than coffee and it's free.

Most-used app on your phone?

PEPID

Last song stuck in your head?

“Just Be Held” – Casting Crowns ★



Garth Walker, MD, MPH

Member-at-Large

University of Chicago
Chicago, IL

memberatlarge@emra.org

In his first year of residency at the University of Chicago, Garth Walker has stepped into the Member-at-Large position on the EMRA Board, following in the footsteps of Ashley Guthrie, DO, whose term ended this spring. Dr. Walker has an undergraduate degree in economics and a master's degree in public health. He has worked at a management health care startup and maintains a research focus on the optimization of health care utilization, social determinants of health, and access to care.

What's your primary goal in your new role with EMRA?

My main project will be to audit the current infrastructure of the EMRA board. Based on an analysis of the organization's goals and the needs of its members, I will assist in facilitating a restructuring the EMRA board to improve its efficiency and effectiveness. In other words, I will be working with our leadership to identify what we as a board do well and developing ways to build and improve upon that.

Additionally, I will serve as a member of the EMRA Finance Committee, the Research Committee board liaison, the International Division board liaison, and the Diversity & Inclusion Committee board liaison.

What do you hope to accomplish within the Emergency Medicine practice?

The emergency room is often the first encounter that various patient populations have with our health care system. The opportunity to be on the front lines of the health care system is one of reasons I chose to become an emergency medicine doctor. Through research and further collaboration with community stakeholders, I hope to play a role in developing cost-effective solutions to some of the systemic health and social issues that often plague urban and other underserved patient populations.

Describe your leadership style in 20 words or less.

I try to lead by example, roll up my sleeves, and get into the trenches with my squad.

What do you do in your free time?

I rely on cross-training, running, swimming, and basketball as great ways to relieve stress. I also love listening to '90s R and B. In addition, I serve on the board for a nonprofit organization called Turning the Page. Turning the Page aims to improve literacy outcomes in Chicago and D.C. It also works to empower inner city parents to become engaged advocates within their children's school communities.

Favorite quote?

"Success is a function of persistence and doggedness and the willingness to work hard for 22 minutes to make sense of something that most people would give up on after 30 seconds." — Malcolm Gladwell

What goes on pizza?

Deep dish of course! Supreme style: sausage, pepperoni, mushrooms and onions

Wine, beer, coffee, water or something else?

Coffee

Most-used app on your phone?

Close battle between GROUPME and CNN

What is on your current reading list?

Michael Lewis "The Undoing Project. A Friendship That Changed Our Minds"
Yuval Noah Harari "Sapiens. A Brief History of Humankind" ★



Prehospital Sepsis Alerts

A STEMI OR STROKE EQUIVALENT?

“This is Medic 19 bringing in a Sepsis Alert, ETA 5 min.” With that alert, you mobilize your team and prepare for the patient. When they arrive, intravenous (IV) fluids and IV antibiotics have already been initiated. A lactate has been performed and is 4.2.

Sepsis is one of the more common life-threatening ailments to present to the emergency department (ED), with an estimated incidence of 3 per 1000 patients, and a mortality reaching 20%.¹⁻³ **While well-defined protocols currently exist for time critical diagnoses such as prehospital ST-elevation myocardial infarction, stroke, and trauma, analogous recommendations for sepsis have remained elusive**, due in large part to the insidious and variable presentation of sepsis.

Justifying Early Intervention

The past decade has been wrought with considerable controversy regarding the efficacy of initial resuscitative measures on outcomes in sepsis. In 2001, a seminal study describing the concept of early goal-directed therapy (EGDT) had far-reaching impact when it reinforced the importance of IV fluids and early antibiotics in sepsis resuscitation.⁴ Since then, a number of well-designed RCTs (PROCESS, PROMISE, ARISE) have challenged this longstanding paradigm and have created substantial uncertainty by demonstrating similar outcomes between EGDT and usual care.^{5,7} Despite

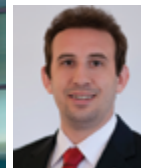
these findings, the 2016 installment of the Surviving Sepsis Campaign has continued to strongly recommend at least 30mL/kg of IV crystalloid within the first 3 hours, as well as the administration of IV antibiotics within one hour.⁸ This is intended to reinforce taking early action.

Beyond these well-studied outcomes of early sepsis recognition, there are a number of other theoretical benefits that exist when applied to the prehospital setting. These include identifying high-risk patients who are refusing transport, identifying appropriate transport destinations for these patients, generating early treatment momentum that enables faster triage to higher level of care within the ED, and jumpstarting Sepsis CMS Core Measures (SEP-1).⁹

Prehospital Identification

Identifying sepsis in the prehospital setting remains difficult. In 2012, a retrospective 10-year cohort study of all adult patients transported by EMS in Seattle demonstrated that only 3.3% of patients were ultimately diagnosed with severe sepsis upon admission.³

Interestingly, of the total aggregate admissions for severe sepsis, 40% arrived by EMS,



Michael Spigner, MD, EMT-CC
EMRA Prehospital & Disaster Medicine Division Chair
Assistant Medical Director, Colerain Township Fire Department
University of Cincinnati
Cincinnati, OH



Alanna O'Connell, DO
Emergency Medicine Resident
Einstein Medical Center
Philadelphia, PA

There has been a push in the field of prehospital research to aid in sepsis diagnosis and intervention.

suggesting that severe sepsis may be less encountered for prehospital providers, but that when an individual with severe sepsis does arrive in the hospital, they are nearly as likely as not to have arrived by ambulance. Notably, only 19% of severe sepsis patients were thought to have a life-threatening condition by EMS, despite the fact that more than 50% met SIRS criteria initially. Furthermore, a significant proportion of patients with severe sepsis were transported by BLS ambulances, and many had patient contact for greater than an hour before arriving in the hospital.

Several structured screening tools have been developed for the identification of sepsis in the prehospital setting. These include the PRESEP, PRESS, BAS 90-30-90, and Robson Screening Tool, which all utilize some variant of the SIRS criteria.¹⁰⁻¹⁹ In the absence of a robust validation, however, definitive conclusions about the efficacy of any of these scoring systems must be deferred. With the recent endorsement of qSOFA in Sepsis-3, some scattered EMS systems have been investigating the utility of this tool in the prehospital setting. The current

body of evidence, however, appears to be extremely weak.²⁰

In addition to the aforementioned scoring systems, which focus heavily on vital signs, there has been an increasing amount of research into the validity of proxies for metabolic activity, such as end-tidal carbon dioxide (ETCO₂) and point-of-care lactate, for sepsis identification.

End-Tidal Carbon Dioxide

The use of ETCO₂ monitoring is already widely implemented by EMS systems to confirm endotracheal tube placement after intubation. Just as capnography can help monitor ventilation in cardiac arrest, it may serve as a surrogate marker for acidosis in sepsis as well.^{21,22}

In 2013, a prospective observational study of adult patients with suspected sepsis sought to assess the association of ETCO₂ with mortality and found that both very low and very high ETCO₂ were associated with increased mortality. Earlier this year, the same investigators published the 12-month results of a prehospital screening tool for sepsis and severe sepsis (utilizing end-tidal carbon dioxide), which was implemented into their own EMS system in Orange County, FL (Figure 1).²³⁻²⁵

While all “sepsis alert” patients were included in the study, they were separated into two subgroups based upon whether there was strict adherence or incomplete adherence to the protocol (ie. not meeting full criteria for “sepsis alert”). In the protocol-compliant group, there was a significantly higher percentage of patients accurately diagnosed with sepsis (78% versus 43%). While these results are promising, they only comprise the cohort of patients who presented via a “sepsis alert.” For this reason, it cannot be concluded how many patients with

sepsis were missed, either due to protocol noncompliance or due to passing the screening test.

Point-of-Care Lactate

While there appears to be a significant inverse relationship between ETCO₂ and lactate, the strength of correlation appears to be moderate, which raises the question of whether it would also be worth also utilizing serum lactate in the prehospital setting.²⁶⁻²⁸

Presently, several devices have been investigated for this use, including the epoc[®] blood analyzer and the iSTAT[®], as well as other POC devices initially designed for use with athletes. To date, it has been difficult to implement the commercially-available, single-purpose lactate meters in the prehospital setting, as the devices that are most affordable to prehospital agencies are often not approved for medical use (but rather for athletes engaging in anaerobic exercises), or require a moderately-complex laboratory license. Studies to date have shown mixed results with respect to device bias, and therefore lactate is not consistently used in the prehospital setting.^{29,30}

Prehospital Treatment: A Case Report from Greenville County EMS

Greenville County EMS in South Carolina has been using a “sepsis alert” protocol since November 2014.^{31,32} Their system responds to over 85,000 calls for service each year, with an average transport time of 16 minutes. In their protocol, prehospital providers are responsible for drawing blood cultures and samples for lactate measurement in patients in whom sepsis is suspected by SIRS criteria. Thereafter, they are permitted to administer a fluid bolus (30cc/kg to a max of 2L) and an intravenous antibiotic (1g ceftriaxone for suspected pneumonia, and 4.5g piperacillin/tazobactam for all other sources).

Between February 2015 and February 2016, 120 trained paramedics called 1,185 “Sepsis Alerts” from a pool of 56,643 patients (2%). Emergency department standard of care for sepsis was continued in 94.1% of Sepsis Alert patients. The authors reported that prehospital providers correctly identified

patients in 73.5% of cases (using ICD-9 admitting diagnosis as a reference standard). A total of 946 blood cultures were collected with a contamination rate of 4.96% (comparable to established thresholds of hospital obtained blood cultures by non-phlebotomists).³³ Lactate level was greater than 2.2 in 46.9% of patients. 72% of these patients received prehospital antibiotics with no adverse effects (of note, antibiotics were deferred when IV access or blood cultures were unobtainable, or when the patient was allergic to penicillin).

Finally, core measure achievement was observationally analyzed at one of their primary receiving facilities. It was found that EMS-transported patients reached CMS core measure goals 90% of the time, as compared to 60% in the ED alone. **The authors also reported that patient mortality due to sepsis is historically low in the hospital system, with an estimated cost savings (related to length of stay) approaching \$600,000.**

While outcome data is still forthcoming, the protocol has been so successful that it has been adopted by the State of South Carolina’s EMS protocols, allowing any EMS agency in the state to employ it.

Conclusion

In summary, prehospital identification of sepsis remains an imperfect science, albeit a constantly improving one. New screening tools implementing SIRS criteria with end-tidal carbon dioxide may show promise for improving the early identification of this potentially-lethal syndrome. While there is strong support for early antibiotics in patients with sepsis, the literature continues to harbor a paucity of powerful studies demonstrating improved outcomes with prehospital administration of antibiotics. As there are a number of potential logistical hurdles that accompany prehospital administration of antibiotics, forthcoming studies, including the Prehospital Antibiotics Against Sepsis Trial (PHANTASi; currently recruiting participants) and outcome studies from Greenville County EMS, will be important in shaping the impetus for improving sepsis care in the prehospital setting.³⁴ ★

FIGURE 1. “Sepsis Alert” Protocol

Adult patient with suspected infection
+
≥ 2 SIRS criteria
Temp >38C or <36C
HR >90 beats/min
RR >20 breaths/min
+
ETCO ₂ ≤ 25 mmHg



Take-Home Naloxone

Preventing Death in an Era of Abuse

Some have expressed concern that the distribution of naloxone may encourage opioid use and paradoxically increase the number of overdoses.



Thomas del Ninno, MD
Emergency Medicine Resident
University of Maryland
Baltimore, MD
@tomdelninno



Danya Khoujah, MD
Assistant Professor, Emergency Medicine
University of Maryland
Baltimore, MD



R. Gentry Wilkerson, MD, FACEP
Assistant Professor, Emergency Medicine
University of Maryland
Baltimore, MD
@gentrywmd

The United States is in the midst of an opioid epidemic, resulting in a significant increase in overdose deaths.¹ From 2000 to 2014, there was a 137% increase in total overdose deaths, which was largely driven by both prescription opioids as well as injected heroin and fentanyl.² The epidemic extends across all demographic and socioeconomic classes. For example, individuals with insurance and females were previously considered low risk but are now contributing significantly to the number of overdoses and deaths.³ Furthermore, in 2012, there were 259 million opioid prescriptions written in the U.S., which equates to roughly one prescription for every American adult.⁴ As the number of opioid prescriptions increase, so too does the potential for prescription misuse, overdose, and death.

Take-Home Naloxone Programs

One of the proposed methods for mitigating fatal opioid overdose is to prescribe naloxone to at-risk patients. Naloxone is a relatively inexpensive and safe medication that works by competitively binding and inhibiting the mu-opioid receptor. By displacing the previously bound opioid, naloxone quickly reverses the potentially lethal effects of opioid overdose, such as respiratory and central nervous system depression. While take-home naloxone (THN) programs have been in place in the U.S. since the 1980s, some have expressed concern that the distribution of naloxone may encourage opioid use and paradoxically increase the number

of overdoses. There are no data to support these negative claims, but there are limited data showing the opposite. At least 2 studies have demonstrated a decrease in opioid use in those trained in the recognition of and response to an opioid overdose.⁵⁻⁶

Who Should Receive THN?

When discussing who would benefit from THN, most would consider patients who use illicit opioids and have presented to the emergency department after an overdose. However, **it is also important to recognize that patients suffering from medical conditions requiring chronic opioid pain medications to control their symptoms could also benefit from THN.** This is not just because of their own personal risk, but also because of the risk to others in the home who may have access to these prescriptions.

Those at highest risk for opioid overdose tend to be those who are unmarried or unemployed, have mental health issues, have received multiple opioid prescriptions, have underlying lung disease, and have had previous episodes of overdose.⁷⁻⁹ However, while it is important to counsel this particular subset of at-risk users, it is just as important to offer training and resources to concerned family members, friends, and spouses.

Available THN Devices

There are 4 methods for naloxone delivery commonly being used in U.S. THN programs: 2 via intramuscular delivery and 2 via intranasal methods. Two methods for intramuscular delivery include an autoinjector and an improvised kit that must be assembled at the time of use. **The autoinjector, EVZIO, uses a 2-step process with audio instructions to guide the subject to deliver a dose of 0.4mg/0.4mL or 2mg/0.4mL of naloxone, depending on the device.**¹⁰ The other intramuscular

PROS AND CONS: Current Available Naloxone Devices

Device	Route of Delivery	Pros	Cons
Naloxone Kit	Intramuscular	<ul style="list-style-type: none"> • Cost ~\$40 for 2 devices 	<ul style="list-style-type: none"> • Multiple parts to assemble • Requires a needle to administer • Not FDA approved
EVZIO	Intramuscular	<ul style="list-style-type: none"> • Voice directions • Easy to use • Concealed needle • FDA approved 	<ul style="list-style-type: none"> • Significant cost ~\$4,500 for 2 devices
Naloxone Kit	Intranasal	<ul style="list-style-type: none"> • No needle involved • Cost ~\$80 for 2 devices 	<ul style="list-style-type: none"> • Multiple parts to assemble • Not FDA approved
NARCAN® nasal spray	Intranasal	<ul style="list-style-type: none"> • Easy to use • No assembly required • FDA approved 	<ul style="list-style-type: none"> • Moderate price ~\$150 for 2 devices

method uses a kit that consists of a vial of naloxone, a needle, and a syringe. People using the intramuscular naloxone kit are expected to successfully assemble the device, draw up the appropriate dose of naloxone, identify the appropriate site of intramuscular injection, and successfully administer the medication. The dose commonly used is again 0.4mg.¹¹

The intranasal methods include a one-piece intranasal device, and an improvised kit that must be assembled at the time of use. The intranasal kit consists of a syringe, an atomizer, and a screw-on vial of naloxone. Instructions direct the person administering the naloxone to deliver half of the dose in one nostril and the other half in the other nostril.¹² The other intranasal delivery device, **NARCAN® Nasal Spray, is a one-piece device that is designed to administer 4mg of naloxone into one nostril.**¹³ Recently, the FDA approved a 2mg strength NARCAN® Nasal Spray for chronic opioid users at risk for severe withdrawal symptoms.

Over-the-Counter Naloxone

Naloxone is not currently FDA-approved for over-the-counter (OTC)

distribution. However, in an effort to make naloxone more available, select pharmacies will offer it without a prescription.¹⁴ **One concern with OTC naloxone is that people would not receive proper training prior to purchasing the drug.** Without training, the device may not be used properly and the activation of emergency medical services (EMS) may be delayed. Consumers may not understand that although an overdose victim may initially respond to a single dose of naloxone, they may require additional doses because of its relatively short duration of action in comparison to the ingested or injected opioid.

In addition, there is controversy over lay-person administration and good Samaritan laws if something were to go wrong, and over whether there should be legislation to protect people at the scene from arrest for possession or similar charges.

Conclusion

While the opioid epidemic continues to worsen, efforts to mitigate its effects include the use of naloxone administered by bystanders as part of take-home naloxone programs. The requirements for training in these programs are not onerous and do not take a significant amount of time. Providing training and prescribing naloxone to at-risk patients or their friends or family members may help prevent fatal opioid overdoses. ★

PROS AND CONS: OTC Naloxone

Pros	Cons
Increased availability of naloxone	Potential misuse of the antidote
Increased privacy	Limited training, if any
Decreased stigmatization of naloxone	May result in delay to first EMS contact



Julie Dodson, MD
Emergency Medicine Resident
OU School of Community
Medicine
Tulsa, OK



Chance Dodson, MS2
OU School of Community
Medicine
Tulsa, OK



Jeffrey Goodloe, MD, NREMT-P, FACEP
Professor and Director of the EMS
Division, OU School of Community
Medicine
Tulsa, OK



Boyd Burns, DO
Associate Professor/Chair
The George Kaiser Family
Foundation Chair in Emergency
Medicine; OU School of
Community Medicine
Tulsa, OK

POSITIVELY USEFUL

A Brief ED Guide to NIPPV

It is important for the emergency physician to be comfortable directing and troubleshooting NIPPV in order to promote optimal patient outcomes.

Paramedics are called to the home of a 63-year-old female with shortness of breath. They find an older woman who is alert but appears anxious, and is in moderate respiratory distress. She is unable to effectively give a detailed medical history due to dyspnea. Two unmarked metered dose inhalers are noted at the patient's bedside. The patient is started on non-invasive positive pressure ventilation (NIPPV) in bi-level positive airway pressure (BiPAP) mode with in-line nebulized albuterol/ipratropium. Upon arrival to the emergency department (ED), the EMS crew report that the patient is much improved. Should you continue NIPPV? If so, what NIPPV parameters should you specify?

Introduction

NIPPV in the emergency department is a common respiratory intervention modality that is increasingly initiated in the prehospital arena. It has been shown to be an effective means of improving multiple etiologies of dyspnea while potentially avoiding the morbidities associated with endotracheal intubation. Because of its frequent utility, it is important for the emergency physician to be comfortable directing and troubleshooting NIPPV in order to promote optimal patient outcome. Herein, we will review common modes of NIPPV, pathophysiology, etiology-specific considerations, and troubleshooting.

Definitions

NIPPV is a broad term used to describe several methods of ventilation management. It often refers to positive

pressure delivered by air-tight facial or nasal mask. Two common modes are continuous positive airway pressure (CPAP) and BiPAP.¹ CPAP provides a constant positive pressure on inspiration and expiration. BiPAP provides a baseline pressure, as well as a second, elevated inspiratory pressure triggered by the patient's inspiratory effort. The lower pressure delivered on expiration is referred to as expiratory positive airway pressure (EPAP) and is analogous to positive end-expiratory pressure (PEEP) delivered by a traditional ventilator. The higher pressure delivered with inspiration is termed inspiratory positive airway pressure (IPAP). The difference between these two values is the pressure support (PS). A minimum respiratory rate can be set on BiPAP, whereas no rate can be set on CPAP. The FiO₂ can be adjusted in both modes. **Because this is a patient-driven modality, the respiratory rate and the tidal volume delivered are determined by the patient's effort, while IPAP and EPAP are controlled by the ventilator.**²

Pathophysiology

There are several beneficial changes in pathophysiology and lung mechanics that may occur with the use of NIPPV. These vary depending on the underlying disease, the severity of the physiologic derangement, and the mode of NIPPV.

In hypoxemic respiratory failure, the extrinsic PEEP delivered by NIPPV can improve alveolar recruitment and gas exchange. Specifically, NIPPV can deliver optimal FiO₂, recruit collapsed alveoli, improve V/Q mismatch and allow improved flow of fluid from alveoli back into circulation.³

In the setting of acute exacerbation of congestive heart failure (AECHF) with acute cardiogenic pulmonary edema (ACPE), cardiac output often improves due to changes in preload and afterload. The additional PEEP delivered by NIPPV increases intrathoracic pressure causing a decrease in venous return, which prevents overfilling of the right heart. Increased intrathoracic pressure decreases left ventricular transmural pressure, thus decreasing afterload.⁴ The net effect

FIGURE 2. Initial Settings¹³

Modality	Initial Setting	Caution
CPAP	5-15 cm H ₂ O	—
BiPAP*		
IPAP	8-10 cm H ₂ O	>15 cm H ₂ O
EPAP	3-5 cm H ₂ O	

*Spontaneous mode

FIGURE 3. Signs of Respiratory Failure⁷

SpO ₂ < 90%
Accessory muscle use
Inability to speak in full sentences
Respiratory rate >24/min
Altered Mental Status

of these changes results in decreased stretching of cardiac muscle fibers, allowing them to function at a more favorable portion of the Frank-Starling curve.

In the setting of hypercapnic respiratory failure associated with chronic obstructive pulmonary disease (COPD), the pressure support provided by BiPAP decreases work of breathing and improves ventilation.³ Further, the positive expiratory pressures provided by either mode can help prevent both air trapping and dynamic hyperinflation.

Indications

When utilized optimally, NIPPV improves oxygenation, work of breathing, respiratory mechanics, and cardiac function. It should be considered for any dyspneic patient presenting to the ED assuming no contraindications exist (Figure 1).⁵⁻⁶ Among the most supported indications for NIPPV are ACPE and COPD.⁷

COPD

NIPPV is commonly used for patients with COPD to augment ventilation and decrease work of breathing in those with moderate-to-severe exacerbations, and is used in conjunction with standard beta-2-agonists and anticholinergic therapy.⁸ It is important for providers to pay careful attention to tidal volumes (these are patient-dependent and not set on the machine, but should be between 5-8cc/kg ideal body weight) as well as unintentional mask leak. In patients presenting with an uncompensated respiratory acidosis (and elevated PCO₂), the IPAP should be raised to increase

FIGURE 1. Contraindications⁷

1. Inability to protect airway
2. Impaired consciousness or inability to cooperate
3. Respiratory or cardiac arrest
4. Hemodynamic instability
5. Serious facial injury or deformity
6. Pneumothorax
7. Upper Airway obstruction
8. Multi-organ failure
9. Recent esophageal anastomosis

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the tidal volumes and improve minute-ventilation. The patient may not tolerate an IPAP above 10 cm H₂O initially, but usually with adequate bedside coaching the IPAP can be steadily increased.

AECHF

NIPPV is a beneficial adjunct to nitrates and typical medical therapy in AECHEF with ACPE. As discussed above, the increased intrathoracic pressures from NIPPV can improve cardiac function in the diseased heart. While both modes of NIPPV demonstrate comparable benefits, CPAP is the modality with the most consistently reproduced benefits in the setting of ACPE.^{5,9,10}

NIPPV Setup

All emergency medicine providers should be comfortable with the set-up and management of NIPPV. For example, it may be necessary to quickly transition a patient from pre-hospital NIPPV when respiratory therapy is not immediately available. ED respiratory therapists are a great resource for learning where the equipment is located and how a particular NIPPV device is managed. A critical and seldom discussed aspect of setup is coaching. Placing a mask on a patient already struggling to breathe can induce panic and subsequent failure of NIPPV. In the NIPPV naive patient, you may be “teaching someone to swim as they are drowning,” so to speak. Going through the process at the patient’s bedside and explaining each step while encouraging and calming them will allow the patient the best chance at NIPPV success. **For patients unfamiliar with NIPPV, begin with low initial pressures and then titrate settings according to the patient’s pathology and response to therapy** (Figure 2).

In patients who arrive on pre-hospital NIPPV, it is important to

assess the duration of therapy and patient’s response prior to arrival. When obtaining initial history, consider the differing nomenclature between traditional ventilators and NIPPV machines. In prehospital jargon, “10 and 5” usually means: 15 cm H₂O IPAP, 5 cm H₂O EPAP, and PS of 10 cm H₂O. When referring to a BiPAP machine, this language actually means: 10 cm H₂O IPAP, 5 cm H₂O of EPAP, and PS of 5 cm H₂O. By accurately obtaining this history, the emergency physician is then prepared to best tailor settings.

Troubleshooting

Because there is no “one-size-fits-all” approach to NIPPV use, providers must quickly establish working differential diagnoses and adjust changes in ventilator settings according to the most likely diagnosis. **For instance, if the patient likely has CHF with ACPE, choose settings that most benefit oxygenation. To do this, maximize extrinsic PEEP by increasing CPAP or EPAP values, while maintaining PS relatively low. If your patient requires augmented ventilation, as would likely be the case with COPD, choose settings that maximize PS by increasing IPAP.** Frequent coaching, monitoring and titration of settings will likely be required until clear signs of improvement are noted.

Sometimes adequate tidal volumes may not be achieved due to unintentional mask leak. Assuring correct mask size and adjustment is necessary to optimize patient comfort and to minimize air leak around the mask. The mask fit should be tight enough to form a seal between the facial skin and the mask interface, but should be loose enough to be able to pull away and reposition if needed.

A patient with excessive facial hair or facial asymmetry will be much more difficult to adequately seal and deliver optimal pressure. Make sure the patient is as comfortable as possible and offer frequent reassurance.

NIPPV Failure

Key clinical markers to re-evaluate frequently on NIPPV patients include: mental status, respiratory rate/work of breathing, vital signs, tidal volumes, and ABG/VBG values.¹¹ If the patient is not improving clinically with frequent re-evaluation and optimal NIPPV management, the provider should not hesitate to intubate if indicated. **In the setting that optimal ventilatory parameters are delivered, there should be significant improvement in the first hour of delivery.** However, each patient should be considered individually as the timing, etiology, and severity of the respiratory distress can contribute to NIPPV failure or success.¹²

If the patient is not improving with levels of applied PEEP (>10-12 cm H₂O) the patient may not have a condition amenable to NIPPV and intubation is likely necessary (Figure 3).⁷ It is possible that no recruitable alveoli remain, and increasing extrinsic pressure may serve only to over-distend functioning alveoli leading to harmful inflammation. Importantly, discontinue NIPPV in any patient with signs that they may be developing a preload dependent state, as this can decrease venous return and hinder cardiac output.

Conclusion

As the initiation of pre-hospital NIPPV increases, the ability of the emergency physician to comfortably transition the patient for continued dynamic therapy is invaluable. In order for this process to be as seamless as possible, a thorough understanding of disease pathology, respiratory mechanics, NIPPV setup, and troubleshooting is paramount. Finally, NIPPV is not a substitute for establishing a definitive airway when indicated. Do not hesitate to intubate when necessary. ★

A critical and seldom discussed aspect of setup is coaching. Placing a mask on a patient already struggling to breathe can induce panic and subsequent failure....

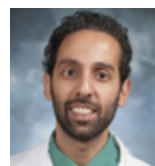


Don't Kid Around

SGLT-2 Inhibitors and the Risk for Euglycemic DKA



Maryam Arshad, MD
Emergency Medicine Resident
Emory University
Atlanta, GA



Sajid Khan, MD
Assistant Professor of Emergency
Medicine
University of Missouri-Kansas City
Kansas City, MO

A 62-year-old female presents with cough and generalized weakness for one day. She has no other symptoms and physical exam is unremarkable aside from mild tachycardia. Past medical history is significant for hypertension, type 2 diabetes, and coronary artery disease. The patient cannot recall her medications but is adamant that she is compliant. Her labwork is significant for the following: white blood cell count 24.5, bicarbonate 10, glucose 139. Urinalysis reveals 2+ ketones and glucose but is otherwise negative. Chest x-ray shows a right lower lobe infiltrate, and the patient is treated for sepsis with fluids and antibiotics. Further workup reveals a lactic acid of 1.9 and a pH of 7.2.

Her husband arrives with a medication list, and she is found to be on Glyxambi (empagliflozin/linagliptin), a combined SGLT-2 and DPP-4 inhibitor.

Is it possible for this patient to be in DKA with a glucose of 139?

Euglycemic diabetic ketoacidosis (euDKA) is typically defined as DKA (pH <7.3, serum bicarbonate <18 mEq/L, and serum or urine ketones) with a blood glucose <200 mg/dL.^{1,2} It was first described in 1973 and had traditionally been recognized in otherwise healthy patients with type 1 diabetes mellitus who had decreased carbohydrate intake.

More recently, however, it has

received attention from the FDA when, between 2013 and 2015, they received 73 reported cases of ketoacidosis requiring hospitalization in patients taking SGLT-2 inhibitors. This led to a warning regarding the use of these drugs in 2015, followed by an alert in 2016 highlighting a possible link between SGLT-2 inhibitors and euDKA.³⁻⁴

How Does it Happen?

The mechanism by which SGLT-2 inhibitors potentiate euglycemic DKA is not entirely clear. **SGLT-2 is a protein found in the proximal convoluted tubule that is involved in reabsorption of glucose.** This class of medications therefore lowers blood glucose levels by increasing urinary excretion of glucose. One theory is that this reduction decreases pancreatic insulin secretion which leads to a cascade of events including lipolysis, free fatty oxidation, and ultimately ketogenesis.⁵ Another theory postulates that SGLT-2 inhibitors may decrease the renal clearance of ketone bodies, resulting in ketoacidosis.⁶

Although research on the pathophysiology is ongoing, the apparent association between SGLT-2 inhibitors and DKA cannot be ignored. **The true incidence is unknown because many cases may go unreported or even missed.** Use of these medications is on the rise, and while they may be effective oral antihyperglycemic agents, they do carry some very real risk.

Canagliflozin, dapagliflozin, and

empagliflozin are the SGLT-2 inhibitors currently approved by the FDA. Of course, not all patients on SGLT-2 inhibitors develop ketosis. Risk factors include illness, starvation, dehydration, pregnancy, and alcohol use.

Is Treatment Similar?

Of course, once recognized, treatment is similar to all other cases of DKA. Intravenous fluids are the mainstay, but dextrose will need to be added sooner in order to maintain a normal glycemic level. An insulin drip should be administered until the anion gap closes and acidosis resolves. Associated potassium abnormalities should also be corrected with a target serum potassium of 4-5 mEq/L.

Take-Home Points

In patients on SGLT-2 inhibitors, ketoacidosis in the setting of a normal blood sugar may be overlooked, and the clinical picture may be misinterpreted as sepsis. While infection may still be present and serve as the precipitating event, simply initiating antibiotics is inadequate. Failure to order appropriate fluid resuscitation and insulin administration will have severe consequences.

Additional Resources

The U.S. Food & Drug Administration has addressed the risk of ketoacidosis among patients taking SGLT-2 inhibitors. Listen to the FDA Drug Safety Podcast at fda.gov/drugs/drugsafety/drugsafetypodcasts/ucm447651.htm. ★

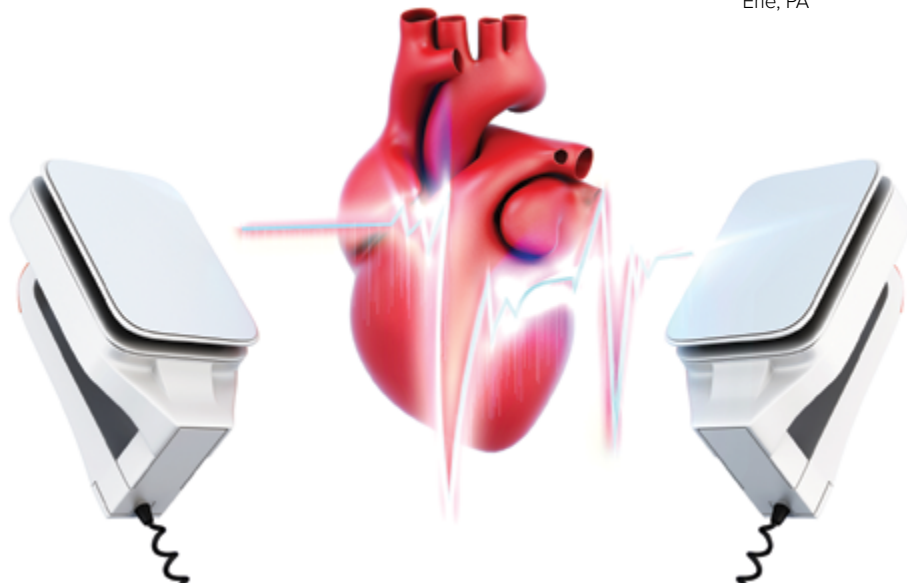
DUAL Defibrillation



Dhimitri Nikolla, DO
Emergency Medicine Resident
Saint Vincent Hospital
Erie, PA

The Achilles' Heel of Refractory V-Fib?

Proposed theories as to why DD may be efficacious include the delivery of more energy to overcome the defibrillation threshold as well as the addition of another defibrillation vector.



A 44-year-old male with no past medical history collapses at home in front of his son, who calls 911 and begins CPR. When EMS arrives, they find the patient in ventricular fibrillation (VF). They deliver seven single biphasic defibrillations, two doses of amiodarone, and one dose of epinephrine per Advanced Cardiac Life Support (ACLS) recommendations.

Upon arrival to the emergency department (ED), the patient remains in VF. After another single biphasic defibrillation, he is given lidocaine, magnesium, calcium gluconate, and sodium bicarbonate. An additional defibrillator is acquired, with plans to perform dual defibrillation (DD).

An additional anterior-posterior set of defibrillation pads are added to the traditional anterior-lateral set (Figure 1), and he is shocked near-simultaneously from both pads at 200J. The patient achieves return of spontaneous circulation (ROSC) after 45 minutes of downtime. An electrocardiogram reveals atrial fibrillation with evidence

of ST-elevation myocardial infarction.

The patient is then transferred to the catheterization lab where a 100% occlusion of the right coronary artery is found and stented.

Background

DD, also known as double sequential defibrillation, double sequence defibrillation, dual simultaneous defibrillation, or dual axis defibrillation, refers to the use of two defibrillators to electrically cardiovert a patient in refractory VF (RVF). **RVF is generally defined as 3 or more episodes of sustained or recurrent VF despite appropriate defibrillation attempts.**¹

There is great variation in the way DD is performed. However, two sets of defibrillator pads are usually placed in the anterior-lateral and anterior-posterior positions.²⁻⁵ Both defibrillators are charged to either 200J or maximum energy, and the patient is shocked simultaneously from both defibrillators.²⁻⁴

Proposed theories as to why DD may be efficacious include the

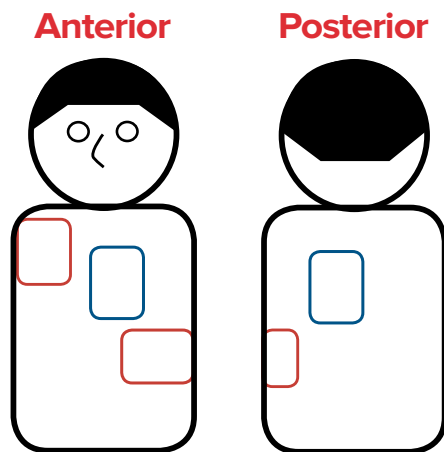


FIGURE 1. Pad Placement for DD

The red boxes represent the anterior-lateral pad placement, while the blue boxes represent the anterior-posterior pad placement.

delivery of more energy to overcome the defibrillation threshold as well as the addition of another defibrillation vector which may overcome poor pad placement or thoracic impedance from, for instance, pulmonary edema or hyperinflated lungs.³

Although DD has long been a procedure employed by electrophysiologists to cardiovert iatrogenic RVF in the electrophysiology lab, use of this technique for out-of-hospital cardiac arrest (OHCA) with RVF is a relatively new concept.⁶

The Evidence

Several case reports and small case series have been published on DD for OHCA, with reports of ROSC as high as 57.1% and neurologically intact survival to discharge as high as 28.6%.^{3-5,7-9} **Nevertheless, a recent retrospective study of 279 OHCA who had RVF after three 200J single biphasic defibrillations did not find a benefit.** They compared the 50 who got DD after the initial three

shocks, to the 229 who were treated with repeated single biphasic defibrillations and found no difference in neurologically intact survival, ROSC, survival to hospital admission, or survival to hospital discharge.²

This lack of difference may be explained by the reality that although the chance of successful cardioversion decreases with subsequent shocks in patients with RVF in OHCA, the total proportion of patients having been successfully cardioverted increases with each subsequent shock.^{10,11} However, as with most retrospective studies, there are many confounding variables including a lack of control for pertinent Utstein variables such as witnessed arrest or bystander CPR, CPR quality data, timing of DD, and pertinent post-arrest care such as hypothermia.

RVF is rare, potentially as low as 0.9% of OHCA with attempted resuscitation; however, greater awareness of the condition as well as new proposed therapies, such as DD and intravenous esmolol, will

likely prompt larger, better quality studies.^{3,12,13} **Because few therapies exist for RVF and since mortality is as high as 97%, it is reasonable to attempt DD for RVF in OHCA despite the significant lack of literature.** Although potentially beneficial, DD should not hinder timely defibrillations and good quality chest compressions.

Case Conclusion

The hypothermic protocol was initiated when the patient arrived to the ICU from the catheterization lab. Over the next two days, the patient struggled with cardiogenic shock secondary to right ventricular failure, as well as disseminated intravascular coagulation. An Impella® percutaneous ventricular assist device was placed due to persistent cardiogenic shock, but clinically, the patient had severe anoxic brain injury. Therefore, the decision was made with family to continue comfort measures, but withdraw life-sustaining care. ★

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Beyond ATLS



Clark Owyang, MD
Emergency Medicine Resident
Icahn School of Medicine at
Mount Sinai
New York, NY
@clark_owyang

Ram Parekh, MD

Assistant Professor of Emergency Medicine
Icahn School of Medicine at Mount Sinai
New York, NY

All these factors coalesce in the trauma bay to create a downward spiral of shock where life-saving interventions wrestle with each other as the patient circles the drain.

What the Manual Doesn't Tell You

A 28-year-old male presents to your trauma bay already intubated, with multiple stab wounds to his chest and right upper extremity. He is hypotensive and tachycardic. An emergent right-sided tube thoracostomy produces no blood and no rush of air, but the patient is now gurgling around the endotracheal tube. An emergent introducer catheter is placed for additional access, and he is induced and re-intubated for concern for tube dislodgement. The patient then codes. A resuscitative thoracotomy is performed immediately, only to find no hemopericardium and a clean thorax.

What went wrong?

Guidelines Are Guidelines

While trauma algorithms are a valuable tool to drive performance during high pressure or time-limited situations, and while both the Eastern Association for the Surgery of Trauma and Western Trauma Association algorithms would

have supported the described treatment and resuscitation of this patient, it is important to remember that guidelines are just that — guidelines. They must always be interpreted within a deeper understanding of context. Could this particular patient's cardiac arrest have been avoided? **Without a fuller appreciation for the physiology and evidence behind certain procedural and pharmacologic trauma interventions, algorithms have the potential to be dangerous.**

The patient's resuscitative thoracotomy revealed no hemothorax, hemopericardium, or significant thoracic injury. Without a clear cause for the patient's decline, the only suspects left in this case of hypovolemic shock were the hemodynamic and pharmacologic interventions of the trauma management. The goal of this article is to shed light on 3 specific interventions that have profound effects on the physiology of trauma patients.

Induction Agent for RSI

The critically ill trauma airway is a delicate balancing act whereby the expected physiologic derangements of intubation are complicated by severe hemorrhage and catecholamine depletion.

Induction creates hypotension, vasodilatation, and a loss of sympathetic surge that could be disastrous for a trauma airway.

The philosophy of rapid sequence intubation (RSI) is structured upon the assumption that the patient is not physiologically optimized or prepared for the insult of intubation. However, poor volume status, fluctuating respiratory system compliance, and derangements of intrathoracic pressures complicate the hemodynamics of RSI induction and paralysis when applied to critically ill trauma patients. All these factors coalesce in the trauma bay to create a downward spiral of shock where life-saving interventions wrestle with each other as the patient circles the drain.

Emergency physicians must choose a sedation agent for RSI that has a stable hemodynamic profile, such as ketamine or etomidate. **However, there is still some debate over the ideal agent for trauma patients in shock.**

A 2016 study showed that an institutional switch from etomidate to ketamine for RSI in trauma produced no significant benefits in terms of mortality, length-of-stay, ventilator-free, or vasopressor-free days.⁶ With the risks of elevated intracranial pressure debunked by recent meta-analyses and systematic reviews from both emergency medicine and neuro-critical care literature, the choice for ketamine induction would seem reasonable for its sympathomimetic effects.^{7,8}

However, both anesthesia and emergency medicine literature has questioned ketamine's efficacy in the context of the catecholamine-depleted patient.¹⁰ Another 2016 study prospectively enrolled trauma patients induced with ketamine and separated them into low or high shock index groups. Defined by the heart rate over the systolic blood pressure, a high shock index (> 0.9) predicts mortality and need for transfusion.¹¹ The study found that high shock index patients

intubated with ketamine maintained a significantly higher pulse rate and were unable to augment their systolic blood pressures when compared to the low shock index cohort. Though further trials of high shock index trauma patients need to be performed, **the findings suggest that catecholamine-depleted patients may not mount the anticipated sympathomimetic effects of ketamine.**

Positive Pressure Ventilation

As the patient hangs in the precipice of hemodynamic collapse, pre-oxygenation becomes an art when the standard practice of non-rebreather (NRB) and nasal cannula is not able to overcome shunt physiology.³ When standard nasal cannula and NRB fail to achieve nitrogen washout and the patient remains hypoxemic, the emergency physician must consider using either noninvasive ventilation (NIV) or invasive ventilation to overcome the atelectatic alveoli.

Positive pressure ventilation (whether invasive or noninvasive) creates unfavorable conditions for the function of the right side of the heart because preload, or venous return, is impeded by high intrathoracic pressures.⁴ **Using either high PEEP or a tension pneumothorax as an example, elevated intrathoracic pressure prevents the pressure head of the vena cava from flowing into the right atrium.** Furthermore, PEEP at lung volumes above functional residual capacity creates higher pulmonary vascular resistance, increasing the pressure against which the right ventricle ejects.⁵ Though many factors influence the effects of noninvasive or invasive on the pulmonary vascular resistance, the general effect is increased resistance.

In contrast, the left heart may benefit from the elevated intrathoracic pressure. Left ventricular wall stress is lessened with increased intrathoracic pressure. Additionally, the pressure differential of the thorax in comparison to the lesser pressure of the systemic circulation creates a decreased afterload for the left heart upon which to eject.⁵ The physiologic effects of positive pressure in the trauma patient cannot be overlooked.

CPR

With multiple life-saving resuscitative measures ongoing at once, it is unclear to what extent the ACLS and ATLS paradigms should factor into decision-making, particularly when the patient loses pulses. **The topic of chest compressions in the setting of traumatic arrest does not have robust data to support it.**

Though conducted with animal data, one study showed that traumatic mechanisms of arrest (specifically, hypovolemia and cardiac tamponade) do not benefit from external chest compressions. Arterial pressure transducers in bleeding baboons showed that diastolic blood pressures (ie, the pressure perfusing the myocardium) dropped after starting external chest compressions. Conversely, a medically-induced (ie, barbiturate-induced) cardiac arrest benefited from external chest compressions with an augmentation of both the systolic and diastolic arterial pressure tracings.¹²

Using end-tidal CO₂ outcomes as a proxy for resuscitation, a 2016 study by the University of Maryland's Shock Trauma Center showed no difference between open vs. closed chest compressions. Though there is an obvious effect on end-tidal CO₂ when an open chest is only ventilating one lung, the current data on whether closed chest compressions offer benefit in trauma is unclear. Another recent study looked at the utility of transthoracic echocardiography to prognosticate traumatic cardiac arrest. **They found that lack of pericardial effusion or lack of cardiac motion on echo could obviate the need to proceed with resuscitative thoracotomy for open compressions and hemorrhage control.**¹⁴

Conclusion

The trauma patient in severe shock has multifaceted physiologic derangements. Life-saving interventions often perturb hemodynamics in ways that work simultaneously with and against resuscitative goals. Given the lack of randomized, prospective data on the critically ill trauma patient, the physiologic data and a deeper understanding of heart-lung interactions are the best tools we have in the trauma bay. ★



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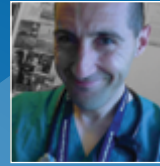
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top 10

Zika Facts

FOR EMERGENCY PHYSICIANS

Zika has gained worldwide attention as an emerging virus, especially with regard to dangerous complications affecting the unborn. In an increasingly interconnected world, the emergency physician must be able to recognize a possible infection, manage symptoms, and recommend methods of prevention. These 10 tips will help in that endeavor.

- 1 The Zika virus (ZIKV) is a member of the *Flaviridae* family and is transmitted by arthropods – most notably the mosquitoes of the genus *Aedes*, but not exclusively by them. It is a virus that is widely circulated in Central and South America,¹ as well as the Caribbean. Ask patients presenting with fever or a history of fever about recent travel.
- 2 Viral transmission occurs mainly through a bite from the female *Aedes* mosquito. However, transmission may also occur human-to-human. The main period of transmission is during pregnancy or around the time of birth.² There are also cases of infection through sex (high viral loads in semen have been reported) and through blood transfusions.³
- 3 80% of Zika virus-infected people do not develop any symptoms, and 20% develop a mild symptomatology in an extremely narrow time window of about 5-7 days. The most common symptoms are a rather itchy skin rash, low-grade fever, arthralgia, non-purulent conjunctivitis, myalgia, headache, and retro-ocular pain.
- 4 Low-grade fever, the presence of conjunctivitis, and extremely itchy maculopapular erythema that may be able to differentiate a Zika virus infection from other *Aedes* transmitted viral infections, such as dengue and chikungunya.⁴⁻⁶
- 5 It is particularly significant to be able to detect a co-infection with dengue⁷ for early treatment and avoidance of NSAIDS during therapy, which may increase risk of bleeding in patients with dengue. Malaria also must be ruled out.
- 6 Zika is a neurotropic virus. Complications fall under the umbrella term “neuro-Zika syndrome,” which is a number of diseases that affect the nervous system. The most diffuse among them is Guillain-Barré syndrome (GBS).⁸⁻¹⁰ In pregnant women, Zika infection could lead to Congenital Zika Syndrome, a combination of microcephaly, intracranial calcifications, neuropsychomotor developmental delay, global hypertonía, and spastic hemiplegia.¹¹
- 7 Diagnosis is based on clinical, epidemiological, and laboratorial criteria. Zika can be isolated from biological fluids, including blood, urine, semen, CSF, amniotic fluids, breast milk, and cord blood. The virus is eliminated from blood rather quickly (2-3 days), but in the urine this virus continues to be excreted weeks from the onset of the infection. RT-PCR tests show high sensitivity and specificity (roughly 100%).¹²⁻¹³ ELISA can detect Zika-specific IgM and IgG from day 5 or 6 after the onset of symptoms. However, regarding the serologic tests, it is necessary to recognize the chance of false positivity because of cross-reaction with other *flaviviruses* in patients previously infected by them.
- 8 Zika is a self-limiting disease. Currently there is neither a vaccine nor a specific antiviral therapy for treatment. The treatment is supportive (bed rest, appropriate fluid intake, antipyretic medications). Acetaminophen is the recommended antipyretic, and antihistamines can be used for pruritus.¹⁴
- 9 In the absence of a vaccine, the goal of prevention is to reduce the number of vector insects and the bite rate. Wearing long-sleeved clothing, uniformly applying topical repellents on uncovered body parts, sealing or shielding any openings in the house, installing bed nets (and using them even during the daytime), avoiding stagnant water, and using fans and air conditioning eliminates potential breeding sites of *Aedes* mosquitoes.¹⁵
- 10 Pregnant women or those wishing to become pregnant should avoid or delay travel to areas where Zika is present. Additionally, they should consider condom usage. During prenatal care in endemic areas, serial ultrasounds are suggested every 3-4 weeks to search the central nervous system for abnormalities.¹⁶ ★



Blood Transfusion Reactions

TACO, TRALI, and Other Considerations



Joseph R. Giles, MD
Emergency Medicine Resident
University of Pittsburgh Medical Center
Pittsburgh, PA



Gary F. Pollock, MD, FACEP
Associate Program Director
Assistant Clinical Professor
University of Pittsburgh School of Medicine
Pittsburgh, PA

A 67-year-old woman with no known medical problems presents to the emergency department (ED) with severe anemia identified by her primary care physician. Bloodwork reveals a hemoglobin of 2.5 g/dL. The patient is consented for blood transfusion and her first unit of packed red blood cells (PRBCs) is started. Thirty minutes later the patient develops rapidly progressive shortness of breath and agitation. **What should you do?**

Immediate Steps

While transfusion reactions are a relatively rare event (0.24% of blood product administrations in 2011), they can be life-threatening and are often difficult to differentiate in the acute setting.¹ Diagnosis of an adverse reaction will be made clinically based upon vital signs and physical exam. For this reason, the uniform initial recommendation is to stop the transfusion for any reaction. This is followed by supportive care with attention to airway, breathing, and circulation.

Initial testing should include a

repeat type and screen of both donor and recipient blood, direct antiglobulin (Coombs) test, urinalysis for hematuria, CBC, BNP, and blood cultures, +/- chest xray.² This helps to determine whether the clinical effects are due to inadvertent antigen mismatching, hemolysis, congestive heart failure exacerbation, or infection.

Febrile Reactions

The most common reaction to blood product administration is a *simple febrile reaction*. This is suggested by the presence of a new fever, defined as a rise in temperature $>1^{\circ}\text{C}$.³ **If the fever is accompanied by back or flank pain, chills and rigors, or hypotension, febrile hemolytic transfusion reaction (FHTR) or transfusion-associated sepsis (TAS) must be considered.**

FHTRs are caused by the destruction of donor RBCs by preformed circulating recipient antibodies. The most serious form is due to ABO incompatibility, with human error being the most common

cause.² However, FHTRs from non-ABO incompatibility are increasing in frequency. **It is important to realize that FHTRs can be fatal.** The mortality rate correlates with the type of antibody causing the reaction and the amount of blood infused.⁴

TAS is secondary to bacterial growth in a stored blood product. ***Yersinia enterocolitica* is the most common organism in packed RBCs** because it grows optimally at the 1-6 °C temperature at which these products are stored. However, platelet transfusions have a higher risk of TAS overall because they are stored at room temperature.³

In either case, initial management includes stopping the transfusion. Intravenous fluids may be given, but vasopressors may also be required for hemodynamic support. **As maintaining renal perfusion is the primary goal during hemolytic reaction, furosemide as well as crystalloids may be used to induce forced diuresis.**³ In TAS, empiric antibiotic coverage can include vancomycin and a broad-spectrum beta-lactam such as piperacillin/tazobactam.

Allergic Reactions

The second most common adverse events that are seen are *allergic reactions* to blood product transfusions. These can range from mild reactions, with urticaria alone, to anaphylaxis. The latter is more common in IgA-deficient individuals who have developed IgG antibodies to IgA.² Anaphylaxis may be difficult to differentiate from a hemolytic reaction in the acute setting, because the latter may not present with fever. Treatment again starts with stopping the transfusion. **If there is urticaria alone, diphenhydramine may be given and the transfusion restarted 20 minutes later if symptoms improve.** If further evidence of multiple system involvement develops, it may be treated as any anaphylactic reaction. **Future transfusions should be performed with washed RBCs.**³ In 2011 in the United States, the incidence of transfusion-associated anaphylaxis was 1:13,843.¹

TACO and TRALI

The presence of dyspnea associated with rales on physical exam and hypertension is suggestive of *transfusion-associated circulatory overload (TACO)* or *transfusion-associated acute lung injury (TRALI)*. In practice these can be difficult to distinguish.

TACO is essentially a CHF exacerbation from the acute increase in intravascular volume.² At-risk populations include the elderly and those with pre-existing cardiac disease. Preventative strategies could include transfusing units over a longer period or administering concomitantly with diuretics.

TRALI is described as a non-cardiogenic pulmonary edema thought to be secondary to increased vascular permeability because of host neutrophils that become activated by substances in donated blood.⁵ Though the reaction will often resolve spontaneously over days, the patient may require intensive airway support, including intubation, until it does.² Diuresis is generally less effective in cases of TRALI.

Delayed Reactions

Emergency physicians should also be aware of the delayed reactions to blood transfusions, in which patients may present to the ED up to 10 days after a transfusion. *Delayed hemolytic reactions* are usually less severe than their acute counterpart. They represent the recipient's development of antibodies to a pre-exposed antigen in the donor product.

Graft vs host disease occurs in immunocompromised hosts who are exposed to healthy lymphocytes in donated blood. These donated competent lymphocytes attack recipient tissues and

are not able to be repelled by the host's weakened immune system. Signs and symptoms can include rash, fever, elevated transaminases, jaundice, nausea, vomiting, and pancytopenia. Treatment is the same as in an acute scenario, but unfortunately, the best management strategy is prevention because **the mortality is >90%.**³

It is worth mentioning that the increasingly complex screening of blood products has resulted in very low transmission rates for hepatitis and HIV. However, exact numbers vary based on source. One recent review quoted an incidence of transfusion-associated hepatitis B as 1:357,000 and HIV of 1:1,500,000 in the United States.⁶ Though small, the risk is not zero — and this information should be included as a part of informed consent prior to transfusion.

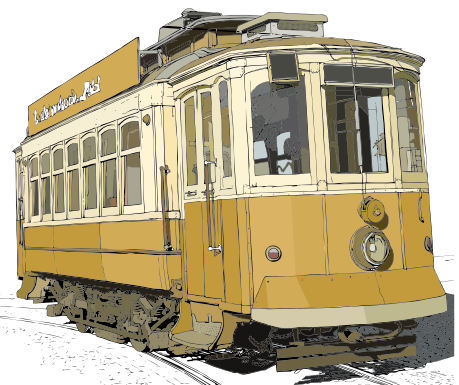
Case Resolution

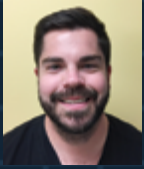
The patient's transfusion was stopped, and while she initially received supplemental oxygen via non-invasive positive pressure ventilation, she ultimately required intubation. Chest x-ray demonstrated bilateral diffuse pulmonary infiltrates.

During her ICU stay, echocardiogram demonstrated diffuse hypokinesis with an ejection fraction of 25-30%. The cardiology consultant felt the patient had pre-existing high output heart failure secondary to her chronic severe anemia, which was exacerbated by the acute volume expansion from blood product administration.

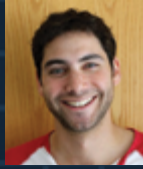
The patient received a total of 6 units of blood during her hospital stay; each unit was given over 6 hours with furosemide administered afterward. She was ultimately extubated 2 days after admission and eventually discharged home. ★

“... the uniform initial recommendation is to stop the transfusion for any reaction.”





Thomas W. Engel II, MD
Emergency Medicine Resident
Cook County Hospital
Chicago, IL
@twengeli



Ari Edelheit, MD
Emergency Medicine
Resident
Cook County Hospital
Chicago, IL
@EdelsMD



Joseph M. Weber, MD
EMS Medical Director, Chicago West
Associate Professor of EM
Cook County Hospital
Rush Medical College
Chicago, IL



Prehospital Termination of Resuscitation

Paramedics are on scene with a 65-year-old male who had a witnessed cardiac arrest (CA). CPR was not started until EMS arrived, and they have been working the resuscitation for 25 minutes. The patient's initial rhythm was ventricular fibrillation (VF), but after 4 defibrillations he is currently in pulseless electrical activity (PEA). He has received a total of 5mg epinephrine and 300mg amiodarone. A supraglottic airway is in place and the current end tidal CO₂ (ETCO₂) is 28. **The crew calls you and wants to know if they should continue working on scene, transport to the hospital, or terminate resuscitative efforts.**

Background

Survival rates from out-of-hospital cardiac arrest (OHCA) vary significantly throughout the United States, but the overall rate remains low at 8.3%.¹ Historically, all OHCA patients were transported “lights and sirens” to the emergency department (ED). Efforts to increase survival from OHCA now focus on high-quality on-scene resuscitation,

with the recognition that patients not successfully resuscitated in the field have a very low likelihood of survival. As such, termination of resuscitation (TOR) in the field for certain patients who do not respond to resuscitative efforts has become a key component of OHCA management.

Existing Decision Rules

Determining which patients qualify for TOR has been the subject of much research and has resulted in the derivation and validation of 2 decision rules endorsed by the American Heart Association, the National Association of EMS Physicians, and the International Liaison Committee on Resuscitation. These rules were validated across both ALS systems with multiple providers performing resuscitation, as well as BLS systems with only 2 responding providers.

First, for EMS systems with only BLS, the termination of resuscitation rule uses 3 criteria:

1. Event not witnessed by EMS
2. AED shock not delivered
3. ROSC not obtained.

A validation study using these criteria

found it to have a 99.5% predictive of death.² If all criteria are met, the resuscitation can be terminated.

Second, for EMS systems with BLS and/or ALS, the termination of resuscitation rule uses 4 criteria:

1. No bystander CPR
2. Unwitnessed event
3. No shock delivered
4. ROSC not obtained with ALS care.

If all these criteria are met, it is 99.8% predictive of death, and the resuscitation can be terminated (Figure 1).³

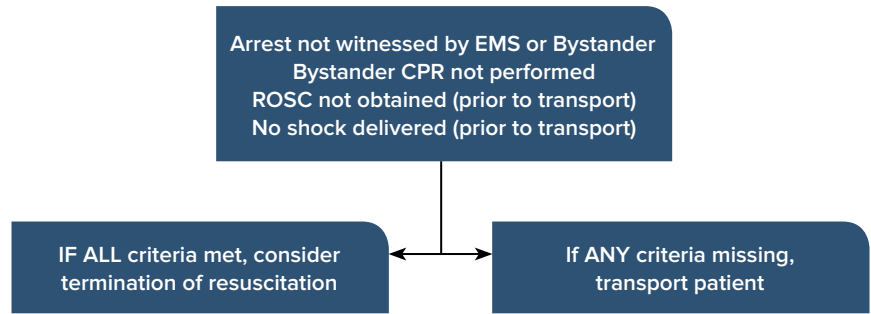
The Role of Online Medical Control

Despite the existence of these decision rules, there is still variability in online medical control (OLMC) physician willingness to terminate OHCA.⁴⁻⁵ This variability is multifactorial and includes a lack of OLMC training, difficulty communicating with EMS providers, and legally unfounded concerns over subsequent litigation.⁶ Additionally, sometimes EMS system issues impede the implementation of field TOR. For example, while it is recognized that TOR for OHCA patients with an extremely low chance of survival helps to avoid

wasteful resource utilization in the ED, non-transport of these patients can put a financial burden on the EMS provider agency that can only bill for their services if the patient is transported to the hospital.

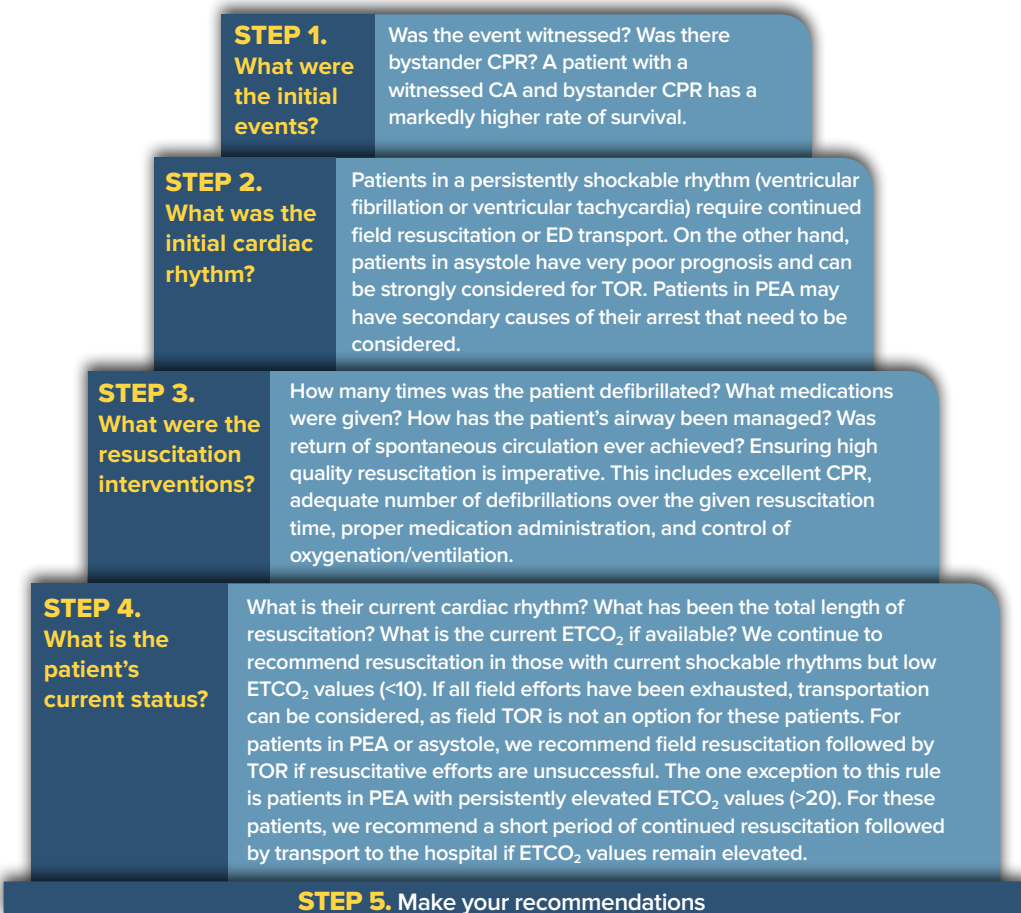
Another reason that TOR is difficult for OLMC physicians is that gray areas do exist. For example, AHA guidelines recommend utilizing ETCO₂ to confirm intubation, monitor resuscitation efforts, and identify ROSC. However, they are less clear on its utilization in TOR. While prior studies have suggested that ETCO₂ does appear to correlate with patient outcome, contradictory data exists and cannot be interpreted in isolation.⁷⁻⁹ It must therefore be interpreted within the context of the resuscitation. **Should a patient who meets all TOR criteria, but has a persistently high ETCO₂, be terminated in the field?** Conversely, should a patient who received a single defibrillation but is now in asystole with a low ETCO₂ be transported to the ED?

FIGURE 1. TOR Criteria for EMS Systems with BLS and/or ALS



Since the practical incorporation of a TOR by OLMC physicians can be difficult, we have created a 5-step thought process to allow even a new OLMC physician to rapidly obtain all needed information and provide concise recommendations.

Three options exist: continued on-scene resuscitation, field TOR, or transport to the hospital with ongoing resuscitation. **The decision to continue on-scene resuscitation should be based on tangible resuscitation tasks that should be performed before the decision to transport or terminate is made.** For example, performing two more defibrillations for a patient in a shockable rhythm, administering bicarbonate and calcium for a patient with suspected hyperkalemia, or ensuring asystole is not fine ventricular fibrillation. Once assigned tasks are performed, field providers can update the OLMC physician, and the decision of TOR or transport can be made.



Conclusion

TOR is a vital part of OHCA management that can be used to provide appropriate, safe, and high-quality care to patients while avoiding futile transportation of patients with low likelihood of survival. Knowledge of local EMS protocols and system resources is of the utmost importance when providing OLMC for patients in CA. If advanced medical care is not an option for an EMS system, we recommend focusing on high-quality BLS with adherence to internationally recognized BLS TOR rules. Furthermore, being able to balance those protocols with validated decision rules and the above five-step decision process can allow even the most novice physician to make the most informed decision during OLMC management of OHCA. ★

Physician Roles in Tactical Emergency Medicine Support



PROTECTING the PROTECTORS

Just before 9 pm on a warm July evening in Dallas, gunfire rang out during a protest. As civilians ran, the men and women of the Dallas Police Department ran into the fray. At the end of the night, 5 officers and 1 suspect were dead, and 9 people were wounded. How do we deliver good care in these dangerous places, when the highest level of medical care possible at the point of injury is paramount?

In Dallas, the Tactical Emergency Medicine Support (TEMS) physicians with the Dallas Police Department responded to the shooting. During this tense situation, they divided their resources, cared for people on the street and at the building where the suspect was barricaded — all the while surveying, triaging, and directing care to definitive treatment facilities. This is TEMS medicine.

History

Battlefield medicine is as old as conflict itself. Over the past 20 years, however, military medicine has made leaps in developing enhanced techniques and an improved understanding of casualty management. In 1996, the first publication of trauma care guidelines for the battlefield outlined the concepts behind Tactical Combat Casualty Care (TCCC).¹ Since then, Special Operations Medics have successfully implemented these strategies, which highlight the

need for standardized approaches to trauma care, particularly for better hemorrhage control, airway management, and pneumothorax amelioration.² The overall result of these improvements was a drop in significant fatalities in combat situations.

The concept behind TEMS stemmed from these military successes and was designed to fit the distinct needs of law enforcement personnel in high-risk tactical settings within the civilian world. TEMS personnel serve to administer



Jonathan Hardy, MS-IV
University of North Texas Health
Science Center
Fort Worth, TX



Faroukh Mehkri, DO
Emergency Medicine Resident
University of Connecticut –
Hartford Hospital
Hartford, CT
@FaroukhMehkri

this aid in dynamic environments where traditional civilian emergency medical services are inappropriate.

Current Models of Tactical Medical Care

In this emerging niche, several practice models are taking hold.

Dual Officer/Medic

The dual officer/tactical medical provider follows the precedent set by the military. Essentially, a health care provider that is of physical, intellectual, and tactical competence is cross-trained into the realm of law enforcement and tactical operations. This role is found in a myriad of law enforcement agencies and can occur in 3 tiers³:

Tier 1

The first tier includes a law enforcement officer (LEO) who is trained



TEMS physicians direct the performance of time-dependent interventions far within the outer perimeter established by law enforcement.

in the basics of hemorrhage control, airway repositioning and clearing, and tourniquet placement.

Tier 2

The second tier comprises an LEO who is trained to the level of an EMT-Basic, EMT-Advanced, or Paramedic. This individual has the rights and responsibilities of an LEO, meaning they can carry a weapon, arrest a subject, and make lawful life and death decisions, but they also provide emergency prehospital care.

Tier 3

The third tier includes training and equipping a “SWATDoc,” or a physician who is closely integrated within the unit. These physicians take ownership of the team, know the medical problems of each officer, have a clear understanding of the risks and benefits of the overall tactical operation, and are present during training and pre/post-operation. They are even available to care for family members should the need arise. Some departments using this system include the Dallas Police Department, Los Angeles Police Department, New York

Police Department, and the United States Secret Service.

Advanced Life Support Standby

In areas where having a medical provider attached directly to the team is not feasible, teams have resorted to having EMS nearby. The advantages are that no additional personnel training have to be met, and EMTs can bring more equipment to the scene. The downsides include a lack of familiarity with the team, a lack of awareness about the mission, an inherent delay of care, and availability of EMS units. In this model, LEOs are at the mercy of local EMS time constraints and financial needs.

Role of Emergency Physicians in TEMS

Physicians as part of TEMS programs are increasing in number as the benefits have become more apparent. Emergency medicine (EM) physicians are in a particular position to offer great expertise to the tactical unit when trained in tactical medicine. Within this model, TEMS physicians direct the performance of time-dependent interventions far

within the outer perimeter established by law enforcement.

Groups such as the Committee for Tactical Emergency Casualty Care (C-TECC) and ACEP’s Tactical Medicine Section are incorporating evidenced-based tactical medicine into established protocols and working to better define the physician role within TEMS.⁴ As EM physicians, there is a growing need for our expertise from the point of injury onwards.

We would encourage you to reach out to these groups if at all interested in developing ways to assist your community within this dynamic field. ★

ABOUT THE AUTHORS

Jonathan Hardy is beginning his fourth year of medical school at the University of North Texas Health Science Center. He is a firefighter/paramedic and former Special Forces Medical Sergeant (18D).

Faroukh Mehkri is beginning residency at the University of Connecticut – Hartford Hospital in July. He graduated from the University of North Texas Health Science Center and served as a Dallas Police Officer in the Strategic Deployment Bureau.

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What You **Must** Know About MACRA



Christopher Parks, MD
Emergency Medicine Resident
Christiana Hospital
Newark, DE

MACRA is going to bring about change whether providers are ready for it or not.

The process in which health care providers and hospitals are reimbursed for the medical treatment of a patient is complex. It involves many parties, a lack of transparency, and an alphabet soup of letters (RVU, CMS, CPT, PQRS to name a few). To add to this complexity, a big change is in the works that is expected to have monumental effects on health care reimbursement.

The Medicare Access and CHIP Reauthorization Act, or MACRA, is a law passed on April 16, 2015, with the final ruling on Oct. 14, 2016. **MACRA is set to transform the way health care providers are reimbursed for treating Medicare beneficiaries.** It was passed separately from the Affordable Care and Patient Protection Act (“Obamacare”) and was done with bipartisan support, which means it is likely here to stay.

Out With The Old, In with The New

Medicare, a federal insurance program, is the largest insurer in the United States. MACRA has repealed the Sustainable Growth Rate, or SGR, which was the prior method that dictated physician service reimbursement for Medicare (remember hearing about the “doctor fix” every year?). As the replacement to the SGR, the Quality Payment Program (QPP) was created. Currently, Medicare is primarily a fee-for-service entity. Fee-for-service

programs, a system in which providers are paid more for the more services they perform, are heavily criticized for a lack of incentive for decreasing costs and improving quality. **The QPP aims to establish payment models that are based on quality measures.** There will be two distinct models: Alternative Payment Method (APM) and Merit-Based Incentive Payment System (MIPS).

The Fine Print of the Law

The first portion of MACRA is straightforward: a 0.5% annual increase

in all physician payments until 2019. However, complexity and rapid changes to payments follow in the remaining portions of the bill.

The payment system in which most providers are expected to qualify is the MIPS. At its core, it will add a performance-based adjustment to a fee-for-service payment model. It will be based on 4 performance categories: Quality, Resource Use, Clinical Practice Improvement Activities, and Advancing Care Information. **Based on these measurements, bonuses and penalties on total annual Medicare payments will be assessed** with a +/- 4% rate in 2019 up to a maximum adjustment of +/- 9% rate in 2022 and going forward. The annual increase in the physician fee schedule in this path will be 0.25% annually starting in 2026.

The APM model will provide an incentive payment for participating in an innovative payment model. An APM will be a payment model in which a provider or organization takes responsibility for patient care performance on cost and quality. These models can apply to a health population, a care episode, or a specific clinical condition. They will involve entities such as Accountable Care Organizations (ACOs). A much smaller portion of providers will fall into the APM model, but they will have access to more incentives — including an annual 5% bonus on Medicare payments from 2019-2024 and a 0.75% annual increase in physician fee schedule starting in 2026.

So When Does This Start?

It has already started! The first performance period began Jan. 1, 2017. **Health care providers will be expected to begin reporting their outcomes data at some point between before Oct. 2, 2017, and those who do not will be penalized.** Payments will be affected starting Jan. 1, 2019.

Does This Affect Emergency Medicine Providers?

Absolutely. There are some exceptions that will be excluded from the QPP, but it is very unlikely that any full-time ED provider will fall below these thresholds. Many details need to be figured out, including group vs. individual reporting and APM models for the ED. Regarding APMs, ACEP and the APM Task Force are working diligently to provide APM models for the ED going forward, but uncertainty ensues in the emergency medicine world with an unpredictable and varying patient population.

What Does This Mean Going Forward?

MACRA is going to bring about change whether providers are ready for it or not. A lot of details need to be resolved, but the largest insurer in the U.S. is now set to associate payments with quality. **This will affect nearly every provider who participates in the care of Medicare beneficiaries, which means all of us.** It is reasonable to expect this change to transform and involve private insurance payments in the future. It will be important for all of us to stay abreast of this and support the efforts of leaders in our field as they advocate for emergency medicine providers in this rapidly changing landscape. *



CEDR
CLINICAL EMERGENCY DATA REGISTRY

Help for Data-Driven Reimbursement

As the policy climate evolves, with health care reimbursement increasingly dependent upon data-backed quality, the American College of Emergency Physicians is helping emergency physicians keep pace. ACEP's Clinical Emergency Data Registry (CEDR) aims to improve public health, the health of individual patients, and the practices of the emergency physicians and APPs who are part of the registry. CEDR measures and verifies the high-quality practice of emergency physicians and their practice partners to facilitate fair payment to those physicians.

CEDR grew in 2016 to include more than 60 emergency departments, with nearly 3 million patient records now represented in the registry. The 2,500 physicians participating in CEDR last year have had their quality data successfully reported to CMS, not only protecting their revenue, but providing new insights into the quality of their patient care.

The 4 CEDR subcommittees (research, measures, education, and outreach) are driving key initiatives, including:

- Developing a research infrastructure and protocols to allow researchers access to the de-identified CEDR database.
- Working with the Quality and Patient Safety Committee, continuing to refine the CEDR measure set with EM-relevant reporting measures that can be used across all payers - one of the major advantages of a QCDR like CEDR in quality reporting to CMS.
- Implementing MOC Part IV for our ABEM diplomates. That's correct — ABEM diplomates will be able to complete their MOC Part IV requirements right from their CEDR dashboard. We're about to begin beta testing, and you can look for this feature to roll out in late autumn this year.

After a 500% growth between 2015 and 2016, CEDR expects a similar growth pattern for 2017. With millions of patient visit records and 44 performance measures, CEDR will be able to provide quality metrics and share critical insights for improvements in operational, clinical, research, and education domains to improve quality of care and patient outcomes. *

I Smell a Rat

Advocating for Resident As Teacher



Image courtesy of Louise Hope, Fifty Words for Snow

It looked like a scene from a horror movie — tiny bones scattered over the kitchen table vaguely resembling an amateur archeological adventure into a pet cemetery. A pair of femurs sat in a diminutive glass that smelled of a high school swimming pool, while a wire string of vertebrae lay on a floral print paper towel still covered in chunks of cartilage and flesh.

“I wonder what on earth is going on in here?” my grandmother asked with a concerned face from our hotel in Fort Lauderdale.

“Science!” I retorted with a big grin. It would take me nearly 2 weeks to fully reconstruct the chicken skeleton, and I certainly wasn’t going to lose time while on vacation.

This wasn’t the first idea that had been inspired by one of my favorite biology teachers, Ms. Henry. For example, there was also the time I captured and fostered an “antlion” (Google it; you won’t be let down), and the time I spent hours trekking through a field of high grass with the goal of gathering every order of insect, only to be completely devastated when my cat decided to eat half of them.

Collectively, these unconventional experiences were what increased my fascination with learning. **Often the highlight of each activity was**

realizing how much I had actually learned by completing the process.

For example, not only did I go through 5 chicken carcasses, but I simultaneously became a near expert in preparing every type of chicken dish imaginable. Chicken lollipops, anyone?

This passion for education has carried over into my medical career. And while not everyone loves education theory as much as I do, **residents must own the responsibility of positively impacting the learning experience of those behind them in training.**

Sure, I could quote the literature on the qualities of effective teachers or say something controversial like how I find most lectures boring and ineffective. Or I could spend time discussing the subtle differences between pimping and the Socratic method. But at the end of the day, it may not be enough. If Ms. Henry taught me anything, it was to be bold and creative.

So, what I ask of you is simple, really: Be a RAT. And I don’t just mean crawl around in sewers looking to mentor turtles who eat pizza. I mean embrace the qualities of a rat — namely, ambition and creativity. **Actively seek out new ways to teach your fellow residents.** Can’t get the IV? Let them practice on your pipes. Not quite comprehending the



Nick Governatori, MD
EMRA Academic Affairs Representative
Assistant Residency Program Director
Thomas Jefferson University
Philadelphia, PA
@nackgy_g

intricacies within hypothermia staging? Dip yourself into a bucket full of ice during conference. I mean, what’s the worst that can happen?

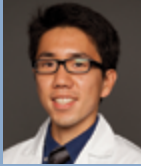
But seriously. **You already know how to do this.** Think back to the first ECG you saw, or that first truly septic patient. Find an innovative way to disseminate the knowledge to your learner. And I don’t just mean the medical facts, but all of the experiences that go along with it.

According to Chinese zodiac legend, 13 animals raced across a river, and their place determined their position on the calendar. It was the rat, with its positive attitude and flexible mind, who rode on the ox’s back and touched the shore first. Be creative like the rat, but instead of literally jumping on your mentor’s back, emulate their qualities in order to be a better and more effective teacher.

Your interns will thank you.

Now, please excuse me while I go snack on a bag of cheese. ★

Residents must own the responsibility of positively impacting the learning experience of those behind them.



Xiao C. Zhang, MD, MS
EMRA Simulation Division Chair
Alpert Medical School of Brown University
Providence, RI



Emily Hillman, MD
Assistant Program Director & Clerkship Director,
Emergency Medicine
University of Missouri-Kansas City
School of Medicine
Kansas City, MO



Adam Kellogg, MD
Associate Program Director
University of Massachusetts-Baystate Health
Springfield, MA



Mary Edens, MD, FACEP
Residency Program Director
LSU Health Shreveport
Shreveport, LA



Adam Kenney, MD
Emergency Medicine Resident
Rutgers New Jersey Medical School
Newark, NJ



Lucienne Lutfy-Clayton, MD
Assistant Professor Emergency Medicine
Associate Residency Director
University of Massachusetts-Baystate Health
Springfield, MA

NAVIGATING International Waters



Top 5 FAQs for International Medicine Graduates Matching into EM

General Overview of the IMG Application Process

International medical graduates (IMG) are physicians who have completed their training from a medical school aside from where they intend to practice. While IMG applicants can offer a wealth of cultural, academic, and medical knowledge diversity to a domestic residency program, many face increasing fundamental challenges during their application process, such as limited EM residency positions and additional accreditation processes (ie, USMLE and ECFMG) before they can apply for U.S. residencies.

The simple truth of the matter is that applying for an emergency medicine (EM) residency as an IMG is tough, and much of the standard application advice does not apply. In order to successfully match, IMGs need to know how the process works for them.

So how, exactly, *does* it work? To assemble the top 5 FAQs, we reviewed data from the National Residency Match Program (NRMP) and from program directors and clerkship directors about optimizing successful enrollment in a U.S. EM residency program.

Before Choosing EM

Prior to applying, it is important to set realistic expectations. Matching into EM is more difficult for IMG students than for U.S. students [Table 1 and Figure 1].

According to the Results and Data from the 2016 Main Residency Match, there

were 1,895 emergency medicine PGY-1 positions with 2,476 total applicants. Of those, 783 were “independent applicants” (31.6%), which includes those who went to international medical schools. EM had a 99.99% fill rate with only 1 unfilled position. Approximately 78% of those spots were matched to US allopathic seniors and 12% were filled by osteopathic applicants. This adds up to some sobering news for the international applicant; **only 5% of available EM positions were filled by U.S.-IMGs, and 1% by non-U.S. citizen IMGs.** This left 30% of independent applicants unmatched among those who listed EM as their only specialty.

Take-Away Points from Away Rotations

One of the most important goals as an EM applicant is to secure a Standardized Letter of Evaluation (SLOE) during an away rotation in the emergency department. According to the 2016 NRMP Program Director Survey results, EM Program Directors ranked “Letters of Recommendation” as the No. 1 factor (97%) in their decision to offer an interview.

Many programs reserve the coveted sub-intern slots (July, August and September) for students from their affiliated medical school. To find viable rotation options, the first step is to look at where students have rotated in the past. The second place to look is the match list for foreign schools to see where IMG’s have



Applying for an emergency medicine (EM) residency as an IMG is tough, and much of the standard application advice does not apply. In order to successfully match, IMGs need to know how the process works for them.

matched previously. The final option is to call the departments where you are interested in rotating to see if you can secure a rotation.

Rotations at non-academic emergency departments may be easier to obtain. However, the letters of recommendation from these sites may not carry sufficient weight to get interviews. All applicants, not just IMGs, need at least 1 (and preferably 2) SLOEs from emergency departments with residency programs. The SLOE is far more useful to program directors than a regular LOR because it forces the writer to compare and contrast the applicant with his/her peers. Not having a SLOE will severely limit your chances as an applicant.

The Application Process

ERAS opens on Sept. 6, with programs able to view applications on Sept. 15. Therefore, the application needs to be completed as close to Sept. 15 as possible. IMG applicants will not receive interview offers until they have at least one SLOE uploaded. They should also take Step 2 early enough to have their scores back when applications go out. While U.S. students may be able to delay Step 2 and still secure interviews, IMGs really need to have both Step 1 and Step 2 scores to maximize their chances. Choose programs that have matched IMGs over the past few years (do this by looking at the match lists published by the schools and at the residencies websites). Applying to programs with no history of matching IMGs is lower yield.

The realistic IMG applicant will apply broadly for emergency medicine but may also apply for other specialties as well. They should not anticipate being able to scramble into EM. Vanishingly few (if any) international applicants (or anyone else, for that matter) have matched via SOAP (Supplemental Offer and Acceptance Program) into EM in recent years.

The Interview

Obtaining an interview is a big step in the right direction. If you have a unique background, use it to your advantage and highlight the qualities and experiences that make you ideal to train. Most important, be prepared to address your IMG status. Expect the question, “Why didn’t you go to medical school in the U.S.?” Have a good, honest answer.

TABLE 1. Annual Emergency Medicine Match Rates from 2009 to 2016

Annual EM Residency Matches	2009	2010	2011	2012	2013	2014	2015	2016
US seniors	1146	1182	1268	1335	1428	1388	1438	1486
US grads	57	66	70	68	44	90	60	73
Osteopathic	163	169	177	171	178	177	203	224
US IMG	70	109	71	69	58	87	75	87
Non-US IMG	23	4	16	25	33	30	36	23
Unfilled	13	16	5	0	3	14	8	1

Data collected from NRMP 2009-2016.

The Rank List

IMG applicants with a longer **contiguous rank list** (the number of programs ranked in the first-choice specialty before a program in another specialty appears on the applicant rank order list) have a better chance of matching into EM residency than applicants with shorter contiguous rank lists. The more interviews you do

(and the more programs you rank), the more likely you are to match.

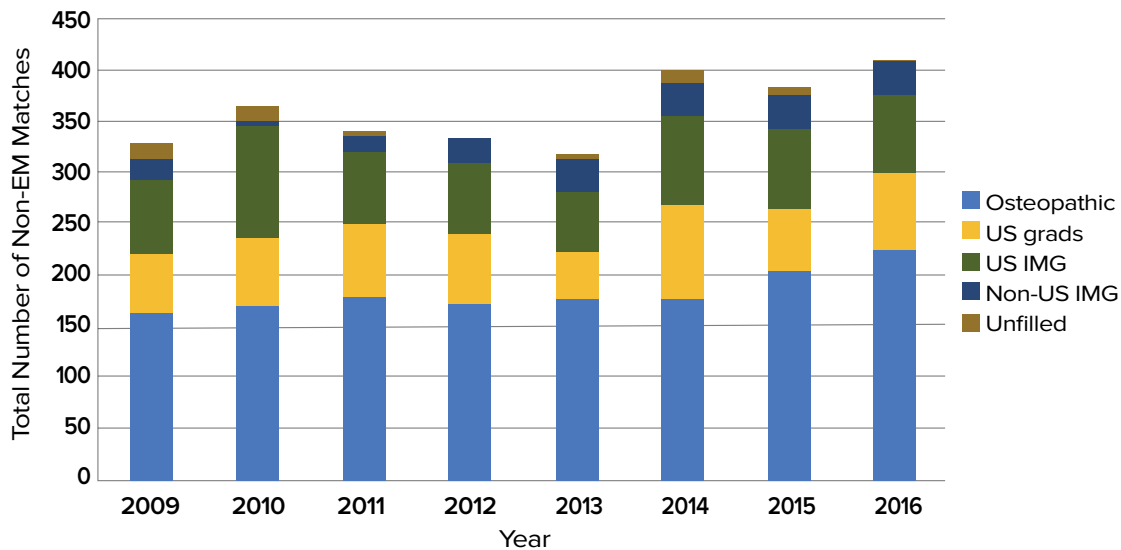
Although no number of interviews guarantees a 100% match rate, the standard recommendation is to rank at least 12 programs (the matched U.S. allopathic seniors had an average rank list consisting of 12.3 programs). In ordering programs on your rank list, do not try to outsmart the algorithm; the match is

applicant-weighted. IMG applicants should rank just like everyone else, based on where they want to go.

While this list may not instantly transform an IMG applicant into an EM-All-Star, it should provide additional subjective and objective guidance to navigate the international waters of the EM residency application process. ★

FIGURE 1. Emergency Medicine Match Rates by non-US Senior Application between 2009 and 2016

Data collected from NRMP 2009-2016.



IMG Match in EM – Expert Feedback

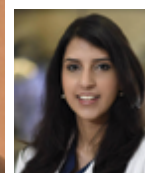
- 1 Why are IMG applicants at a disadvantage?**

It is challenging for U.S. EM Program Directors to be familiar with the myriad of international medical schools. As a result, non-U.S. IMG students need to demonstrate objective mastery of the medical arts via top grades, strong letters of recommendation (at least one SLOE), above average USMLE scores, and a robust CV. Any academic difficulty from an IMG applicant is a major red flag and warrants a back-up plan.
- 2 Are there financial implications to hiring an IMG resident?**

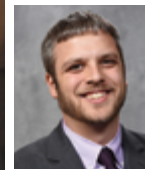
Yes. Some medical institutions only sponsor certain types of visas, and for others, the Department has to pick up the tab. It is difficult for a PD to justify spending money to match an IMG applicant when they can match an equally qualified U.S. graduate for free.
- 3 What is one major pitfall for IMG applicants?**

Spelling and grammatical errors. PDs are bombarded with thousands of applications within hours of ERAS opening. Any simple grammatical mistakes or typos may reflect (possibly inaccurately) your level of English proficiency and lead to rejection. **Advice:** Have someone read your application, and then have someone read it again.
- 4 HIGH YIELD! What can IMG applicants do to tip the scale to their favor?**
 1. Find a mentor and advisor to guide you through this challenging, but exciting process.
 2. Apply (although not exclusively) to programs that have a history of accepting IMG applicants.
 3. Rotate at an academic program and get an outstanding SLOE.
 4. Build an overall strong ERAS application:
 - a. Demonstrate to the PDs that you are not afraid of a challenge.
 - b. Include your unique services, leadership, and research.
 - c. Don't forget to mention your unique academic and cultural experiences.
- 5 What is our single most important advice to an IMG applicant?**

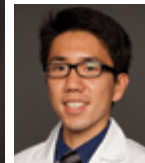
Before you apply to any EM programs, make sure you are the best possible candidate, having crossed all of your T's and dotted your I's before clicking the submit button.



Shehni Nadeem, MD
EMRA Membership Coordinator
Baylor College of Medicine
Houston, TX
@ShehniNadeem



Scott Pasichow, MD, MPH
EMRA Vice-Speaker of the Council
Brown University
Providence, RI
@SPMD16



Xiao C. Zhang, MD, MS
EMRA Simulation Division Chair
Brown University
Providence, RI

Andrew Kohner
Baylor College of Medicine
Houston, TX

Medical Simulation 102

Introduction to Simulation in EM Residency

Medical simulation was first formalized with roots in military medicine as a modality to practice in a low-risk or risk-free environment.¹ Since its inception, it has found its way into graduate medical education across all specialties, with varying styles of clinical presentation and learner exposure – from basic task trainers to fully immersive high-fidelity environments using interactive computer-based simulators (aka Sim Man).² Each type of simulation is designed to help develop a different skill in its participants. Task trainers, such as those used for specialized procedures (eg, central lines, intubation, thoracotomy), can provide targeted training with specific teaching goals

in a safe and protected teaching environment.³

Recent medical literature reveals that residents exposed to medical simulation training gain academic confidence, decision-making skills, multi-tasking abilities, teamwork, and standardized testing skills (eg, oral boards).⁴ Emergency medicine (EM) programs are also turning increasingly to simulation to aid residents in preparing for a series of medical situations, from common case presentations such as acute myocardial infarction to high risk-low incidence situations, such as perimortem cesarean section. Currently, 91% of EM residencies utilize some form of simulation for education with their residents.⁵

To help new residents navigate the

expansive ocean of medical simulation, authors from various academic institutions created a list of tips, revised and reviewed based on available simulation literature (see page 37).

Next Steps

Now that you're excited about it, run with it! Encourage your residency program to try more simulation in the place of traditional lecture-based didactics, or simply schedule some time in the simulation lab to work on a skill or patient case. Consider joining the EMRA Simulation Division or competing in the EMRA SIMWars competition at ACEP17. Options exist for how to engage in simulation as a resident, and it's up to you to make it your own!

The goal for simulation is not task completion but optimization.

Top 5 Tips to Get the Most Out of Simulation in Residency

These 5 pointers will ease new residents into simulation and maximize the potential benefits.

➤ PRE-READING

Have an idea of what broad categories or topics may come up during your simulation experience (eg, pediatrics, toxicology, etc.). Try to preview some relevant material prior to your active learning session in order to minimize the knowledge gap. This will allow you to focus better on identifying issues and learning systematic approaches during the session. Studying material ahead of time also empowers the learner to ask more informed questions or to target a particular area of weakness.

➤ HAVE A PLAN OF ATTACK (SYSTEMATIC, ROLES)

In any real clinical case in the acute care setting, there is a systematic approach to the patient. As medical students, most learn how to perform a full history and physical in a logical format. As residents, these methods of become increasingly important because there now exists a management component. When beginning a simulation case, consider assigning roles. Decide who will be the team leader, who will do procedures, etc. This is very much akin to the roles that exist in real codes or shock/trauma shifts. Once each team member has an assigned task, consider the best way to gather information, assess, and manage the patient. This involves not only having a prioritized and comprehensive method to approach the patient, but also employing a closed-loop communication model that minimizes medical errors and patient safety concerns.

➤ START WITH THE END IN MIND (HAVE CLEAR GOALS, OBJECTIVES)

As with any part of medical education, have a clear idea of what you want to accomplish during the training session. For some, this may be a chance to learn how to identify particular pathologies, while for others it may be a chance to practice the Focused Assessment with Sonography in Trauma (FAST) ultrasound exam in a controlled environment. It may be helpful to let the simulation session leaders know what your objectives for the session are so they can help you better achieve them.

➤ WORK ON THE PROCESS, NOT THE RESULT

We often catch ourselves doing things out of habit or out of past experience without knowing why we do them. When running a simulation case, continuously work to improve and examine the process used to achieve the desired end result. Knowing the how and why enables you to achieve a greater level of understanding and perfect the systems process. There is a lot to be learned in how to approach an issue in multiple fashions and why each of those options exists. Plus, having a process allows you to think clearly in challenging cases.

➤ REFLECT/GET FEEDBACK

Ultimately, simulation is a chance to try and refine techniques without risk to patients. Instead of achieving a task, one can re-run a scenario multiple times to find the way that works best. The goal for simulation is not task completion but optimization. This is why it important to reflect on each session and gather feedback about what went well and what could be improved upon. Remember that when interacting with a real patient, everything is done to ensure the best possible outcome. Simulation allows the opportunity, through trial and error, to create the most efficient method for achieving the best outcome. ★

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ACEP17
Washington, D.C.



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Event Details and Past Winning Presentations emra.org/Events/20-in-6-Resident-Lecture-Competition

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EMRA Events at ACEP17

They'll Be **Huuuge!**

EMRA Residency Program Fair

Saturday, October 28

12:30 – 2:30 pm

Medical students line up at the door waiting to meet you and your team!

They're bursting with excitement to meet the movers and shakers in the emergency medicine space!

EMRA Job & Fellowship Fair

Sunday, October 29

5 – 7 pm

Residents visit this most prestigious job fair with a plan.

They're anxious to get their career started and word's out that this is the place to start their job search!



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FOR MORE EXHIBITOR INFORMATION: EMRA17 Residency Program Fair or Job & Fellowship Fair
Contact Summer Armstrong at sarmstrong@emra.org or call 866-566-2492, ext. 3152



empower

Sharing our Stories

Your Time, Your Legacy

Angela Siler Fisher, MD, FACEP
@afishermd @TeamMaveRx

Medical School: Texas Tech University Health Sciences Center

Residency: Christiana Care Health Services

Fellowship: Christiana Care Health Services

Current Position: Founder, MaveRx™, A Leadership Consulting Firm; Facility Medical Director, First Choice Emergency Room at Richmond

In 2002-2003, you served as EMRA President while you were chief resident at Christiana Care — while also learning the ropes as a first-time mom. What stands out most about that chapter of your life?

I'm the first and only breastfeeding EMRA president! What stands out? The outpouring of support that makes it possible for developing young leaders to take on so many different roles simultaneously. I had those titles, and I certainly accomplished things, but it was not without the help of everyone around me. My husband is a radiologist and he was a resident as well, yet he really made it possible for me to take on so much at once. First and foremost, his support was crucial, but then also my many mentors, faculty and colleagues, EMRA and ACEP staff — it truly was a team effort.

These days, you run MaveRx™, a leadership consulting firm. You've served as faculty for the ED Directors Academy. You founded the Texas Two Step CPR project, which has now partnered with HealthCorps and Dr. Oz. You were a founding member of the Baylor College of Medicine Section of EM and residency program. What drives you — and what's next?

I'm an extrovert — an extreme extrovert. I absolutely derive energy from those around me, and I've been so fortunate throughout my career to find people who are willing to support me and help turn ideas into reality. That's what I want to do now; in fact, that's how MaveRx was born. It's my way to give back. I'm a non-traditional leader and I've made some missteps in my career, but I was able to recover because I was cushioned by the great advice of others. All of it made me who I am today, and I want to be a guide for those who might be on the rise or might be facing a bumpy road. The leadership tips I give are applicable at all levels.

When did you know that emergency medicine was your calling? First, my mom was an ER nurse. I have 4 siblings, and all 5 of us started off in critical care nursing. My first real job — at age 19 — was as a registration clerk in the ER. I put myself through nursing school as a registration clerk, and then through medical school as an ER nurse. Both my husband and I are doctors, and we absolutely love it — so much so that we want our kids to be doctors.

Best time management tip? I think the key to everything in life is networking. Have the contacts at your disposal so that when you're working on a project, whether it's professional or personal, there's someone you can reach out to. Don't reinvent the wheel. Know what's already out there.

Best advice you ever received? Find your life passion. Great things happen at the nexus of what we enjoy doing, what we're good at doing, and what is worth doing. You have to really dig deep in yourself and find out what that is.

Peanut butter or chocolate? Both!

What goes on pizza? What doesn't go on pizza??

Most-used app? My contacts app — I'm always either reaching out to people or serving as a phone book for others.

Favorite Twitter feed? I love @emresidents!

Family? Huge shout-out to my husband, Brandon; my kiddos, Siler (13) and Harmon (11); and my mom and my dad! I could not do this without them. ★



Debra Ravert, MD
Emergency Medicine Resident
Johns Hopkins University
Baltimore, MD

Reflections on Becoming a Doctor

The Crucible of Medicine

I entered the third year of medical school with great excitement. I was finally out of the classroom and seeing real patients, connecting with them and discussing their care with residents and attendings who challenged and inspired me. This is what I had waited for during those long years in the classroom.

About halfway through the year, however, I started to notice that I was having trouble connecting with some of the patients. To be honest, I found them grating and unpleasant. Some were rude or withdrawn, others agitated or openly hostile. Many were suffering as a result of their own poor self-care, and **I was concerned about my own lack of sympathy for these people.**

By the end of third year, I developed a simple strategy to help me see difficult patients with fresh eyes: I imagined each of them as an infant, held by a family member who loved and cherished them. After all, each of these challenging patients had once been adored. And if they had not been, all the more reason to feel for them now.

For a brief time, this strategy worked remarkably well. I felt my patience expand. I did not take rude comments personally nearly as often. I made connections where I had not been able to previously, and I felt I was truly providing better care. In fact, I was invited to join my school's humanism society and even won an award for humanism.

Then I started my residency in emergency medicine.

I was exhilarated and terrified. The pace was much faster and my responsibility much weightier. Within a month, my strategy had proven itself to be maladaptive.

Many of my patients' stories were just too sad. Poverty and violence and substance abuse had shaped the lives and psyches of too many people. **I made it through resuscitations only to collapse emotionally afterward,** sobbing in the ambulance bay or crying on my husband's shoulder late at night. I knew I had to change my approach or else be ruined by it.

It took time and practice to brace myself against the onslaught of pain and discomfort I see on every shift. Now, in my third year of residency, I can hold the hand of a sobbing mother and tell her that her teenage son died of his bullet wounds. I can tell the young mother of two that her cancer has spread to her spine and is almost certainly going to kill her. Does this mean I am a better doctor, or just a numb one?

After all these years, I have found that becoming a doctor is much like becoming a parent. **People warn you that it will change you, but you do not really understand until you have been through the transformation yourself.** I worry this process has changed me too much.

Unfortunately, by deliberately becoming inured to pain, I have become more detached from other emotions, too. Maybe this is why emergency physicians are stereotypically thrill-seekers, adrenaline junkies. Maybe skydiving and race car driving allow us to feel something, when it can be difficult to feel anything at all.

Residency offers plenty of other pressures besides constant exposure to other people's hurt. Hours are long and variable, leaving little time for family or self-care or sufficient rest. In addition,

many residents leave medical school with crushing debt that can lead to a different kind of hopelessness. This reality sharply limits safe exit options for any resident who, faced with brutal schedules and unrelenting human suffering, might otherwise rethink their career choice.

There has been a lot of attention lately on physician wellness. Suicide is strikingly more common in medical students, residents, and attending physicians than in the general public. Residency programs in particular are starting to focus more on wellness and resiliency. While a necessary first step, unfortunately a one-size-fits-all approach will be difficult to find.

For me, family has served as anchor and salvation. When I have seen too much death, too much hopelessness, or too much sorrow, I start to feel sealed off from real life. **Spending time with my family melts the edges of my frozen feelings — but it takes time.** The first day off is often disconcerting; I've missed my children so much, but they're not used to me being home all day and I'm not used to their special brand of chaos. By the second day off, the kids are less wary of me and I'm more patient with them, and I start to remember who I was before and who I could be again.

My love for my husband, my children, and my mother is the only thing stronger than the self-protective wall around my feelings. I'm always a better doctor, wife, mother, and person when I have enough time away from work to be true to myself again. Unfortunately, sufficient time is hard to come by in residency. I hold on and hope that attending life will offer more of the balance we all seek. ★



CONSULT CORNER

Neurology



Brendan Eby, MD
Neurology Resident
Washington University in St. Louis
St. Louis, MO



Brendan Eby, MD, of Washington University in St. Louis shares insight on how to best collaborate with your neurology colleagues.

What is the most effective way to present a neurology consult over the phone?

Start with a specific question. Neurology is a broad field that spans the brain to the peripheral nerves. Nailing down a discrete problem to address helps us frame the rest of your information. Next, neurologists usually like a fairly detailed history. Always try to ask about onset, timeline, recent medication changes, and any prior visits for similar neurologic complaints (brief chart reviews can be extremely valuable). Lastly, **ALWAYS include your exam**. Even a completely normal exam has important diagnostic implications. Also, this way, we can potentially make imaging recommendations up front.

What basic workup do you prefer to be completed prior to placing a consult?

This might go without saying, but if there is concern for a central process in the brain, **get a head CT**. While not always sensitive, it is a quick and easy way to rule out major abnormalities.

For most problems, particularly nonspecific or subjective complaints (altered mental status, spells, worsening of baseline deficits), **get basic lab tests** (CBC, BMP, UA, and drug screen). Common systemic illnesses must be ruled out before more extensive testing like MRI, EEG, and lumbar puncture.

If the patient is on any relevant medications, try to **obtain drug levels** to check for adherence and toxicity.

What do you consider to be emergent consultations?

Obvious emergencies:

- **Stroke:** Most hospitals have a Code Stroke, which should be used accordingly. Make sure you get the Last Known Normal (as opposed to when they were found abnormal), as this will be the most important first piece of information.
- **Status Epilepticus:** A single seizure is not an emergency. However, if they are continuing to seize, benzodiazepines are clearly first line.

Less obvious emergency:

- **Neuromuscular Respiratory Distress:** Patients with myasthenia gravis and Guillain-Barré Syndrome can develop diaphragmatic weakness and tank fast. In addition, they might not look like your typical respiratory patients because they are too weak to become tachypneic. For all patients with myasthenia and facial/swallowing complaints, obtain a Forced Vital Capacity and Negative Inspiratory Force, and watch them closely.

What are some common procedures that an EM resident should feel comfortable with managing in the community?

Lumbar Puncture (our only real procedure): We do these very commonly, and generally we do not feel it is a big deal. However, it is critical to rule out possibly life-threatening disorders (meningitis, subarachnoid hemorrhage, etc.) A lot of extra work can be avoided by being comfortable with performing the LP in the ED.

Neuro Exam: I know it's not a procedure, but it really is important, because objective findings (weakness, ataxia, cranial nerve palsies) can be as diagnostic as LP results and head CTs. More important, when you don't feel confident about your exam, the consultant is not going to feel confident in the consult you are calling.

Consider also some **specific exam maneuvers** to bolster your point. For instance, the Dix-Hallpike and HINTS tests for vertigo or pronator drift and orbiting for subtle weakness are excellent ways not only to test patients, but to demonstrate to your neurology consultant that you are being thorough, thoughtful, and trustworthy in your information.

Top 3 ED pet peeves?

1) **Not doing an exam:** It's probably readily apparent by now, but objective exam findings are extremely important. If you haven't even tried an exam, it will feel like you aren't respecting the neurologist's time. No one wants to feel like they are consulted just to do the H&P.

2) **Calling about a headache before trying anything:** I recommend having at least an initial cocktail that you are comfortable with (like ketorolac and prochlorperazine). Consider asking the patient what typically works. Of course, narcotics are usually not appropriate.

3) **Giving benzodiazepines after the seizure stopped:** Yes, status epilepticus is an emergency. However, if the seizure is over, the medicine is only going to make the patient sleepy, obscure the exam, and make them take longer to come back around. If you are concerned about another seizure, consider loading them with a true anti-epileptic, like levetiracetam.

Other pearls for emergency medicine residents?

Call before you sedate the patient. While not always possible, if you're heading toward sedation, intubation, etc., consider a courtesy call so we can get a quick pre-exam. It is perfectly fine if you haven't gotten the whole story.

Photograph, video, or record odd movements and spells (within HIPAA guidelines). A picture is worth a thousand words. If the patient is doing something you know will be difficult to explain over the phone, consider finding a way to record it (work phone, departmental camera, etc.) *

ABEM Board Eligibility



After you graduate from an ACGME-accredited EM program, you have a limited time to become ABEM board certified. Generally, you are “board eligible” for 5 years after

the date you graduate. You do not have any additional certification requirements under the Policy on Board Eligibility if you:

- Apply for certification during the first certification application period available
- Take and pass the first Qualifying Examination available
- Take and pass the first Oral Certification Examination available

If there is a delay in any of these three activities, you will have to complete LLSA tests and attest to completion of CME in order to remain board eligible. A second 5-year period of board eligibility is possible for physicians who meet specific requirements, as outlined in the ABEM policy.

Physicians who lose their board eligibility status must complete additional, ABEM-approved training to again become board eligible. Details are available on the ABEM website at www.abem.org/Board-Eligibility. Please note: Do not rely solely on ABEM reminders of these requirements; you'll still be held to the requirements whether you receive (or heed) reminders or not. If you have questions, please email BoardElig@abem.org or call 517-332-4800, ext. 384. ★

Stallings to Co-Chair the ACGME Council of Review Committee Residents



After serving the past 2 years as the resident member of the ACGME Review Committee for Emergency Medicine (RC-EM), outgoing EMRA Board member Leonard Stallings, MD, has been elected co-chair of the ACGME Council of Review Committee Residents (CRCR).

The CRCR, a 34-member board comprising the current resident representatives to review committees for various specialties, advises the ACGME Board of Directors on issues related to graduate medical education, accreditation, resident well-being, work hour restrictions, and more.

As CRCR chair, Dr. Stallings will be a voting member of the ACGME Board. ★

Our Very Own Shark Tank: Introducing incubatED!



ACEP is excited to bring incubatED to innovatED – our interactive, award-winning educational feature in the ACEP17 Exhibit Hall. incubatED will be a special section within the innovatED space specifically designed to showcase incubator and/or early-stage health care products. Additionally, this year, we will hold a special pitch event — a "Shark Tank" like event especially for select incubatED participants to pitch their product to angel investors and venture capitalists. Make plans now to take part!

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- Some level of intellectual property must be established
- Must have a physician/clinician advisor or recommender

The deadline to apply for incubatED is June 30! Get details at www.acep.org/explore-the-latest-innovations-in-em. ★

We're on our way to Washington, D.C.



Fall Awards

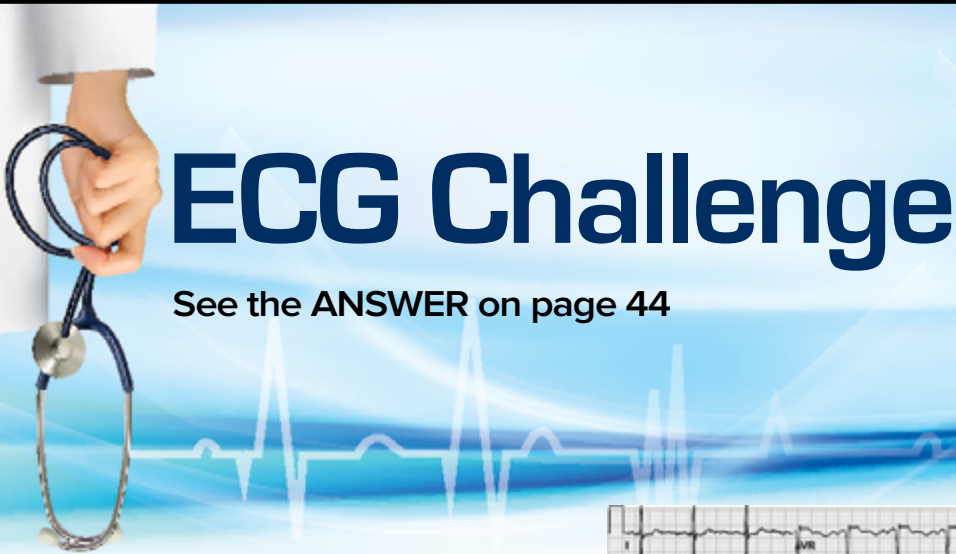
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ECG Challenge

See the ANSWER on page 44



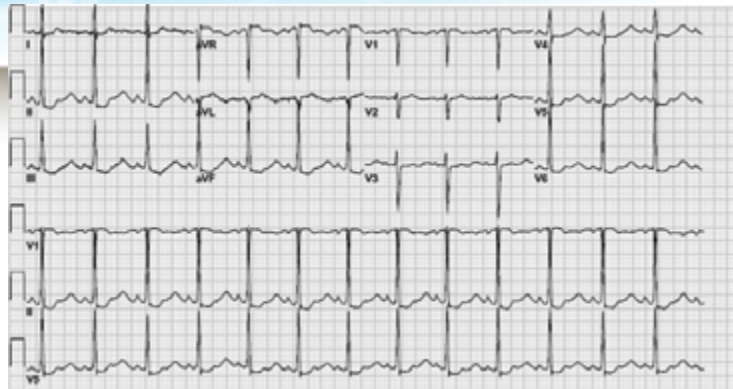
Maryam Arshad, MD
Emergency Medicine
Resident
Emory University
Atlanta, GA



Sajid Khan, MD
Assistant Professor of
Emergency Medicine
Univ of Missouri-Kansas City
Kansas City, MO

CASE. A 54-year-old woman presents with weakness, poor appetite, and weight loss for several days. She also reports profuse non-bloody diarrhea. Vital signs are unremarkable, and an ECG is obtained and shown at right.

What are you concerned about?



Annals of Emergency Medicine

Resident Editorial Board Fellowship Appointment

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

Please visit *Annals'* Web site at www.annemergmed.com for a copy of the complete application.

Due date is Monday, July 10, 2017



Questions should be directed to
Martha Morrison
Editorial Assistant
Annals of Emergency Medicine
at 800-803-1403 x 3223
or by email at
mmorrison@acep.org



ECG Challenge

ANSWER

This ECG demonstrates a prolonged QT interval and the presence of U waves. Given the patient's symptoms, the most likely diagnosis is hypokalemia. A variety of arrhythmias may be seen in patients with hypokalemia, including sinus bradycardia, premature atrial and ventricular contractions, atrioventricular block, and even ventricular fibrillation. Other less common changes include QT prolongation, ST segment depression, and the presence of a U wave. A U wave is a deflection after the T wave which is usually in the same direction, and is more pronounced in the presence of bradycardia.

When potassium levels are depleted, it is also prudent to check a magnesium and phosphorus level and replete accordingly, especially since hypokalemia and hypomagnesemia are associated with an increased risk of torsade de pointes. Hypomagnesemia can also worsen hypokalemia by furthering urinary potassium loss.

Finally, If the patient is hemodynamically unstable, potassium should be replaced through a central line for more rapid administration. This patient was indeed profoundly hypokalemic, with a level of 1.6. IV potassium was ordered in the ED and the patient was started on a potassium drip: 40mEq KCL in 1 liter of LR at a rate of 125mL/hr.

LEARNING POINTS

1. Hypokalemia can present with a variety of ECG findings, ranging from sinus bradycardia to ventricular fibrillation. Presence of a U wave is usually associated with profound hypokalemia.
2. In the presence of hypokalemia, it is important to aggressively treat other electrolyte abnormalities, specifically magnesium and phosphorus.
3. If the patient is hemodynamically unstable, potassium should be replaced through a central line for more rapid administration. ★

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Board Review

QUESTIONS

PEER (Physician's Evaluation and Educational Review in Emergency Medicine) is ACEP's gold standard in self-assessment and educational review. These questions are from *PEER VIII*. For complete answers and explanations, visit the [Board Review Questions page](#) under "Features" at [emresident.org](#).

To learn more about *PEER VIII*, or to order the newly released *PEER IX*, go to [acep.org/bookstore](#).



1. Two young parents bring their 4-month-old daughter to the emergency department for excessive crying. She has been gaining weight appropriately, is afebrile, and had a normal birth history. Which of the following has the highest yield in leading to a correct diagnosis?
 - A. Applying a cardiac monitor
 - B. Obtaining a urinalysis and culture
 - C. Staining the eyes with fluorescein
 - D. Undressing the infant completely
2. A 30-year-old woman presents 2 hours after ingesting an unknown quantity of aspirin. She has normal vital signs, no tinnitus, no acidosis, no measurable level of acetaminophen, and a serum salicylate concentration of 24 mg/dL. Which of the following is the appropriate management plan?
 - A. Hemodialysis
 - B. Observation and measurement of serial salicylate concentrations
 - C. Urinary acidification
 - D. Use of the Rumack-Matthew nomogram to determine disposition
3. A 7-year-old girl presents by ambulance in full cardiopulmonary arrest. The paramedic reports that the mother said the girl had been vomiting and had diarrhea for several days. What is the best approach to obtain access?
 - A. Central intravenous line in the femoral vein
 - B. Central intravenous line in the subclavian vein
 - C. Intraosseous line in the anterior tibia
 - D. Peripheral intravenous line in the antecubital fossa
4. End-tidal carbon dioxide monitoring is:
 - A. A poor predictor of correct endotracheal tube placement
 - B. An early indicator of carbon dioxide when the colorimetric sensor turns purple
 - C. An early indicator of respiratory depression during procedural sedation
 - D. Less accurate when used during CPR
5. What is the most common cause of death in advanced Parkinson's disease?
 - A. Drug toxicity
 - B. Respiratory failure
 - C. Suicide
 - D. Trauma-related injury ★

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

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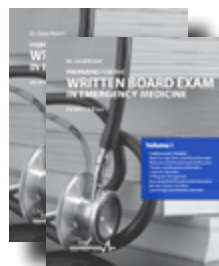
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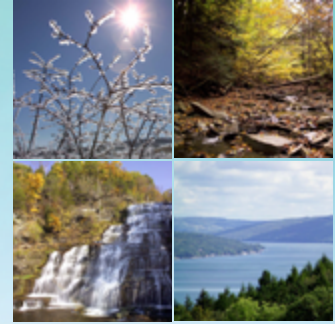
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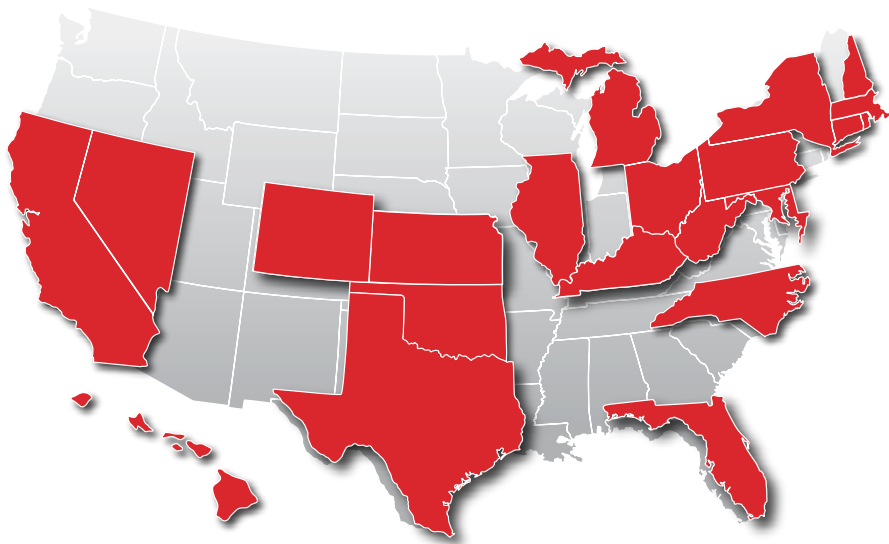
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Applicants must have graduated from an accredited Emergency Medicine Residency Program and be board eligible or board certified by ABEM or AOBEM. We seek candidates with strong interpersonal skills and the ability to work collaboratively within diverse academic and clinical environments. Observation experience is a plus.

For additional information, please contact:

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For additional information or to apply for a position, visit emergency.med.ufl.edu/opportunities.

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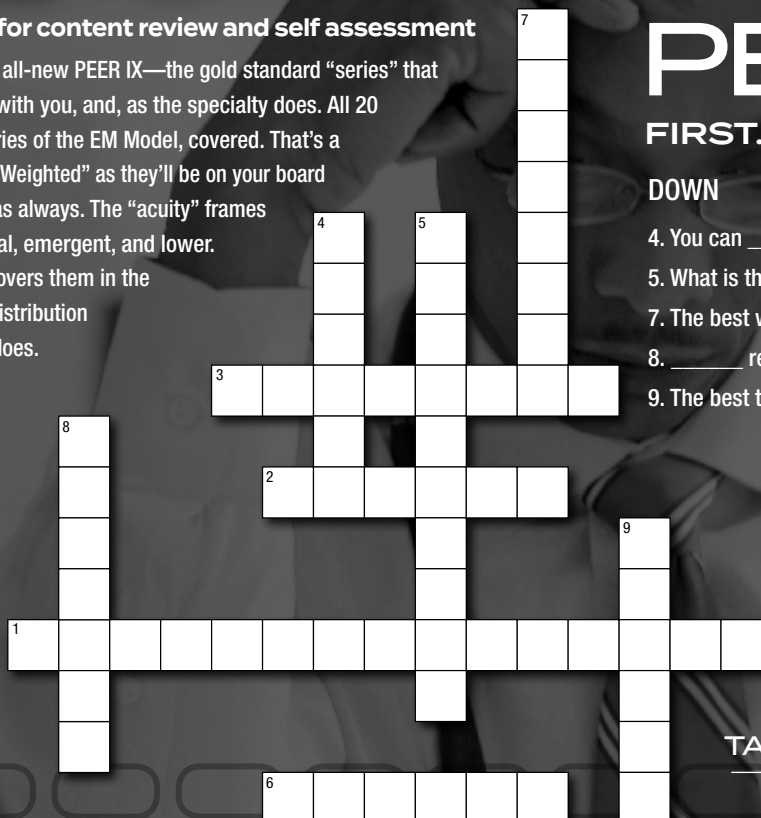
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