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# ACEP Now

The Official Voice of Emergency Medicine

JULY 2020

Volume 39 Number 7

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## Endovascular Therapy With or Without tPA

*What do the studies say?*

by KEN MILNE, MD

### The Case

A 61-year-old healthy female presents with two hours of right-side weakness as well as slurred speech. She has a National Institutes of Health Stroke Score/Scale (NIHSS) of 10, and you are concerned about a large vessel occlusion (LVO) based on the high NIHSS as well as the presence of both an upper extremity drift and the speech abnormality. A noncontrast computed tomography (CT) scan of her head shows no evidence of a bleed. A CT angiogram plus CT perfusion demonstrate a clot in the left proximal middle cerebral artery (MCA), with a small infarcted area and a large penum-

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## The Case for Resident Hazard Pay

The challenges of residency in the era of COVID-19

by CHRISTOPHER CLIFFORD, MD

A recent survey of 91 residency programs in New York City showed that at least 340 residents had become infected with COVID, with anesthesia and emergency medicine residents having the highest probability of contracting the disease. Approximately 50 percent of residents had suboptimal personal protective equipment (PPE) and around 75 percent



### RESIDENT VOICE

of programs had resident redeployment.<sup>1</sup> Anecdotal reports are even more striking, with one physician stating that 80 percent of their

internal medicine residents missed time from work because of COVID-19 symptoms.<sup>2</sup>

With all this stress weighing on the young doctors of our country, you would think offering hazard pay would be a no-brainer. Residents are underpaid and carry high debt burdens. Meanwhile, many of our physician assistant (PAs) colleagues are receiving hazard pay, and hospitals are recruiting extra staff with free lodging and meals on top of exorbitant amounts of money, upwards of \$10,000 per week, in order to address COVID-19 needs.<sup>3</sup>

### Is Hazard Pay Realistic?

A common reason for refusing residents hazard pay is the current financial strain on hospitals due to the pandemic. However, few details are offered after this initial point is conveyed.

A typical New York City hospital CEO earns more than \$1 million a year. A normal hazard pay stipend averages about \$1,250 per resident. Therefore, a one-time pay reduction of 12.5 percent for the average New York City hospital CEO could easily fund

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**"IT'S NOT  
A FEMALE  
RESIDENT  
PROBLEM"**

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# NEWS FROM THE COLLEGE

## UPDATES AND ALERTS FROM ACEP

### Registration Opens for ACEP20: Unconventional

An unprecedented year calls for an unconventional convention! After thoughtfully considering many different options and ideas, ACEP decided to move ACEP20 to a unique digital experience.

Since the COVID-19 pandemic emerged, there have been months of deliberative discussions among the Board of Directors, Finance Committee, Educational Meetings Subcommittee, and staff. A poll of the membership in early May showed that 57 percent of the respondents had travel restrictions, and a majority of the commenters indicated a preference for an online experience for various reasons. While the delivery of ACEP20 may be different, you can expect the same expert education and CME credit from the world-class faculty you respect. Registration opened July 15 at [www.acep.org/acep20](http://www.acep.org/acep20).

### Council Resolutions Due July 26

As part of ACEP20: Unconventional, the Council will meet virtually on Oct. 24–25. All ACEP members are invited to submit resolutions for the Council to consider. Each resolution must be submitted by at least two members of the College. Learn more about submitting resolutions and how your resolutions can guide ACEP's future plans at [www.acep.org/council](http://www.acep.org/council).

### Skip to the Front of the Amazon Line

When members told us they were having trouble buying essential supplies like hand sanitizer and household disinfectant, we contacted Amazon to see how we could work together to fix that problem. In mid-June, we launched a new member benefit that gives ACEP members access to a central business account, allowing them to purchase important supplies before the general public. View the instructions for signing up at [www.acep.org/amazon-benefit](http://www.acep.org/amazon-benefit).

### Improve Your ED's Pain and Addiction Care

We may be in the midst of a global pandemic, but the opioid epidemic isn't going away. ACEP's newest accreditation program, Pain and Addiction Care in the ED (PACED), is the nation's only specialty-specific program that allows emergency departments to improve pain and addiction care. Elevate the quality of patient care with innovative treatments, alternative modalities, and impactful risk-reduction strategies in a collaborative team setting, resulting in positive outcomes for your patients, families, health care workers, and communities. Learn more at [www.acep.org/paced](http://www.acep.org/paced).



UNCONVENTIONAL  
2020

### COVID-19 Physician Wellness Hub Helps You Find the Right Support

Just like race car drivers have to make pit stops to refuel during a long race, you may need to check on your mental health to stay well during this COVID-19 marathon. The Wellness Hub ([www.acep.org/wellness-hub](http://www.acep.org/wellness-hub)) includes options for peer support and crisis counseling, plus the latest advocacy efforts related to removing barriers to care. Emergency physicians can address stress at its source, whether it's related to patient care, workplace, litigation, finances, or personal stuff. For those who want to do a deeper dive into specific issues, the Hub has topical libraries for burnout, post-traumatic stress disorder, physician suicide, and more.

### Virtual Grand Rounds to Continue Through 2021

ACEP's Academic Affairs and Education Committee created the monthly Virtual Grand Rounds program in April as a way to provide free education for emergency physicians and residency programs during this time of social distancing. It allows you to track learner participation while engaging in Q&As with course faculty on different monthly topics. Once the sessions are complete, they are posted in the ACEP eCME catalog for online learning. Topics previously covered include COVID-19 (April), Physician Wellness (May), and Airway (June). The following sessions are coming up. Register at [www.acep.org/virtual-grandrounds](http://www.acep.org/virtual-grandrounds).

- **July 22:** Ultrasound
- **Aug. 26:** Pediatrics
- **Sept. 23:** International
- **October:** No Virtual Grand Rounds because of ACEP20
- **Nov. 18:** Neurology
- **Dec. 16:** Cardiology
- **Jan. 27:** Vulnerable Populations/Social Determinants of Health
- **Feb. 24:** Simulation: OB Emergencies with EMRA



### CALL FOR COVID-19 RESEARCH

The *Annals of Emergency Medicine* and *JACEP Open* welcome late-breaking manuscripts related to the COVID-19 pandemic. Please send pre-submission inquiries to [annemergmed@acep.org](mailto:annemergmed@acep.org) or [jacepopen@acep.org](mailto:jacepopen@acep.org).



# RESIDENCY SPOTLIGHT

## VANDERBILT EMERGENCY MEDICINE

Twitter: @VUMC\_EM

Location: Nashville, Tennessee

Year founded: 1993

Current number of residents: 39

Program length: 3 years

### Fun facts:

- Only Level 1 trauma center and burn center in middle Tennessee.
- A varied patient population, as both a quaternary referral center and one of the largest charity care providers in the state.
- Nationally known for a focus on didactic and bedside teaching.
- Mentorship tracks include a “3+1” design intended to help residents find a career track that fits their needs and interests. (The program supports residents who decide to continue beyond the three years of training, whether that involves moving into a focused faculty practice or doing a fellowship.)
- Fellowships include EMS, international medicine, and ultrasound.



VANDERBILT EMERGENCY MEDICINE

### What makes the research program stand out?

It regularly ranks in the top 10 of National Institutes of Health funding for emergency medicine research. The Vanderbilt Emergency Medicine Research Division provides residents interested in research with education and opportunity. For example, PGY-3 resident Chris Evans, MD, just joined the editorial board of the *Annals of Emergency Medicine*.

### What unique benefits does your city have to offer?

Nashville is one of the fastest-growing cities in the country. Known as “Music City,” Nashville is a hot spot in the entertainment industry. Other industries of note include finance, insurance, and health care. Despite its booming population, there is an abundance of parks and green space, lakes, and other outdoor activities. It is a city with a small-town feel and one of the friendliest cities in the United States.

### How has the coronavirus outbreak impacted the program?

We took advantage of the increased use of virtual meetings to include our faculty, fellows, residents, and alumni from all over the country in weekly Zoom calls. This allowed us to band together with friends old and new to check in, provide support, and share some time together amid this time that is crazy for all of us.

—Nicole McCain, MD, Keith D. Wrenn Residency program director



### Trivia

In the 1800s, Nashville was named the “Athens of the South” as there were numerous institutions of higher education. There is even a giant replica of the Parthenon of Athens, Greece. It was also the first southern city to establish a public school system.

# Critical decisions

in emergency medicine

What criteria should be used to rapidly identify a child's hydration status?

**See Page 4.**



Find three case-based situations that help answer this question and be prepared for whatever may come.

In the June 2020 issue now.



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# Virtual Chaos

It's time to standardize the nomenclature of acute care telemedicine

by JESSE PINES MD, MBA, MSCE; AND AMER ALDEEN, MD, FACEP

Telemedicine refers to the use of technology to create a virtual connection between clinicians and patients to facilitate health care delivery. The goal is to facilitate and optimize communication and consultation. Some acute care telemedicine was already in use prior to COVID-19 in places like urgent care, emergency departments, and hospital floors. Telemedicine use has undergone a meteoric rise since March.

As telemedicine has become mainstream, a brewing lingo problem has begun to bubble. In short, we need to agree on a shared terminology. For example, the terms “direct-to-consumer,” “retail,” “tele-stroke,” “e-ICU,” “tele-ICU,” “e-emergency,” “ET3,” and many others are frequently bandied about without clear definitions. This variation in nomenclature is a veritable word salad. This can create confusion and miscommunication, even among insiders. We need to align the terminology to provide a consistent description of these concepts to enhance communication efficiency and program effectiveness.

## Acute, Emergency, Hospital Care Nomenclature

Here we propose a standardized telemedicine nomenclature for acute, emergency, and hospital care. An effective nomenclature taxonomy should be 1) sufficiently descriptive, 2) create mutually exclusive categories wherever possible, 3) avoid overly burdensome language, 4) be intelligible to multiple audiences, and 5) be expandable to describe future use cases and concepts. Our nomenclature, which we call the Pines-Aldeen Acute Care Telemedicine (PAACT) Classification, involves two distinct positions for words/phrases (similar to Arabic numeral digits) for each use case. The first word/phrase describes the source of the patients. The second word/phrase describes the use case with the “Tele-” prefix added.

As an example, Healthsystem Tele-Observation is the use of telemedicine to deliver observation services within a hospital or health system. By contrast, Employer Tele-UrgentCare is the more traditional, direct-to-consumer telemedicine (eg, Teladoc or American Well) delivered to employer clients for acute urgent (mostly low-acuity) care.

We propose the explicit category of Tele-Emergency for patients (and for other stakeholders within health systems) who think they may need an emergency department. Tele-Emergency would skew toward the higher-acuity cases (eg, abdominal pain) while Tele-UrgentCare is conceptualized for lower-acuity care (eg, seasonal allergies). Table 1 describes each use case with a description of the source of the patients and the specific telemedicine services delivered. The table is not designed to be comprehensive; with its position-based digit system, the PAACT Classification allows any stakeholder to build upon the nomenclature with simple terms understandable by all. For example, a third word/phrase position could be added to describe the exact technology used or another variable.

With the PAACT Classification, we anticipate more efficient communication to describe and advance the science of telemedicine to achieve improvements in patient outcomes, experience of care, and cost savings. ➕

**DR. PINES** is the national director of clinical innovation at US Acute Care Solutions and professor of emergency medicine at Drexel University in Philadelphia.

**DR. ALDEEN** is chief medical officer of USACS and is based in Tampa, Florida.

Table 1: Pines-Aldeen Acute Care Telemedicine (PAACT) Classification

Use Case	Patient Source	Program Goal	Consult Type	
			Patient-Clinician	Clinician-Clinician
<b>Employer Tele-UrgentCare</b>	Employees with acute, unscheduled, low-acuity complaints	Provide medical care for low-acuity, unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	
<b>EMS Tele-UrgentCare</b>	Pre-hospital workers who have identified ambulance patients eligible for treat & release telehealth	Provide medical care for low-acuity, unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	X
<b>Healthsystem Tele-Consult (Tele-Stroke, Tele-Psychiatry, Tele-[Specialty])</b>	Healthsystem/hospital patients with specific conditions requiring unscheduled specialist care not available in person	Deliver timely specialist care in acute-care settings	X	X
<b>Healthsystem Tele-Emergency</b>	Healthsystem/hospital patients with acute, unscheduled, higher-acuity complaints who may need ED care	Provide medical care for more serious unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	
<b>Healthsystem Tele-UrgentCare</b>	Healthsystem/hospital patients with low-acuity, acute, unscheduled complaints	Provide medical care for low-acuity, unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	
<b>Healthsystem Tele-FollowUp</b>	Healthsystem/hospital patients who have been recently discharged from the ED or hospital	Identify and remediate problems and concerns post-discharge	X	
<b>Healthsystem Tele-Hospitalist</b>	Healthsystem/hospital patients admitted to the hospital floor	Provide remote staffing to improve efficiency	X	X
<b>Healthsystem Tele-ICU</b>	Healthsystem/hospital patients admitted to the hospital ICU	Provide remote staffing to improve efficiency	X	X
<b>Healthsystem Tele-Observation</b>	Healthsystem/hospital patients in the observation unit	Provide remote staffing to improve efficiency	X	X
<b>Healthsystem Tele-Triage</b>	Patients who have presented to the ED	Reduce time-to-clinician and shorten ED length-of-stay and reduce left-without-treatment by placing orders early	X	
<b>Insurer Tele-UrgentCare</b>	Insurer beneficiaries with acute, unscheduled complaints, or those who have been referred from an insurer nurse triage line	Provide medical care for low-acuity, unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	X
<b>School Tele-UrgentCare</b>	School students where school nurses have questions about acute, unscheduled complaints	Provide medical care for low-acuity, unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	X
<b>SNF Tele-Emergency</b>	Skilled nursing facility (SNF) residents identified by SNF staff with acute, unscheduled complaints who are eligible for treat & release telehealth	Provide medical care for low-acuity, unscheduled complaints; triage higher acuity care to appropriate setting/specialist	X	X

# A Mnemonic for the Physiologically Difficult Airway

“CRASH” helps you recognize and modify critical variables in advance of intubation

by RACHEL MUNN, DO; JARROD MOSIER, MD, FCCM; DARREN BRAUDE, MD; CALVIN A. BROWN, III, MD; AND FRED ELLINGER, JR., NRP

There are two causes of difficult airway: anatomy and physiology. These two factors are not always equally considered. Sometimes, difficult physiology is overlooked. This makes sense. You can't just eyeball a patient's physiological profile.

This may be one reason the focus of difficult airway prediction has historically been on identifying anatomical challenges that interfere with direct laryngoscopy, commonly aggregated in the LEMON mnemonic (Look externally, Evaluate, Mallampati, Obstruction or obesity, Neck mobility).<sup>1</sup> Over time, the focus of airway assessment expanded to include mask ventilation, extraglottic devices, and cricothyroidotomy, each with unique predictors of difficulty summarized in standard mnemonics from The Difficult Airway Course and the *Manual of Emergency Airway Management*.<sup>1</sup>

We've made great progress with this framework. As emergency airway management has evolved, the number of cases in which intubation cannot be rapidly achieved in the emergency department has shrunk to only a few percent. In fact, the rate at which surgical airways is performed is now less than 0.5 percent.<sup>2</sup> There has been growing recognition that difficulty completing the procedural mechanics of intubation is only part of the challenge; studies demonstrate up to a 19.2 percent incidence of hypoxemia, 25 percent incidence of hypotension, and 4 percent to 11 percent incidence of cardiac arrest.<sup>3-6</sup>

While challenging anatomy may contribute to these complications, it is often the patient's underlying physiology that has the greater impact. Success with the first attempt is associated with a dramatic reduction in complications, but a complication rate up to 20 percent is associated with physiological disturbances, which may be amenable to modification prior to intubation.<sup>7-9</sup> From these experiences and observations evolved the distinct concept of the “physiologically difficult airway” to contrast with the “anatomically difficult airway.”<sup>10</sup>

The addition of an “S” to LEMON to make LEMONS was an early attempt to add consideration of a patient's physiology to the preintubation assessment, but this only accounted for hypoxemia.<sup>11</sup> Similarly, the HEAVEN mnemonic adds consideration of hypoxemia and blood loss to traditional anatomical markers.<sup>12</sup> Other major physiological variables to be considered include increased oxygen consumption, right heart dysfunction, severe metabolic acidosis, and hypotension. We believe that the physiologically difficult airway deserves its own mnemonic,

**Table 1: The CRASH Mnemonic**

	PHYSIOLOGICAL ABNORMALITY	RESPONSE
<b>C</b>	Consumption Increase	Optimize preoxygenation, apneic oxygenation; anticipate short apnea times
<b>R</b>	Right Ventricular Failure	Optimize preoxygenation, inhaled pulmonary vasodilators, choice of induction agents, early use of vasopressors
<b>A</b>	Acidosis (Metabolic)	Correct underlying issues; avoid mechanical ventilation, if possible; minimize apnea time/consider awake intubation; maintain increased minute ventilation
<b>S</b>	Saturation	Optimize preoxygenation, including noninvasive ventilation and DSI, apneic oxygenation, including high-flow nasal delivery
<b>H</b>	Hypotension/Volume	Volume resuscitation, vasopressors

CRASH, to help recognize and modify the critical physiological variables in advance of intubation (see Table 1). CRASH can be used to remember the following considerations:

**Consumption:** The peripheral consumption of oxygen is increased in pediatrics, sepsis, acute respiratory distress syndrome, excited delirium, thyrotoxicosis, and pregnancy. These patients may exhibit a normal saturation during preoxygenation; however, the increased peripheral consumption may still result in rapid desaturation. Anticipating a shorter apneic time and maintaining adequate oxygen delivery to compensate for the increased consumption are of paramount importance. Any decreased oxygen delivery past the anaerobic threshold may lead to precipitous decompensation. Meticulous preoxygenation, improving low cardiac output, and correcting anemia may preserve adequate oxygen delivery.

**Right Ventricular Dysfunction/Failure:** In patients with right ventricular dysfunction, such as in massive pulmonary embolism, intubation is often the last step in the right ventricular “cycle of death.” The right ventricle (RV) has limited ability to increase contractility and output in response to increased demand.<sup>13,14</sup> RV dilation and tricuspid regurgitation occur quickly when RV afterload is increased; this may be worsened by fluids administered in an attempt to increase the

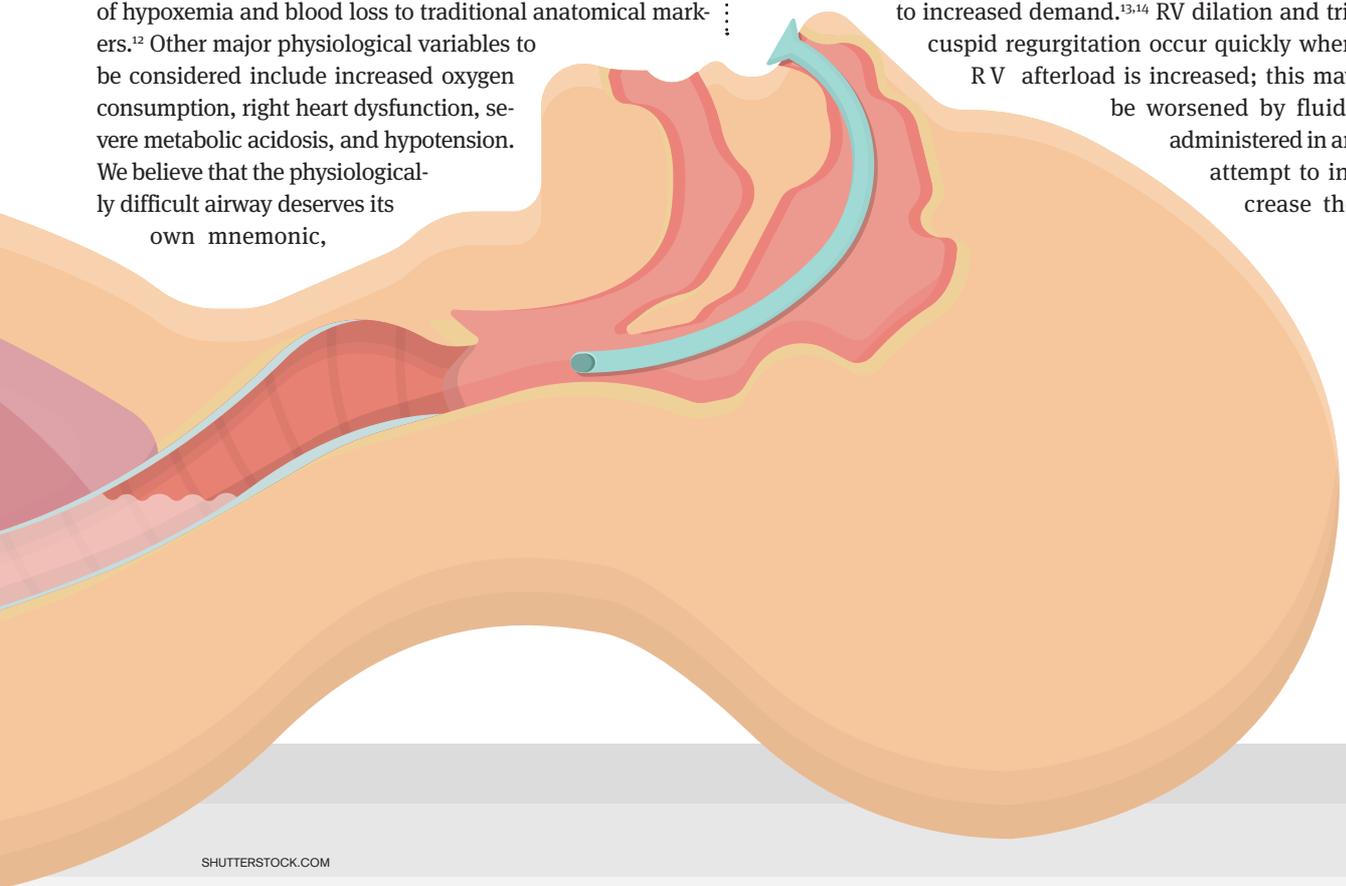
preload. Rapid sequence intubation paralysis may lead to hypercapnia, atelectasis, and hypoxemia, which all independently increase pulmonary vascular resistance and right ventricular afterload—often to the point of cardiovascular collapse. Cardiac ultrasound can help identify a failing RV and guide judicious fluid resuscitation, appropriate vasoactive, and inhaled pulmonary dilator medication use.<sup>10,13-15</sup>

**Acidosis:** Patients exhibiting profound metabolic acidemia, such as diabetic ketoacidosis, severe sepsis, or major trauma, present an increased risk because any interruption of ventilation or inability to match the necessary compensatory minute ventilation can result in life-threatening acidosis. A recent study showed that, with 60 seconds of apnea, pH drops 0.15 and PaCO<sub>2</sub> increases by 12.5 mmHg, which can be devastating to fragile patients.<sup>16</sup> Compensatory ventilation is best left intact by avoiding intubation, but if patients do require intubation, a strategy that limits or eliminates the apneic period and addresses the minute ventilation requirement postintubation should be adopted.

**Saturation:** Hypoxemia is a known complication of emergency airway management and has been associated with multiple complications, including peri-intubation cardiac arrest.<sup>3,6</sup> Preoxygenation/denitrogenation are essential to assure maximal safe apnea time by providing a reservoir of oxygen to draw upon. Best performed with a tight-fitting mask and flush-rate oxygen, or a bag-valve-mask with one way valve and at least 15 liters of flow, denitrogenation may be objectively assessed by monitoring end-tidal oxygen.<sup>17</sup> Upright positioning opens up functional residual capacity, while CPAP opens up functional residual capacity and recruits alveoli to improve ventilation-perfusion mismatch. In patients who will not tolerate CPAP, delayed sequence intubation (DSI) may be considered.<sup>18</sup> In refractory hypoxemia, an awake intubation should be considered.<sup>19</sup> Aerosol risk may also be considered for patients with COVID-19 and other highly contagious respiratory illnesses.

**Hypotension/Volume:** Critically ill patients requiring advanced airway management are at significant risk of hypotension in the peri-intubation period. Many critically ill patients are volume depleted or vasoplegic or have primary or comorbid cardiomyopathy. Induction agents and the transition to positive pressure ventilation can amplify these deleterious states and precipitate arrest. Fluid resuscitation, vasopressors, or inotropes may be indicated prior to intubation, depending on the clinical scenario.

The anatomically difficult airway is well-recognized and well-studied, although no faultless predictors exist. The physiologically difficult airway is equally important but generally underrecognized and underdiscussed. The CRASH mnemonic



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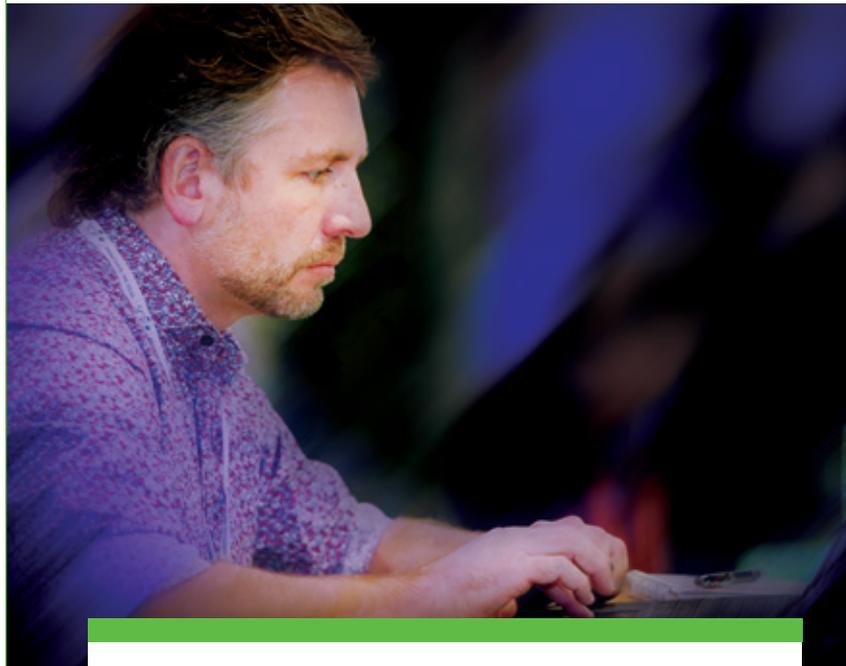
should assist in the assessment and management of the physiologically difficult airway. Addressing the factors represented in this mnemonic will help mitigate the risk of morbidity and mortality associated with advanced airway management in critically ill patients. 📌

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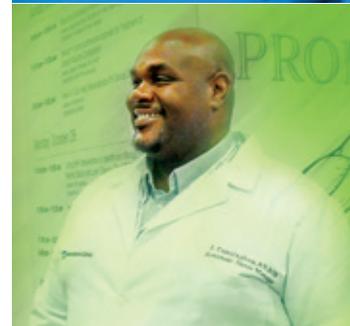
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# So You Want to Be a TV Star?



UNTOLD STORIES OF THE ER

Scene from the set of *Untold Stories of the ER* episode "I'm So Dead."

Q&A with a real-life doc from the TV series *Untold Stories of the ER*

**E**mergency medicine pioneer Robert Slay, MD, recently discussed his emergency medicine career and his acting with *ACEP Now*.

**ACEP Now: How did you get your start in emergency medicine?**

**RS:** After completing an Army residency in internal medicine, I passed the internal medicine board exam but functioned as an internist for only one year. In 1976, I was assigned to Brooke Army Medical Center in San Antonio, Texas, as an internist. Brooke had more than 700 beds and an ER that was a major trauma center and saw around 60,000 patients a year. There was no recognized EM specialty and just the beginning of a few fledgling training programs in emergency medicine nationwide.

The chief of internal medicine at Brooke gave me an alternative to being exiled to the eternally boring abyss of the clinic. "Bob, we have a real problem with our medicine residents running amok in the ER with no supervision—they are killing patients," he

## An On-Set Prank

by ROBERT SLAY, MD

**O**n the first day of my eighth season writing for and acting on *Untold Stories of the ER*, I decided to have a little fun on the set.

The show was always filmed in Vancouver, British Columbia, on a set scavenged from a defunct mental hospital on the outskirts of town. All of the crew were Canadian locals, and the same people were always on the set, except for the director. Every season we had a new, insecure, fledgling, itinerant director—easy prey.

If your idea for an *Untold Stories* show is accepted, you will be offered the opportunity to tell your story on camera and to reenact it as yourself. Amateur-actor doctors playing themselves—every director's nightmare. *Untold Stories* is a scripted, reality-based show, so the doctor-actor must recite dialogue, hit their marks, and perform procedures, all with cameras and lights in their face and 30-odd people (the crew) watching.

The director and crew are wary of new doctor-actors because some have been incredibly bad. A bad doctor-actor means it may take 12 or more agonizing hours to get an acceptable 10-minute reenactment on film.

The crew is glad I am a veteran of multiple previous shows. Now we have a reason-

able chance of moving through the production on time. Then I let them in on what is about to happen to our unsuspecting new director, Hugh.

Day one, scene one: After an hour of setting up, we are finally ready to roll cameras. Hugh starts directing.

"OK, Dr. Bob, let's rehearse this scene," he says.

"You know, Hugh, I think we should just roll film and do the scene extemporaneously, without a rehearsal," I say. "I think it would be fresher and more energetic that way." (All directors love the word energetic.)

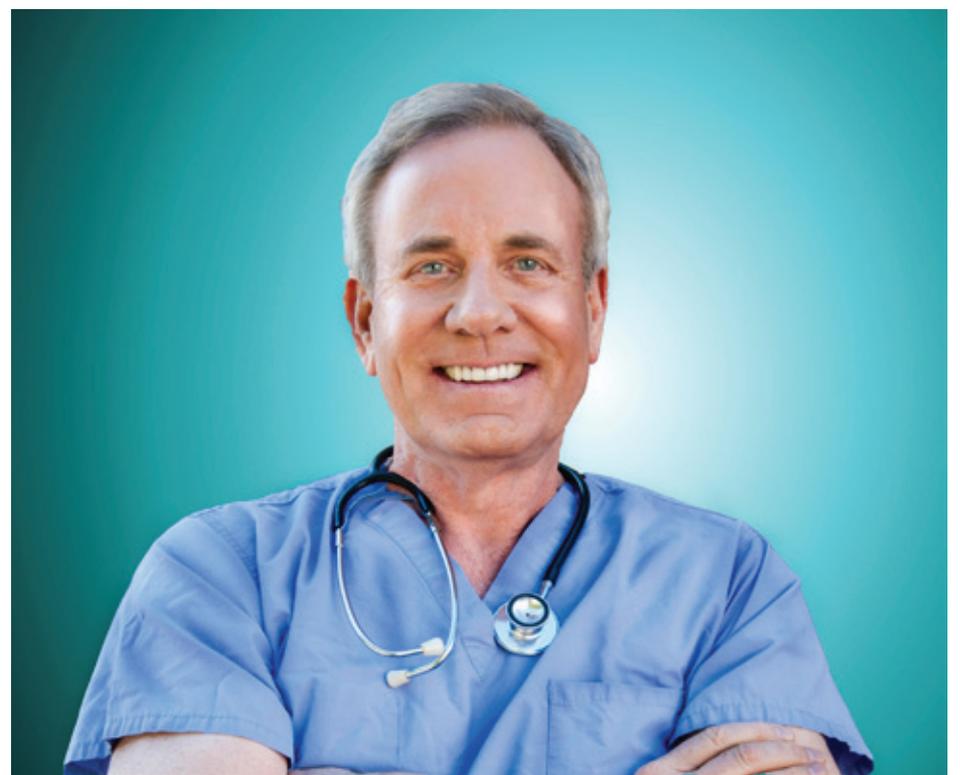
"I wrote the script, and I have already run lines with the actors," I continue. "This Code Blue scene is a resuscitation. I do this all the time. I can do this in my sleep. This is simple. Trust me, Hugh."

This is a monumental power struggle, but Hugh reluctantly concedes because I am the principal of the production and he can't really fire or replace me. One way or another, we have to get this done.

With palpable sarcasm, he gives in. "I guess we're going to do it Dr. Bob's way."

The filming begins: "Quiet on the set, places, sound rolling, frame cameras, background, and *action*."

That's when I make my move. I suddenly become stiff, with terrified, widened eyes. I



slowly shuffle to the wrong spot, then stare straight into the camera. On your first day on set, the director will tell you there is one thing an actor must never, ever do: look into the camera.

I start reciting my lines. "Please call respiratory," I say haltingly. "We have a Code—line please—oh, yeah, Blue!"

"Cut, cut, cut!" the director screams. He charges from behind his stack of monitors, red-faced. "Please tell me this is not happening," he says eye to eye, neck veins distended. "I simply cannot work with you. They told me

you had done this before. Oh my god."

"Hugh, just kidding," I say, and the crew starts cheering.

We got Hugh that day and several other directors over the years. The director and I always became friends after that, and we then would shoot the episode with a newfound equilibrium. ☺

**DR. SLAY** is a practicing emergency physician in San Pedro, California; emergency department residency director; and board examiner for ABEM. Contact him at [drbobslay@gmail.com](mailto:drbobslay@gmail.com).

said. “Would you be willing to go down there and stop the carnage and maybe even teach them?”

I snapped up the offer. I and several other atypical internists began supervising while learning emergency medicine, with the residents rotating in the ER. Two years later, we got approval and started the first EM residency training program in the armed forces.

I was able to grandfather in to taking and passing the newly established EM board exam. I finished a 20-year Army career as a colonel, residency director, and chief of the department of emergency medicine at Brooke.

While assigned at Brooke, I had the privilege of becoming a member of the elite antiterrorist, super-secret Delta Force. I participated in the ill-fated hostage rescue attempt in Iran in 1980. The debacle of Desert One and failure of the hostage rescue mission haunt me to this day.

After retiring from the Army, I have worked in emergency medicine as an emergency physician and continue to work in a community hospital in San Pedro, California. I also had the good fortune to become an oral board examiner for the American Board of Emergency Medicine.

**ACEP Now: How did you become involved with the TV show *Untold Stories of the ER*?**

**RS:** I was working in the Los Angeles area in 2005 and had gained some notoriety as an EM storyteller. I have always liked to perform, and I found that stand-up comedy is fun but a real challenge and requires lots of practice. I did better just telling real ED stories. As all emergency physicians know, there are some real stories we tell each other that are not just unbelievable but often funny.

During the first year of the show, one of the show’s producers had seen me perform in a storytelling contest and contacted me to do the show. I had a funny story of moonlighting in an ED in a small Texas town and dealing with a pseudo coma patient, a local football hero, a crusty old ED nurse, and an old-school local doc who taught me how to really practice medicine. The story was called “Coma Cowboy.” It is still one of the most popular stories of the series to date.

Since then, I have been lucky enough to write for and act in 16 shows over 14 seasons. I continue to perform, both as a storyteller and in stand-up. My YouTube channel is “Dr. Bob Slay, ER Story Teller.” When you see my performances, you will understand why I keep my day job.

**ACEP Now: Why should emergency physicians consider doing the show?**

**RS:** I know all emergency physicians out there have a story. It should be told. The producers want drama, humor, truth, and a formula. The story should include a mystery diagnosis, an “aha” moment, and a great conclusion.

An example is a story I did with a pediatric patient with a suspicious long bone fracture and a positive total body X-ray for multiple fractures. Child protective services were called for obvious child abuse, and the child was taken from the parents. The “aha” moment was noticing the child’s blue sclera and confirming an osteogenesis imperfecta diagnosis. The parents were absolved, and we concluded with a tearful, warm, and fuzzy ending.

Do it for your legacy. We are all toiling away in the ED, seeing incredible human suffering, salvation, and hope. We need to tell the world. Do your kids know what you really do? Do the show, and you can show them, your grandkids, and the world.

**ACEP Now: Do patients recognize you from the show?**

**RS:** Yes, about every other shift. They recognize my voice and ask me if I am on the show. Usually, it is a young girl around age 9 because almost 80 percent of the viewers are female and between the ages of 7 and 32 years old. I take a lot of selfies with 11-year-old girls.

**ACEP Now: How can emergency physicians become part of the show?**

**RS:** I assume the show is going to have a 15th season because it is the longest-running reality-based medical show in television history. I will be submitting my ideas, and I hope other emergency physicians will as well. Send show ideas to the producer, Bob Niemack, at [bniemack@mac.com](mailto:bniemack@mac.com). Bob will get back to you—he loves a good story.

Take a risk and send a story idea. These stories need to be told. You know you can act; you have been acting your entire career! 📺

## Share Your Story

Dr. Slay suggests that telling your ED stories is a way to leave a legacy. The COVID-19 pandemic is shaping the legacy of emergency medicine as we write this, and you have a starring role. ACEP’s new COVID Captures platform provides a simple way to record your frontline stories for future emergency physicians. Share your experience at [moments.acep.org](https://moments.acep.org).

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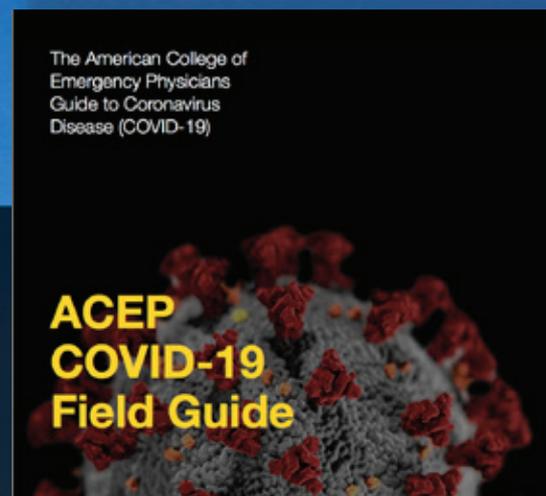
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# ACEP4U: From Forum to *Field Guide*

## HOW FRENZIED KNOWLEDGE SHARING LED TO THE COVID-19 FIELD GUIDE



by JORDAN GRANTHAM

As of mid-June, ACEP's *Field Guide to COVID-19 Care in the Emergency Department* had grown to more than 250 pages of COVID-19 clinical content. Nearly 200 health care entities and public health organizations across the world were linking to it from their own websites, and it had been independently translated into five additional languages.

Before the *Field Guide* became a valuable clinical resource in the fight against COVID-19, it all began in a member forum where emergency physicians across the world were sharing lessons learned at warp speed.

### EngagED Goes Global

On Jan. 21, ACEP sent all members a Clinical Alert email to make them aware of the novel coronavirus that had just been detected for the first time in the United States. That alert marked the beginning of an escalating need for the rapid sharing of information among emergency physicians across the world.

On March 2, ACEP participated in a call with members in Washington state, who were experiencing the COVID-19 crisis before the rest of the country. The Washington contingent wanted to be able to share their firsthand experiences to help other emergency physicians prepare, and they needed a platform to facilitate dialogue.

Two days later, ACEP created a new forum within its EngagED community that was exclusively dedicated to sharing information about COVID-19. As the global health crisis was snowballing and ACEP received more requests to broaden access to this forum, the decision was made to allow select nonmember participants. Because family physicians are often part of the ED staff in rural emergency departments, members of the American Academy of Family Physicians Emergency Medicine/Urgent Care Member Interest Group were invited to participate on March 23. The forum was then opened further to include American Board of Emergency Medicine diplomates. As of mid-June, the forum had 3,987 participants, 642 conversation threads, and 2,799 discussion posts. The forum has a growing global audience, with users in more than 90 countries.

### From Forum to *Field Guide*

Information was being shared in the COVID-19 forum so quickly that important content was being buried in competing threads. To address this problem, ACEP Practice Management Manager Sam Shahid, MBBS, MPH, began providing forum users with comprehensive

daily summaries of the information shared. Dr. Shahid read every post, connected relevant content with other posts, and organized it by clinical topic.

It didn't take long for those forum summaries to become unwieldy. (The final summary in May was a whopping 473 pages!) In early April, seeing the need for a resource that summarized current COVID-19 guidance all in one place, ACEP's clinical, educational, and information technology teams collaborated to create the *Field Guide to COVID-19 Care in the Emergency Department*.

Using the knowledge base formed within those EngagED daily summaries, Dr. Shahid led an interdepartmental team to compile the information. They solicited content experts to pen various sections and filled in the gaps with their own research. Meanwhile, ACEP's information technology team designed a mobile-friendly website structure that would allow the content to be updated continuously and make it simple for emergency physicians to sort and view clinical content on their phones. It came together incredibly fast. From conceiving the idea to publishing the *Field Guide*, the entire process took only 12 days.

After its publication on April 8, the *Field Guide* immediately became ACEP's most popular COVID-19 resource. Its breadth and reach grew as quickly as the body of clinical knowledge for COVID-19, and it has expanded to 250 pages. (But don't worry, the table of contents helps sort the information quickly.) The *Field Guide* goes beyond clinical information to include resources related to regulatory affairs, financial help, reimbursement, and wellness assistance.

As of mid-June, the *Field Guide* had more than 120,000 views and was being linked to from nearly 200 health care and public health agencies as a valuable resource. Emergency clinicians in other parts of the world took notice, too, reaching out to ACEP for permission to independently translate it into Urdu, Hindi, Spanish, Japanese, and Chinese.

As the COVID-19 crisis continues, ACEP will continue to update the *Field Guide* with the latest information. We encourage you to save [www.acep.org/covid19-field-guide](http://www.acep.org/covid19-field-guide) to your phone and other devices so you can reference this resource whenever you need it.

**MS. GRANTHAM** is ACEP's communications manager.

## Global Geographical Breakdown of COVID-19 Forum Participants

Afghanistan	1	Kuwait	3
Antigua and Barbuda	3	Macao	1
Argentina	8	Malaysia	3
Australia	22	Mexico	15
Bahamas	11	Nepal	3
Bahrain	2	Netherlands	5
Barbados	4	New Zealand	5
Belgium	2	Nicaragua	4
Belize	1	Northern Mariana Islands	1
Bolivia	7	Norway	3
Botswana	1	Oman	3
Brazil	32	Pakistan	26
British Indian Ocean Territory	1	Panama	2
Canada	42	Paraguay	1
Cayman Islands	1	Peru	15
Chile	6	Philippines	13
China	3	Poland	1
Colombia	22	Portugal	1
Costa Rica	7	Qatar	5
Croatia	1	Romania	1
Dominica	3	Rwanda	4
Dominican Republic	5	Saudi Arabia	26
Ecuador	29	Slovakia	1
Egypt	25	Slovenia	5
El Salvador	1	Somalia	2
Ethiopia	1	South Africa	13
Finland	2	Spain	3
France	1	Sri Lanka	1
Germany	4	Sweden	3
Ghana	3	Switzerland	4
Guatemala	3	Syrian Arab Republic	3
Guyana	2	Taiwan	3
Haiti	2	Tanzania, United Republic of	12
Honduras	2	Thailand	11
Hong Kong	1	Trinidad and Tobago	3
Iceland	1	Tunisia	1
India	66	Turkey	16
Indonesia	4	Turks and Caicos Islands	1
Iraq	7	Uganda	5
Ireland	5	Ukraine	1
Israel	6	United Arab Emirates	11
Italy	2	United Kingdom	29
Jamaica	17	United States	3,353
Japan	8	Uruguay	1
Jordan	2	Zambia	2
Kenya	6	Zimbabwe	1
Korea, Republic of	2		

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1. McNabb KM, et al. (2017) Carolinas Health Quality Summit. 2. O'Brien MP, et al. (2018) *Pediatr Infect Dis J*. 37(9):868. 3. DiDiodato G, et al. (2019) OFID. 6(4):ofz119. 4. Cailleaux M, et al. (2020) *Eur J Clin Microbiol Infect Dis*. 39(2):293. 5. Nabower AM, et al. (2019) *Hospital Pediatrics*. Oct;9(10):763.

# Resuscitative Transesophageal Echocardiography in the ED

A primer for the emergency physician

by MICHAEL O'NEIL, MD; ARUN NAGDEV, MD; AND FELIPE TERAN, MD

**B**edside transthoracic echocardiography (TTE) has become an invaluable tool in emergency and critical care medicine. Bedside assessment of the presence or absence of a pericardial effusion, gross ejection fraction, size of the right ventricle, and cardiac activity during cardiopulmonary resuscitations has become standard in residency training and general practice.<sup>1</sup>

In the past few years, a growing group of emergency department sonographers has pioneered work in how transesophageal echocardiography (TEE) performed at the bedside may provide similar utility. Like the previous generation of clinicians who were able to teach legions of ED sonographers to perform various exams at the bedside, these sonographers have helped the availability of TEE at the bedside start to become a reality.

TEE offers a few clear advantages over the classic TTE performed in most emergency departments today. First, because the probe visualizes the heart through the esophagus, the windows are excellent and easy to obtain (the lungs, ribs, and habitus do not interfere). Second, TEE allows the sonographer to be off the chest during active CPR, facilitating visualization of the heart continuously to guide management while not interrupting compressions. TTE can be used for assessing fluid responsiveness in mechanically ventilated patients, the guidance of pacemaker placement, and the guidance of extracorporeal membrane oxygenation (ECMO) cannulation during initiation of extracorporeal circulation (ECPR).

Given its reliability in providing high-quality images regardless of patient-related or external factors that often limit TTE, TEE represents a powerful tool for the delivery of critical care.<sup>2-4</sup>

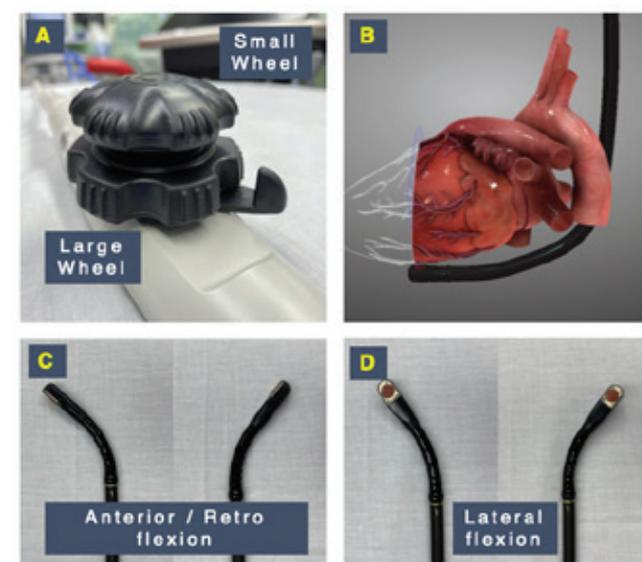
Once a modality used only for comprehensive examinations, over the last two decades TEE has expanded from its traditional diagnostic indications (ie, cardiac surgery, suspected endocarditis, or cardioversion in atrial fibrillation) to assist the evaluation and management of patients with acute hemodynamic decompensation, shock, and cardiac arrest in operative and nonoperative environments.

The use of TEE in the emergency department and critical care settings, often defined as “focused” or “resuscitative” to describe its goal-directed nature and differentiate the scope and objectives of application from comprehensive or consultative TEE, has been shown to be feasible, safe, and clinically impactful in the emergency and intensive care settings, and its use has been supported by society guidelines.<sup>1-4</sup>

In this article, we aim to provide a practi-



**FIGURE 1:** TEE probe (A) includes a controller with two wheels and two lateral buttons, an endoscopic shaft, and a probe head (B). The probe head houses the piezoelectric crystals that generate the ultrasound beam.



**FIGURE 2:** Mechanical controls of a TEE probe. (A) A large wheel controls anteflexion, as required to obtain a transgastric short axis view (B) and retroflexion (C). A small wheel performs lateral flexion (D).



**FIGURE 3:** (A) Lateral buttons allow for digital rotation of the ultrasound beam (omniplane) generated in the probe head. (B) Rotation between 0° and 180° using these buttons allows the probe to develop views in multiple planes such as coronal or transverse (note the purple omniplane axis). (C) The four-chamber view or sagittal plane in a bicaval view is shown for comparison.

cal overview on the use of resuscitative TEE for emergency physicians.

## Why Do We Need Resuscitative TEE in the ED?

Echocardiography represents a valuable component in the evaluation of unstable patients, including those with undifferentiated shock and in cardiac arrest. In many settings, TTE guides resuscitations during the critical phase of care, can determine rapidly reversible causes, and can identify when efforts may be futile. Unfortunately, optimal views can be a challenge; recent data show that integrating TTE into cardiac arrests may inadvertently prolong compression pause duration.<sup>5</sup> Some of the common factors limiting the quality of TTE images include body habitus and emphysema.

In our experience, we have found three primary applications where TEE can prove useful and influential in the emergency department.

**1) Guiding Cardiac Arrest Resuscitation:** The primary indication for use of resuscitative

TEE in the emergency department is during cardiac arrest.<sup>3,4</sup> In addition to the same diagnostic and prognostic qualities provided by TTE images, including the identification of reversible causes such as cardiac tamponade or pulmonary embolism (PE), TEE also provides advantages during resuscitation. Recent animal and human data have shown that standard cardiac compressions may not squeeze the left ventricle but rather the left ventricular outflow tract. TEE allows rapid adjustment of the compression location and may result in higher rates of return of spontaneous circulation (ROSC).<sup>6</sup> Also, chest compression interruptions can be limited because the probe can obtain optimal views of the heart during active CPR.<sup>7</sup>

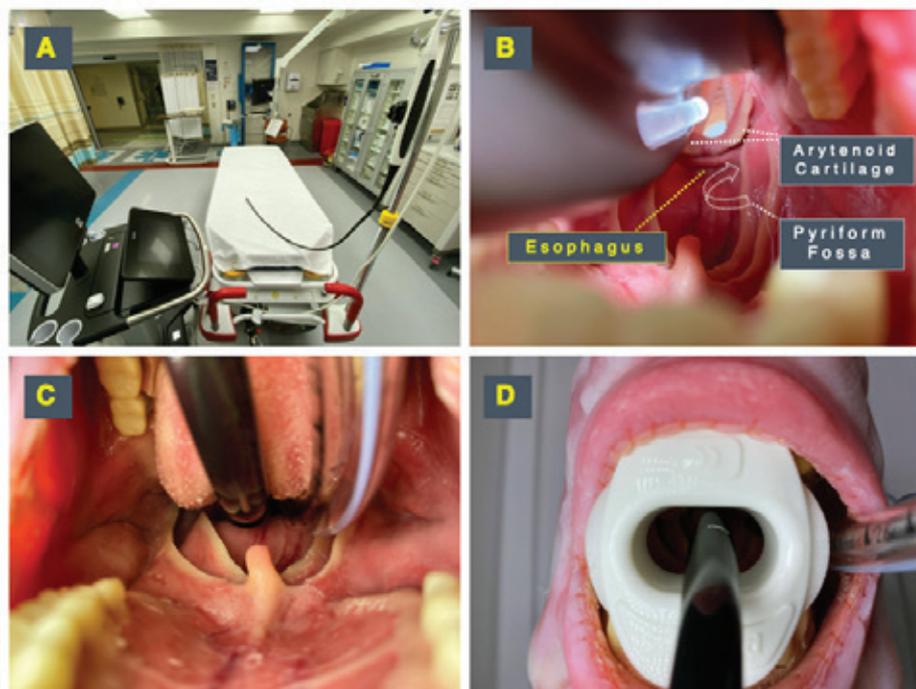
**2) Evaluation and Management of Shock in Intubated Patients:** Although TTE remains the first-line modality for the assessment of patients in shock in the emergency department, TEE is a powerful alternative for intubated patients in whom TTE windows are inadequate

or unavailable. Once placed, TEE can help establish the etiology or predominant mechanism of shock, perform serial hemodynamic assessments estimating stroke volume (SV) and SV variation, determine preload sensitivity using respirophasic variation of superior vena cava diameter, and monitor hemodynamic interventions (ie, initiating or titrating vasopressor therapy).<sup>8-10</sup>

**3) Procedural Guidance:** In addition to its diagnostic value and usefulness as a hemodynamic monitoring tool, resuscitative TEE has a unique role guiding several emergency procedures, such as initiation and monitoring ECMO, and the placement of intravenous pacemaker wires.<sup>11,12</sup>

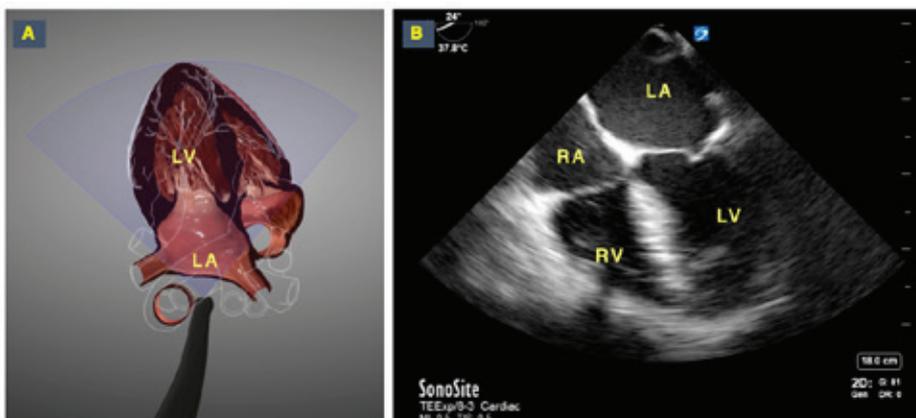
## TEE Safety

The risks associated with comprehensive TEE examinations have been studied extensively in the perioperative and echocardiography laboratory environments. Major complications such as oropharyngeal trauma, esoph-



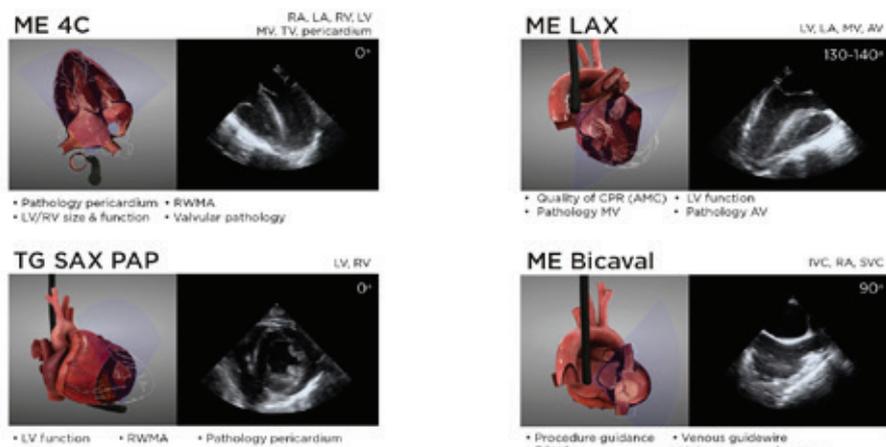
FELIPE TERAN

**FIGURE 4:** Probe insertion technique. (A) The TEE probe handle should be hung or held by an assistant to allow free movement of the shaft. (B) The probe should be inserted maintaining midline to avoid common sites of obstruction at the arytenoid cartilages and pyriform fossae. (C) Once at the base of the tongue at midline, a “chin lift” maneuver will facilitate passage by opening the esophagus. (D) Once in place, a bite block previously loaded into the probe should be placed to avoid damage by the teeth on the probe.



3-D GRAPHICS REPRODUCED WITH PERMISSION BY HEARTWORKS INTELLIGENT ULTRASOUND

**FIGURE 5:** Retrocardiac “point of view” of the TEE probe. Image A shows the TEE probe’s point of view, which provides sonographers with an ideal perspective to understand the spatial orientation and anatomical relationships needed to develop and interpret TEE views. Image B shows the corresponding mid-esophageal 4 chamber view in TEE, with the left atrium in the near field.



**FIGURE 6:** Summary of the views and main clinical applications of the four core resuscitative TEE views. Additional views can be used on a case-by-case basis to answer questions and guide management in specific clinical scenarios. Some of these views include mid-esophageal 2C (ME 2C), mid-esophageal aortic valve and ascending aorta short and long axis (ME AV SAX, ME ascending aorta SAX/LAX), right ventricular inflow-outflow (ME RV I-O), descending thoracic aorta (DTA SAX and LAX), and deep transgastric 5 chamber (Deep TG 5C). A full protocol including additional resuscitative TEE views can be found at [www.resuscitativetee.com/protocols](http://www.resuscitativetee.com/protocols).

ageal perforation, and major bleeding are exceedingly rare, with incidence rates ranging between 0.01 and 0.08 percent.<sup>13-16</sup> Furthermore, in the resuscitative setting, the risk of these complications is often outweighed by the benefit of obtaining time-sensitive and life-saving information, making the safety profile of TEE comparable to many other commonly performed emergency procedures.

### How to Perform Resuscitative TEE

**TEE Probe Knobology:** In place of the normal hand movements used when performing TTE (eg, fanning, sliding, rotating, etc.), the TEE probe uses mechanical digital compo-

ponents to produce the desired images. The endoscopic shaft may be advanced, withdrawn, and turned to locate the heart. The lockable wheels on the handle then help produce the various movements similar to tilting, fanning, and rocking the probe by anteflexing and retroflexing the transducer (see Figures 1 and 2).

In addition to these mechanical controls, digital components allow for rotation of the imaging plane itself (the ultrasound beam) in a 180° plane. This is referred to as the omniplane, and it’s displayed by a half circle with a range of 0–180° located at one of the top corners of the screen. The utilization of the omniplane allows for further characterization and

detailed views of the heart and surrounding structures. This movement is similar to looking at structures in the long and short axis when utilizing a TEE probe (see Figure 3).

**Probe Insertion:** Resuscitative TEE is generally performed only in intubated patients. The placement of the TEE probe is performed similarly to the placement of an orogastric tube. The flexion wheels are first placed in the unlocked position to allow for free movement of the probe tip. With the transducer facing anteriorly, the probe is advanced into the mouth and pharynx under direct vision and manual guidance to maintain midline position.

The most common anatomical sites causing obstruction of the TEE probe during insertion in an intubated patient are the arytenoid cartilage and the pyriform fossa. Therefore, to access the esophagus and avoid pharyngeal injuries, it is critical to keep the probe at the midline while advancing it. This can be performed by either digitally guiding the probe or under direct visualization with a video laryngoscope.

To aid in the passage of the probe tip past the upper esophageal sphincter, the mandible may be pulled forward gently and the patient’s neck partially flexed. Be careful not to dislodge the endotracheal tube (see Figure 4).

**Acquiring and Interpreting TEE Images:** Understanding the anatomical position of the heart is fundamental to the practice of echocardiography and particularly for TEE. A mental representation of the cardiac anatomy is required to comprehend how images are generated from the esophageal position when performing TEE. This is the view most anatomy textbooks and echocardiography learning resources use to display the heart, and it is the view that makes the most sense to understand how TTE views are generated.

On the other hand, to interpret TEE views, a different anatomical perspective must be understood. The TEE probe head is located in the esophagus and obtains images from a retrocardiac perspective. This inverted imaging position is often difficult for even seasoned TTE sonographers, but it is the starting point in understanding TEE imaging. Simply put, this new perspective is the view of the heart and great vessels as seen by the TEE probe when the image is generated from the esophageal position. This retrocardiac perspective facilitates the understanding of how the different mechanical and digital movements in TEE generate the views obtained while using this modality (see Figure 5).

The right atrium (RA) and right ventricle (RV) are relatively anterior cardiac structures. Meanwhile, the left atrium (LA) and left ventricle (LV) are posterior structures. The LA is the closest structure to the esophagus at the mid-esophageal level, so the ultrasound beam passes through this structure first. This is why mid-esophageal views have the LA located in the near field of the image and can be conceived as the scanning window to visualize the heart in TEE. The heart lies anterior and slightly left in relation to the esophagus, with the LA “leaning” against the esophagus. The right heart is situated anteriorly within the mediastinum and is the farthest structure from the esophagus, which is why, unlike in TTE, in TEE the RV is seen in the far field of the image.

### Imaging Planes and Resuscitative TEE Views

Four core TEE views are most commonly used in resuscitative settings and provide the highest yield of information. These include mid-esophageal 4 chamber (ME 4C), mid-esophageal long axis (ME LAX), transgastric short axis at

the level of papillary muscles (TG SAX PAP), and mid-esophageal bicaval (ME bicaval).

Developing the cognitive and motor skills needed to acquire and interpret these views proficiently, like any other imaging modality, takes practice. In our experience, simulation training is essential in both skill acquisition and maintenance of competency. Therefore, we recommend that clinicians who would like to incorporate TEE into their clinical care find a resuscitative TEE hands-on course to provide them with structured training, then supplement that training with mentored training in live patients (see Figure 6).

### Conclusion

Emergency medicine has rapidly developed from its early days into a dynamic field in which experts push boundaries in optimal clinical care. Resuscitative TEE is yet another attempt to both define our growing specialty while offering the best care for our critically ill patients. Acute care physicians (including emergency medicine) will continue to define indications of TEE and to expand the field, integrating this novel technology into our scope of practice.

Today, it has become standard for many ED clinicians to perform bedside transthoracic ultrasound in the evaluation of a hypotensive or dyspneic patient. In the near future, TEE will become another invaluable tool during the resuscitation in the emergency department.

As William Gibson once said, “The future is here. It’s just not evenly distributed yet.”

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# Would You Recognize Acute Flaccid Myelitis (AFM)?

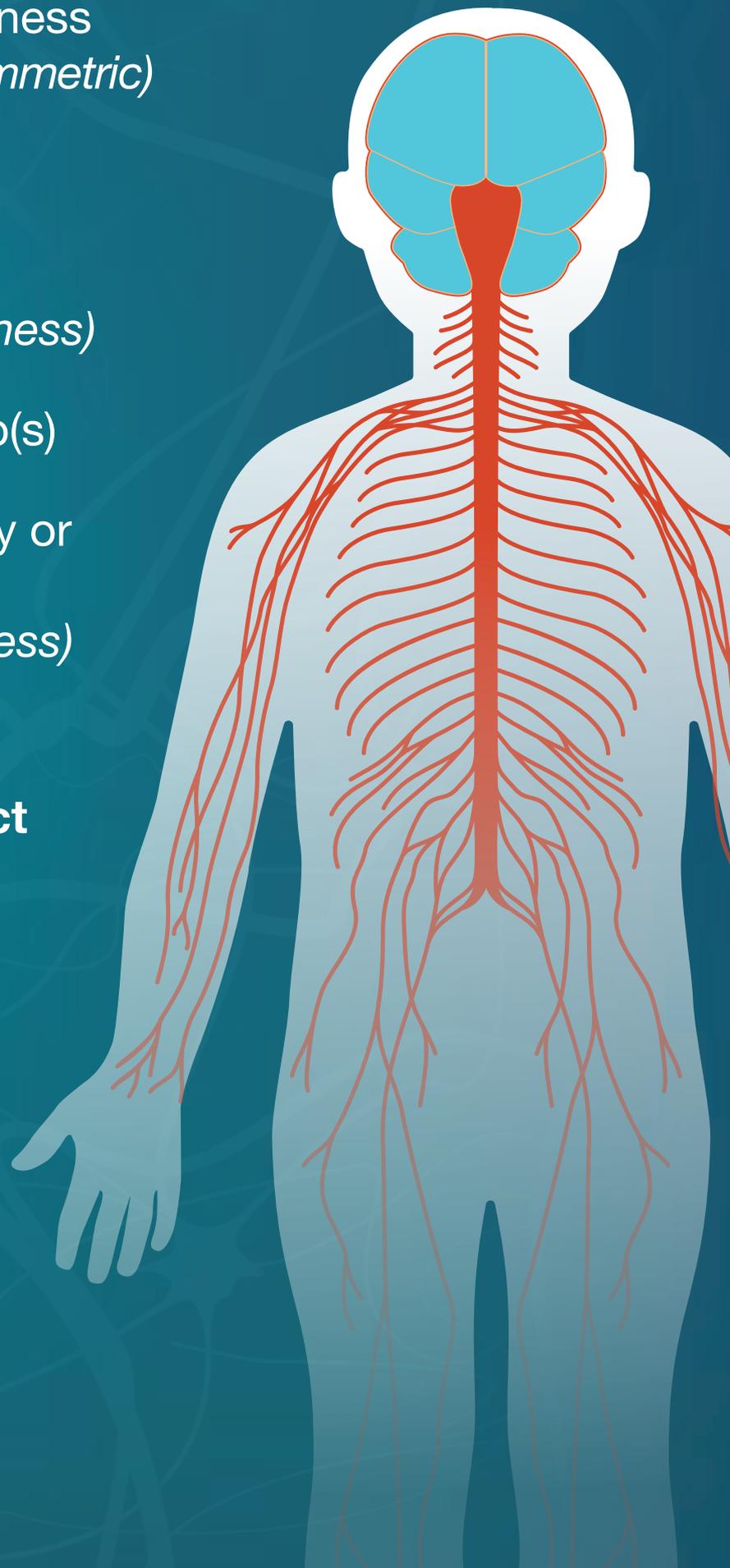
Acute flaccid myelitis (AFM) is an uncommon but life-threatening neurological condition that mostly affects children.

## AFM symptoms include:

- ✓ Sudden onset of flaccid limb weakness  
*(more proximal than distal, often asymmetric)*
- ✓ Hypotonia, hyporeflexia
- ✓ Cranial nerve abnormalities  
*(facial, oculomotor, or bulbar weakness)*
- ✓ Pain in neck, back, or affected limb(s)
- ✓ Preceding febrile illness, respiratory or GI symptoms  
*(1-2 weeks prior to onset of weakness)*

**Hospitalize patients immediately, collect specimens, and contact your health department.**

Learn more at [CDC.gov/AFM/HCP](https://www.cdc.gov/AFM/HCP)



bra. She is a candidate to receive endovascular therapy (EVT) based on your institution's current guidelines, but she is also within the current window for the administration of tissue plasminogen activator (tPA).

### Clinical Question

Should you give tPA while waiting for your neurointerventional team to arrive, or is EVT alone noninferior to EVT with tPA?

**Background:** Thrombolytics as a possible treatment for acute ischemic stroke (AIS) has been discussed for decades. The famous NINDS trial led to tPA being approved for AIS within three hours of onset in those patients who met strict criteria.<sup>1</sup> ECASS III was published in 2008 and expanded the window to 4.5 hours.<sup>2</sup> ACEP has published guidelines on the safety and efficacy of tPA for patients with AIS. The ACEP guidelines give level B and level C recommendations.<sup>3</sup>

The controversy over the use of tPA for AIS does not seem to be going away. A recent reanalysis of ECASS III failed to show the commonly assumed benefit but confirmed the potential increase in harm of tPA.<sup>4,5</sup>

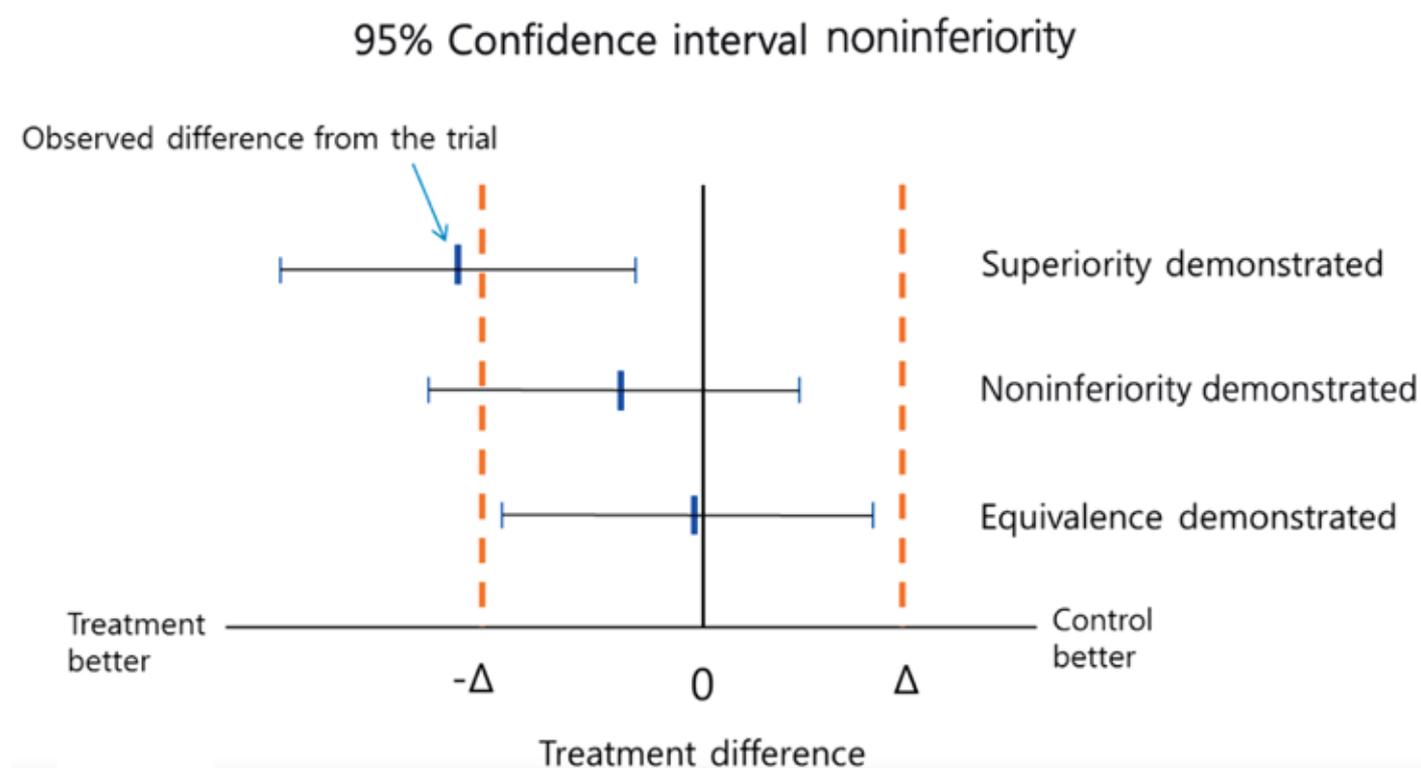
The treatment of AIS did substantially change with the publication of the MR CLEAN trial.<sup>6</sup> This was the first study demonstrating a benefit to endovascular treatment of a specific subset of ischemic stroke patients—specifically, those with large vessel occlusions presenting within six hours of symptom onset. MR CLEAN was followed by a number of other publications seeking to replicate and refine treatment as well as expand the window for treatment.

One major question regarding EVT treatment was whether the use of systemic thrombolytics like tPA results in better outcomes or if it simply exposes the patient to increased risks at a higher cost.

**Reference:** Yang P, Zhang Y, Zhang L, et al. Endovascular thrombectomy with or without intravenous alteplase in acute stroke. *N Engl J Med.* 2020;382(21):1981-1993.

- **Population:** Patients 18 years of age or older presenting within 4.5 hours of AIS symptoms with a cerebral vascular occlusion on CT angiography of the intracranial internal carotid artery or middle cerebral artery (first and/or second segments) and an NIHSS >1, and if endovascular thrombectomy was intended to be performed.
- **Exclusions:** Disability from a previous stroke or contraindication to IV alteplase, plus any contraindication for thrombolysis according to American Heart Association guidelines.
- **Intervention:** Endovascular thrombectomy.
- **Comparison:** Endovascular thrombectomy plus systemic tPA (0.9 mg/kg).
- **Outcomes:**
  - » **Primary Outcome:** Modified Rankin Scale (mRS) score assessed at 90 days.
  - » **Secondary Outcomes:** Death from any cause at 90 days, successful reperfusion before thrombectomy, recanalization at 24–72 hours, NIHSS score at 24 hours and five-to-seven days, and final lesion volume on CT and mRS comparisons.
  - » **Safety Outcomes:** All hemorrhages and symptomatic intracranial hemorrhages, occurrence of pseudoaneu-

**Figure 1: Testing Superiority and Equivalence/Noninferiority**



**Table 1: Secondary Outcomes**

	Thrombectomy Alone	Combination Therapy	Relative Risk (95% Confidence Interval)
Mortality at 90 days	17.7%	18.8%	0.94 (0.68–1.30)
Symptomatic intracranial hemorrhage	4.3%	6.1%	0.70 (0.36–1.37)
Successful reperfusion prior to endovascular therapy	2.4%	7.0%	0.33 (0.14–0.74)
Overall successful reperfusion	79.4%	84.5%	0.70 (0.47–1.06)
Recanalization at 24–72 hours	85.1%	89.1%	0.71 (0.42 to 1.20)

rysm and groin hematoma at the site of arterial puncture used for thrombectomy, cerebral infarction in a new vascular territory at five to seven days, and mortality within 90 days.

### Authors' Conclusions

“In Chinese patients with acute ischemic stroke from large-vessel occlusion, endovascular thrombectomy alone was noninferior with regard to functional outcome, within a 20 percent margin of confidence, to endovascular thrombectomy preceded by intravenous alteplase administered within 4.5 hours after symptom onset.”

### Key Results

The study included 656 patients with a median age of 69 years, and slightly more were male. The median NIHSS score was 17.

- **Primary Outcome:** Adjusted odds ratio (aOR) for the mRS.
  - » aOR = 1.07 (95% CI, 0.81–1.40), demonstrating noninferiority because the lower limit of noninferiority was set at 0.80.
- **Secondary Outcomes:** see Table 1.

### Evidence-Based Commentary

**1) Consecutive Patients:** The publication did not explicitly say patients were recruited consecutively. Without this information, it is hard to comment on whether there was selection bias.

**2) Blinding:** There was a lack of blinding of the treating physicians and study participants. This could have biased the study toward the EVT alone if that hypothesis was known to these two groups.

**3) Intention-to-Treat (ITT):** Using an ITT analysis is a quality indicator for superiority designs. However, for noninferiority trials, a per-protocol analysis is the more conservative approach to minimize bias (see Figure 1). Using an ITT can bias the results toward the null hypothesis (ie, finding noninferiority). The authors did perform a per-protocol analysis, but this could only be found in the supplemental material.

**4) Patient Outcomes:** These data were obtained by interviews either performed in person or by telephone. The authors did not provide information on how many assessments were performed using each method. Telephone interviews are suboptimal for assessing functionality. It would have been helpful in interpreting the data to see if there were any differences that could be attributed to the way outcomes were assessed. Wider confidence intervals around the point estimate of efficacy could have been introduced into the data set by telephone interviews and biased the results toward finding noninferiority.

**5) External Validity:** The standard AIS care in China may contain differences compared to the United States, limiting the external validity of these results.

### Bottom Line

If EVT is readily available and the patient is a candidate for this treatment modality, there does not appear to be a role for systemic thrombolysis in patients with acute ischemic stroke.

### Case Resolution

You engage in shared decision making with the patient and her spouse. The decision is to

hold off on administration of systemic thrombolytics and await the neurointerventional team. They arrive and take the patient for EVT, and she has a successful outcome.

*Thank you to Dr. Anand Swaminathan, an assistant professor of emergency medicine at St. Joseph's Regional Medical Center in Paterson, New Jersey, for his help with this review.*

**Remember to be skeptical of anything you learn, even if you heard it on the Skeptics' Guide to Emergency Medicine. 📌**

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# “It’s Not a Female Resident Problem”

The denial of gender discrimination in emergency medicine

by ANITA CHARY, MD, PHD; EMILY CLEVELAND, MD, MPH; FARAH DADABHOY, MD, MSC; MELANIE MOLINA, MD; MARGARET SAMUELS-KALOW, MD, MPHIL, MSHP; AND ADAIRA LANDRY, MD, MED

**Scenario 1:** A male surgical resident speaks over a female emergency medicine resident as she performs her trauma survey, confusing the care team about the patient’s injury burden and plan. Afterward, the emergency medicine resident voices her concerns to her male attending about having her role publicly undermined. “I think this is particularly a problem for female residents,” she says. He responds, “It’s not a female resident problem. They do this to everyone.”



**Scenario 2:** At the physicians’ workstation, a nurse asks the male attending about the plan for a patient being cared for by a female resident physician sitting in proximity. The attending answers the nurse’s question without involving the resident. The resident then respectfully tells the attending that she’d appreciate being looped into conversations about her patients. “Female residents often aren’t recognized as the decision makers about our own patients’ care,” she says. He responds, “It’s not a female resident problem. This happens to male residents, too.”

**Scenario 3:** During a residency conference, a resident brings up several barriers to placing central lines in the emergency department for critically ill patients. She recounts the numerous times she was told the procedure could be performed in the ICU and to send patients upstairs. A male resident says, “I’ve never had that experience.” She responds to her male co-resident, “I think this is a female resident problem,” reflecting her personal perception and her female co-residents’ perceptions that ED staff show more support for male residents to perform procedures. A male attending responds, “It’s not a female resident problem.” He says the decision depends on whether there are beds ready.

**Common Experiences for Female Physicians**  
As female resident physicians, we have the privilege of working with masterful clinician-educators on a daily basis. We are humbled by their knowledge and clinical skills. However, we are troubled when we raise concerns about gender inequalities to attending physicians and receive the response, “It’s not a female resident problem.”

## Common Experiences for Female Physicians

We recognize not every health care challenge or unprofessional interaction stems solely from gender inequalities.<sup>1</sup> Maybe the surgery resident was under extraordinary stress from sleep deprivation. The nurse who bypassed the resident might have forgotten her name, choosing to defer to the attending, whom she knew well. Though the patient headed to the ICU needed a central line, the ED volume was high, limiting the ability to perform time-intensive procedures.

However, when we witness unprofessional and unsupportive interactions happening repeatedly and disproportionately more often to us than to our male colleagues, we feel compelled to bring it to the attention of our superiors. We do so in hopes of improving patient care and developing a better training environment for ourselves and others.

Emergency medicine remains a numerically male-dominated field, with recent national surveys estimating women constitute only 33 percent of academic EM faculty and 35 percent of EM residents.<sup>1,2</sup> Compounding the lack of representation, female emergency physicians struggle to be recognized as doctors and are frequently mistaken for nurses or technicians.<sup>3,4</sup>

Furthermore, female EM residents are rated as less competent than male counterparts, both by supervising faculty and by nursing colleagues.<sup>5,6</sup> In one recent survey of medical trainees, including EM residents, 86 percent of male respondents and 96 percent of female respondents reported observing or experiencing gender-based discrimination in the workplace.<sup>7</sup>



Despite increasing evidence highlighting gender discrimination in emergency medicine, as female physicians, we are often told problematic interactions are not related to our identity. As interns, we mostly stayed silent about discriminatory incidents. We were doubtful of our instincts and our perceptions—a common reaction among clinical trainees who face discrimination in the workplace.<sup>8,9</sup> As we progressed in residency, however, our cumulative experiences cast away self-doubt.

Beyond how these interactions affect our confidence, gender discrimination affects patient safety. When we are removed from critical conversations, orders go unrecognized or duplicated, and medications are administered without our knowledge. When colleagues assume control during resuscitations, leadership roles become muddled, and information risks being lost.

When we explicitly name a gender-based problem in a training environment, we risk being labeled a troublemaker—someone who is not adaptable, someone who is not a team player, someone who is fixated on inequalities. Despite the professional risk of calling attention to a challenging issue, we feel obligated to name these problems and advocate for solutions, for residents and patients.

**A Better Approach**  
We have a simple message for emergency medicine faculty: When we reveal gender-based disparities occurring in our work environment, we are welcoming you into the conversation surrounding unacceptable interactions in female residents’ educational experiences. We invite you to listen and consider the possibility that what we are telling you is not happening in isolation. Even if the problem affects male residents, too, we

## A Better Approach

want you to know we perceive that women bear the brunt of these problematic interactions. Regardless of your intention, the impact of the response, “It’s not a female resident problem,” is to dismiss a perspective that is based on a lived reality of daily discrimination. “It’s not a female resident problem” is a response that justifies inaction.

Strategies exist to reduce the impact of gender bias on female residents. Help assure roles are clarified and respected during high-stakes situations, such as resuscitations. Direct questions about patients to the female residents taking care of them, especially when we are in close proximity. Join residents in conversations with administrative team members about throughput and procedural needs.

Ultimately, female residents want to be recognized for our potential and capability. Please accept our invitation to help create a work environment that supports all physicians equally. 🍀

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# Ethical Protection of Powerless Populations

The case for patient- and public-centered approaches to the COVID-19 pandemic

by V. RAMANA FEESER, MD; ELIZABETH CLAYBORNE, MD, MA, FACEP; AND ERIK BLUTINGER, MD, MSC

COVID-19 is highlighting health inequalities that span race, ethnicity, and socioeconomic status as emerging data show the disease burden on vulnerable and disadvantaged American populations.

Recent studies show disproportionately high rates of morbidity and mortality across different races. A recent Centers for Disease Control and Prevention report found that Black Americans have been disproportionately hospitalized by COVID-19 compared to other races, and another study found even higher death rates among Black Americans in the major hot spot of New York City.<sup>1,2</sup> Another study found that the Latino population had a SARS-CoV-2 positivity rate about three times higher than that seen in other racial/ethnic groups.<sup>3</sup> Similar disparities are found in other populations, including undocumented immigrants, the homeless, nursing home residents, and those who are incarcerated. As an *Annals of Emergency Medicine* editorial stated, “When one further considers that our nation has even more religious, cultural, sexual, gender identity, and other forms of diversity, it is apparent that the magnitude of the opportunity for improvement is enormous.”<sup>4</sup>

COVID-19 has again made it clear: patient- and public-centered approaches are needed to improve population health, particularly for vulnerable populations. Authorities must balance public health trade-offs, including balancing personal freedom, economic growth, and social unrest. For example, social distancing is the most effective way to slow the spread of the virus, even more than masks.<sup>5</sup> But how can we ignore the moral imperatives, let alone health benefits from systemic change that could result from protests after the recent killings of George Floyd in Minneapolis, Breonna Taylor in Louisville, and Ahmaud Arbery in Atlanta? Protesting is risky, but so is not protesting.

Public health interventions need to account for all community types and all needs, both immediate and future. However, our failure to address longstanding disparities around adequate housing and high-density neighborhoods in the past renders today’s policies less equitable. Social distancing was employed as a “one-size-fits-all” national policy. But some communities lack the necessary infrastructure to achieve this or to do it safely. Social distancing might increase COVID-19 exposure in some communities of color rather than protect them from it by displacing individuals from their sparse network of family and friends who often help insure social protection and preserve a person’s well-being.

Even at the individual level, long-standing disparities across communities affect a person’s chances of becoming ill. Some minorities are either in, or close to, the level of poverty



that is most immediately and detrimentally impacted by any serious illness episode or economic downturn. Even small setbacks can push people over the poverty line, irrevocably. Statistics show the alarming, disproportionate rates of infection and death in the Black American community despite the best intentions of public health officials.<sup>5,6</sup> Have we fully considered the effects of our prior inaction? To solve these complex problems, how can we make new policy and formulate new solutions?

Partnerships between hospitals, community organizations, and local establishments are important. With sufficient coordination, public policy can use evidence-based strategies to reduce COVID-19 health disparities in high-risk populations while accounting for social determinants of health. National and state health equity task forces should bridge the gap between services being provided and public health interventions being implemented for those living in higher risk communities.

For communities, testing and contact tracing are a necessary first step. With knowledge of those at highest risk, the COVID-19 spread can then be more easily contained and appropriately targeted. For example, drive-through testing cannot apply to many low-income individuals who don’t have access to vehicles. Instead, testing sites should be deployed to zip codes with high infectivity rates. We also need to consider how to isolate people who are already living “at capacity” in tight spaces. Otherwise, what’s the point?

Hospitals have the ethical obligation of allocating scarce resources towards those individuals in greatest need. Often, patients confined to small spaces and living quarters—including homeless shelters—are most vulnerable to the infectious spread of respiratory illness and failure to properly social distance. Even basic interventions like educating the underserved with better techniques for handwashing, social distancing, and physical protection will go a long way. The electronic medical record system should be used more effectively, too, by linking patient addresses to neighborhood data so that disparities are minimized, whether it’s finding the closest pharmacy or building a more targeted discharge plan.

Knowledge needs translated into meaningful practice with use of better outreach programs and technology. We can direct funding and expand social work programs plus community dissemination of basic supplies (such as hygiene kits) to ensure that the uninsured have equal access to life-saving measures.

Moving forward, research, assessment of existing ED interventions, and new ideas will be integral for proper resource allocation and population health. As states only recently began to release more race/ethnicity data timed with states reopening, we need to be completely transparent with this data at the state level, identify hot spots, and move appropriate mitigation strategies to these areas. Our ability to do this will help address some of

the immediate aspects of health inequalities exposed or exacerbated by COVID-19.

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about 100 house staff with hazard pay.<sup>4</sup>

The CARES Act Provider Relief Fund has begun to distribute an unprecedented \$175 billion to hospitals, with some New York hospitals already receiving more than \$250 million in aid. Some of this money is undoubtedly going to medical supplies and other critical infrastructure.<sup>5</sup> In light of these infusions of financial aid, hazard pay would not seem to be an overly burdensome ask.

### Is Hazard Pay Ethical?

Articles in the press have quoted leaders and other physicians arguing that residents should not be focusing on “making a few extra dollars” and that doing so is not becoming of a caring doctor. This unfairly asserts that a resident cannot have an opinion on more than one matter at a time. It promotes a culture that prioritizes suffering as the driving force that makes a great physician. Negotiating a middle point and expressing concerns are actually skills that residents should be encouraged to learn before independent practice and should not be actively suppressed by leadership.<sup>6</sup>

Some argue that residents should be considered students, which makes them unable to negotiate pay. It is true that residents are in training, but this argument fails to recognize that residents are integral to an academic hospital infrastructure. It is improper to posit that residents are simply students when they are demanding hazard pay yet classify them as essential staff who need to be redeployed to provide valuable patient care during a pandemic. In fact, the United States Supreme Court has already ruled on this: residents are not students.<sup>7</sup>

Major medical bodies support hazard pay. In April 2020, the American Medical Association officially recognized resident hazard pay in their guiding principles, stating “residents should be candidates for hazard pay in a way that is equitable to other health care workers.”

### Is Student Loan Forgiveness Better Than Hazard Pay?

Congress currently has multiple student loan forgiveness proposals in front of them for front-line workers, including Student Loan Forgiveness for Frontline Health Workers Act, Opportunities for Heroes Act, and Student Debt Emergency Relief Act.<sup>8</sup>

While student loan forgiveness would be appreciated, it would not help residents with current day-to-day struggles as hazard pay would. A normal salary for a first-year resident in New York City is around \$60,000 a year, a large portion of which immediately disappears due to New York’s high living costs. While a small stipend may seem like a drop in the bucket for most, it is actually quite substantial for a resident that doesn’t have significant funds at baseline.

Medical students and residents have advocated for student loan forgiveness for decades without success. Despite current circumstances, it would be rare to see an issue with so much history and precedent pass through Congress with ease. To rely on student loan forgiveness in place of hazard pay is unwise.

Ultimately, the onus is on hospitals to take on this initiative. Residents were redeployed and willingly took on extra hours all to help with the workload. Residents exemplified all the admirable qualities you would want in your employees during a crisis. For hospitals to not recognize that is demoralizing.

### Next Steps

Some hospitals have offered hazard pay to their house staff. New York-Presbyterian is offering \$1,250 to all staff who worked the COVID-19 front line. Mount Sinai not only offered their residents hazard pay but also announced that their executive leadership team would take a significant pay cut during the coronavirus crisis.<sup>9,10</sup>

Many hospitals have not been so generous. Residents need strong advocacy from physician organization groups to suggest a fair starting hazard pay rate and suggest making payments retroactive to when cases first appeared at their hospital. Such policy statements would give hospitals a framework for negotiation and potentially move talk into action.

Residents have tried petitions that received many thousands of signatures, they’ve tried organizing letters and emails to leadership, and some have even resorted to talking to the media in an attempt to be heard.<sup>6,11,12</sup> All of this has spurred little change. We need physicians, nurses, other staff, and the industry as a whole to recognize the unfairness of our situation and to stand with us in order to create this greatly needed change. +

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## ABEM Modifies Certification Deadlines Due to COVID-19

In order to meet the challenges of COVID-19, the American Board of Emergency Medicine (ABEM) has modified certification and residency training requirements and moved the ConCert Exam online. Here is a summary of the modifications. Visit [www.ABEM.org](http://www.ABEM.org) for more information.

TYPE	MODIFICATION
Continuing Certification	Deadline moved to June 30, 2021
Subspecialty Certification for: Emergency Medical Services Medical Toxicology Pediatric Emergency medicine Undersea and Hyperbaric Medicine	Requirements due date moved to June 30, 2021
Subspecialty Certification for: Anesthesiology Critical Care Medicine Hospice and Palliative Medicine Internal Medicine-Critical Care Medicine Pain Medicine Sports Medicine	Requirements due date moved to Dec. 31, 2021
ConCert Examination	Online, open-book format Summer 2020 exam: July 27–Aug. 16 Fall 2020 exam: November 2–22
Oral Certification Exam	Not being offered in 2020. Options for 2021 still being considered
Residency Training Requirements	A two-week quarantine period will not negatively affect eligibility



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Contact Jana Nelson at 469-499-0157 for more information.



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## Experts and Testiliars

What’s to be done about unethical experts?



CHRIS WHISSEN & SHUTTERSTOCK.COM

by GITA PENSA, MD

**Note:** Part 2 of a 2-part series.

*“There are a lot of physicians out there that don’t care about throwing their colleagues under the bus—not because [the defendant] provided substandard care but because they want to be paid. They know if they say what the attorney wants them to say, they’re more likely to be called back again, to bill again ... and I have noticed myself ... that when I don’t give the attorney the answer they are looking for, they tend to not ask me to do plaintiff work again.”*

—physician expert, “Doctors and Litigation: The L Word” podcast

In part one of this two-part series, I discussed the ethics of expert witness testimony and how the behavior of unethical experts can fuel unjust malpractice litigation, creating considerable stress for the defendant. Even well-meaning experts can do harm to the system by misunderstanding or misapplying the legal concept of “standard of care.”

Teaching skills for providing ethical and effective legal testimony is largely ignored during

medical training; expert witnesses are mostly self-styled, with any instruction usually coming from attorneys, who have their own motives.

Although many physicians do deliver fair, accurate testimony for

both plaintiffs and the defense, there are unfortunately also physicians who deliberately supply misleading, exaggerated, or frankly false testimony for tidy sums of money. What can be done about these “testiliars”?

Physicians who feel they have been wronged by an expert witness often have feelings of betrayal, rage, and helplessness. The stakes are high, and emotions are raw. Defendants sometimes have the urge to exact “revenge” in some manner—not in a violent way but rather they often have the desire to disempower or discredit that expert in a public manner. It is absolutely critical, however, that defendants understand that *no* action

against, or engagement with, an expert witness should be taken during the entirety of a legal case. (In rare cases, this may be done but only through your attorney.) Any attempt to directly engage with or affect the reputation of an expert during litigation is considered witness tampering or intimidation. This is considered a *criminal* action and can lead to very serious consequences.

One tragic example of these consequences involved a physician who was unaware of the need to wait until his trial was over to complain about an expert’s unethical testimony to that expert’s employer. This defendant took his own life after his actions were discovered by the court and he was accused of witness tampering. He left a suicide note detailing his grief over the manner in which expert witness testimony is handled in the United States.<sup>1</sup>

There are ways, however, in which physicians may safely work with their attorneys during litigation to diminish the potential impact of an unethical expert. I’ve covered this topic as the creator and host of the podcast “Doctors and Litigation: The L Word.” Here are a few suggestions from Louise Andrew, MD, JD, whom I recently interviewed for the podcast. Competent attorneys will be aware of these, but I advise double-checking with them.

- Familiarize your attorney with the ACEP Code of Ethics for expert witnesses.<sup>2</sup> The attorney can “remind” the expert at deposition that this code exists and go through it line by line. This alerts the expert to the potential for scrutiny of their testimony later—and just may change what comes out on the record.
- Make sure the expert meets your state requirements to testify against you. For example, some states do not allow physicians from other specialties to testify against emergency physicians.
- Check the expert’s credentials on their CV against what is listed on specialty board sites and <http://docfinder.docboard.org>. This site is a wing of the Administrators in Medicine program, in collaboration with the Federation of State Medical Boards. You can see what information state boards have about the expert, including whether the person is board-certified, has had any malpractice settlements or judgments against them, or has been disciplined. A

good question to ask is whether the expert is *currently* board-certified. (In my first trial, a hematologist claimed to be board-certified under oath but, in fact, had let his certification lapse many years before; it was quite compelling when my attorney brought this fact out on the stand.)

- If the testimony is not credible, help your attorney understand your reasoning. This will help them craft their arguments in preparing for trial.
- Ensure that your attorney has utilized legal subscription services that compile information about expert witnesses, including CVs, articles, or chapters they have authored. Check for inconsistencies from their testimony that could be leveraged against them.
- If the expert has testified in federal court, there may be a large amount of information to be discovered, as experts in federal cases are held to a higher standard than at the state level. Federal experts are required to submit copious documents and previous testimony, which will be on record.

After your case is *completely* closed, you might safely consider the pursuit of justice against an unethical expert. This desire, or a desire to change the system, can be compelling. Greg Henry, MD, FACEP, states in the podcast, “I probably know a dozen doctors who went to law school just to get even.” Most physicians, however, would likely opt for a less labor- and time-intensive option (although I have acquaintances who have done just that).

If law school isn’t in the cards but you want to take action, you should be thoughtful about how you proceed. Suing the expert is generally not an option, as there are protections for expert witnesses under the law. This ensures there will be experts willing to testify when required. One physician interviewed for the podcast (called Dr. M) recounts how he made many copies of an expert’s testimony after his case was over and mailed it to her colleagues and employer along with a note asking them to read it and consider taking steps if they found it egregious. Actions of this nature are quite tempting, but you should be aware that this could potentially expose the physician to further litigation for defamation or tortious interference with contracts (wrongful interference in a business contract).

Dr. M also proceeded with what is generally considered a “safer” option: the pursuit of censure from a professional organization, in this case ACEP. Many professional societies, including ACEP, have methods for submitting testimony for review or for citing ethics violations. For most organizations, including ACEP, the complainant must be a member of the organization (which makes it difficult to pursue an expert of a different specialty). An ACEP member may also file a complaint on someone else’s behalf. ACEP’s procedure for the review of testimony regarding standard of care can be found online.<sup>3</sup> If the review panel finds there is indeed inaccurate or unethical testimony, it may choose to privately or publicly censure the expert; more significant or repeat transgressions may result in suspension or expulsion from ACEP. Suspension (temporary) or expulsion (permanent) may be reported to the National Practitioner Data Bank, which, among other things, becomes an effective way to hamper their further work as an expert witness.

The expert’s testimony in Dr. M’s case was indeed found by the ACEP review panel to be egregious, prompting a formal censure of the expert. This expert was, in fact, the subject of more than one complaint and was eventually suspended from ACEP, with an accompanying National Practitioner Data Bank report filed.

Although going through the formal process of submitting testimony can take time, that time can bring perspective and some healing. Physicians may shy away from submitting testimony, not wanting to relive painful events. However, the submission of truly unethical testimony has the potential to bring a sense of closure and justice as well as help future defendants, a good thing that might come out of a difficult process. +

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# Go Big, Go Early

Tips for managing active seizures in the ED

by ANTON HELMAN, MD, CCFP(EM),  
FCFP

Although most seizures resolve spontaneously in one to three minutes, the seizures we typically face in the emergency department are the generalized tonic-clonic type and have been going on for a longer period of time, usually fulfilling the Neurocritical Care Society guidelines' criteria for status epilepticus—a continuous seizure lasting more than five minutes, or two or more seizures within a five-minute period without



return to neurological baseline in between.<sup>1</sup> We know status epilepticus is associated with a mortality rate as high as 43 percent, and as the duration of

seizures increase, the outcomes become poorer, especially in seizures lasting more than 30 minutes, owing to brain anoxia, acidosis, and rhabdomyolysis that occurs with ongoing seizure activity.<sup>2,3</sup> In fact, the seizure duration is the only potentially modifiable determinant of mortality. It is believed that the longer the seizure, the more refractory to medication it becomes.<sup>4</sup>

**The point:** We should approach seizing patients in the emergency department swiftly and aggressively, with the goal of immediate seizure cessation.

## First-Line Agents

While the patient is placed in the lateral decubitus position with an IV established (with venous blood gas sent off to rule out hyponatremia as a cause of the seizure), capillary glucose checked, and oxygen delivered via nonrebreather and nasal trumpets, the first two doses of medication should be drawn up so they can be given in rapid succession if needed. Benzodiazepines are considered the first-line medication for seizures.<sup>1</sup> The most important determinant of benzodiazepine efficacy in terminating seizures may be time to administration rather than choice of benzodiazepine or route.

The goal: to administer the first dose as soon as possible. Although some experts recommend waiting five minutes before administering the first benzodiazepine dose and giving it slowly over a few minutes (the reasoning being that the majority of seizures resolve spontaneously in less than five minutes and that these medications at therapeutic doses produce significant side effects), apnea and hypotension are more common with ongoing seizure activity. Aborting the seizure results in less respiratory depression, despite the high benzodiazepine dose. As such, I recommend administering the first benzodiazepine as soon as possible, via intravenous (IV) push.

The next most important aspect of benzo-

## TIME



0-5  
MINUTES



10-15  
MINUTES



15-20  
MINUTES

## Emergency Treatment Algorithm for Convulsive Status Epilepticus

1. ABCDEFG (ABC's and Don't Ever Forget the Glucose)
2. Airway: lateral decubitus, nasal trumpets, O<sub>2</sub>, suction
3. IV access
4. Concurrently search for reversible cause

### FIRST-LINE AGENTS

Lorazepam 0.1 mg/kg IV, max 4 mg, repeat once in 4 min  
or  
Midazolam 10 mg IM once

### SECOND-LINE AGENTS

Levetiracetam 60 mg/kg  
IV (max 4,500 mg)  
or  
Fosphenytoin or  
Phenytoin 20 mg/kg IV  
(max 1,500 mg)  
or  
Valproate 40 mg/kg IV  
(3,000 mg)

### ADVANCED AIRWAY MANAGEMENT

RSI  
Preoxygenation: BVM  
Induction: propofol  
or "ketofol"  
Paralytics: Rocuronium if  
Suggamadex is available  
or seizure duration  
>25 min.; otherwise  
succinylcholine

### REFRACTORY MEDICATION IN STATUS EPILEPTICUS

Propofol: 2–5 mg/kg IV, then infusion of 2–10 mg/kg/hr  
Midazolam: 0.2 mg/kg IV, then infusion of 0.05–2 mg/kg/hr  
Ketamine: 0.5–3 mg/kg IV, then infusion of 0.3–4 mg/kg/hr  
Lacosamide: 400 mg IV over 15 min., then 200 mg q12h PO/IV  
Phenobarbital: 15–20 mg/kg IV at 50–75 mg/min  
Consider consulting anesthesia for inhaled anesthetics

CONTINUED on page 22

diazepam administration in patients suffering from status epilepticus concerns adequate dosing. Don't just give 2 mg of lorazepam. Why? Observational studies suggest benzodiazepines are underdosed in 76 percent of status epilepticus patients.<sup>5</sup> It is imperative the first dose of benzodiazepine is dosed properly (ie, lorazepam 0.1 mg/kg IV up to 4 mg or midazolam 0.2 mg/kg intramuscular [IM] up to 10 mg). IV lorazepam is the preferred benzodiazepine because it has been shown to be better than diazepam for time to cessation of seizures and requirement of a different drug or general anesthesia.<sup>1,6,7</sup> When no IV is available, IM midazolam is preferred because it has been shown to be noninferior to IV lorazepam in a recent landmark randomized controlled trial.<sup>8</sup>

Again, treat seizures early via IV push with adequate doses of benzodiazepines.

### Second-Line Agents

After two adequate doses of IV lorazepam have been given two to four minutes apart, the drug you should reach for may surprise you. It's propofol. Propofol should be considered concurrently with a traditional second-line agent such as levetiracetam, fosphenytoin, or valproic acid.<sup>9</sup> It is important to understand that the goal of using propofol is to achieve seizure *cessation*, while the goal of traditional antiepileptic medications is to prevent seizure *recurrence*. Multiple trials have demonstrated unacceptable seizure durations of 30–45

minutes using traditional second-line agents without use of a sedative-hypnotic drug.<sup>10,11</sup> Propofol use is familiar to emergency clinicians in other conditions and has been shown in recent meta-analysis to have a better disease control rate and faster results and reduced tracheal intubation time compared to barbiturates.<sup>12</sup> The recommended dose is propofol IV bolus 2 mg/kg, followed by 50–80 mcg/kg/min (3–5 mg/kg/hr) infusion.

Turning to intubation, some experts recommend ketofol (ketamine plus propofol) based on the theoretical benefit of blocking both N-methyl-D-aspartate and gamma-aminobutyric acid receptors with ketamine and propofol, respectively.<sup>13</sup> I also recommend using a paralytic agent to maximize the chance of first-pass success. Long-term neuromuscular blockade should be avoided whenever possible so patients can be moni-

tored for ongoing seizure activity and serial neurological exams can be conducted until EEG monitoring is available.

The choice of paralytic agent depends on patient factors, duration of seizure activity, and access to the rocuronium reversal agent sugammadex. If there are no clear contraindications for using succinylcholine and the patient has been seizing for less than 20–25 min, it is reasonable to use succinylcholine given its short duration of action. If sugammadex is available, consider rocuronium. Sugammadex should only be used in a controlled fashion to reverse the rocuronium after the airway has been secured and the patient has been stabilized. Its purpose in status epilepticus is only to reveal underlying physical seizure activity to aid in titrating sedative infusions rather than as a tool used for an anticipated difficult/challenging airway.

Choosing among antiepileptic drugs is less about any upsides and more about avoiding contraindications. The recent ESETT trial, which included adults and children with persistent benzodiazepine refractory generalized convulsive status epilepticus, found *no difference* between the use of levetiracetam, fosphenytoin, and valproate in seizure cessation and improved alertness by 60 minutes.<sup>14</sup> However, phenytoin and fosphenytoin have sodium channel blockade effects, similar to the mechanism of action of certain toxidromes such as tricyclic antidepressant and cocaine overdose. The additional sodium channel blockade of phenytoin/fosphenytoin could therefore result in dangerous and even fatal cardiac dysrhythmias. These drugs should generally be avoided in toxicological causes of seizure for this reason. Although controversial, valproate should be avoided in pregnant patients.<sup>15</sup> Perhaps the safest medication is levetiracetam dosed at 60 mg/kg IV (maximum 4.5 g).

### Third-Line Agents

For refractory status epilepticus, defined by failure of seizure cessation after a second-line medication, options include propofol, midazolam (0.2 mg/kg IV, then infusion of 0.05–2 mg/kg/hr), ketamine (0.5–3 mg/kg IV, then infusion of 0.3–4 mg/kg/hr), lacosamide (400 mg IV over 15 minutes, then maintenance of 200 mg q12h PO/IV), and phenobarbital (15–

**We should approach seizing patients in the emergency department swiftly and aggressively, with the goal of immediate seizure cessation.**

# Thank you Dean Wilkerson

for more than 16 years of leadership  
as Executive Director of the American  
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20 mg/kg IV at 50–75 mg/min) in consultation with an intensivist.

### Underlying Cause

A concurrent search for the underlying cause of the seizure should be pursued. Always start by considering any immediate life-threatening conditions that require immediate treatment with specific antidotes (in parentheses below). These include:

- Vital sign extremes: hypoxemia (oxygen), hypertensive encephalopathy (labetalol, etc.), and severe hyperthermia (cooling)
- Metabolic: hypoglycemia (glucose), hyponatremia (hypertonic saline), hypomagnesemia (magnesium sulphate), and hypocalcemia (calcium gluconate or calcium chloride)

- Toxicologic: anticholinergics (bicarbonate), isoniazid (pyridoxine), lipophilic drug overdose (lipid emulsion), etc.
  - Eclampsia: typically after 20 weeks of pregnancy and up to eight weeks postpartum (magnesium sulphate)
- After such conditions have been identified/treated or excluded, it is useful to divide other possible causes into intracranial versus systemic. Imaging and lumbar punctures may be indicated.

With this approach, you can lower the risk of anoxic brain injury, multiorgan failure, and death as a result of refractory status epilepticus in your patients with status epilepticus.

And if you can't remember all the details and remember only one thing in the heat of the moment, remember this: Go big, go early.

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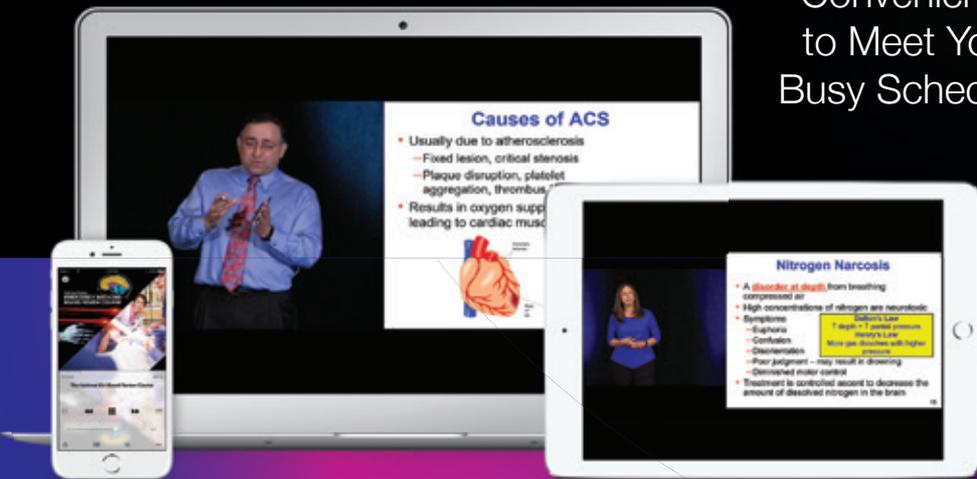
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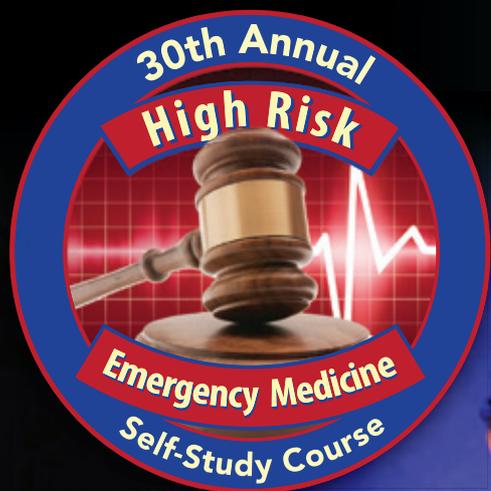
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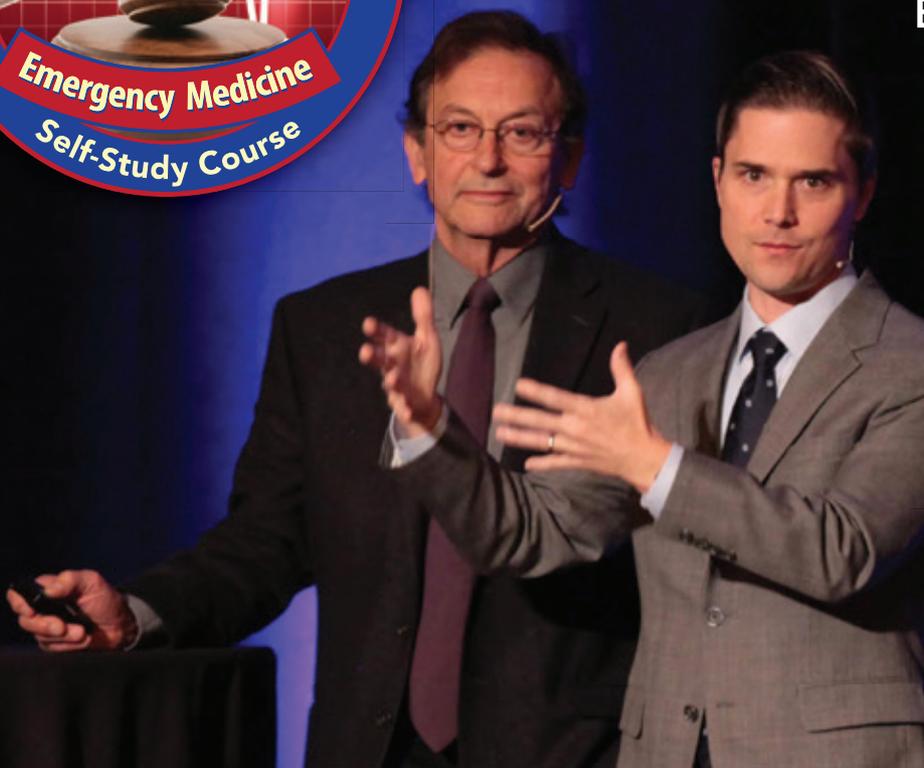
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