

EM Resident

The background of the cover is a close-up photograph of a green, spiky cactus or succulent plant. The plant has many sharp, pointed spines and is set against a blurred green background. The lighting is soft, highlighting the texture of the plant's surface.

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Wilderness Toxins

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Unsafe Nursing Ratios Incapacitate EDs, Endanger Patients

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It's the evening surge at a busy ED where all beds are occupied. Several admitted patients — including 2 critically ill — are waiting for rooms upstairs. A quick glance reveals a full waiting room with multiple potentially sick patients. Then, 2 new patients arrive via EMS. Each will require immediate stabilizing interventions. If nursing resources were not already overwhelmed, they now will be.

In the blink of an eye, this setup has created one of the most high-risk practice environments in emergency medicine. Yet, few emergency physicians would recognize it as such or even think twice about it. After all, it's just another day.

But consider this: Decreasing the nurse-to-patient ratio immediately increases the frequency of medication errors and all-cause mortality for all patients in the ED — not only the critically ill ones who just arrived.¹⁻⁴

In fact, there is strong evidence to suggest that protected emergency nursing ratios are key not only for patient safety, but also for departmental efficiency.^{5,6} So, why is it controversial to ask that EDs provide adequate nursing staffing?

Staffing issues have been front and center to nursing legislative efforts for quite some time. In fact, campaigns to establish standardized nurse-to-patient ratios have been underway by nursing professional societies since the early 1990s.⁷ The American Nurses Association currently advocates for state-based regulations that require hospitals to create staffing plans individualized to each nursing unit. This effort is endorsed by the Emergency Nurses Association, the largest professional society representing emergency nurses. Both organizations stop short of supporting mandated nurse-to-patient ratios.⁷⁻⁹

The major adversaries to standardized nurse-to-patient ratios have historically been hospital associations and nurse

executives, who argue that fixed ratios leave minimal flexibility in scheduling around variation in patient volume and acuity. Simply stated, standardized nurse-to-patient ratios cost more.⁷

To date, 14 states have passed legislation regarding nurse staffing.

The regulatory language trends toward ambiguity, leaving much to the discretion of hospital administrators. Only 7 states require that hospitals internally monitor any nurse staffing metrics at all, let alone nurse-to-patient ratios.

Minnesota law avoids the concept of self-monitoring altogether and simply mandates that each hospital's Chief Nursing Officer develops a staffing plan "with input from others." As previously mentioned, nurse executives are the largest opponents to standardized staffing ratios.

Massachusetts law requires ICUs to be staffed with nurses at a ratio of either 1:1 or 1:2, depending on the stability of the patient. However, there is no specific mention of critically ill patients in the ED or patients admitted to the ICU who are boarding in the ED. The regulation does not mention nurse-to-patient ratios in any other specialties.

California remains the only state with a legally defined minimum nurse-to-patient ratio for all nurses. Per the regulation, there is always a mandatory 1:4 ratio in the ED. For critically ill patients in the ED and those admitted to the ICU, the maximum ratio is 1:2. Since passing this legislation in 2004, evidence shows the trends seen with dangerous nurse staffing levels are indeed reversible with mandatory staffing ratios.⁶ It should be noted that the California Nurses Association separated from the ANA over philosophical differences in the late 1990s, with nurse staffing policy being one of the primary issues.⁷

While most states have yet to pass legislation regarding nurse staffing, external accrediting organizations have weighed in on the issue to various degrees. Although the Joint Commission is not a government agency, most states require its

approval before a health care organization may qualify to receive reimbursements from Medicare and Medicaid.

The Joint Commission does not explicitly require reporting of nurse-to-patient staffing ratios, though this metric could satisfy a portion of the qualification assessment should the data be presented. In the category of nurse staffing standards, the Joint Commission requires reporting on a minimum of 4 metrics from a list focused on patient outcomes. Of the 4 metrics, 2 must involve "human resource indicators" such as overtime use. The other 2 must involve "clinical or service indicators" such as patient falls.¹⁰

So, who exactly is keeping track of nursing ratios? Outside of a small minority of states, the answer is simple — no one.

ACEP's current policy on nurse staffing is similar to ENA and ANA policy statements. The American Academy of Emergency Medicine takes it a step further and advocates for a 1:3 maximum nurse-to-patient ratio with protected triage and charge nurse roles for higher acuity departments.^{11,12}

As a young specialty, emergency medicine has the unique ability to rapidly adopt evidence-based practices and make changes to better care for our patients. In this, emergency physicians must stand by our nurse colleagues and advocate for safe staffing ratios. Although hospital associations and nurse executives control the budgets, everyone must work together on this issue to keep patients safe.

So, the next time the ED is staffing nurses at an unsafe ratio, consider documenting it and reporting this patient safety deficiency through the local incident reporting system. After all, a quick post-shift email isn't going to increase patient mortality.

But dangerous staffing practices?

The evidence suggests that it might.

To learn more about the ongoing national advocacy efforts for safe nurse-to-patient staffing ratios, visit the National Nurses United website at www.nationalnursesunited.org/ratios. ★

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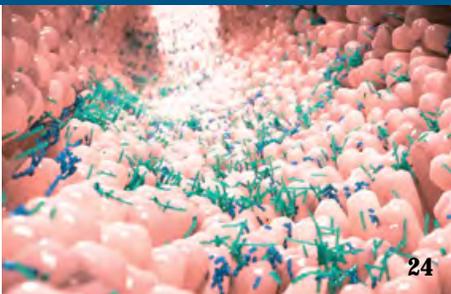
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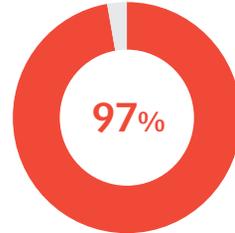
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EMRA Continues Advocating for You!

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It's been an exciting spring for advocacy: Our partners at ACEP successfully lobbied the Joint Commission to allow us to eat and drink in the ED, and EMRA refused to support continuing the AAMC's Standardized Video Interview program for medical students after reviewing the data.¹

But one issue that hasn't received enough attention is "Scholarly Activity." **Our freedom to pursue our professional passions as residents just came under attack, so EMRA stood up for us and fought back.**

Let me explain...

For years, the ACGME has required EM residents to pursue a "scholarly activity" project in residency. Historically, EM has been an innovative and progressive field, recognizing our right to fulfill this requirement through more than just peer-reviewed research, such as non-peer reviewed FOAM posts and presentations at local and national conferences on a topic you're passionate about.² That's because while peer-reviewed research is critically important to developing the knowledge base of our specialty, it's just one of many important ways residents can shape the future of Emergency Medicine.

Recently, a "consensus report" from a group of research directors advocated for a far narrower interpretation of what constitutes scholarly activity, so EMRA reached out and banded together with the program directors at CORD

and our fellow residents at ACOEP-RSO and AAEM-RSA to publish a rebuttal in the *Western Journal of Emergency Medicine*.^{3,4}

But writing letters isn't the only way EMRA stands up for you. We work closely with the resident representatives to the ACGME Review Committee for EM, CORD, the EM Model of Clinical Practice Task Force, the EM Milestones Review Task Force, and the ACEP Board. In fact, most of those resident representatives concomitantly serve on the EMRA Board. Plus, we have regular meetings with virtually all of the stakeholders in our field, including board certifiers (ABEM), osteopathic physicians (ACOEP), academicians (SAEM), clerkship directors (CDEM), and program coordinators (EMARC).

We do all of this to ensure that **every time a decision that affects EM residents' lives is being made,**

the EM residents' voice on the issue is heard loud and clear.

We also democratically debate our policy stances at our semi-annual Representative Council meetings at CORD and ACEP (which you can now attend virtually). We created a yearlong Leadership Academy and a brand-new Health Policy Academy to train more than 200 residents and medical students to become the movers and shakers of the next generation. We fund 120 national leadership positions for residents and medical students through our 20 committees, and we are launching EMRA 45 under 45, a celebration of those who have positively influenced our specialty.⁵⁻⁹

So if you're excited about shaping the future of emergency medicine too, check out our opportunities, reach out, and help make the future even brighter than it already is! ★



Making Sense of Balance Billing

RJ Sontag, MD

EMRA Health Policy Committee
UT Health San Antonio

Emergency medicine features heavily in recent media reports regarding “surprise” medical bills.^{1,2} Whether questioning the utility of emergency care, the associated hospital fees, or the changes in insurance coverage, most of these reports fail to recognize emergency medicine’s unique position at the intersection of the failures of access, coverage, and payment in the modern health system. Our specialty is more frequently being put in a defensive position by patients, media, and the government. Though many factors contributing to the issue are out of our hands, the current policy landscape lends us some control to help our patients and our specialty.

What is Balance Billing?

A medical emergency can often be one of the most frightening moments of a person’s life. When faced with a problem like uncontrolled bleeding, chest pain, or a stroke, patients often seek treatment from the nearest emergency department. After a patient has been treated and stabilized, their physician then bills an insured patient’s health insurance company. If the provider is “in network,” meaning they have a pre-existing contract to provide medical services at a specific rate, the insurance company provides the full negotiated reimbursement. If the provider and health insurance company do not have a contract, the services are “out of network” (OON), and insurance companies often pay a lower rate. The physician who provided the required emergency care may then try to recover the unpaid balance — the difference between the lower out-of-network rate and the standardized payment for that service — by billing the patient for the difference. This practice is known as **balance billing**.

When patients do not understand their insurance coverage and the implications of OON care, they can be caught off guard by these balance bills. Further complicating

Doctor out of network?

Insurance often pays less than the full bill...



...the part that insurance doesn’t cover is the **balance bill**.

the matter is the increasing prevalence of other cost-raising changes to insurance coverage. In particular, high-deductible insurance plans increase out-of-pocket costs for patients in the form of rising deductibles and copays. All of these changes — balance bills, high deductibles, and increased copays — are often lumped together in the popular media and labeled as “surprise bills.”^{3,4} **What patients often view as “surprise bills” are actually the result of insurance companies narrowing their networks and increasing costs to patients.**

Balance Billing Can Affect Anyone

Balance billing burdens all medical specialties, but emergency care is the only care required by law to be provided regardless of insurance status as delineated by the Emergency Medical Treatment and Labor Act (EMTALA).⁵ Further, **when patients are having a medical emergency, they often do not get the chance to figure out which emergency physicians are in network or out of network.** As would be expected, emergency medicine

accounts for about one-quarter of cases of balance billing.⁶ While the percentage is not insignificant, the prevalence of balance billing may actually be as low as 2% of ED bills.⁷

Balance Billing in Emergency Medicine

Emergency physicians serve an important role in the health care system by acting as the health care safety net for patients regardless of their insurance status. Physicians may agree to accept a lower in-network rate for their services in exchange for an easy, streamlined reimbursement process and higher patient volumes. Health insurance companies benefit from this arrangement, as evidenced by their reporting of record profits and stock increases.⁸ When a health insurance company tries to further increase profits by refusing to contract for a fair amount, any care provided by that physician is reimbursed at an OON rate, leaving a large balance that is the responsibility of the patient.

A Further Complication

The relationship between hospitals and the physicians that staff them adds an additional layer of complexity to

the matter. While hospitals may opt to negotiate with health insurance companies to create in-network contracts, emergency departments are often staffed by physicians from independent companies. Naturally, these physicians often want to protect their right to independently negotiate with health insurance companies before entering into contracts, and patients may not realize that their in-network hospital may be staffed with OON physicians. Though the prevalence of this discordance is not known nationally, a recent study in Texas showed that at least **some insurers offered no in-network emergency physicians at more than half of their in-network hospitals.**⁹

Both physicians and patients suffer when insurance companies refuse to provide reasonable options.

Policy Solutions

Patients reasonably expect their health insurance to cover their emergency care. Balance billing pits patients and physicians against each other. As expected, consumer advocacy groups and federal and state legislatures are stepping up to find solutions.¹⁰ Proposed solutions include required reimbursements, balance billing limits, and advance disclosure requirements. Some of these policies have found a home in federal and state laws over the last decade, closing some of the gaps, but leaving the need for a more comprehensive solution.¹¹ In January 2019, ACEP presented a framework to curb the rise of these bills.¹²

Require Reimbursement

Health insurance companies have the right to reimburse OON physicians at a lower rate than their in-network colleagues.¹³ Recognizing this disparity, the Affordable Care Act (ACA) levels the playing field by requiring some health insurance companies to reimburse at only the in-network rate.¹⁴ **Required reimbursement rates reduce the amount of balance billing,** but the solution has several flaws. First, the ACA

only makes changes to new and federally regulated health insurance plans. It does not require the in-network reimbursement rate for grandfathered plans nor for self-funded, employer-sponsored plans, which make up the majority of health insurance in the US. Second, in-network rates may be unreasonably low. This is evidenced by the fact that some OON physicians have chosen not to accept the lower rates offered by in-network contracts with the health insurance company in the first place.¹⁵ Any balance left between the physician's rate and the reimbursed rate is still subject to balance billing, and the ACA provides no provision to address that.

Limit Balance Bill Amounts

Another solution proposes legal regulations to prohibit or limit the amount of the balance bill, which provides a certain amount of protection to patients. States like Texas and New York pioneered this policy solution of limiting balance billing. As with the policy requiring reimbursements, this solution is not without flaws. For many patients, the balance bill limit (\$500 in Texas, for example) is not an insignificant expense. At the same time, the actual bill may be substantially higher, leaving the physicians who are legally required to provide medical care without a legal guarantee to payment for that care. Appeals are possible; Texas provides for a mediation process for higher bills, and New York provides for a binding arbitration process.^{16,17} As with the aforementioned required reimbursements, these policies apply differently to different types of insurance, leaving many patients and physicians without a solution.

Require Advance Disclosure

Some states require disclosure in advance so that a patient can make an informed decision about whether to accept out-of-network care.¹⁸ This solution makes sense for non-emergent care when there is time to research in-

network physician options. **In medical emergencies, the luxury of time rarely exists, meaning advanced disclosure is of limited value.**¹⁹ Requiring insurers to disclose deductibles on their insurance cards would also help inform patients of their responsibility when seeking medical care.

Force In-Network Contracts

One way to reduce the burden on patients for identifying in-network providers can be found in the private sector. In an effort to reduce the number of in-network hospitals staffed by out-of-network physicians, some hospitals have begun requiring all physicians to enter into in-network contracts with health insurance companies.²⁰ **Private sector solutions often benefit hospitals and insurance companies.** Physicians are often harmed as they face a difficult negotiating position and reduced employment prospects.

How You Can Help

As patients, physicians, and insurance companies work to reduce the amount of balance billing, the policies surrounding the issue continue to evolve. Earlier this year, President Trump stated his support for banning these sorts of bills.²¹ The Senate is also pushing a bipartisan solution.²² No current government solution fully recognizes emergency physicians' unique vantage point on this matter. **Emergency physicians have an ethical and legal obligation to treat all patients, and their engagement in the conversation regarding solutions is more vital than ever.** Emergency physicians who do not advocate for their position risk losing their voice regarding future regulations. Continuing to communicate the opportunities inherent in serving as the health care safety net, coupled with the burdens of the unfunded mandate of EMTALA, will help guide future government regulations and private sector actions that will most benefit patients. ★

Speak up for your specialty! Attend the ACEP Leadership & Advocacy Conference in Washington, D.C., May 5-8. Sign up today at acep.org/lac!



WILDERNESS TOXINS QUIZ

Can You Identify the Poison?

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The prompt identification of a potential environmental toxin allows for early treatment and management. Specific identification as well as recognition of pertinent signs and symptoms are important skills for everyone who spends time outdoors. Many plants found in various regions can result in toxic or poisonous effects when encountered by humans. Whether through direct cutaneous contact, ingestion, or other exposure, many plants can exhibit a local or systemic reaction. Try to identify the following flora from the photo or clinical history. (*Answers following.*)

Patient #1



You are working in an ED in Texas when EMS brings you a 20-year-old male who “isn’t acting right.” He is flushed, tachycardic, febrile, and has completely dry skin. He states that he and his friends were eating a plant they found in the woods, “trying to get high.” He shows you a picture of the plant.

Patient #2



You are out hiking in the woods in rural South Carolina when your friend goes off the trail through a patch of low brush. Soon after, he begins to experience significant redness, itching, and small blisters over his legs. You look closer at the area where he walked and see this...



Patient #3

A patient presents to the ED in Ohio complaining of chest pain and “passing out.” He states that he is a forager and has been eating leaves from a plant he thought was safe. He shows you what he’s been eating.

Patient #4



A hiker calls 911 after finding his 3-year-old son eating mushrooms from a small patch during a family camping trip in central California. He was able to take a picture of the mushroom and showed the first responders.

Patient #6



A 17-year-old male is brought to the ED after ingesting multiple beans as pictured. He blended them with juice and drank the mixture in an attempt to commit suicide. He presents shortly after ingestion, with nonspecific symptoms including weakness, nausea, vomiting, and abdominal pain.

Patient #5



A woman is brought to the ED with hypotension (BP 60s/40s), bradycardia (40 bpm), and vomiting. Electrocardiography reveals ST depressions in inferior leads. The patient was slow to respond to verbal stimuli, but exam was otherwise non-focal. While preparations are made to take the patient for cardiac intervention, further history reveals that symptoms began shortly after having consumed honey that was brought to her from a Turkish friend.

Patient #7

A toddler presents to an urban ED with swelling of the lips and tongue with irritated, painful mucosa. The posterior oropharynx appears benign and there is no stridor or respiratory distress. The patient's mother brings in several large leaves from one of their houseplants. She reports the child was chewing on them shortly before symptoms began.



Patient #8

A foraging hobbyist is brought in by ambulance having a seizure. He found a "parsnip variety" near a pond in New York City's Central Park. His companion brings in a picture of the plant. An experienced forager from the Midwest, he followed his usual strategy of tasting a small part of the plant before planning to cook with it the next day. He has never had a problem when eating "water parsnip" before.

Quiz: Can You Identify the Poison?

Summary

Early identification of a possible plant-based toxin or exposure can greatly assist in the management and stabilization of an affected individual. In general, eliminating potential additional exposure and commencing supportive care are the first-line treatment of many environmental toxins.

Become familiar with the specific toxic plants that may be found in your region, and be prepared when exploring outdoors or providing care. Know the contact information for your local poison control center and discuss exposures with them for up-to-date treatment and management options.

Patient #1: Jimsonweed (*Datura stramonium*)



The patient likely ingested *Datura stramonium* or Jimsonweed. The seeds, stems, leaves, and roots can be ingested or smoked in an attempt to obtain hallucinogenic effects. However, this can result in an anticholinergic toxidrome in an exposed individual due to the presence of atropine, L-hyoscyamine, and L-scopolamine, inhibiting the peripheral and central muscarinic acetylcholine receptors.¹ Symptoms include agitation, delirium, fever, tachycardia, dry skin and mucous membranes, skin flushing, diminished bowel sounds, and urinary retention.^{2,3} The treatment of an acute toxic exposure is largely supportive, and driven by symptoms. Specific anticholinergic antidotes for significant intoxication including physostigmine can be administered usually after discussion with a specialist.^{2,4}

Patient #2: Poison oak (*Toxicodendron diversilobum*)



The likely culprit is poison oak (*Toxicodendron diversilobum*). Other plants that commonly cause allergic dermatitis include poison ivy (*T. radicans*) and poison sumac (*T. vernix*).

Poison ivy can be identified as a short vine or shrub with groups of 3 long, oval leaves with an apex point. The “common” or Eastern version can be found in the Eastern United States and Southern Canada, while the Western variety is found in Western states except California.

Poison oak can be found along the Pacific Coast and Southeastern United States, and it is identified by stems with groups of 3-5 oval leaves 3-7 cm long with wavy to deeply lobed margins and a rounded tip.

Poison sumac is found mostly in wet, marshy regions of the Southeastern United States and can be identified by having groups of 7-13 leaves arranged as pairs along a central stalk, with a single leaflet at the end.^{5,6}

Exposure to all varieties can cause a localized contact dermatitis because of a Type IV hypersensitivity reaction to the compound oleoresin urushiol found in the leaves, stems, berries, and roots.^{7,8} Symptoms usually present within 24-48 hours from exposure in a previously sensitized individual and can include intense pruritus and erythema, followed by vesicles and bulla.⁵ Treatment includes symptom control with topical steroids, cool compresses, and antihistamines for localized cases, and oral steroids for more serious reactions. The lesions will likely heal on their own in 7-10 days.^{6,8}



Left: Poison Ivy (*T. radicans*)
Above right: Poison Sumac (*T. vernix*)



Patient #3: Foxglove (*Digitalis purpurea*)

These bright flowers come from the foxglove (*Digitalis purpurea*) plant. This and many other wild plants contain potent chemicals that affect the heart, called cardiac glycosides (including digoxin).⁹ Poisonings after ingestions of this plant display similar characteristics as digitalis toxicity, including nausea, vomiting, visual disturbances, abdominal pain, hyperkalemia, A/V conduction blocks, bradycardia, and ventricular tachydysrhythmias including bidirectional ventricular tachycardia.^{10,11} Supportive care is the mainstay of treatment, but obtaining a serum digoxin level may help make a definitive diagnosis. However, the quantitative value does not correlate with the degree of toxicity from exposure to a non-pharmaceutical cardiac glycoside and should not be used to guide antidote dosage.¹¹

Patient #4: Death Cap (*Amanita phalloides*)

This mushroom is the deadly *Amanita phalloides* or “death cap.” All parts of the mushroom contain toxins, with amatoxin as the main agent causing effects in humans.^{12,13,14} The liver is the primary organ affected, but the kidneys and other organs are also impacted. Amatoxins inhibit RNA synthesis and prevent protein synthesis, inhibiting normal liver regenerative capacity and leading to hepatic failure.^{13,14} Symptoms usually appear after a latent period and include abdominal pain, nausea, and vomiting followed by jaundice, seizures, coma, and ultimately death.¹³ The main treatment options include supportive care and potentially liver transplant if there is progression to complete liver failure.¹²



Patient #5: Rhododendron

The patient is suffering from poisoning from grayanotoxin found in the honey, which was produced near rhododendron in bloom. Concentration of grayanotoxin in the honey leads to “mad honey disease,” which is marked by hypotension, bradycardia, nausea, vomiting, and somnolence due to the effect on sodium channels and the M2 receptor. Treatment includes supportive care and atropine.¹⁵



Patient #7: Elephant’s ear

Raphides are an insoluble crystalline form of oxalate that is present in a variety of common household and agricultural plants including the leaves of elephant’s ear, pineapple, kiwi fruit, and others. Oral exposure leads to physical irritation to tissues including pain and edema that, in rare instances, can lead to airway compromise.¹⁷ Treatment is symptomatic and supportive. Other types of plants have similar raphides, and common placement of these in households as decorations can lead to accidental exposure. *Inset image: Raphides*



Patient #6: Castor beans (*Ricinus communis*)



The ingestion of castor seeds may cause mild symptoms but commonly proves to be fatal. The content of ricin in castor beans varies widely, and the bioavailability depends heavily on mechanical separation from the

beans, as in chewing or grinding. Castor beans from *Ricinus communis* are among the most toxic readily available plants. Ricin, a protein toxin found in the seeds, is inactivated with cooking, as in the preparation of castor oil. Its toxicity stems from inhibition of protein synthesis. Ingestion of ricin can lead to nausea, vomiting, abdominal pain, GI hemorrhage, and possibly death. Other routes of exposure such as inhalation and parenteral injection are more deadly and of concern for acts of terrorism. Specific testing for ricin is potentially difficult, but another specific small molecule, ricinine, is readily detectable by gas chromatography-mass spectrometry.¹⁶

Patient #8: Water hemlock (*Cicuta maculata*)

Water hemlock (*Cicuta maculata*) contains cicutoxin in large quantities in its root bulb. It is considered one of the most toxic plants in North America and is prevalent in waterways in North America.¹⁸ There are many edible plants that have a similar appearance, including water parsnip.¹⁹ ★



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Excited Delirium

Acute Management in the ED Setting

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A 25-year-old man presents to the ED brought in by EMS for altered mental status (AMS). Prior to arrival, paramedics provide a radio report stating that patient was found agitated, behaving aggressively, and then climbed on the hood of the ambulance. He was noted to be extremely strong and difficult to restrain. Paramedics administered 5 mg midazolam intramuscularly and were able to physically restrain him, but upon arrival he remains extremely agitated, yelling and slamming himself against the stretcher sidebars. He does not answer any questions and his speech is nonsensical. On exam, the patient is markedly tremulous, hot to touch, with myoclonic jerks and bruxism. Extensive superficial abrasions are noted about his abdomen, thorax, and extremities. He is too agitated to obtain initial vitals. What are your next steps?

Background

Excited delirium syndrome (ExDS) is a common yet poorly characterized ED presentation with a wide differential diagnosis. Described in the literature for more than 100 years,¹ it is hypothesized to involve catecholaminergic excess involving endogenous stress-related catecholamines, exogenous catecholaminergic drugs,² and/or overstimulation of dopamine and NMDA glutamate receptors in the setting of psychiatric or organic medical illness. Causes can be grouped broadly into metabolic/endocrine, neurologic, infectious, toxicologic, and psychiatric etiologies (Table 1).

Most common among these is the concurrent presence of acute drug intoxication, particularly sympathomimetics, and history of mental illness with psychotic features. The incidence of ExDS varies widely, with rising incidence in the 1980s³ linked to increased use of cocaine,⁴ amphetamines, and phencyclidine. Recently, synthetic cathinones and cannabinoids have been implicated.^{5,6}

Patients are often identified initially by law enforcement. Intervention by law enforcement to control individuals experiencing ExDS via physical, chemical, or electrical restraints are associated with an

exceedingly high rate of morbidity and mortality; ExDS is implicated in more than 3% of police interventions involving

use of force, is associated with more than 10% of deaths in police custody, and between 38%-86% of ExDS related mortality has occurred in police custody, particularly associated with police coercion methods and/or positional asphyxia.²

By itself, ExDS carries an extremely high mortality risk, with approximately 2/3 of ExDS patients dying in the prehospital setting⁷ in the absence of any major trauma, physical restraint, or police intervention. Mortality is most strongly associated with respiratory depression, severe hyperthermia, acidemia, or a combination thereof.⁸ Of these, profound hyperthermia has the strongest association with mortality:⁹ extreme core temperatures can alter blood-brain barrier permeability, contribute to protein malfunction or degradation, and potentiate glutamate induced neurotoxicity.¹⁰

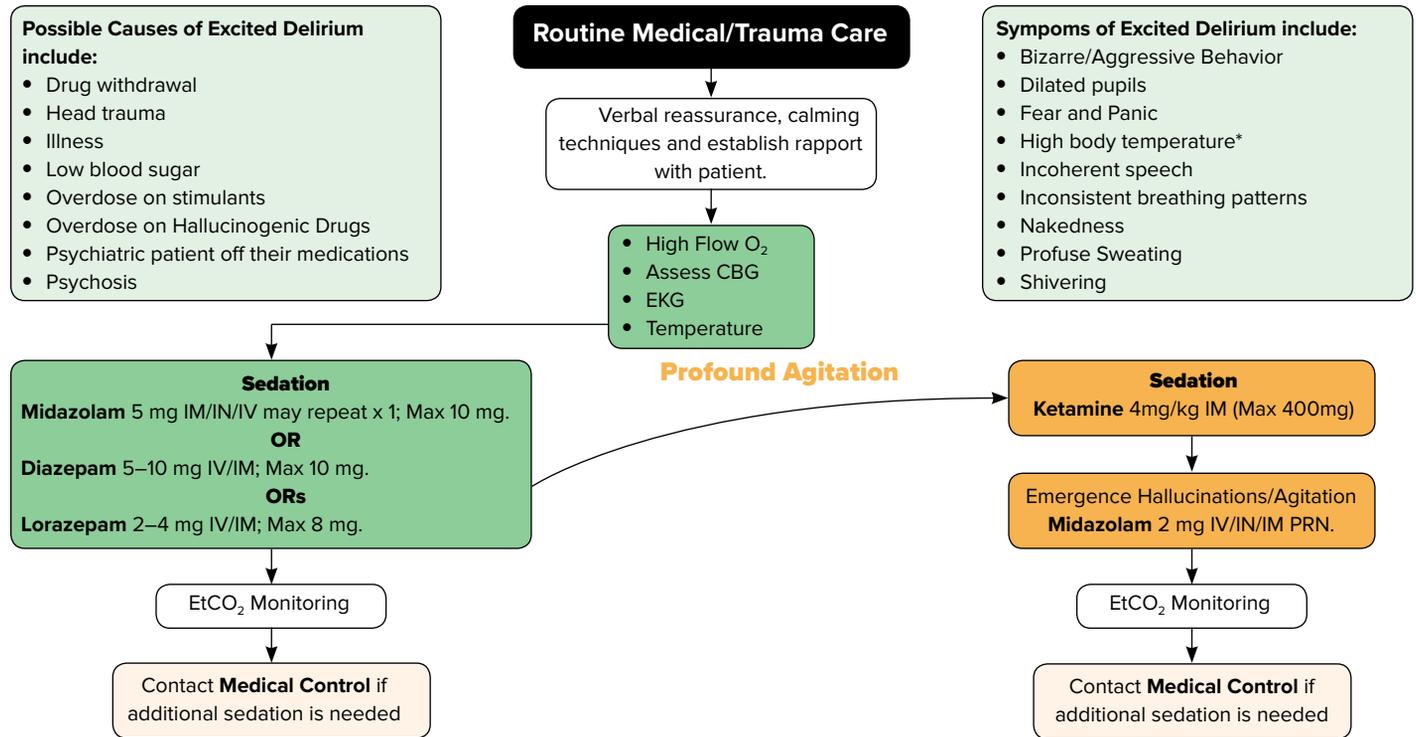
Differential Diagnosis

To date, there is no universally recognized definition for ExDS. The initial description developed from post-mortem identification based on history and was an encompassing term used across many medical and legal settings. In a 2009 White Paper, the American College of Emergency Physicians described ExDS as a subset of AMS and recommended that despite the vagueness of the clinical entity, salient features of

TABLE 1. Potential Underlying Etiologies of Excited Delirium

SYSTEM	ETIOLOGY
Metabolic/ Endocrine	<ul style="list-style-type: none"> • Electrolyte abnormalities • Hepatic encephalopathy • Hypercarbia • Hyperglycemia • Hypoglycemia • Hypoxia • Thyrotoxicosis • Uremia
Neurologic	<ul style="list-style-type: none"> • Dementia • Head injury • Paraneoplastic anti-NMDAR encephalitis • Post-ictal state • Seizure
Psychiatric	<ul style="list-style-type: none"> • Acute psychosis • Mania • Medication stoppage • Personality disorder • Schizophrenia
Infectious/ Inflammatory	<ul style="list-style-type: none"> • Autoimmune encephalitis • Herpes encephalitis • Meningitis • Sepsis
Toxicologic	<ul style="list-style-type: none"> • Alcohol • Amphetamines • Cocaine • Neuroleptic Malignant Syndrome • Phencyclidine (PCP) • Polypharmacy • Serotonin Syndrome • Synthetic cannabinoids • Synthetic cathinones

FIGURE 1. Sample prehospital protocol for ExDS, from Louisiana Region One Protocol Effort¹⁴



*High body temperature is a key finding in predicting a high risk of sudden death. ANother key symptom to the onset of death while experiencing excited delirium is “Instant Tranquility.” This is when the suspect who had been very violent and vocal suddenly becomes quiet and docile while in the car or sitting at the scene.

history should be combined with the differential diagnosis for common causes of AMS to describe the presentation. ExDS has been described as “a syndrome of uncertain etiology characterized by delirium, agitation, and hyperadrenergic autonomic dysfunction,” with “characteristic symptoms of bizarre and aggressive behavior, shouting, paranoia, panic, violence toward others, unexpected physical strength, and hyperthermia.”¹¹ ExDS patients typically present with any combination of agitation, heightened pain tolerance, tachypnea, and diaphoresis; these patients have a propensity to develop severe acidemia with progression to sudden cardiac arrest.¹¹ The common presenting features of the syndrome and the broad overlap with other conditions necessitates the investigation of other underlying etiologies, as noted in Table 1.

Management

Management is tailored to patient presentation and should be centered on 4 pillars of evidence-based care: control of agitation, correction of hyperthermia,

avoidance of acidosis, and investigation into the underlying etiology (Table 1).

Because positional asphyxia, respiratory depression, severe hyperthermia, acidosis, and/or catecholamine-induced fatal arrhythmias¹² may precipitate cardiovascular collapse, these should be prevented and managed aggressively. These pillars hold true in the prehospital setting as well as in the ED, as quick recognition, and deliberate, appropriate treatment by prehospital providers can lessen harm and prevent poor outcomes. Many EMS agencies have specific protocols to address ExDS, often emphasizing the primacy of safe positioning and prompt sedation with benzodiazepines and/or ketamine. Where not explicitly defined in protocol, prehospital providers should prioritize these approaches in practice, recognizing that ExDS patients are, or have the potential to become critically ill very quickly. Early identification by EMS personnel can allay risk for sudden

death, alert receiving ED staff, and assist medical examiners in better understanding the presentation and identify the probability that the patient was experiencing ExDS.¹³

Control of Agitation

Consensus recommendations for the pharmacological management of AMS is to treat underlying etiology first and then address behavioral symptoms. However, ExDS is typified by a dangerously agitated state that nearly universally requires sedation.² Severe agitation may preclude IV access or labs early in the patient encounter. As such, initial goals in the undifferentiated ExDS patient should be to quickly and effectively provide sedation while restraining the patient in a safe position. Following many in-hospital deaths of patients placed in restraints, the Joint Commission and many hospital policies elaborate specific requirements for safe physical restraints. These include frequent face-to-face provider reassessment of restraint necessity to

minimize mechanical restraint time. Important principles when restraining a patient include avoidance of pressure on the face, neck, and chest, which would lead to asphyxiation, respiratory or metabolic acidosis, and death. Likewise, ExDS may be secondary to hypoxia, and placing a non-rebreather with 100% oxygen is preferable, as it doubles as a spit-mask. Additionally, it is often necessary to use 4- or 5-point restraints, placing the patient in the supine position with the head of the bed elevated to 30° while restraining one of the patient's arms above the head and the other below the waist.

While the traditional mainstays for pharmacologic management of

agitation includes benzodiazepines (particularly lorazepam and midazolam), antihistamines such as diphenhydramine, and antipsychotics, there are many drawbacks to these drugs in the ExDS patient (Table 2). As progression to cardiovascular collapse is most highly associated with hyperthermia, respiratory depression and acidemia, pharmacologic choices in sedation of patients with ExDS should complement efforts to counteract these alterations in physiology, not worsen them. In recent years, national shortages of IV diazepam and lorazepam,¹⁵ alongside a preponderance of evidence and provider preference has encouraged the use of ketamine for sedation

management of ExDS, with typical dosing ranges provided in Table 2. Relative latitude in both calculation and route of dosing, rapid onset of action, and ease of progression from sedation to delayed or rapid sequence induction and intubation make ketamine a good primary choice in ExDS patients with or without IV access.¹⁶ Another benefit of ketamine is the fact that it preserves the patient's airway reflexes, allowing them to continue spontaneous breathing. While most ketamine sedated patients do not necessitate aggressive airway management, attention to the patient's airway, as well as monitoring for procedural sedation, should be utilized in all ExDS patients treated with ketamine.

TABLE 2. Pharmacologic Options for Management of Excited Delirium

Drug	Route	Dose (Mg)	Onset (Min)	Duration of Effect	Adverse Effects	Comments	
Benzodiazepines							
Diazepam	IM	10	15-30	15-60 min	<ul style="list-style-type: none"> Respiratory depression Hypotension May require frequent redosing 	<ul style="list-style-type: none"> Poor bioavailability via IM route 	
	IV/IO	5-10	2-5	15-60 min			
Lorazepam	IM	4	4	60-120 min		<ul style="list-style-type: none"> Poor pharmacokinetic profile for IM route Best pharmacokinetic profile for IM route 	
	IV/IO	2-4	2-4	60-120 min			
Midazolam	IM	5	10-15	120-360 min			<ul style="list-style-type: none"> Poor pharmacokinetic profile for IM route Best pharmacokinetic profile for IM route
	IN	5	3-5	30-60 min			
	IV/IO	2-5	3-5	30-60 min			
Antipsychotics							
Haloperidol	IM	10-20	15	180-360 min	<ul style="list-style-type: none"> Extrapyramidal symptoms QTc lengthening may be dangerous in those with underlying toxicologic etiologies 	<ul style="list-style-type: none"> Antihistamine effect can decrease diaphoresis and potentiate hyperthermia Avoid in QT prolongation or intoxication with CNS depressants 	
	IV/IO	5-10	10	180-360 min			
Ziprasidone	IM	10-20	10	240 min			
Other							
Ketamine	IM	4-5 mg/kg	3-5	60-90 min	<ul style="list-style-type: none"> Respiratory depression Emergence reaction Laryngospasm Hypersalivation 	<ul style="list-style-type: none"> Causes few hemodynamic changes, even in agitated pts Reports show < 33% of pts receiving 5 mg/kg required re-sedation As many as 40% of pts receiving ketamine ultimately required intubation, but pharmacokinetic profile is favorable as induction agent If 2 doses required in first 60 min of initiation of sedation, infusion may be started with titration to effect 	
	IV/IO	0.5-2 mg/kg	1	20-30 min			
	Infusion	1-1.5 mg/kg/hr					
Diphenhydramine	IM/IN	50	5	6-12 min	<ul style="list-style-type: none"> Antihistamine effect can decrease diaphoresis & worsen hyperthermia 	<ul style="list-style-type: none"> Can be use prophylactically or to treat extrapyramidal symptoms of antipsychotic dopamine blockade 	
	IV	25-50	1	4-6 min			

Correction of Hyperthermia

Management of hyperthermia is an important tenet of ExDS management, and should be initiated immediately after control of agitation. Temperature management in ExDS is similar to that in the setting of environmental hyperthermia, and may include removal of clothing, passive external cooling, forced air cooling blanket systems, and cold IV fluids.

Avoidance of Acidosis

Avoidance of any acidosis is important, and may be secondary to a variety of etiologies, including hypoperfusion, rhabdomyolysis, and respiratory depression. As part of initial workup, venous or arterial blood gases should be obtained to assess underlying acid/base derangements. Management should be targeted to the underlying pathology and may include intravenous fluid resuscitation or respiratory support. In the case of an ExDS patient managed with sedation, including ketamine, end-

tidal CO₂ (etCO₂) monitoring is required for monitoring the rate, depth, and adequacy of respiration.

Investigation into Underlying Etiology

After patient has been stabilized and sedated, workup should be guided by the physical exam and history. Complete physical exam is critical—patients with ExDS may have significant underlying injuries, and efforts to restrain can exacerbate any pre-existing trauma. Initial investigations should include blood glucose, CBC, BMP, and toxicologic screens for any co-ingestants. Consider CPK if suspicious for rhabdomyolysis, blood cultures and/or LP if concern for sepsis and/or septic meningitis. Imaging may be pursued to investigate any potential underlying trauma.

Case Conclusion

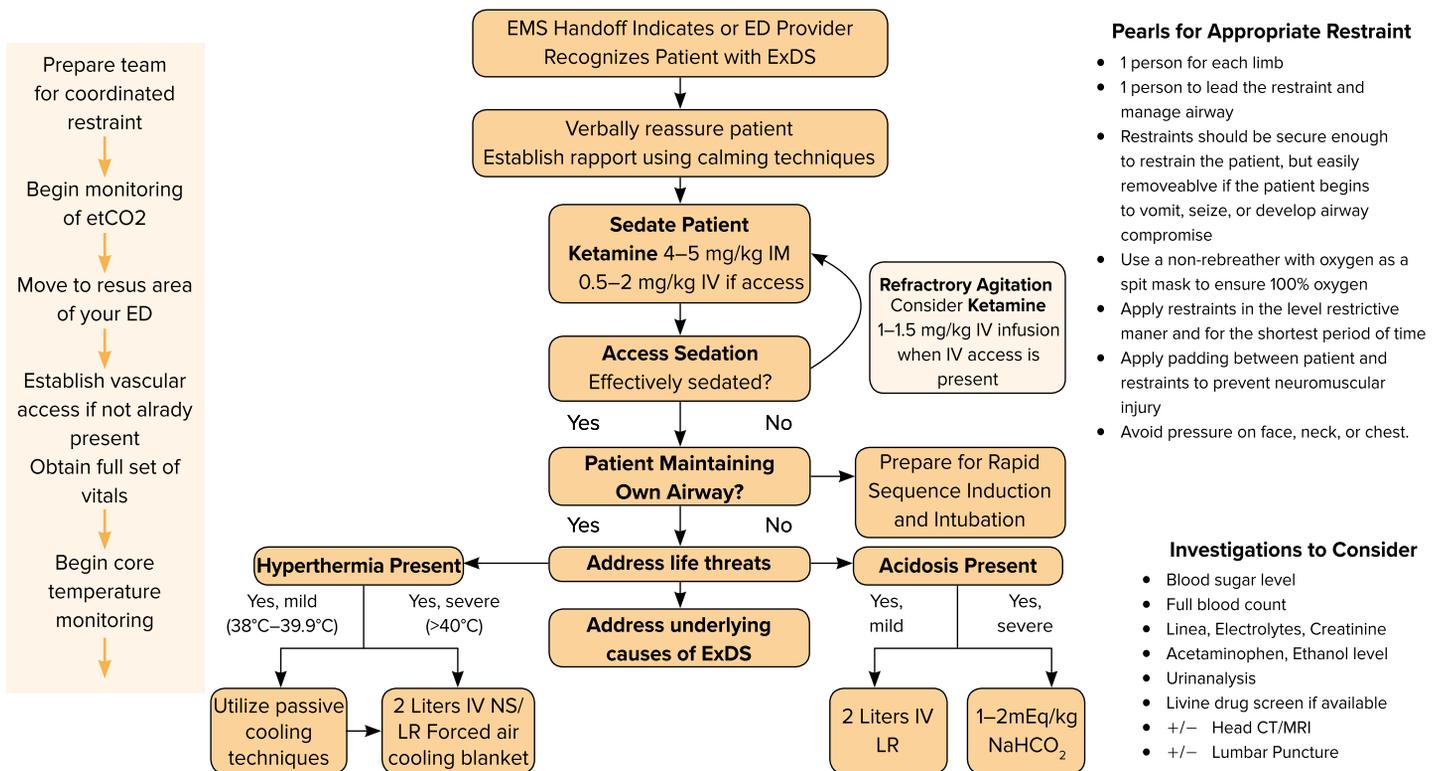
Following transfer to ED stretcher, patient was placed in 4-point soft restraints with a nonrebreather and 100% oxygen with assistance from hospital security; 5 mg/kg ketamine

IM was administered, with significant reduction in agitation. The patient was placed on etCO₂ and brought to the resuscitation bay for close monitoring. He was found to be tachycardic with a pulse of 150, hypertensive at 150/94, hyperthermic at 39.6° C. End-tidal showed 38mmHg CO₂ and 20 respirations/minute. Labs revealed no abnormalities. Cold packs were placed to axilla and groin, and 2 L of cooled lactated ringers was administered IV with improvement in temperature.

Based on the physical exam and history, concern was for excited delirium secondary to an unknown sympathomimetic agent with hallucinogenic qualities, and the patient was admitted to ICU stepdown with supportive care.

The patient’s agitated delirium resolved on hospital day 2, and he was transferred to inpatient psychiatry for continued observation. He was discharged on day 4 with referral to psychiatric services and support for drug use. ★

FIGURE 2. Algorithm for Acute ED Management of Excited Delirium



Rare Occurrence of Lemierre's Syndrome: A Case Report

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A 29-year-old man with no past medical history presents to the ED with 1 week of right-sided dental pain and new onset facial swelling. He was seen in the ED of a different hospital earlier in the week and had been started on oral penicillin for a dental infection. Initial physical exam on this repeat ED visit is notable for right mandibular/sub-mandibular swelling and tenderness, significant trismus, and jaw malalignment. Initial vital signs are as follows: Temperature 101.1 degrees Fahrenheit, heart rate 101, blood pressure 131/84, oxygen saturation 100 percent on room air. Labs and blood cultures are obtained, notable for acute kidney injury and leukocytosis. Antipyretics, IV fluids, and broad-spectrum antibiotics are administered. Bedside ultrasonography (Figure 1), is concerning for a non-compressible right internal jugular vein. Contrast-enhanced computed tomography (CT) of the neck is concerning for multiple complex periodontal, submandibular, and masticator space abscesses, with associated thrombosis of the internal jugular vein (Figure 2). Consultations to oral and vascular surgery are placed, and the patient is admitted to the hospital for continued care.

Discussion

Lemierre's syndrome was first described by French bacteriologist André Lemierre in 1936. In his landmark publication, *On Certain Septicaemia Due to Anaerobic Organisms*, he eloquently describes the condition as an "anaerobic postanginal septicaemia," and found that it classically, and interestingly, afflicts previously healthy, young adults.¹ Historically the disease is also termed the "forgotten disease," after its steep decline in incidence following the advent



Figure 1 (above). Bedside ultrasound of the patient's neck showing a non-compressible internal jugular vein, concerning for thrombosis

of antibiotics.² **While only affecting 1 in 1 million patients per year, a misdiagnosis could potentially be fatal.**

Today the condition is defined as a septic thrombophlebitis of the internal jugular vein due to an adjacent deep-space neck infection. On history and exam patients with Lemierre's can have fevers, rigors, odynophagia, neck pain/tenderness, swelling, limited range of motion of the neck, and perhaps the pathognomonic "cord sign." This is seen in less than half of cases, and characterized by pain and swelling along the sternocleidomastoid muscle.³

Infections are nearly universally oropharyngeal in origin and disseminate via direct extension towards the carotid sheath. Patients frequently present to the ED appearing clinically ill, requiring aggressive resuscitation and treatment for sepsis. Management often requires definitive surgical treatment of the primary infection.⁴

Complications from Lemierre's syndrome include persistent bacteremia, septic shock, and septic emboli to joints



Figure 2 (at right). CT neck with contrast showing: A) one of many abscesses; B) loss of patency of internal jugular vein, concerning for thrombosis

or lungs. Pathogenic bacteria are usually normal anaerobic flora of the oropharyngeal cavity (classically *Fusobacterium necrophorum*). Initial antibiotic recommendations include ampicillin-sulbactam, piperacillin-tazobactam, or a carbapenem.³ If associated with an internal jugular catheter, it is recommended to add vancomycin as well (in addition to catheter removal).⁵ The role of anti-coagulation is controversial, and is often reserved for cases of persistent bacteremia, limited response to antibiotics or surgical drainage, or large clot burden.³ In severely refractory cases, surgical exploration of the internal jugular may be warranted.²

Case Conclusion

The patient in this case was taken to the operating room for surgical exploration of his oral cavity with drainage of multiple complex loculated abscesses. He was continued on ampicillin-sulbactam postoperatively and remained hemodynamically stable. He did not receive anticoagulation. He was discharged home on ampicillin-clavulanic acid in stable condition with plans for close follow-up. ★

Ultrasound-Guided Subclavian Vein Cannulation

The Vessel to Remember!

A 75-year-old morbidly obese female with a history of diabetes, CHF, and CAD presents to your ED in septic shock secondary to *C. diff.* colitis. Her blood pressure does not respond to her initial 30 cc/kg bolus, and you decide it's time for central line placement and vasopressors. With her large pannus and *C. diff.* infection, femoral cannulation is undesirable, and when you attempt to lay her down in Trendelenburg (or even flat), she becomes severely dyspneic.

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Questions

1. What are your next steps?
2. If you choose subclavian access, what are the benefits? What are the potential complications?
3. How can you optimize your chance of success and minimize the risks?

You decide the subclavian vein is your best access option. There are potential hazards, but you realize you can reduce the likelihood of these and increase your chance of success by using ultrasound.

Anatomy³

The subclavian vein is the continuation of the axillary vein as it courses beneath the clavicle. It travels superiorly starting at the lateral border of the first rib, then under the clavicle medially until it joins the internal jugular vein. The subclavian artery runs superior and posterior to the subclavian vein. Importantly, the lung and pleural cavity lie deep and inferior to the subclavian vein and are particularly vulnerable to accidental puncture on the left chest (as compared to the right) where the apex of the lung can extend above the first rib. The brachial plexus courses superiorly and deep to the medial portion of the subclavian artery, and the thoracic duct lies on the left side.

Technique

Utilizing the high-frequency linear probe, the subclavian vein can be approached in either the short or longitudinal axis.

Anatomically, the subclavian vein can be accessed utilizing a supraclavicular or infraclavicular approach.

Supraclavicular Approach

To cannulate the vein in the supraclavicular approach, stand at the head of the bed as if placing an internal jugular line. Place the probe above the clavicle and visualize the vein. You may want to find the internal jugular vein first and trace it distally until it joins the subclavian. Position your needle tip at the center of the probe and puncture the skin, traversing the fascial planes. Continue to visualize the needle tip until it enters the vessel. Insert the guidewire once the needle is in the lumen of the vessel. Withdraw the needle, continue with scalpel incision and dilatation, and insert the catheter over the guidewire. Of note, you will always utilize the short axis view when employing the supraclavicular approach.

Infraclavicular Approach

With the patient in the supine position (if possible), place the probe in the infraclavicular fossa and identify the vasculature 2-3 cm distal to where the subclavian vein courses below the clavicle. Cannulation occurs more laterally as compared to the landmark approach. Obtain a long-axis view of the axillary vein and distal subclavian vein. Use compressibility and/or pulse-wave Doppler to confirm visualization

of the vein (as opposed to the artery). Take note of the lung pleura beneath the vessels. Insert the needle at the midpoint of the short footprint of the probe and continue to visualize the needle in long axis as it approaches the vessel. Once the needle is visualized in the lumen, insert the guidewire, monitoring placement dynamically with ultrasound. After scalpel incision and dilatation, insert the catheter over the guidewire.

Another option is to approach the subclavian vein infraclavicularly in the short axis, as seen below. Note the difference in probe position for obtaining a short axis versus long axis view is quite minimal, requiring only small movements to obtain.

Questions Revisited

1. *What are your next steps?*
2. *If you choose subclavian access, what are the potential benefits? What are the potential complications?*
3. *How can you optimize your chance of success and minimize the risks?*

Using the high-frequency probe in a longitudinal, infraclavicular approach, you cannulate the subclavian vein on the first try. You confirm placement and your patient receives the care she needs.

There are a multitude of benefits to subclavian vein access. Subclavian lines have been associated with fewer cases of thrombosis and infection (though recent studies show less significant differences in infection rates

between femoral, internal jugular, and subclavian vein access due to sterile practices).^{1,5,6} The subclavian vein often remains patent in hypovolemic patients and is frequently more accessible in the setting of cervical spine or pelvic trauma or when the patient is unable to tolerate a Trendelenburg position. Potential complications include the risk of arterial cannulation (and decreased ability to apply pressure secondary to the anatomical location relative to the clavicle), pneumothorax, nerve injury, hematoma, hemothorax, or thoracic duct injury. Some studies list complication rates with blind technique as high as 18.8%.⁵

Ultrasound helps improve upon these benefits and mitigate such risks. Studies have revealed increased cannulation success with fewer attempts and decreased time to successful cannulation with the use of ultrasound. Furthermore, ultrasound use is associated with a decreased rate of pneumothorax, hematoma, and arterial puncture. Some providers have limited experience with this technique, which can pose a challenge. Additionally, there is limited data regarding ultrasound-guided subclavian approach. Practice is integral to gain the full benefits of ultrasound-guided subclavian access.

Bottom Line

Ultrasound-guided subclavian vein access is a safe, effective and efficient option for central venous cannulation. Using ultrasound can decrease the time to cannulation in addition to many of the feared complications. However, more data and practice with the technique may be required for providers to feel comfortable with this under-utilized access option. ★

Utilizing the high-frequency linear probe, the subclavian vein can be approached in either the short or longitudinal axis.

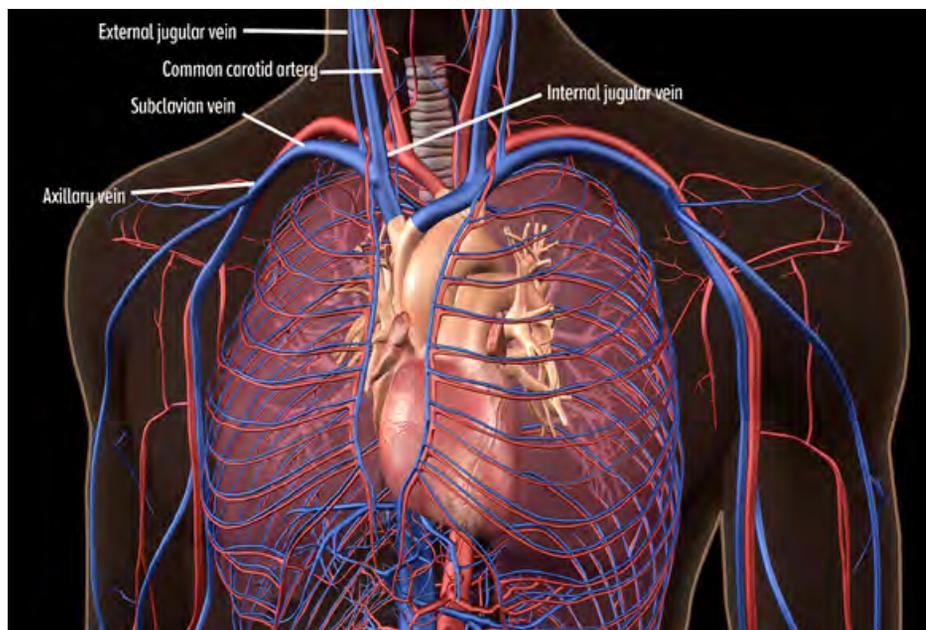


FIGURE 1. Subclavian Anatomy



FIGURE 2. Subclavian vein (SCV)



FIGURE 3. a. Cephalic vein; b. Axillary vein; SCV: Subclavian vein

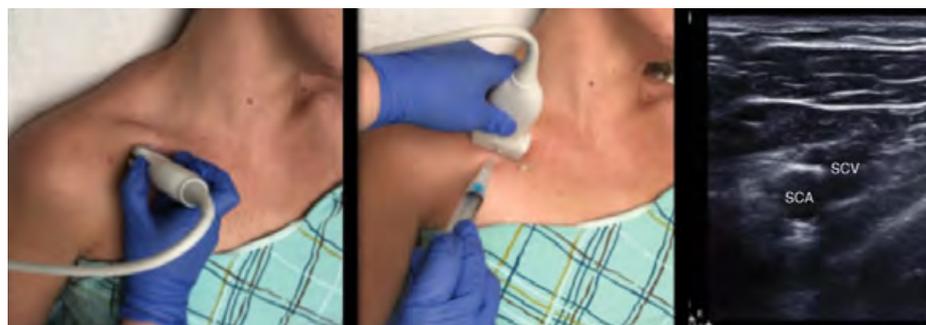


FIGURE 4. SCV: Subclavian vein; SCA: Subclavian artery

EXTENDING THE WINDOW

Updates in Prehospital Stroke Alert Identification Clinical Scenario

Brittany Beel, MD

University of Florida Gainesville

A 70-year-old male with a history of HTN, HLD presents to the ED via EMS for weakness and aphasia. Family is able to tell you he was last normal before he went to sleep around 11 p.m. They say he woke up at 6 a.m. mumbling and unable to speak coherently. On physical exam, he has a right-sided facial droop, loss of right arm sensation and function, and a left-sided gaze preference. It is now 11 a.m. EMS reports they did not issue a stroke alert because of an unclear onset of symptoms. The patient's CTA demonstrates a large left-sided middle cerebral artery (MCA) stroke.

Until recent trials, this patient would be unlikely to receive an EMS stroke alert or undergo acute stroke intervention. In the 2013 American Heart Association stroke guidelines, tPA was only recommended within 4.5 hours of stroke onset, and mechanical thrombectomy was only endorsed within the first 6 hours.¹ These guidelines therefore excluded a large population of patients with strokes, including those with delayed presentation to the ED, and those who awaken with stroke symptoms—and thus have an unclear time of onset. A way to increase the window for effective intervention was clearly needed.

In 2018, the DAWN and DEFUSE trials expanded the window for stroke intervention. The DAWN trial was a multicenter, randomized open label trial that specifically examined patients known to be well 6-24 hours earlier with a mismatch between clinical deficit and infarct. Patients included in the trial were randomized to receive thrombectomy or standard medical therapy. Enrolled patients had evidence of occlusion at the intracranial internal carotid artery (ICA), first MCA segment, or both. The results of the trial showed better outcomes for disability and functional independence for thrombectomy patients compared with standard medical care. For every 2 thrombectomy patients, 1 additional patient had a better outcome.²

The DEFUSE trial also examined outcomes in patients receiving thrombectomy versus standard medical care 6-16 hours after last known normal. This trial included a broader population than the DAWN trial. Specifically, the DEFUSE trial included more patients with a larger ischemic core, as well as patients with a lower National Institutes of Health Stroke Score (NIHSS) and milder symptoms. The results of the trial similarly revealed better functional outcomes for patients receiving thrombectomy as compared to standard medical care.³

As a result of these trials, the 2018 AHA Stroke Guidelines broadened the window for stroke intervention to up to 24 hours in select patients.⁴ Now that the window has been expanded, the question becomes: **How do EMS crews identify which patients qualify as a stroke alert, and how do we**

direct those patients to the most appropriate ED?

In the state of Florida, EMS medical directors in different practice settings addressed the new guidelines in 2 distinct ways.

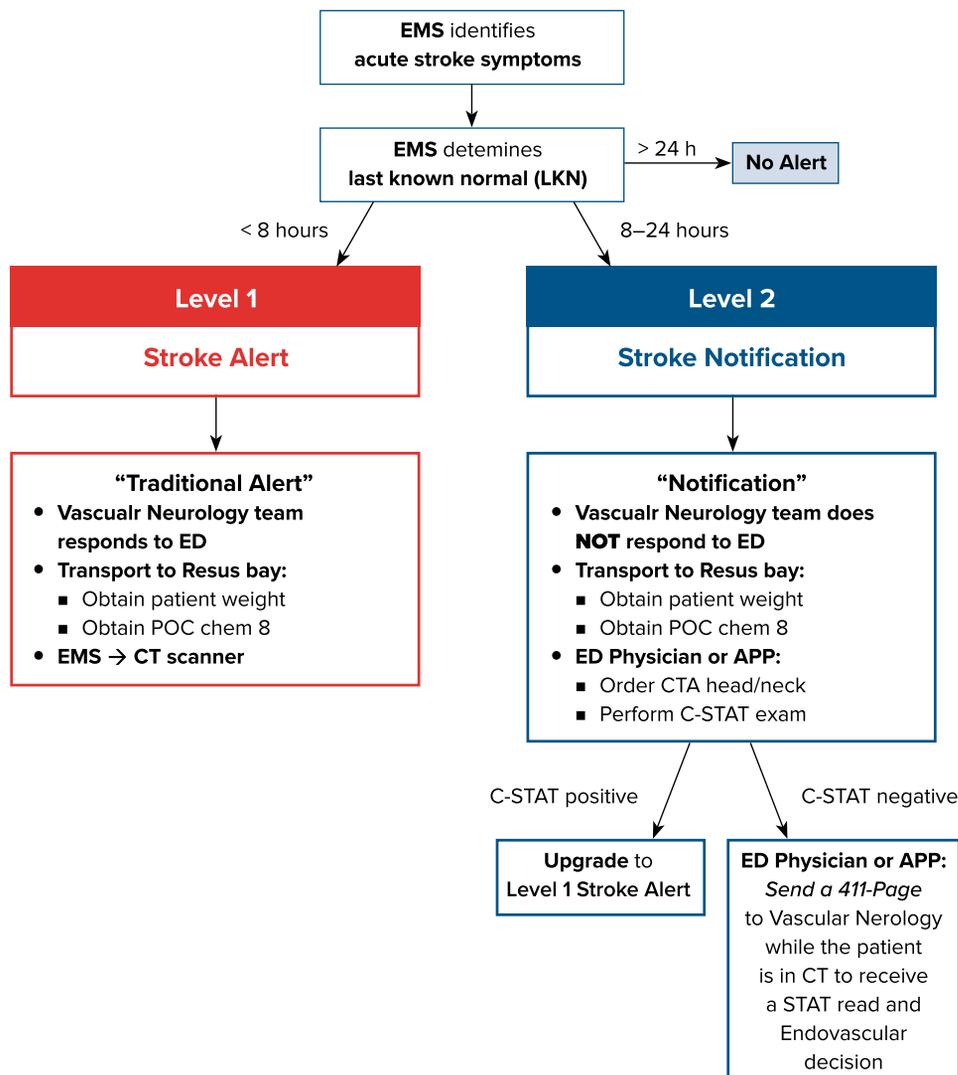
Lake County has approximately 340,000 people, but has no comprehensive stroke centers. Desmond Fitzpatrick, MD, Medical Director of Lake County EMS, needed to carefully determine which patients with stroke symptoms would benefit from direction of transport to comprehensive stroke centers an hour away. In response, Lake County adopted a field stroke scale called LAMS (the Los Angeles Motor Score) to identify patients likely to have a large vessel occlusion stroke. Patients with an elevated score are then transported to an in-county hospital capable of a rapid CTA. When that imaging identifies a large vessel cutoff, the patient receives

TABLE 1. C-STAT Exam

Cincinnati Stroke Triage Assessment Tool — Screen for Large Occlusion Strokes
 ≥2 points is positive

Injury	Positive if...	Value
Conjugate Gaze Deviation	Gaze is acutely impaired in one direction.	2 points
Level of Consciousness	Fails 1 or more of each of the following: <ul style="list-style-type: none"> • Ask age and current month • Ask to follow 2 commands: close eyes, open and close hands 	1 point
Arm Weakness	When held up, one or both arms drifts down to bed within 10 seconds.	1 point

Stroke Alert Pathway



tPA and is immediately flown to the nearest comprehensive stroke center for endovascular care.

In comparison, Alachua County has approximately 260,000 people and features 2 comprehensive stroke centers, including the University of Florida. Jason Jones, MD, the Medical Director of Alachua County Fire Rescue (ACFR), considered adopting a stroke triage scale similar to LAMS. However, he notes that in a study by Turc et al., all of the triage scores produced false negative rates exceeding 25%, and thus fail to identify a large share of patients suffering from large vessel strokes.⁵

Dr. Jones feels the most critical question is: **“When do acute stroke symptoms stop being a time-sensitive emergency?”** He asked an assembly of vascular neurologists, neurosurgeons, and emergency physicians. The consensus was “when neurologists or neurosurgeons provide definitive intervention, or when neuroimaging reveals no such intervention is needed.” As a result, in this resource-rich setting, ACFR developed a policy to issue stroke alerts for all new focal deficits less than 24 hours old. Since the majority of interventions occur in the first 6-8 hours of symptoms, a 2-tier system is necessary to appropriately use hospital resources and reduce the burden on neurologists, he said.

At the University of Florida (Gainesville), stroke alerts are now sorted into level 1 and level 2 alerts based on the patient’s time last known normal (LKN). (Figure 1) A Level 1 stroke alert is a patient with LKN 0-8 hours prior, and results in the Vascular Neurology team responding immediately to the emergency department. A Level 2 stroke alert is a patient LKN 8-24 hours prior. These patients proceed directly on the EMS stretcher and to CTA imaging, at which time the ED contacts Vascular Neurology to review the CTA remotely and determine if intervention is necessary. An emergency physician can also upgrade the stroke alert to a level 1 if the CSTAT (Cincinnati Stroke

In the 2013 American Heart Association stroke guidelines, tPA was only recommended within 4.5 hours of stroke onset, and mechanical thrombectomy was only endorsed within the first 6 hours.

Triage Assessment Tool) score is ≥ 2 . (Figure 2).

“While the 2-level system may increase the workload of our hospital stroke system, we greatly extend our ability to identify and reverse stroke deficits,” Dr. Jones said. “This process also allows EMS to distinguish patients requiring critical imaging and notify the ED before arrival. As the window widens, we have to adapt.”

The DAWN and DEFUSE trials have already changed the AHA stroke guidelines, but EMS agencies also need to adapt to the new stroke regulations. This article demonstrates 2 such adjustments: adding more detailed stroke scales and expediting transport protocols. Regardless of the method agencies choose to adopt, change must occur in order to provide the best possible patient care. ★

ED Management of Inborn Errors of Metabolism

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Inborn errors of metabolism (IEMs) can present with a variety of nonspecific signs and symptoms. Acute metabolic decompensations can occur either in the perinatal period or later in childhood and are usually triggered by stressors such as fever, vomiting or prolonged fasting. A workup for metabolic disorders must be initiated alongside the standard diagnostics in the event of an unexpected deterioration in a full term baby after an uneventful perinatal period. IEMs result from enzyme deficiencies in important metabolic pathways. They are usually single gene disorders inherited in Mendelian patterns with some exceptions (eg. mitochondrial disorders). Symptoms arise due to accumulation of toxic substances (such as ammonia), failure of energy production systems, or accumulation of complex molecules in organelles.

Clinical Presentation

Newborns may be completely asymptomatic at birth, and it may take anywhere from hours to weeks for features to develop. The birthing process can itself be a trigger for the decompensation or it could be following the introduction of carbohydrates, proteins and lipids via feeds. Since they can be unresponsive to conventional therapies, obtaining a detailed history is extremely vital.

Vomiting can be a common presenting symptom. Children can become dehydrated from significant vomiting and it is more important to ascertain whether the child is able to

maintain adequate intake of required calories. Neurological manifestations can range from decreased activity, altered mental status, lethargy and seizures to coma and death. Decreased activity can lead to poor feeding and therefore inadequate caloric intake, perpetuating a vicious cycle. Certain conditions may present with hypotonia or apneic episodes. Metabolic disorders are among the many possible etiologies for children presenting with seizures. Dysfunction of certain organ systems may also indicate an underlying metabolic condition. Jaundice, respiratory distress, failure to thrive, hiccups, and hypothermia should all raise suspicion for IEMs. Abnormal odor of the urine could be a possible manifestation of metabolic disorders.

As with most genetic disorders, eliciting a family history is important (eg, other affected family member, siblings, and multiple unexplained early deaths). Since most metabolic disorders are inherited in an autosomal recessive manner, a history of consanguinity would raise suspicion. Some disorders like OTC deficiency are X linked, and are less likely to cause a severe presentation in girls. The differential diagnoses for a child presenting with these symptoms include sepsis, cardiac dysfunction, encephalitis, altered mental status secondary to traumatic brain injury, ingestion, and electrolyte disturbances among others.

Physical Exam

A thorough physical exam may reveal the presence of syndromic features/dysmorphic features that could narrow the diagnosis. For example, the presence macrocephaly, hypospadias, and rocker bottom feet could point the diagnosis in the direction of glutaric aciduria type 2. The exam should include evaluation of facial features, a detailed ophthalmologic exam, hearing evaluation, cardiac exam, abdominal exam for hepatosplenomegaly, neurological exam, and a genital exam. Possible abnormal features that may be observed include cataracts, cardiac murmurs, features of myopathy, hepatomegaly, and ascites. Rapid breathing could be an indication of efforts of compensate of metabolic acidosis as a consequence of urea cycle defects or hyperammonemia.

Investigations

The advancement of newborn screening has dramatically reduced the mortality and morbidity associated with many IEMs. It involves universal screening of all newborns through dried blood spots obtained through a heel prick at birth. The goal is to screen for treatable metabolic as well as some non-metabolic diseases at pre-symptomatic stages.

A battery of tests should be ordered when suspecting a metabolic condition including but not limited to — a blood gas, glucose, lactate, ammonia, LFTs, plasma amino acids, urine organic acids, plasma carnitine, plasma acylcarnitine, electrolytes,

TABLE 1. Common Therapies in IEM and their Doses

Medication	Dose	Indication
Dextrose 10% IVF	1.5x maintenance	Inadequate caloric intake
Intralipids	2-3 g/kg/day	Chronic inadequate caloric intake (Do not use in fatty acid oxidation defects)
Levocarnitine	25-100 mg/kg/day	Organic Acidurias or carnitine deficiency
Sodium benzoate	250–500 mg/kg/day in 2-3 divided doses	Hyperammonemia
Sodium phenylbutyrate	250 mg/kg in D10W over 90-120 min	Hyperammonemia

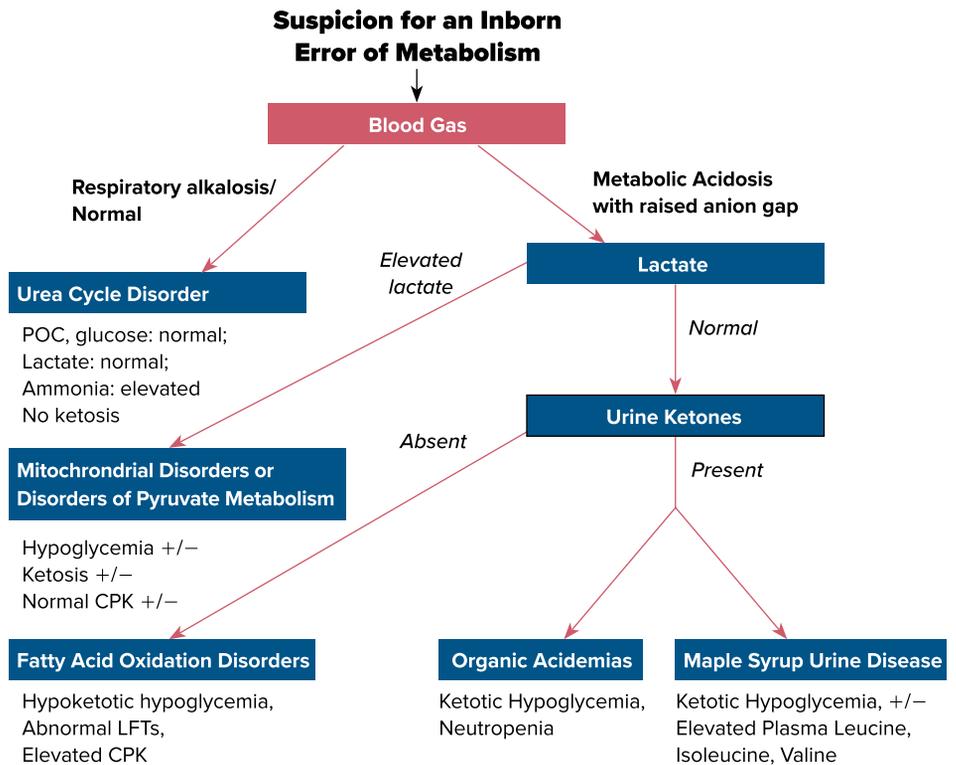
blood urea nitrogen, uric acid, complete blood count, and urine ketones (think rainbow tube set). Ammonia samples should always be drawn under the following parameters: free flowing sample, directly placed on ice and analyzed within 1 hour of drawing the sample. Plasma amino acids and urine organic acids will usually result much later, but should be drawn at presentation, as they are more likely to be abnormal and therefore diagnostic during an acute metabolic crisis. Consider obtaining CSF amino acids and CSF neurotransmitters if performing a lumbar puncture in the setting of neurological features.

Management

In the presence of a known IEM, many families may carry a management protocol which is to be followed during acute illnesses. Dextrose containing fluids should be started immediately in most categories of IEMs to supplement the body's metabolic needs, and blood tests to evaluate the metabolic status should be ordered. The primary metabolic provider should be consulted for further management sooner than later. As confirmation of a diagnosis can take time, the initiation of empiric treatment can be lifesaving. Intravenous dextrose should be initiated immediately and a 10% dextrose solution is the preferred via a peripheral IV. The IV fluids should be run at a rate enough to provide 120% of baseline caloric requirement. Age appropriate electrolytes should be included in the IV bag. Intralipids may also be used for additional calories; however this may be contraindicated in certain IEMs such as fatty acid oxidation disorders. It is important to note that the infusion of dextrose and lipids is for the provision of adequate caloric intake to prevent a catabolic state.

As the pathology of many metabolic disorders results from the accumulation of toxic metabolites in catabolic pathways, the initial aim of treatment is to prevent the breakdown of the substrates. Therefore, dietary intake of the implicated substrates (such as protein in urea cycle disorders or maple syrup urine disease) should be temporarily eliminated (NPO, special

FIGURE 1. A Simplified Diagnostic Algorithm for Suspected IEM based on Biochemical Findings



formula protein free or lactose free, ketogenic diet etc). Correct dehydration, metabolic acidosis, or electrolyte abnormalities. Consider sodium bicarbonate or acetate in the presence of significant acidosis. Eg: Hyponatremia should be promptly corrected in a maple syrup urine disease patient who could have cerebral edema secondary to leucine encephalopathy. Continue monitoring response to therapy and interventions.

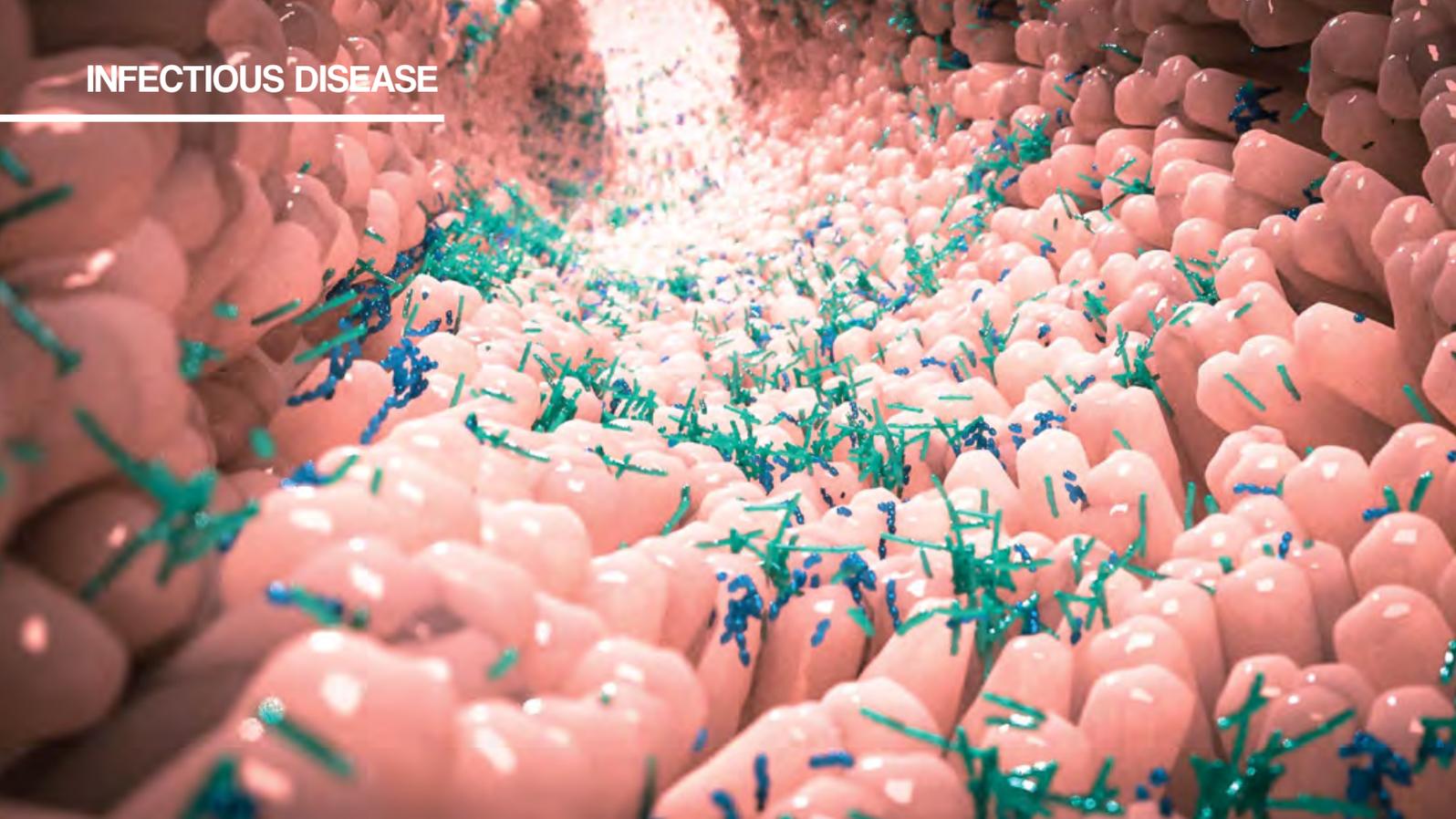
The next step is to increase the excretion of the already accumulated toxic metabolites. Sodium benzoate and sodium phenylbutyrate or Ammunul may be used to decrease plasma ammonia levels. The presence of refractory metabolic derangements such as hyperammonemia or lactic acidosis may be indications for hemodialysis as the renal excretion rate may not be fast enough to prevent secondary end organ damage. Levocarnitine is widely used in primary carnitine uptake deficiency, organic acidemias, fatty acid oxidation disorders and other metabolic disorders. This medication helps to transport fatty

acids into the mitochondria and also aids in elimination of organic acids by forming carnitine esters.

Conclusion

IEMs are individually rare, but as class of disorders they are not uncommon. Each IEM is a unique clinical entity with a characteristic biochemical defect. However, they share a permutation of metabolic aberrations, and based on these certain generic management strategies can be formed. As metabolic doctors are usually only available at large academic centers, emergency physicians are often at the forefront to identify and treat these children. Maintaining a high index of suspicion, ordering the initial gamut of biochemical testing in a timely manner and being well versed with basic treatment strategies goes a long way in reducing the mortality and morbidity associated with these diseases.

This article aims to discuss cardinal strategies in the acute management of IEMs. However, physicians can also refer to the following resources (GeneReviews, New England Consortium of Metabolic Programs) for further detailed management. *



How to Give Your Patients Bacteria and Not End Up in M&M

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Yes. You read that title correctly. This article is about giving your patient bacteria... probiotics, that is.

In the ED, we see a lot of complaints that may be responsive to probiotics. Probiotics are “live microorganisms that, when administered in adequate amounts, confer a health benefit on the host”.¹ In practice, the most common and accepted use of probiotics is as an oral form of a bacteria native to the patient’s gut microbiome. They have long been thought of as a nontraditional treatment modality; however, research on the role of probiotics and the microbiome has exploded in recent years.

The role of the microbiome is becoming more and more apparent. It has been shown to be associated with several autoimmune conditions and is now accepted as the likely pathology of many functional bowel disorders, including irritable bowel disease (IBS). It

Probiotics are no longer a pseudoscience or “alternative” practice. They should be part of every physician’s armamentarium.

also plays a major role in metabolism and obesity. The role of the microbiome from birth is highlighted by the increased rates of asthma, allergies, and gastrointestinal disorders with cesarean births. There is even evidence supporting the practice of introducing a mother’s vaginal secretions to their baby’s skin after a cesarean birth in an effort to influence the microbiome of the infant.² The role of the microbiota is further evidenced by the increasing use of fecal microbiota transplant, now approved for chronic *Clostridium difficile* (*C. diff*) colitis and soon to be approved for inflammatory bowel disease.

Another way to alter the microbiome is the use of probiotics. They have been used for centuries and studied since the early 1900s, with the first commercially developed probiotics becoming available

in 1935.³ The original theory was that by introducing “good” bacteria species into the gastrointestinal (GI) tract, the growth of beneficial colonies of flora would be promoted. This view has since been superseded by the modern theory on probiotics, which suggests more of an immunomodulatory role. However, let’s address some evidence-based applications of probiotics in the ED.

Antibiotic-Associated Diarrhea

The most common and perhaps most well-studied use of probiotics is for the prevention of antibiotic-associated diarrhea. The literature has demonstrated clear benefit with probiotic use for both adults and children to reduce the risk for both *C. diff* and non-clostridial diarrhea. This applies to both admitted and discharged patients.⁴

C. diff is a well-known and feared complication of antibiotic use. The concept of using probiotics for *C. diff* prophylaxis has been suggested for inpatient and critically ill patients for several years. Some moderate-quality evidence suggests this is helpful, with the most benefit for those at higher risk (>5%) of contracting *C. diff*.

There was some discussion in the medical community after a 2018 study published in *Cell* suggested that patients taking probiotics may not restore their normal flora after antibiotic exposure as quickly as those not taking probiotics.⁵ Critics of probiotics cited this as evidence of futility, while supporters suggested it may actually serve as evidence for the immunomodulator theory. While the question of mechanism does warrant further investigation, the study was a small, mechanistic study that enrolled only 21 patients and is unable to overturn the clear trend toward benefit observed in over 20 randomized controlled trials. Therefore, we should continue to give every patient to whom we prescribe antibiotics a probiotic until the mechanism of action can be better understood.

Gastroenteritis/Gastritis

There is strong evidence that diarrhea associated with pediatric gastroenteritis improves more rapidly when the child receives probiotics in addition to oral rehydration therapy.^{6,7} The literature regarding probiotics in adults with gastroenteritis is inconclusive at this time, but it should be stated that no studies have found any increased risk of complications with the use of probiotics.

There is some evidence to suggest that probiotics aid in *Helicobacter pylori* clearance when used in combination with triple or quadruple therapy. For other causes of gastritis, the data is unclear. There have been innumerable animal and in vitro studies suggesting a benefit in gastritis, but the studies in humans so far have focused on *H. pylori*.

Hepatic Encephalopathy

Patients with hepatic encephalopathy (HE) are traditionally given rifaximin and lactulose therapy. Rifaximin works by destroying gut bacteria that produce ammonia, which is thought to be the

cause of HE. Following this theory, probiotic use would be implicated as a potential benefit. Not surprisingly, several studies have shown that probiotics compared to placebo (with or without lactulose) improve symptom resolution in HE. No studies have shown mortality benefit, however.⁸ In this, it would be reasonable to add probiotics to lactulose/rifaximin therapy in patients with HE.

Irritable Bowel Syndrome

Probiotics have overwhelmingly been shown to improve symptoms in functional bowel disorders. Specifically, they have been studied in the context of IBS in adults and chronic diarrhea in children.⁹ This is in line with what we now understand as an underlying pathophysiologic factor in IBS—small intestinal bacterial overgrowth (SIBO). Despite what you may have been taught, IBS is not purely psychosomatic or anxiety-driven; though these factors may still play a role in amplification of symptoms. Rifaximin has recently been approved for treating IBS with diarrhea, again supporting a mechanistic role for probiotics to address an underlying pathology of bacterial overgrowth. Treating these patients can sometimes be frustrating or disheartening because we have little to offer them and their condition is rarely emergent. Prescribing probiotics to this group of patients will likely improve their symptoms in the long run and allow you to offer something new, instead of simply discharging them with instructions to “stay well hydrated and try Imodium”.

Dose, Duration, Type

Unfortunately, the best dose, duration, and type of probiotics for the aforementioned conditions is not yet understood. There are 4 main classes of bacteria commonly found in probiotics:

1. *Lactobacillus/ Bifidobacterium* species (the most numerous gut flora)
2. *Saccharomyces boulardii*
3. *Bacillus* and other soil-based or spore-forming bacteria
4. *Escherichia coli*

An additional challenge is that probiotics are not as regulated as pharmaceuticals, meaning that the contents and amount within each dose can vary. In individual studies, there are

some suggestions about using different strains of bacteria for certain benefits, but no single strain has consistently demonstrated superiority.

Another constraint for inpatients receiving probiotics is the hospital's formulary. Most hospitals have few, if not only one probiotic selection available. With no data to support any particular bacteria, this can be simplified by default use of the probiotic your hospital has on formulary.

Regarding dosing, the highest dose available is safe if the patient can tolerate it. Most commercial brands have between 1-20 billion colony-forming units per capsule. The number of bacteria in the gut is estimated to be in the trillions, so even a “large” commercial dose (20 billion CFU) would have a small impact on the overall GI flora.

Safety

Probiotics are overwhelmingly safe. In the vast majority of studies with a placebo control, the control group had equal (and often more) adverse events than the probiotic group. Occasionally, certain strains are ineffective in relieving a patient's diarrheal symptoms. In that case, switching to another strain is often successful. There have been a few isolated case reports of bacteremia from probiotics, but these occurred exclusively in either severely immunocompromised patients or those with a known defect to the GI mucosa. While exceedingly rare in practice, this minimal risk can be mitigated by withholding probiotics in severely immunocompromised patients, such as those actively undergoing chemotherapy induction.

Conclusion

Probiotics are no longer a pseudoscience or “alternative” practice. They should be part of every physician's armamentarium. One evidence-based practice that you can start tomorrow is to prescribe probiotics with every antibiotic script that you write for a patient at risk for antibiotic-associated diarrhea. In addition, there are several conditions that we see often in the ED that may benefit and are unlikely to be harmed from probiotic administration: gastroenteritis, peptic ulcer disease, hepatic encephalopathy, and IBS. ★

HEMOLYTIC ANEMIA

from Combined Use of Dapsone and Hydrochlorothiazide

Editor's note: This article is adapted from the author's poster presentation at EMRA Case-Con 2018.

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Fatigue and generalized weakness are commonly encountered complaints in the emergency department.¹ The workup of these patients is often challenging because of the broad range of possible etiologies. Fatigue and generalized weakness are hence classified as “non-specific symptoms” since the differentials range over 14 ICD-10 categories.² Amidst the patients who present to the ED with nonspecific complaints, 60% tend to have a serious outcome within the next 30 days³ and have significantly higher mortality than the patients who present with specific complaints.⁴ ED guidelines on the approach to patients who present with nonspecific complaints are not very well established. In 56% of patients who present to the ED with nonspecific complaints, the primary ED diagnosis did not correlate with the discharge diagnosis.⁵

This case report describes the case of a 56-year-old woman with a medical history significant for Type 2 diabetes, hyperlipidemia, hypertension, and linear IgA bullous dermatosis, who presented with a 6-day history of fatigue and generalized weakness. Upon investigation, this fatigue was attributed to drug-induced hemolysis, with an underlying drug interaction between dapsone and hydrochlorothiazide potentiating the adverse effect. This case study highlights the need to investigate patients who present with non-specific complaints with a potentially life-threatening cause in mind.



Case Presentation

A 56-year-old female presented to the ED complaining of worsening fatigue and weakness for 6 days. She denied any flank pain, fevers, runny nose, chills, headaches, abdominal pain, changes in bowel movements, melena, or urinary complaints such as hematuria or dysuria. There was no history of recent travel, exposure to sick contacts, or trauma.

Her past medical history was significant for Type 2 diabetes, hyperlipidemia, hypertension, and linear IgA bullous dermatosis. The patient was previously on lisinopril for

hypertension, however 3 months prior the patient started to notice a diffuse rash with vesicles on her body for which she consulted a dermatologist. She was deemed to have an allergy to lisinopril, which was discontinued. She was started on prednisone of an unrecalled dose, which was subsequently stopped when the rash subsided. However, the rash came back a few weeks later, and a biopsy confirmed the diagnosis of linear IgA bullous dermatosis. The patient was started on dapsone 25 mg QD, and her G6PD workup was negative. She has been following up with her dermatologist for weekly blood counts.

One week prior to the ED visit, the patient's dapsone dose was increased to 100 mg QD, her hemoglobin was documented at 11.4 g/dL, and she was started on hydrochlorothiazide for hypertension.

Physical examination showed a pale-appearing female. Vital signs were stable except for an elevated blood pressure of 145/77 mmHg. She had significant conjunctival pallor and icterus without any edema. The rest of the physical examination findings were within normal limits.

Fingerstick glucose on admission to the ED was 458 mg/dL without an elevated anion gap or beta-hydroxybutyrate. She was started on 1 L of normal saline over 1 hour and was given 8 units of insulin. Repeat blood glucose level after 90 minutes was 167 mg/dL. Blood was obtained and showed a complete blood count remarkable for anemia at 7.2 g/dL with reticulocytosis. Total bilirubin levels were elevated at 4.2 mg/dL with predominantly unconjugated hyperbilirubinemia. Elevated LDH levels of 773 U/L were present. Urine analysis showed a moderate hematuria and the presence of urobilinogen. The fecal occult blood test was negative. Chest X-ray was normal and CT abdomen didn't show any bleeding. Two units of packed cells were transfused while in the ED.

The patient was diagnosed with hemolytic anemia, which was thought to be precipitated by dapsone and hydrochlorothiazide. The offending medications were stopped, and the patient was admitted to the medical service. Hemoglobin level gradually improved, and the patient reported clinical improvement on discharge.

Discussion

This is a case of a middle-aged female who presented with complaints of generalized weakness and fatigue. There are no established guidelines on how to approach a patient presenting with non-specific complaints such as fatigue. Infectious, metabolic, and oncologic processes — many with poor outcomes — are often associated with this presentation.⁶ Because of this, we

recommend a wide diagnostic approach in these patients. Obtaining a detailed history, specifically looking for inciting events that precipitated the condition, can provide useful diagnostic clues. A detailed review of the patient's medications is essential for a complete history.

Elderly patients who visit the ED are taking an average of 4.2 different kinds of medications per day, and adverse drug reactions contribute to 10.6% of their ED visits.⁷ A detailed physical examination can often unmask important clues to the diagnosis. Neurological causes of weakness have to be evaluated quickly since the management of these conditions is often time sensitive. In this patient, the review of medications revealed that the patient was prescribed dapsone and hydrochlorothiazide, and physical examination showed the presence of anemia.

The primary step in the approach to any patient presenting with anemia is to determine whether it is acute or chronic.⁸ Our patient had a 4 mg/dL reduction in her hemoglobin levels over a period of 1 week, which was highly concerning for acute blood loss. Blood loss is the most common cause of clinically significant anemia;⁹ however, the patient didn't report any hematemesis, melena, hematochezia, hematuria, vaginal bleeding, or any cutaneous bleeding episodes. The stool was negative for the presence of occult blood. She had elevated reticulocyte count, serum lactate dehydrogenase levels, and an unconjugated hyperbilirubinemia with preserved RBC morphology, which was suggestive of acute hemolytic anemia. Review of medications revealed her use of dapsone and hydrochlorothiazide which pointed us towards the diagnosis of drug-induced hemolytic anemia as a probable cause of her symptoms. However, confirmation of this is beyond the scope of the ED.

The management of anemia in the ED primarily focuses on determining the immediately correctable causes and determining the need for blood transfusion. The threshold to initiate

blood transfusion in individuals with asymptomatic anemia is less clear.^{8,10} Hemoglobin levels less than 7 g/dL is commonly used as the threshold to initiate blood transfusions¹¹ and in patients with an acute drop in hemoglobin levels or in individuals with symptomatic anemia, the clinician can initiate transfusions at much higher levels.¹² In a patient who is not actively bleeding, each unit of transfused RBCs increases the hemoglobin levels by about 1g/dL¹³ and this effect can be observed in patients as early as 15 minutes after the completion of the transfusion.¹⁴

Dapsone has long been known to cause hemolytic anemia, especially in people with G6PD deficiency; it causes a drop in hemoglobin levels up to 3 g/dL in up to 16% of the patients who receive a standard dose.¹⁵ This effect has been attributed to the generation of free radicals and protein mixed disulfides in red blood cells.¹⁶ Dapsone has been recommended for the treatment of leprosy, dermatitis herpetiformis, brown recluse spider bite, and linear IgA bullous dermatosis.¹⁷ Testing the patient for G6PD enzyme deficiency has been recommended prior to initiating dapsone, along with periodic monitoring of hemoglobin levels.¹⁷ Hydrochlorothiazide causes anemia by the mechanism of immune hemolytic anemia.¹⁸ There haven't been any reported cases of hemolytic anemia resulting from the combined use of dapsone and hydrochlorothiazide to the author's knowledge. Since the mechanism of hemolysis is different in both dapsone and hydrochlorothiazide, the combined use of these medications may result in a much higher drop in hemoglobin levels than if they were used alone.

This case emphasizes the need to approach the patients with non-specific complaints presenting to the emergency department with broad and potentially life-threatening outcomes in mind. This is also the first reported case of a combined effect of hemolytic anemia in a patient without G6PD enzyme deficiency taking dapsone and hydrochlorothiazide. *

Responding to the Demand *EM Residency Programs and Global Health Experiences*

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Global Health has become a growing field of interest among recent medical students and medical residents. A 2011 study showed that as many as 60% of medical school graduates used “global health experiences” as criteria for their residency ranking decisions.^{1,2} Emergency medicine in particular has drawn substantial interest from “globally minded” future physicians. It has been reported that 68% of EM residency applicants with prior global health experience ranked residency programs with global health opportunities higher.³ Furthermore, up to 86% of EM residents reported that they would like to participate in an international rotation during residency;⁴ however, there is often inadequate guidance and support from most accredited organizations, hospital systems, and residency programs.⁴

Although the majority of residency programs offer elective opportunities, few provide the foundation for formal global health experiences. With that said, one can clearly see that programs with established global health experiences or tracks will likely be more attractive to graduating medical students, thus more competitive in the match.



Why Focus on Global Health?

The benefits of international clinical rotations for a physician’s development have long been recognized. These include improved physical exam skills, broader medical knowledge, and improved procedural competency.⁵ By providing care to underserved populations around the world, residents are exposed to the challenges of practicing medicine in the face of language barriers, cultural differences, and scarcity of resources.

In addition to the individual physician’s development, the knowledge and skills acquired abroad can also help our future leaders meet the current needs of the U.S. health care system, which is seeing a continual rise in the number of immigrants.⁶ Health care providers who are accustomed to working in resource-limited

environments have been shown to order fewer tests and feel more comfortable in their clinical judgment.⁷ This is not only crucial for meeting the ever-changing demands of our country’s health care system now, but also in building for the future.

Global populations bring an understanding of regional disease processes. Global health experiences broaden knowledge through exposure to different diseases and to advanced stages of diseases that may be treated earlier in developed nations. During one recent experience in Peru, a first-time seizure led to a diagnosis of neurocysticercosis — and to an important understanding that 50% of first-time seizures in patients from endemic regions are attributed to neurocysticercosis.⁸ With the transient nature of the global population, we

must be prepared to diagnose illnesses that have previously been limited to developing countries and provide culturally sensitive care to a global population.

Data suggests that roughly 74% of trainees who participate in a global health course or elective and have experience caring for patients internationally are drawn to working in underserved and multicultural communities.⁹ This is becoming increasingly important because with more than 300 million border crossings per year in the United States alone, knowledge of tropical medicine, parasitology, and epidemiology will be paramount to the early detection of communicable and non-communicable diseases here at home.⁷ Residents with prior global health experiences are better equipped to serve patients of the U.S. and the world.⁴ We need robust global health programs in our residencies now to prepare the next generation of doctors for the global population they will treat.

The importance of global health experiences is underscored for many of us in the modern EM residency program. For instance, University Hospital in San Antonio, Texas, serves a global population. The ED patient population arises from a community of 100+ different national citizenships, with patients from more than 130 different countries in any given calendar year.

Texas is one of the top states for refugee settlement, with San Antonio being one of the largest resettlement cities within Texas. Students, residents, and faculty have the opportunity to volunteer at the San Antonio Refugee Health Clinic, a multi-disciplinary clinic that provides free care to refugees who have relocated to San Antonio. The global health curriculum at UT Health focuses on health issues that transcend national boundaries with a focus on social and economic determinants of population health.

Global Health: Training for the Future

Health care is not one-size-fits-all, and the future of medicine must take into account all aspects of a person's life — not simply their physical well-being. Global health rotations offer unique training in this regard.

As an outsider unfamiliar with local customs — and possibly not fluent in the language — you must work harder to build trust and respect. You must go an extra step to understand the factors influencing your patient's decision and ability to seek or continue medical care. Treatment plans typically offered in the U.S. may not be a good option elsewhere, for a number of reasons.

During a global health rotation, physicians are able to take a step back and find a sustainable solution, one that does not require a complete transformation of lifestyle or abandonment of important cultural practices. This is a crucial skill as medicine moves forward, at home and abroad. ★



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“Firefighter down!”

Sudden Cardiac Events and Risk Mitigation for Emergency First Responders

Editor's note: This article is adapted from the author's poster presentation at EMRA Case-Con 2018.

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Sudden cardiac events (SCEs) are responsible for nearly half of firefighter line-of-duty deaths and represent a significant risk for morbidity in the occupation. Many firefighters exhibit risk factors with concomitant elevated morbidity and mortality rates. Stations must implement evidence-based medicine in regular practice to prevent SCEs.¹⁻⁷

The purpose of this case study is to bring attention to the issue of sudden cardiac events. It is also vital to seek solutions that can be readily implemented in station protocols, for both voluntary and paid professional staff.

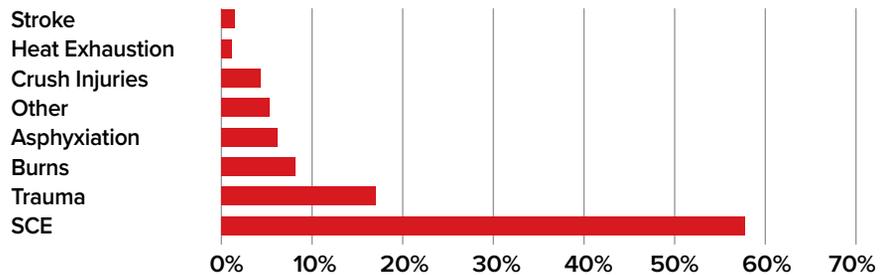
Case Description

A 62-year-old male volunteer firefighter was completing a medical call when he complained of rapidly elevating pressure in his head. He collapsed on the scene. His partner immediately performed CPR, defibrillated the patient twice, and activated emergency medical services. Upon hearing “Firefighter down!” broadcast on the emergency channel, paramedics returned to the scene to assist with the resuscitation. The patient was determined to be in full cardiac arrest and without vitals for approximately 6 minutes.

The patient was stabilized and transported to a trauma center. His troponins were elevated, and ECG demonstrated ST elevations in the anterior leads. He underwent a double coronary artery bypass graft (CABG) procedure on the left anterior descending artery. The remainder of his hospital course was unremarkable.

The patient was able to return to limited duty after 3 weeks of

FIGURE 1. Firefighter Line of Duty Deaths



rehabilitation. He was at full-duty status after an additional 2 months of recuperation. The firefighter's successful resuscitation was directly attributed to the first responders' rapid actions — particularly his partner's extraordinary reaction in her first “Doctor 100” call.

Discussion

SCEs are the most common causes of firefighter line-of-duty deaths. For every firefighter death from SCEs, 17 additional firefighters survive cardiovascular events. Most incidents occur while responding to calls or within 24 hours afterward, and SCEs are associated with exertion 98% of the time. Poor diet, lack of conditioning, and age are significant risk factors.

Additionally, up to 88% of firefighters are obese, leading to increased risk of metabolic syndrome and SCEs.¹⁻⁴

Key recommendations were developed to reduce morbidity and mortality from SCEs. These include:⁴⁻⁶

1. Provide annual medical examinations consistent with the National Fire Protection Association (NFPA) 1582⁷ guidelines and be cleared for duty.
2. Mandate regular participation in fitness programs tailored to FFs.
3. Educate stations on preparing healthful meals.
4. Monitor FFs during and up to 24 hours post-event.

Clinical Significance

SCEs account for a major cause of morbidity and mortality among firefighters. Nearly half of all LOD deaths have been from SCEs, with the average occurring at 45 years of age.⁸ As a comparison, the average age of sudden cardiac death in the U.S. is 65.6 years for males and 72.0 years for females.⁹ It is therefore essential for each station to implement preventive, evidence-based medical measures. By taking recommended precautions, risk of SCEs can be significantly mitigated.¹⁻⁷

While the Florida Heart and Lung Bill (Statute 112.18)¹⁰ provides worker's compensation benefits for death or disability from SCEs that are thought to be incurred in the line of duty, risk mitigation is a preferable route, particularly for preventable causes. Emergency medical service directors can have a profound impact by implementing the steps outlined above as part of their occupational health duties to ensure the firefighters under their superintendence experience fewer SCEs.¹¹

Acknowledgements

Special thanks to the Putnam County, Florida, Volunteer Fire Departments for their assistance in this case report. ★

EM Podcasting Advice

FROM ANDY LITTLE, DO



Will Hockett

Tate Higgins

Oregon Health & Science

University Medical School

Producers of *EMIGCast*, a EM podcast for medical students by medical students.

With limited time to sit and read, the majority of EM residents tune in to medical podcasts, so what started as hobbyists home-brewing episodes has grown into high-quality content produced by EM podcasters all over the country. Helping to lead the way is Andy Little, DO, who has been podcasting for nearly 3 years as one of the hosts of *EM Over Easy*. He is also an advisor to *EMRA•Cast*, helping to train the next round of EM podcasters. We caught up with Dr. Little to understand his podcast process and pick up some lessons for other EM podcasters hoping to take their garage project to a bigger stage.

Stoke Factor

You gotta do it because you love it. The motivation for making a good podcast isn't about numbers or dollars, but about the spirit of sharing the good conversations and the learning that happens when busy, professional, high-achieving friends take the time to sit down and catch up with each other. While it's not a source of massive revenue, the podcast *has* opened some cool opportunities: This year Dr. Little will travel to Santiago, Chile, and New Delhi, India, as a speaker.

Content

EM Over Easy — with Dr. Little, Tanner Gronowski, DO, and Drew Kalnow, DO, EMT-P, records 3-4 episodes per month and publishes 1-2 per month, so content is constantly in production. But an idea can take 6 months to develop, yet still not be worth publishing, which can be frustrating.

"Know that you're gonna fail a lot, and accept that," Dr. Little advises. Even the episodes that make it into publication won't all be well-received, but popularity can change over time as listeners go back to previous episodes.

His podcast started as a monthly breakfast club to check in with friends. This evolved into talking about the "non-clinical aspects of EM, the bad news, the angry patients, the crazy shifts." The podcast is still recorded in the original format at a dinner table.

Dr. Little keeps a running list of topics and finds a synergy from material outside of medicine. One recent episode on behavioral expectations was inspired by a sports blog. In another episode recorded during an Ohio ACEP conference, *EM Over Easy* spoke with physician leaders regarding Ohio's "I'm Sorry" law, affording liability protection when a health care provider tries to express sympathy or condolences in the wake of a bad outcome. That podcast led to a later interview with a state representative and a call to action that could potentially impact future law.

Technical Tips

You don't need to break the bank, but don't spend less than \$50 on a mic — garbage in equals garbage out, which will result in more time spent in post-production. Dr. Little recommends a dynamic mic as opposed to a condenser. The dynamic mic will be more focused than a condenser, which tends to record unwanted extra sounds (from air vents to pops from your lips and tongue). These might not be noticeable when you're recording, but put in a pair of earbuds and these distractions can make an otherwise great episode unlistenable. For gear, he's currently using an Audio Technica 2005 XLR Mic with stand and shock mounts. Other podcast favorites include the Blue Yeti or Snowball Mics. Finally, you can improve your recording with a recorder called the Zoom H5, which allows for multiple tracks. If your computer still has a firewire port, an inexpensive option is finding a used Apogee Duet online.

Post-Production

To edit out the inevitable background noises, control volume, or delete long pauses and loud coughs you'll spend a

tremendous amount of your time in post-production. Initially it took Dr. Little about 5 minutes of editing for every 1 minute of published audio. "You get good at reading audio waves," he said, "just like EKGs."

With experience will come more efficiency, and currently, it takes Dr. Little about 45 minutes to edit a 30-minute episode. For software, most Mac users can start with Garageband because it's easy and free. Other popular options include Audacity or Hindenburg, which allows multiple people to edit the same episode.

Building a Following

You can't just produce content and expect it to be heard. "If you're going to start a podcast, then you need to be all-in for social media," Dr. Little advises. "Twitter, Instagram, Facebook, etc., need to be leveraged to your benefit."

More than half of *EM Over Easy*'s listeners come from these platforms, so if you're not big on social media then you should partner with somebody who is. In addition, don't forget traditional avenues like emailing friends and colleagues, linking to your podcast during presentations, and recording live episodes at conferences to generate unique content and interest.

EMRA is championing the cause of nurturing EM podcasters with the inaugural 5-member class of EMRA podcasting fellows and the rejuvenation of *EMRA•Cast*. These fellows are completing a yearlong curriculum designed to teach the best methods, from unboxing the microphone to publishing polished dynamic content and getting it heard.

If you want to get started making a podcast, Dr. Little recommends that you "do something you know about, and do something you can."

"*EM Over Easy* is a subset of my persona and how I view the world as a provider," he said. It's also a reminder to us all of the power and the importance of sitting down around a table and swapping stories with friends on a regular basis. ★

Resilience: The Art of Picking Yourself Up After a Fall

Jeffrey Gardecki, DO

Rowan University SOM/Jefferson Health

Emergency physicians face death nearly every shift. Fortunately, you can often determine this when you first set eyes on the patient. The real pain is felt when your senses fail you — when the person who walks in, never leaves.

On a routine shift, toward the end of my PGY-2 year, I went to see a woman in her early 40s with the vague triage complaint of decreased appetite. I met a pleasant but apprehensive woman who relayed to me a history of swelling in her ankles and decreased appetite over the preceding few weeks. She had no prior medical history but had not seen a doctor in many years. She said she drank at least 8 alcoholic beverages a day for at least the past 10 years. She was frankly jaundice which she said was also new over this period. She was hypotensive with a systolic pressure in the lower 80s, but appeared well perfused, in no distress, and was mentating appropriately. I initiated a rather extensive workup with concern for a multitude of insidious life threats given her appearance.

I walked out of her room and my attention was directed to the care of other patients in the department. Some time later I heard an overhead announcement of code blue to CT. My heart sank as I looked over and saw my patient was no longer in her bed.

I knew it was her.

By the time I got to the scanner, my attending was intubating the patient without sedation or paralytics. I checked for her femoral pulse before quickly jumping on her chest and starting compressions on the CT gantry.

What made this experience so distressing was that she was able to walk in with her complaints. She was able to ambulate to the bed, sit down, and converse with me as if it was any other day. Although she looked to be chronically ill, I could never have imagined the events would proceed as rapidly as they did.

When the code was finally called, I could not overcome the sense of shock I felt. Emotionally barren and raw, I completed my charts for the patients I had seen that shift and documented as clearly as I could the events that transpired in her care. What did I do wrong? How had I taken this woman who was walking and talking and rendered her to a state in which she was intubated in the CT scanner?

After a great deal of time, soul searching, and personal reflection I have reached a state of solace in the knowledge that I might never fully understand the steps that precipitated the patient's unfortunate demise. An analogy my attending told me at the time did not bring

me comfort immediately, but has provided me valuable insight in the months following the event. **We see patients routinely who present to us on the sharpest edge, teetering between a multitude of factors pushing them toward a state of disequilibrium and rapid decompensation.**

Patients seem to inherently know when the margins become razor-thin and will come to us before their own reserves are exhausted by the pathophysiologic process behind their chief complaint.

One of the most important lessons I learned from this experience is accepting the unacceptable. **It is not possible to save every life, every limb, every loved one who has experienced a catastrophic event.**

I will work to make myself the best physician I can be. Read, listen, observe, and do all I can to increase my knowledge and experience. However, the time will come when acceptance and humility is the medicine for the malady that plagues me on my way home and into the start of the next shift. I must accept that I am human, I cannot save everyone, and that patients under my care may die. Resilience is taking the next step after you fall, getting back to your feet when you are afraid to stand, and remembering how to run. ★



Cure Sometimes, Comfort Always

Castrenze Fricano
University of Minnesota
@castrenzefricano

I had a very unique experience in medical school where I was able to complete an entire year of clerkships at a rural hospital as the only medical student without residents — a tremendous opportunity to learn. Very shortly after arriving at my site I was given a pager. I was placed on the call list for all cardiac arrests, trauma activations, and rapid medical responses. This turned out to be very good for my education as I was paged quite frequently. I was able to participate in multiple cases where high-level, aggressive critical care was needed. I recall one time being paged for a cardiac arrest in the ED. Normally I would participate in providing direct patient care; however, this time it was different.

As I walked into the ED, I headed toward the resuscitation room. On my way I passed a crying woman. I arrived to find a middle-aged man in cardiac arrest. A team of nurses and doctors were assembled, working on him vigorously. My first instinct was to grab a set of gloves and assist in the resuscitation. In this room the gloves are in the corner, and with everything that was going on it was just easier to go outside the room and grab

them from a cart. As I did that, I saw the same crying woman again. I reached for a pair of gloves and turned back to go join the resuscitation team.

But then I stopped.

I'm not exactly sure why I paused. I was there solely to learn medicine, and certainly what was happening in the room — however unfortunate — was an excellent learning opportunity. Yet instead of going in the room, I turned to the crying woman.

She was the patient's wife. She had brought him into the hospital because he had been feeling ill all day. He was being admitted to the hospital, and the hospitalist had just completed performing a physical exam when he went to cardiac arrest.

Since that time everyone had been so focused on helping her husband no one had a chance to talk with her. I can't imagine what she felt.

Part of me wanted to go in the room to participate in the resuscitation, but instead I stayed with her. For some reason I felt that was more important at the time. I think I figured I had been part of many cases of cardiac arrest, and there were so many people in the room her husband was well-cared-for without me.

I knew I could have a greater impact if I stayed with her.

She couldn't stop crying. We were standing outside the resuscitation room, but we could see everything that was happening. For the uninitiated I imagine what she saw seemed barbaric, the things we do to "help" people.

I proposed we find a seat somewhere so I could explain what the team was doing — but also because she seemed so distraught. I thought it best to spare her from the sight of the ongoing resuscitation of her dying husband.

She kept saying over and over again something about her children and how would she tell them. She sometimes would plead with God to save her husband.

At first, I tried explaining everything in very clinical terms. She just kept crying.

At some point I remember stopping and just saying how sorry I was. I was sitting next to her on a hospital bed. She couldn't see my face, but I had started to cry as well. I sat with her, my arm around her shoulders, as they worked to save her husband's life.

It was about 10 minutes later when they were able to get a pulse. She was so happy and so thankful. In my mind I knew her husband's prognosis was grim. He had been in cardiac arrest for a rather long time, and though he had "survived" his cardiac arrest, the ultimate outcome was likely not pleasant. I did not share this with her. Maybe this was the best outcome in a sense, as now she would have more time to process it all.

She thanked me just before she and her husband left on an ambulance to a larger hospital that offered a higher level of care. I wished them both well.

This was one of the hardest days in my medical career so far. The experience remains etched in my brain. My takeaway is that I have so much more to offer than my medical knowledge or clinical skills. **Sometimes just being there — to talk to, to comfort, to alleviate suffering — might be what's most important and needed.** ★



Sometimes just being there — to talk to, to comfort, to alleviate suffering — might be what's most important and needed.

EMRA 2019 Awards Recipients

Spring Announcement

We are proud to offer more than \$100,000 in awards, scholarships, and grants every year — recognizing outstanding work and helping to foster excellence among clinicians, educators, and leaders in emergency medicine. Please congratulate the EMRA 2019 Spring Awards recipients, who will be recognized in-person at ACEP19 in Denver.

MERIT AWARDS

Academic Excellence Award: Hani Kuttab, MD, University of Chicago

Alexandra Greene Medical Student Award: Michael Messina, Ohio University COM

Chief Resident(s) of the Year:

Ohio State Chief Residents

Katherine Buck, MD
Carolyn Martinez, MD
Krystin Miller, MD
Caitlin Rublee, MD, MPH

Fellow of the Year: Nida F. Degesys, MD, Stanford University

Resident of the Year: Kelly Wong, MD, Brown University

Jean Hollister EMS Award: Benjamin Nicholson, MD, Boston Medical Center

Rosh Review “One Step Further” Award: Aubri Carman, MD, Maricopa Medical Center

Robert Doherty, MD, ACEP EMF Teaching Fellowship: Aalap Shah, MD, Medical University of South Carolina

FACULTY AWARDS

Residency Director of the Year:

Charlotte Wills, MD, Alameda Health System — Highland Hospital

Associate Residency Director of the Year:

Abra Fant, MD, FACEP, Northwestern University

Residency Coordinator of the Year:

Christy Angerhofer, Denver Health

GRANTS

Be the Change Grant:

Gregory Peters, Harvard Medical School

TRAVEL SCHOLARSHIPS

ACEP Scientific Assembly

Abraham Akbar, Baylor College of Medicine

Alexander Danaj, Texas Tech University Health Science Center-Lubbock

Taylor Docter, UCSD School of Medicine

Michael Gendreau, Arizona College of Osteopathic Medicine

Simon Ostrowski, University of Massachusetts Medical School

Vir Singh, MD, MBA, University of Central Florida-Ocala

Sriram Venkatesan, Sri Ramachandra University — India

Critical Care Medicine Conference

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EDDA

Allen Chang, MD, Stanford University Medical Center

Farah Z. Dadabhoy, Harvard Affiliated Emergency Medicine Residency

Elena DiMiceli, MD, NYU/Bellevue Medical Center

Sam Slade, DO, MBA, FAWM, Kingman Regional Medical Center

Ynhi Thomas, MD, Baylor College of Medicine

EDPMA

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Mahesh Polavarapu, MD, Christiana Care Health System

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FemInEM FIX19

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Kimberly Moulton, MD, Stanford University Medical Center

LAC

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Shelby Hoebee, University of Arizona
Courtney Hutchins, MD, University of Chicago

Valerie Pierre, MD, Brookdale University Medical Center

SAEM

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Hani Kuttab, MD, University of Chicago

Justine Seidenfeld, MD, Cook County/ Stroger Hospital

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TECC/Mercyhealth

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Corey McNeilly, MA, UT Health San Antonio

TEMS/Mercyhealth

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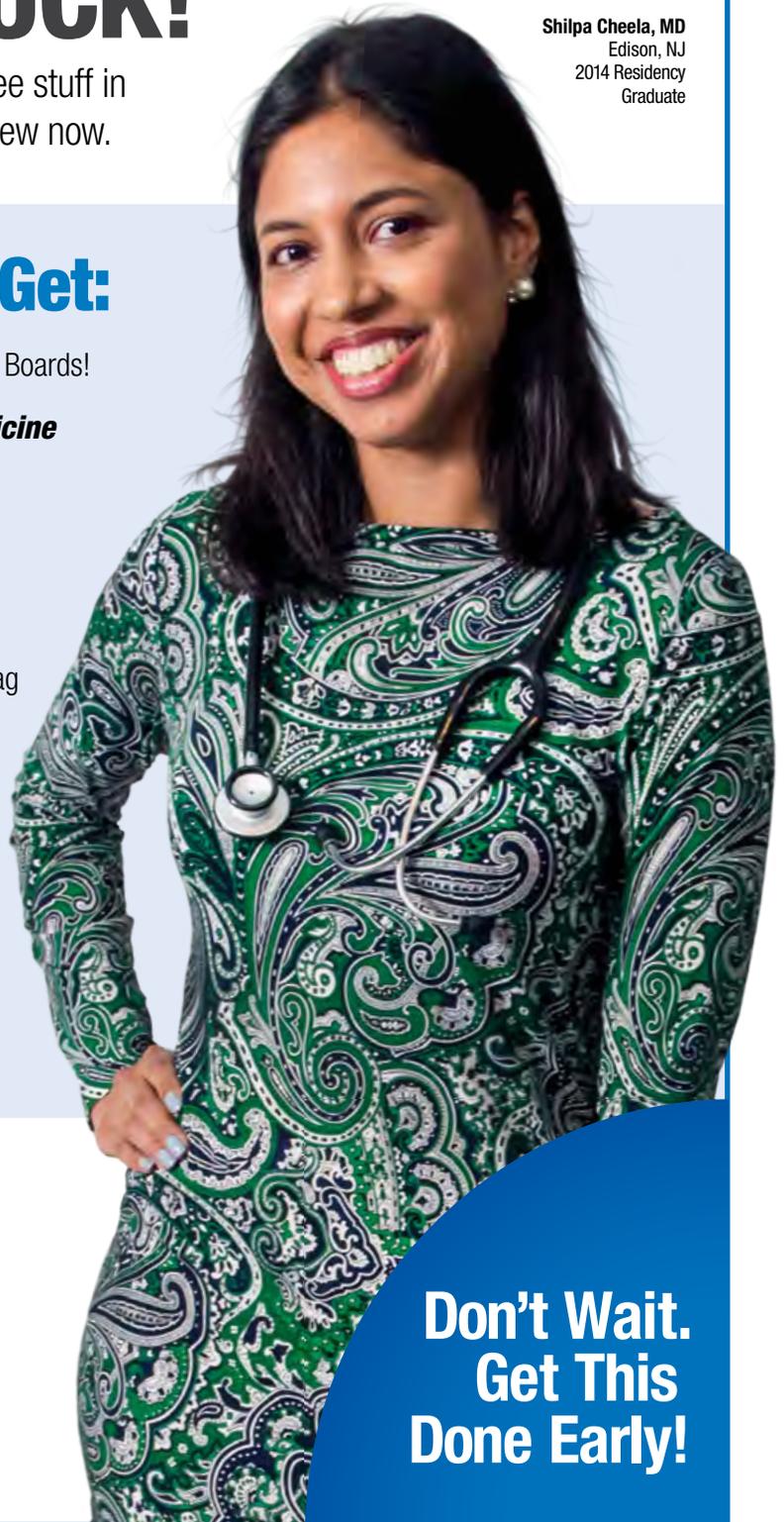
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Honoring the Inaugural Class of the EMRA Leadership Academy

The inaugural graduates of the EMRA Leadership Academy were honored this spring in a ceremony held during CORD Academic Assembly. These up-and-coming leaders participated in monthly educational sessions, year-long mentoring, and individual capstone projects designed to improve the specialty.

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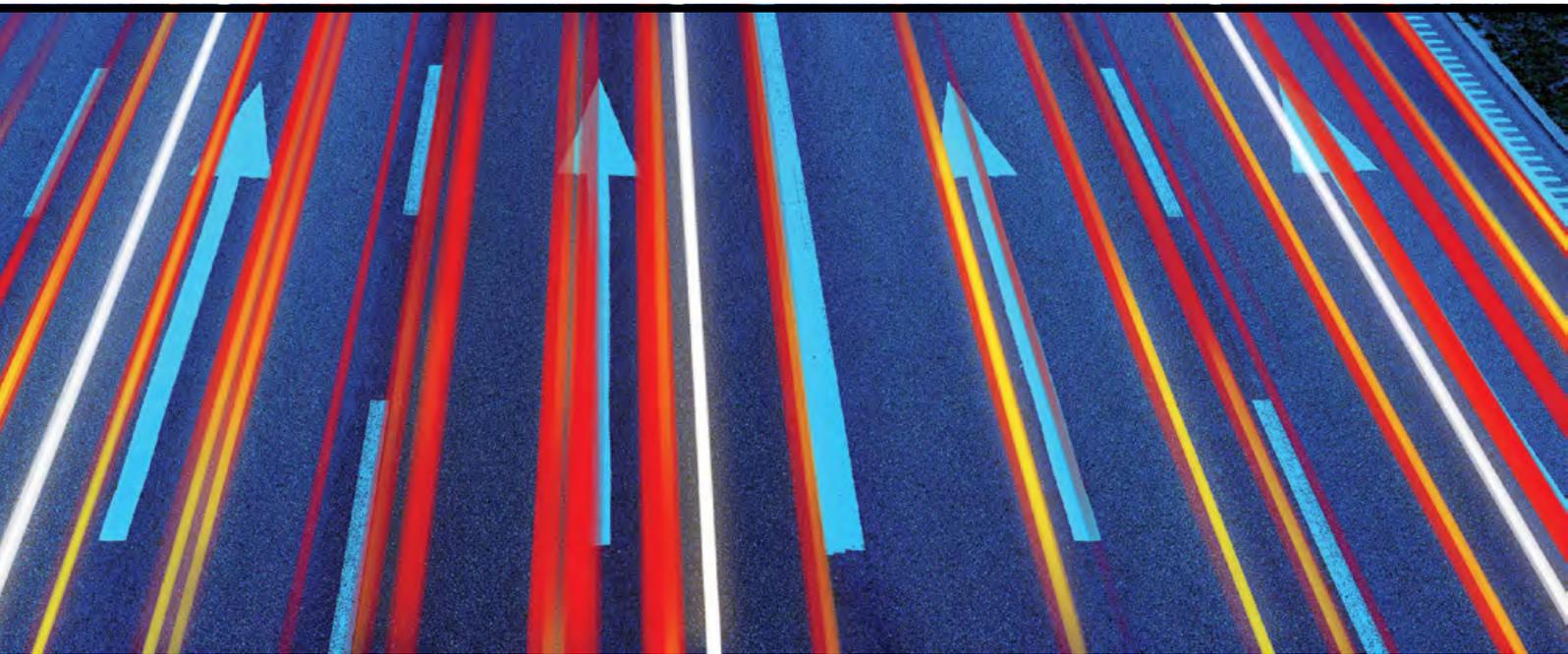
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Legislative: Ryan Koski-Vacirca, Wake Forest School of Medicine

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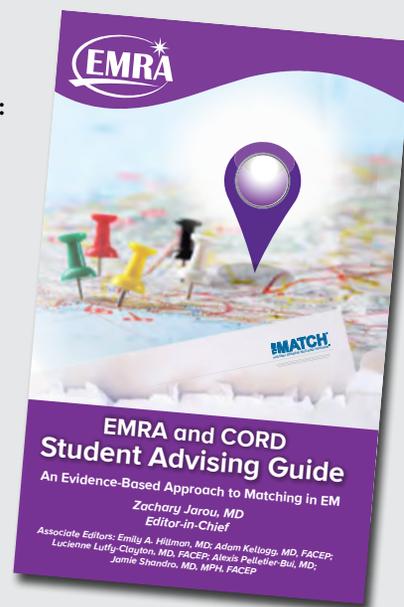
How to Match in EM: New Evidence

If any medical student has ever asked you for advice — or if you need advice yourself — then you must read the soon-to-be-released “EMRA and CORD Student Advising Guide: An Evidence-Based Approach to Matching in EM.”

This resource remakes EMRA’s Medical Student Survival Guide into a primer for matching into the specialty, based on current evidence. How many audition rotations should you do? How do you line up SLOEs? How many interviews do you really need in order to match? What factors actually matter most in the process? Get advice based on analyses of recent match results, current literature, and surveys completed by the decision-makers in the specialty.

Many thanks to all the chapter teams — a faculty member, resident, and student member each collaborated to produce these chapters. Special recognition goes to **editor-in-chief Zach Jarou, MD**, and the Student Advising Guide senior editorial team — **Emily Hillman, MD; Adam Kellogg, MD, FACEP; Lucienne Lutfy-Clayton, MD, FACEP; Alexis Pelletier-Bui, MD; and Jamie Shandro, MD, MPH, FACEP**. These six physicians, all members of the CORD Advising Students Committee in Emergency Medicine, dedicated the past 8 months to developing the Student Advising Guide, focusing on ways to mitigate the stress, anxiety, and expense of the match process.

The book will be included in EMRA student member kits and will be posted online. ★



2019 Recipients of ABEM 30-Year Certificates

Emergency medicine was recognized as the 23rd medical specialty in 1979, and the American Board of Emergency Medicine (ABEM) administered the first certification examinations in 1980. ABEM recognizes physicians who, as of December 31, 2018, have marked 30 years of being board certified in emergency medicine. Because board certification is a voluntary process, this landmark accomplishment reflects a dedication to the specialty, a commitment to continuous professional development, and the long-standing provision of compassionate, quality care to all patients.

To maintain certification for 30 years, ABEM-certified physicians must participate in a program of continuous professional development and learning in the specialty. The ABEM Maintenance of Certification Program consists of activities that assist certified physicians keep current with medical advances, provide opportunities for practice improvement, and encourage optimal interactions with patients. Physicians must also pass the ConCert Examination (a clinically focused, comprehensive examination) every 10 years.

ABEM salutes these physicians for their dedication to the specialty, their recognition of the value of board certification, and their commitment to caring for acutely ill and injured patients. ABEM-certified physicians are among the finest health care providers in the United States. Each of them exemplifies the ABEM mission, “To ensure the highest standards in the specialty of Emergency Medicine.”

A list of the 697 physicians who have reached this milestone is available at abem.org. ★

2019 Main Residency Match Breaks Records

The 2019 Main Residency Match is the largest in the history of the National Resident Matching Program.® A record-high 38,376 applicants submitted program choices for 35,185 positions, the most ever offered in the Match. The number of available first-year (PGY-1) positions rose to 32,194, an increase of 1,962 (6.5%) over 2018. The influx of positions is due, in part, to the increased numbers of osteopathic programs that joined the Main Residency Match as a result of the ongoing transition to a single accreditation system for graduate medical education programs.

The results of the Match are closely watched because they can be predictors of future physician workforce supply. There also is significant interest in the competitiveness of specialties, as measured by the percentage of positions filled overall and the percentage filled by senior students in U.S. allopathic medical schools.

Emergency medicine programs offered 2,488 first-year positions, 210 more than in 2018, and filled all but 30. The overall fill rate was 98.8%, and 65.0% were filled by U.S. allopathic seniors. Since 2015, the number of EM positions has increased by 667, or 36.6%, driven in part by AOA programs entering the NRMP Match. ★

Free Service Can Help with Moving

EMRA alumni member Arun Ganti, MD, MPH, FAWM, has devised a new service to help defray the cost of moving..

“The idea stems from my own experience moving for residency,” Dr. Ganti said. “I experienced the benefits of having a shared move firsthand, and I’m hoping to re-create this for others who are in the same situation.”

Called Backlode (backlode.com), the service is free and straightforward:

- Sign up at backlode.com by providing your email address, the cities you’re moving from/to, and the desired time frame for your move.
- Browse the Backlode database to look for users with whom you can share a move. (All email addresses will be kept private.)
- Contact a moving company of your choice and negotiate a rate. ★

Calling All Medical Students!

EMRA is launching a new event: the EMRA Spring Medical Student Forum will help reduce the stress and anxiety associated with matching in EM.

A panel of EM faculty and program directors will share advice on the many aspects of matching into the specialty. It's a must-attend event.

Saturday, May 4, Hyatt Regency Crystal City at Reagan National Airport, Washington, D.C. Registration: FREE for EMRA members – but spots are limited!

Held the day before the ACEP Leadership and Advocacy Conference, this event complements our longstanding Fall Forum. **EMRA Medical Student Forum attendance is free for EMRA members but attendance is limited!** Register at emra.org/be-involved/events-activities/medical-student-forum. ★

ABEM Drops CME Requirement

ABEM has removed the MOC requirement that physicians attest to completing an average of 25 CME credits every year. The American Board of Medical Specialties (the umbrella organization for specialty boards) approved this change for ABEM because LLSA activities are essentially CME activities for which CME credit can be claimed. Eliminating this MOC requirement is one more way that ABEM is working to lessen the burden for physicians while maintaining the value of certification. ★



UPCOMING EVENTS

April 28-May 1: EDPMA Solutions Summit, Scottsdale, AZ

May 4: EMRA Spring Medical Student Forum, Washington, D.C. area

May 4-7: ABEM Spring Oral Certification Exam, Chicago

May 5-8: ACEP Leadership & Advocacy Conference @ Grand Hyatt, Washington, DC

May 13-16: Essentials of EM @ The Cosmopolitan, Las Vegas

May 14-17: SAEM spring conference, Las Vegas

 **EMRA HANGOUTS**
First Thursday of every month

 **EMRA CAST** EMRA-Cast: Listen at your convenience

Nominate a Colleague for EMRA's 45 Under 45



As EMRA celebrates its 45th anniversary, we want to celebrate YOU — the young influencers who are shaping the future of Emergency Medicine by making a difference in your community, your hospital, and our field. Do you know a rock star who is making an impact — in big or small ways? Someone who is quietly — or boldly — shaping the future of our specialty?

Nominate them to be one of EMRA's 45 Under 45! This special recognition shines a light on the amazing work our members are doing. This fall, we will celebrate 45 superstars in emergency medicine under age 45.

The deadline to nominate yourself or someone else is July 15.

Visit emra.org/be-involved/awards/45under45 for criteria, additional information and the application! ★

Advocacy in Focus

As health policy heats up on topics ranging from reimbursement practices to firearm injury research, it's more important than ever for emergency physicians to understand and exercise their advocacy abilities.

Fortunately, EMRA can help.

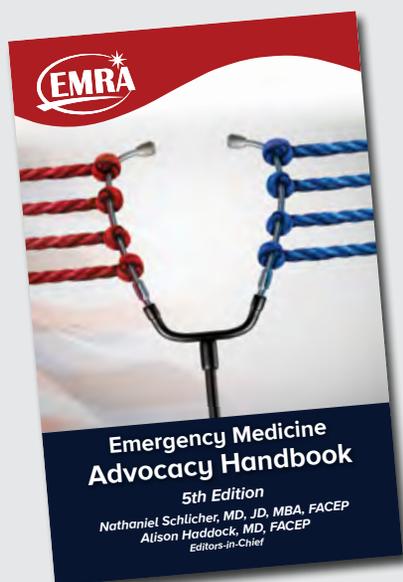
The “**Emergency Medicine Advocacy Handbook, 5th edition**,” will be released in conjunction with the ACEP Leadership & Advocacy Conference in May. This resource, which will also be posted as an audio book on emra.org, lays the foundation for advocacy knowledge in the specialty.

The book puts today's health care policy climate into context and offer insight on how the changing political landscape can affect emergency physicians and their patients.

Editors-in-chief **Nathan Schlicher, MD, JD, MBA, FACEP**, and **Alison Haddock, MD, FACEP**, along with associate editor **Rachel Solnick, MD, MSc**, led a team of more than 90 emergency physicians, residents, and medical students in developing this edition.

US Acute Care Solutions provided an educational grant to help fund the book because the importance of advocacy is paramount, according to L. Anthony Cirillo, MD, FACEP, the company's director of Clinical Health Policy & Legislative Advocacy.

“The impact of policymaking on the lives of physicians and our patients is difficult to overstate,” Dr. Cirillo said. “This is why US Acute Care Solutions' commitment to advocacy is so strong — because it is no exaggeration to say lives depend on it.” ★



45 EMRA years

established 1974

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

1974

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

1975

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

1982

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

1988

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

1994

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

2000

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

2005

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

2013

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

2016-PRESENT

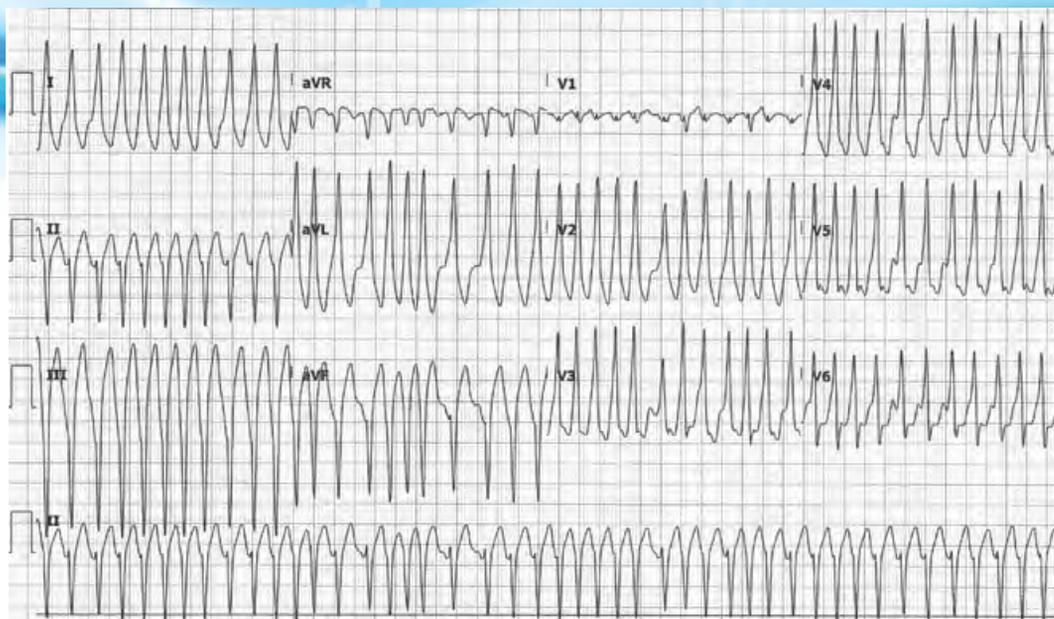
Multiple on-shift guides and publications are published including EMRA's *EM Fundamentals*, *EKG Guide*, and *EMRA and ACMT Medical Toxicology Guide*. Membership exceeds 15,000 and EMRA now funds 111 leadership positions.



ECG Challenge

Adam Quinn, MD
 Christiana Care Health System

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



CASE.

A 54-year-old male with a history of hypertension presents to the ED with palpitations.

What is your interpretation of his EKG?

See the ANSWER on page 44



THE *next* 50 YEARS

EMF funds game-changing research in vital areas such as traumatic brain injury, sepsis, the use of bedside ultrasound and protocols for TIA. EMF promotes research that supports effective health policy including ED crowding, and closures, as well as payment reform, alternate payment models and the ED's role in care coordination for Medicare beneficiaries. **We need your help to plan the next 50 years!**

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ECG Challenge

Answer

The EKG shows an irregularly irregular wide-complex tachycardia (WCT) with an average ventricular rate of 270, no obvious P-waves, and left axis deviation. The differential for a very fast irregularly irregular WCT without P-waves is very limited, especially in a patient who is talking and has a measurable blood pressure. The extremely fast ventricular rates, often up to 300 bpm, and presence of delta waves, best seen in aVL, seen on this EKG suggest the presence of an accessory pathway (AP), making AFib with Wolff-Parkinson-White syndrome (WPW) the most likely etiology. Unfortunately, there was no prior EKG for comparison.

The importance of identifying AFib with WPW, and not mistaking it for AFib with aberrant conduction, is due to the treatment. The mainstay of treatment for AFib with RVR (in the absence of an AP) is to slow conduction through the AV node with nodal blocking agents. The role of the AV node in normal cardiac physiology is to slow conduction between the atria and ventricle to maximize ventricular preload via the atrial kick. In AFib, the AV node prevents ventricular rates from exceeding 220-240 bpm in the absence of any extrinsic factors that increase conduction velocity (eg, catecholamine surge or hyperthyroidism). Conduction down the AP is usually faster than the AV node, so in AFib with WPW, the AV node acts as a brake that tempers the faster AP conduction. Nodal blockers don't work very well on the AP, so using them to treat AFib with WPW will allow for increased conduction down the AP that could potentially precipitate ventricular dysrhythmias. The safest treatments for AFib with WPW are procainamide (if the patient is stable) or cardioversion. Procainamide reduces conduction velocity throughout the entire cardiac conduction system, including the AP and ventricle, and inhibits ectopic atrial pacemaker activity. Amiodarone should not be used as it has nodal blocking properties and questionable efficacy on reducing conduction velocity through the AP. ★

LEARNING POINTS

Irregular Wide Complex Tachycardias

- Rate > 100 bpm, QRS > 120 ms, and variable RR interval
- DDx includes
 - Atrial fibrillation with aberrant conduction (BBB or WPW)
 - Atrial flutter with variable block and aberrant conduction
 - MAT with aberrant conduction
 - Polymorphic ventricular tachycardia
 - Ventricular fibrillation

Case Conclusion

The patient was immediately placed in a room and noted to be diaphoretic and ill-appearing. Initial vital signs showed tachycardia and tachypnea with a slightly elevated blood pressure. The decision was made to treat with cardioversion given his symptoms, clinical appearance, and extreme tachycardia. After successful cardioversion, his symptoms and clinical appearance improved significantly. A repeat ECG showed sinus tachycardia with a short PR interval and initial slurring of QRS (delta wave) consistent with WPW.

Labs were notable for an elevated troponin of 0.13, likely because of demand ischemia, and a low TSH with elevated free T4. During his hospital stay, he was evaluated by endocrinology and diagnosed with Graves' disease, which was thought to be the trigger of his new-onset AFib and likely contributed to the rapid ventricular rates seen on his initial EKG. He later underwent catheter ablation of his AP and was discharged home.

Atrial Fibrillation with WPW

GENERAL FEATURES

- Very fast, irregularly irregular tachycardia

EKG FEATURES

- Ventricular rate typically 180-300 bpm
- Variable QRS morphologies in any single lead

CLINICAL SIGNIFICANCE

- Often misdiagnosed as atrial fibrillation with aberrancy from BBB
- AV nodal blockers should be avoided- can precipitate ventricular fibrillation and cardiovascular collapse
- Procainamide and cardioversion are safe treatment options for AFib with WPW



For more details, please see pages 28 and 45 of the *EMRA EKG Guide*.

Board Review Questions



PEER (Physician's Evaluation and Educational Review in Emergency Medicine) is ACEP's gold standard in self-assessment and educational review.

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

Order PEER at acep.org/peer

1. A 73-year-old man presents with painless intermittent gross hematuria. He smokes cigarettes daily and uses ibuprofen frequently for back pain. Urinalysis reveals 3+ blood and 1+ protein with 30 RBCs/hpf and no WBCs on microscopic examination. Which of the following disposition plans is most appropriate?
 - A. CT scanning of the abdomen and pelvis followed by urgent urology follow-up
 - B. Manual irrigation of the bladder by catheter until the urine is clear and then admission
 - C. Reassurance and consideration of prostate hypertrophy therapy
 - D. Urine culture and empiric antibiotic coverage for *Escherichia coli*
2. Which of the following findings is most suggestive of myocarditis?
 - A. Disproportionate tachycardia
 - B. Fever with night sweats
 - C. Paroxysmal nocturnal dyspnea
 - D. Pleuritic chest pain
3. A 52-year-old man presents by ambulance with shortness of breath and hoarseness, following a fire in an industrial plant. Examination reveals a very hoarse voice, difficulty speaking, occasional audible stridor, and significant wheezing in all lung fields. Vital signs are BP 102/54, P 108, R 28, T 37.1°C (98.8°F); SpO₂ is 90% on room air. What is the next most appropriate step in the management of this patient?
 - A. Administer albuterol 5 mg by nebulizer
 - B. Administer decadron 10 mg IV
 - C. Initiate BiPAP
 - D. Perform immediate RSI
4. A 19-year-old man presents with his mouth open in a fixed position with his tongue protruding and his neck twisted to the side. He has had nausea, mild headache, vomiting, and diarrhea for 2 days, for which his primary care physician prescribed promethazine and loperamide. Vital signs are normal. What is the best next step in management?
 - A. Administer diphenhydramine
 - B. Administer tetanus immunoglobulin
 - C. Obtain a lateral soft tissue neck x-ray
 - D. Perform RSI
5. A 72-year-old woman presents by ambulance following cardiac arrest. She received good quality chest compressions for about 10 minutes in the field and 2 rounds of defibrillation before return of spontaneous circulation. Paramedics established a supraglottic airway and started bag-mask ventilation. Bilateral coarse breath sounds were noted. Vital signs on arrival include BP 105/62 and P 87; oxygen saturation is 94%. Several minutes later, BP is 85/67, P is 114, and oxygen saturation drops to 83%. The monitor shows sinus tachycardia. The respiratory therapist says the patient is becoming increasingly difficult to ventilate. Breath sounds are present on the left but severely diminished on the right. What other new findings might be expected?
 - A. Distended right atrium and ventricle on ultrasound
 - B. Jugular venous distention and subcutaneous emphysema on examination
 - C. Muffled heart sounds and an enlarged, globular cardiac silhouette on chest x-ray
 - D. Significant respiratory variation in diameter of the inferior vena cava on ultrasound ★

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



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



Emergency Medicine Residents' Association

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

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CALIFORNIA

Ventura: New hospital under construction and scheduled to open in the spring of 2018 with a state-of-the-art Emergency Department. Practice with a stable ER group on the central coast of California and only 70 miles from LAX. Positions available in two facilities for BC/BE emergency physician. Main facility is a STEMI Center, Stroke Center with on-call coverage of all specialties. This is a teaching facility with residents in Family Practice, Surgery, Orthopedics and Internal Medicine. Admitting hospital teams for Medicine and Pediatrics. 24-hour OB coverage in house and a well-established NICU. Annual volume is 48K patients with nearly 70 hours of coverage daily and 12 hours of PA/NP coverage. All shifts and providers have scribe services 24/7. Affiliated hospital is a smaller rural facility 20 minutes from Ventura in Ojai. Malpractice and tail coverage is provided. New hires will work days, nights, weekends and weekdays. Come work with a well-established high caliber group with expected volume growth potential at our new facility. Enjoy the life style of a beach community yet outside the hustle of the LA area. Please send a resume to Alex Kowblansky, MD, FACEP, at kowblansky@cox.net.

TEXAS



Leading Edge Medical Associates is a one-of-a-kind, private, independent group of all board-certified EM physicians in northeast Texas, offering a full range of clinical opportunities in EM. Our physicians enjoy shifts in a tertiary care trauma center as well as in nearby, lower volume clinical settings, all with high compensation and excellent full benefits. We are known for innovation in the industry and for developing strong EM leaders through LEMA's Leadership Development Institute. Almost half our physicians are former chief residents. LEMA is unique in its ability to offer physicians the best of both worlds, hospital-based and freestanding, academic and community medicine. LEMA is a group of exemplary physicians who work together as a team, value each member's input, and have a level of integrity, honesty, and trust that makes this innovative group truly one-of-a-kind. Interested in joining Texas's premier private group? Contact: SUZY MEEK, MD, CAREERS@LEMA-EM.COM.

WEST VIRGINIA

Huntington: Saint Mary's and VEP Healthcare are committed to high-quality care and patient satisfaction while providing physician support and high compensation. Saint Mary's Hospital in Huntington is a 393-bed acute care hospital. The emergency department cares for 57,000 patients annually and is equipped with 46 exam rooms with 3 trauma bays, and 4 psych beds. Offering 10-hour shifts using Sorian EMR system. VEP offers independent contractor status, paid malpractice +tail, stock ownership, flexible schedule, leadership training and development, and productivity-based compensation! Cindy Keller, (925) 482-8419, mkeller@vephealthcare.com, <http://www.vephealthcare.com>.

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Please contact Ashley Dowless, Corporate Director, Physician Recruitment
at 910-615-1888

or adowl@capefearvalley.com for additional information.



RUTGERS

New Jersey Medical School

Academic Emergency Physician

Rutgers New Jersey Medical School, Newark, NJ

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For more information or to submit a CV/cover letter please contact:

Lewis S. Nelson, MD

Chair, Department of Emergency Medicine

185 South Orange Avenue, MSB 609

Newark, NJ 07103

E-609

Email: Lewis.Nelson@njms.rutgers.edu

Rutgers University is an AA/EEO employer. All applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, citizenship, disability or protected veteran status.

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FOR ADDITIONAL INFORMATION PLEASE CONTACT:



Susan B. Promes, Professor and Chair, Department of Emergency Medicine c/o Heather Peffley,
Physician Recruiter, Penn State Health Milton S. Hershey Medical Center
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Ideal Emergency Medicine physician candidates are those boarded in emergency medicine or board eligible in emergency medicine working interested in an academic emergency medicine environment at CHOC Children's Hospital of Orange County.

Ideal Pediatric Emergency Medicine physician candidates are those boarded in pediatric emergency medicine or board eligible in pediatric emergency medicine working interested in an academic emergency medicine environment at CHOC Children's Hospital of Orange County.

CHOC Children's Hospital of Orange County is a newly opened ultramodern emergency department of 35 beds with Level II trauma center designation, rapid assessment and treatment area, fellowship and resident involvement. Additionally, all emergency physicians are supported with medical scribes and mid-level providers.

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Contact Information Contact EMSOC@emsoc.net for applications and additional information, or call 714-543-8911.

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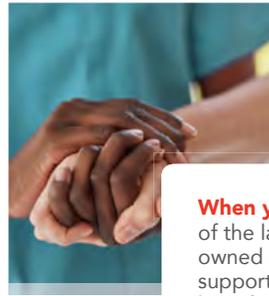
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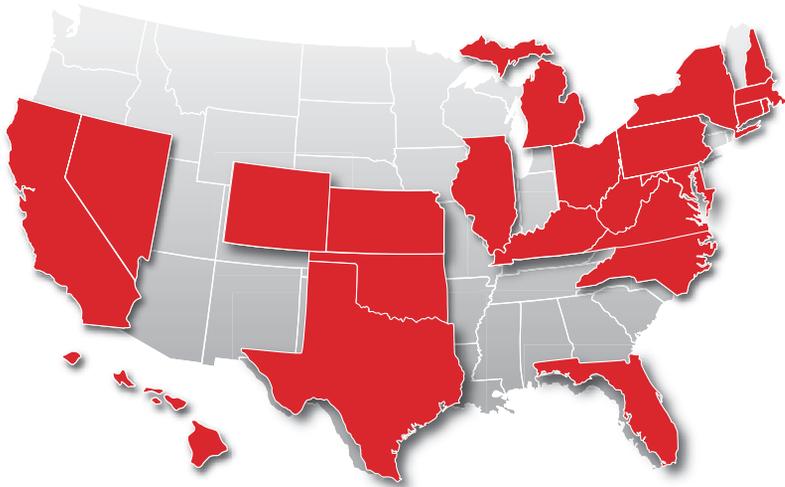
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72714C HR&E 02/17

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For more information, please contact David Parker at (828)879-8419 or by email at mountainep@msn.com.

Emergency Medicine & Toxicology Faculty

Rutgers Robert Wood Johnson Medical School

The Department of Emergency Medicine at Rutgers Robert Wood Johnson Medical School, one of the nation's leading comprehensive medical schools, is currently recruiting Emergency Physicians and Medical Toxicologists to join our growing academic faculty.

Robert Wood Johnson Medical School and its principal teaching affiliate, Robert Wood Johnson University Hospital, comprise New Jersey's premier academic medical center. A 580-bed, Level 1 Trauma Center and New Jersey's only Level 2 Pediatric Trauma Center, Robert Wood Johnson University Hospital has an annual ED census of greater than 90,000 visits.

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

Qualified candidates must be ABEM/ABOEM certified/eligible. Salary and benefits are competitive and commensurate with experience.

Sub specialty training is desired but not necessary.

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

**Robert Eisenstein, MD, Chair, Department of Emergency Medicine
Rutgers Robert Wood Johnson Medical School
1 Robert Wood Johnson Place, MEB 104, New Brunswick, NJ 08901**
Email: Robert.Eisenstein@rutgers.edu
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Huntsville Hospital is a Level I Trauma Center and the Regional Referral Center for North Alabama and Southern Tennessee. Huntsville Hospital is Alabama's only Top 50 Heart Hospital by Truven Health Analytics and one of America's 50 Best Cardiac Surgery Programs by HealthGrades.

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

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



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